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**.01 CONCRETE PIPE**

**.01.01 General**

This specification covers the material requirements for circular concrete pipe to be used for the conveyance of storm water and sewage. All pipe materials shall meet the requirements of OPSS 1301, OPSS.MUNI 1820, this specification and be selected from the Approved Sewer Products List.

All pipe supplied shall be from a plant listed as Prequalified under the Plant Prequalification Program by the Ontario Concrete Pipe Association.

**.01.02 Classes and Uses of Concrete Pipe**

The classes of concrete pipe specified for various construction applications are outlined as follows:

- a) Reinforced Concrete Pipe:  
ASTM Designation C-76, Class III, or CSA A257.2, 65-D
- b) Reinforced Concrete Pipe:  
ASTM Designation C-76, Class IV, or CSA A257.2, 100-D
- c) Reinforced Concrete Pipe:  
ASTM Designation C-76, Class V, or CSA A257.2, 140-D

Reinforced concrete pipe shall be used for the construction of storm sewers, manhole channels, and inlet chamber drains which require pipe with an internal diameter of 300mm and larger.

**.01.03 Sulphate Resistant Portland Cement**

Portland cement used in the manufacture of concrete pipe shall be Type HS High Sulphate Resistant and meet the requirements of OPSS 1301. The type of cementing materials used shall be marked on each pipe in accordance with OPSS 1301.07.02.

**.01.04 Inspection and Testing**

Pipe manufacturers shall provide the City all reasonable facilities to permit the City representative to verify that the pipe conforms to the City's specification.

The pipe manufacturer shall provide the required test specimens, labour and testing equipment required to satisfy the City that the proposed pipe materials meets the specification.

The costs of all testing shall be at the expense of the pipe supplier and/or manufacturer.

**.02 CLAY PIPE**

**.02.01 General**

This specification covers the material requirements for circular clay pipe to be used for the conveyance of storm water, sewage, and industrial waste.

**.02.02 Classes and Uses of Clay Pipe**

Extra strength clay pipe shall be used for the construction of the following installations:

- a) Storm sewers, sanitary sewers and manhole channels up to and including pipe with an internal diameter of 600mm.
- b) Inlet chamber drains up to and including pipe with an internal diameter of 600mm, and inlet chamber drain risers up to and including pipe with an internal diameter of 250mm.
- c) Private sanitary drains and private sanitary drain risers for pipe with an internal diameter up to and including 250mm.
- d) Catch basin drains, catch basin drain risers, and manhole drop pipes for pipe up to and including an internal diameter of 250mm.

**.02.03 Inspection and Testing**

Pipe manufacturers shall provide the City all reasonable facilities to permit the City's representative to verify that the pipe conforms to the City's specification. The pipe manufacturer shall provide the required test specimens, labour, and testing equipment and machines to meet the quality assurance conditions of the City.

The costs of all testing shall be at the expense of the pipe supplier and/or manufacturer.

**.03 PVC PIPE**

**.03.01 General**

This specification covers the material requirements for circular PVC pipe to be used for the conveyance of storm water and sewage. All pipe materials shall meet the requirements of OPSS 1841, this specification and be selected from the Approved Sewer Products List, latest edition.

**.03.02 Classes and Uses of PVC Pipe**

The Standard Dimension Ratio (SDR) is the ratio of the average pipe diameter to the minimum wall thickness. The specified SDR values for main sewers and private drain laterals are as follows:

- a) SDR 35 for main sewer installations with a pipe diameter of 200mm up to and including 600mm.
- b) SDR 28 for private drains and laterals.
- c) Profile or Ribbed pipe is not accepted.

**.03.03 Inspection and Testing**

Pipe manufacturers shall provide the City all reasonable facilities to permit the City's representative to verify that the pipe conforms to the City's specification. The pipe manufacturer shall provide the required test specimens, labour, and testing equipment and machines to meet the quality assurance conditions of the City.

The costs of all testing shall be at the expense of the pipe supplier and/or manufacturer.

**.03.03.01 Pipe Stiffness**

The pipe stiffness shall be determined at 5 % deflection according to ASTM D2412. The minimum pipe stiffness requirements for SDR values of 35 and 28 shall be 50 and 100 respectively.

**.03.03.02 Internal Hydrostatic Pressure**

A typical joint assembly shall be subjected to an internal pressure of 74 kPa for 10 minutes without leakage.

**.03.03.03 Internal Vacuum**

A typical joint assembly shall be subjected to an internal vacuum of 74 kPa for 10 minutes without leakage.



**.05 BEDDING AND BACKFILL OF SEWERS**

**.05.01 General**

Bedding and backfill shall be conducted in accordance with the depths and widths specified on the standard drawings and/or on the Contract Drawings.

OPSS.MUNI 401.07.10 is revised by the following:

**.05.02 Bedding**

Bedding shall be Granular 'A' material conforming to Form 600, placed in accordance with SEW-300, SEW-301 and SEW-302. Granular 'A' bedding material shall extend to a minimum of 300mm above the top of pipe.

Granular 'A' bedding material shall be compacted in accordance with Form 900. Bedding shall be shaped and compacted adequately to support pipe barrel and bells as required.

**.05.03 Backfill**

Unless otherwise specified on the Contract Drawings or documents, trenches may be backfilled with select, approved native excavated earth materials from trenches. Where these materials are unavailable or deemed to be unsuitable, granular backfill shall be used.

Where Granular backfill is used, it shall be Granular "A" or "B" Type II, shall conform to Form 600 and shall be compacted in accordance with Form 900.

The use of unshrinkable fill shall be employed where normal means cannot produce the required compaction of the material.

**.06 CCTV SEWER INSPECTION**

**.06.01 Inspection Related Instructions**

- a. All works shall be in accordance with these Special Provisions and OPSS 409, with precedents being these Special Provisions.
- b. Unless otherwise specified, Inspect and code all observations in accordance to:
  - a) CSA PLUS 4012-10 “Canadian Standard Association Technical Guide - Visual inspection of Sewer Pipe”
  - b) NASSCO PACP “Pipeline Assessment Certification Program” – for mainline inspections.
  - c) NASSCO MACP “Manhole Assessment Certification Program” – for manhole inspections.
  - d) NASSCO LACP “Lateral Assessment & Certification Program” - for lateral inspections.
- c. Only NASSCO certified software shall be used for collection and management of inspection data. See <https://www.nassco.org/certified-software> for further details.
- d. Unless otherwise specified, the Contractor shall ensure that all sewers are completely clean and free of debris and ready for CCTV inspection.
- e. All CCTV inspection operators shall have been certified or re-certified under NASSCO PACP no more than three years prior to commencement of the Contract. The operator shall be fully conversant with picture interpretation and sewer condition assessment to identify any defects or deficiencies found within the sewer mains.
- f. The CCTV camera and illumination system shall be capable of providing a clean, accurate colour and in-focus record of the sewers internal condition and the inspection shall not proceed while the lens is dirty. The sewer section shall be kept clear of fog and the inspection shall not proceed while fog is present in the pipe. Operators shall ensure picture quality and clarity is maintained during the entire inspection. Lighting and focus should be adjusted to sufficiently illuminate and observe the circumference of the pipe during inspection.
- g. Pan and tilt to observe features, including all connections and defects of the pipe only when the camera has stopped at the desired distance. Video footage with evidence of pan and tilt movements while the camera is traveling will not be accepted by the City for review and payment.
- h. Maximum speed of the camera during the inspection shall not exceed 10 metres/minute.
- i. Upstream and downstream invert measurements taken from the surface must be completed for all inspected sewers, measurements are to be completed from the surface grade to the center of the channel not the benching and must be recorded as part of CCTV inspection header information.
- j. The Contractor will be held responsible for damage to street surfaces, curbs, gutters,

existing utilities, etc. that result from their negligence during any inspection. The Contractor shall repair, at their cost, any damage resulting there from, which shall be subject to approval, by the City.

- k. In the event any inspection equipment becomes lodged, lost or out of control in any way, there must be a contingency plan in place that has been prepared for these circumstances. The contingency plan must include, but not be limited to, public health and property, crew safety, and operational integrity of the sewer system. Any and all costs associated with the execution of this plan shall be the sole responsibility of the Proponent unless otherwise agreed to by the City's Project Manager. No claim for lost time will be considered due to this occurrence.
- l. All obstructions, defects, irregularities must be fully inspected and documented. The Contractor must inform the City's Project Manager or administrator immediately of any irregularities, such as locations of hazardous atmosphere, manhole lid missing, damaged or buried, debris blockage obstructing greater than 50% of the sewer cross-section and sewers that are in immediate danger of structural failure or collapsed. Where possible, the survey shall be reversed so that the extent of the blockage or collapse can be assessed.
- m. The Contractor, under the supervision of the Project Manager, or their representative, may install plugs in the sewers to prevent the flow of sewage during inspection for a period of no longer than 10 minutes. The plugs must then be removed for a minimum of 10 minutes after which time they may be installed again for the period stated above. Plugs shall only be installed when and for the time period directed by the Project Manager where the existing flow hinders a proper inspection.
- n. A sewer information screen in the format below shall be displayed for a minimum of 10 seconds at the start of all sewer inspections. Inspection shall not proceed while the information screen is being displayed. Example information screen below:

1	Contract No.: Cxx-xx-xx	Date: 20 Oct 2020
2	Asset ID / COMPKEY: 84322	Time: 16:00:00
3	Street Name: GRAHAM AVE S	Sewer Use: SS
4	Start MH ID: HM11E037	Finish MH ID: HM11E038
5	Start MH Address: 284 GRAHAM AVE S	Finish MH Address: 256 GRAHAM AVE S
6	Start MH Depth: 3.2m	Finish MH Depth: 3.4m
7	Survey Direction: D	Height: 300 mm
8	Material: VCP	Width: 300 mm
9	Segment Length: 80.4m	Pre-Cleaning: H
10	Weather: Dry	
11	CCTV Contractor: CCTV SPEC INC	

**\*Note: Depth measurement is Surface Grade to Invert**

- o. During the inspection, clearly display 'From' and 'To' Manhole IDs, travel chainage in meters, date and time, and street name on the periphery of the screen. Arrange the information to minimize interference with the inspection image. Defect code and description should appear on the screen while 'coding' for at least 5 seconds.





- p. During the inspection, the CCTV camera will be used to perform an internal scan of the start, finish and any uncharted manhole(s) found. Scanning shall include panning and tilting of the camera to observe the condition of the walls, steps, any connections present, and lastly the manhole lid.
- q. General data requirements for sewer main inspections shall be as follows:

Asset ID/Compkey	Only City of Hamilton assigned compkeys shall be used
Video Resolution	Minimum recorded video resolution must be 420 lines with an NTSC size of 720 x 480 at 29.97 frames/second
Video Format of digital CCTV	mp4
Timestamp	Time and date to be 24 hr military format for all settings
Database	Microsoft Access Database conforming to NASSCO data model
Sewer Main Video Files Naming Convention	Compkey_StartManhole_Date.mp4 Ex. 77230_HK07E062_20200624.mp4
Photograph Files Naming Convention	Compkey_Date_ObservationPosition_DefectCode.jpg Ex.77230_20200624_11.5_HVV.jpg
PDF Inspection Report Naming Convention	Compkey_StartManhole_Date.pdf Ex. 77230_HK07E062_20200624.pdf

**.06.02 CCTV Reports and submittals**

- a) Unless otherwise specified the Contractor shall submit the following once all inspections are complete:
  - o Microsoft Access Database structure shall be as specified in the latest NASSCO standard formatting for mainline (PACP), manhole (MACP), or lateral (LACP) inspections
  - o Inspection videos
  - o PDF inspection reports
  - o Project tracking sheet as directed by the City's Project Manager or administrator
  
- b) All submissions shall be made on a removable portable hard-drive or flash-drive (USB 3.0 compatible), of reliable quality and sufficient capacity to store the data set in its entirety. Inspection videos and reports shall be saved in separate folders and labelled accordingly. Hard drives will become the property of the City of Hamilton and will not be returned to the Contractor. All hard drives shall be properly labelled with the following submission information:
  - 1. Contractor's Name
  - 2. Contract Number
  - 3. Contact Person & Phone Number
  - 4. Date
  
- c) The Contractor is required to keep a record of all inspection material for the duration of the maintenance period, or a minimum of 3 years from the date of inspection.

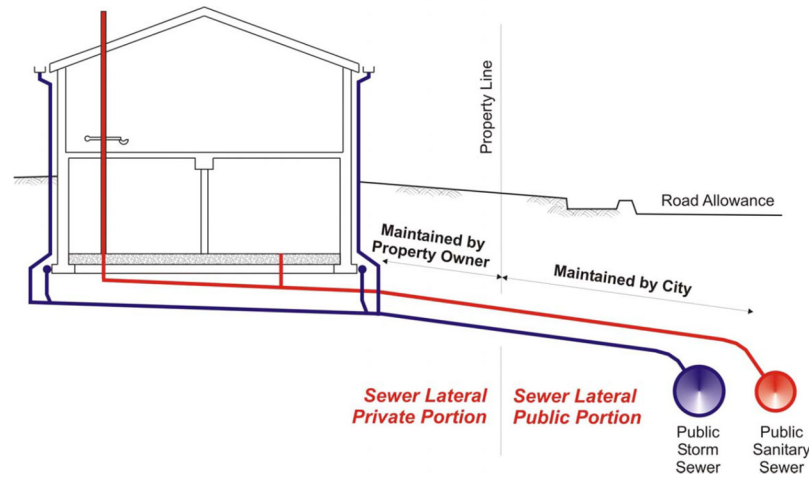
**.06.03 Occupational Health and Safety – Confined Space Entry**

- a. The Contractor shall ensure that all aspects of the required work are, at all times, in full and complete compliance with the Occupational Health and Safety Act, as amended.
  
- b. The Contractor shall provide approved equipment and training to personnel who enter confined spaces as may be required. The procedures the contractor follows for Confined Space Entry must meet or exceed the requirements outlined by the Occupational Health and Safety Act.

**.06.04 Lateral Inspection and Asset Inventory**

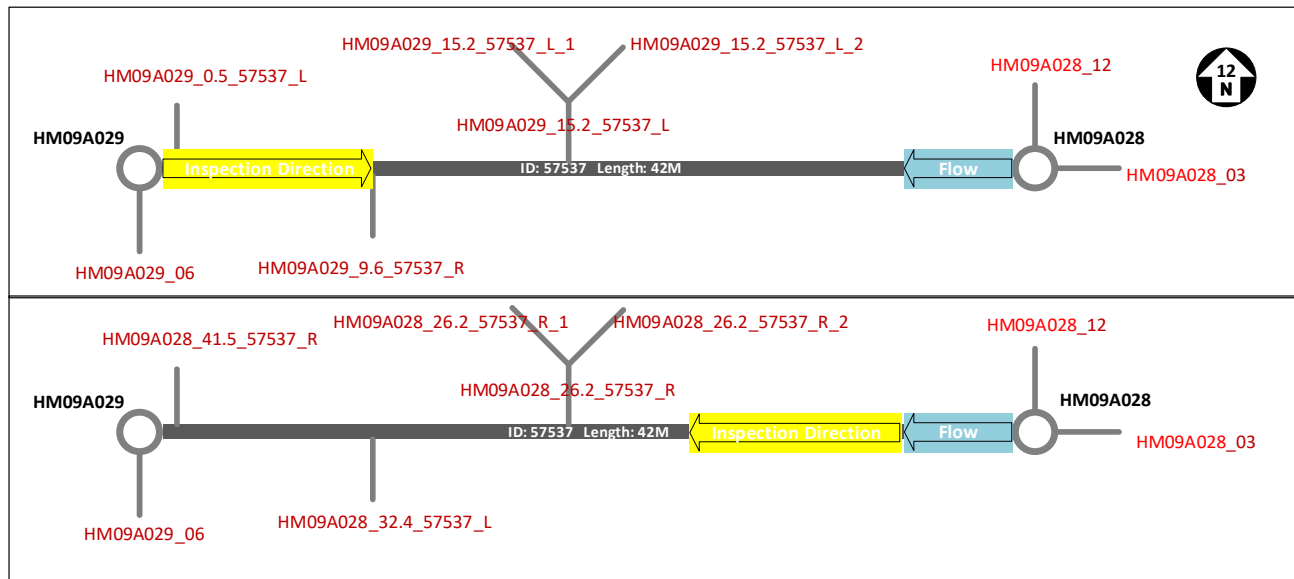
- a. A Sewer Lateral-Private Portion refers to the drain pipe extending from a building on private property to the Sewer Lateral-Public Portion. The Sewer Lateral-Private Portion may be used to convey either storm water, sanitary sewage, or a combination of the two. **Figure 1** outlines the location of the Sewer Lateral-Private Portion.

Figure 1: SEWER LATERAL OVERVIEW



- b. Unless otherwise specified, Contractors shall inspect laterals from the mainline sewer only and up to property line (public portion).
- c. Where sewer lateral inventory is not available, Contractors will be required to generate lateral inventory based on conditions observed during inspection in relation to the existing mainline sewer inventory. **Figure 2** outlines the methodology for lateral ID creation.

Figure 2: Sewer Lateral Inspection – Lateral ID Creation



**ID Components - Mainline Laterals (PACP Lateral\_Segment\_Reference field)**  
Starting Manhole ID\_Chainage\_Mainline ID\_Direction of Lateral

Start Manhole ID: The Hansen Manhole ID (MH\_ID\*)  
Chainage: Length in m to one decimal point from start manhole to lateral connection  
Mainline ID: The Hansen Mainline ID (COMPKEY\*)  
Direction of Lateral: L – Left, R – Right

\*City of Hamilton GIS layer field name reference

**ID Components - Manhole Laterals**  
Manhole ID\_Clock Position

Manhole ID: The Hansen Manhole ID  
Clock Position: North is 12 o'clock

- d. A lateral information screen in the format below shall be displayed for a minimum of 10 seconds at the start of all lateral inspections. Inspection shall not proceed while the information screen is being displayed. Example information screen below:

1	Contract No.: Cxx-xx-xx	Date: 20 Oct 2020
2	Sewer Main ID / COMPKEY: 84322	Time: 16:00:00
3	Lateral ID: HM11E037_3.2_84322_R	Sewer Use: SS
4	Start MH ID: HM11E037	Height: 150 mm
5	Chainage from Start MH: 3.2	Width: 150 mm
6	Address: 284 GRAHAM AVE S	Pre-Cleaning: H
7	Lateral Survey Direction: U	Weather: Dry
8	Material: VCP	
9	Segment Length: 10 m	
10	CCTV Contractor: CCTV SPEC INC	

- e. General data requirements for lateral inspections shall be as follows:

Asset ID	Lateral IDs will have the format: StartManhole_Chainage_Compkey_Direction of Lateral Ex. HK07E062_41.5_77230_R As outlined in <b>Figure 2</b>
Video Resolution	Minimum recorded video resolution must be 420 lines with an NTSC size of 720 x 480 at 29.97 frames/second
Video Format of digital CCTV	mp4
Timestamp	Time and date to be 24 hr military format for all settings
Database	Microsoft Access Database conforming to NASSCO data model
Lateral Video Files Naming Convention	StartManhole_Chainage_MainlineID_Direction of Lateral Ex. HK07E062_41.5_77230_R.mp4 <b>V3: additional suffix to indicate a post-rehab video</b> Ex. HK07E062_41.5_77230_R_V3.mp4
Photograph Files Naming Convention	Compkey_Date_ObservationPosition_DefectCode.jpg Ex. HK07E062_41.5_77230_R.jpg
PDF Inspection Report Naming Convention	StartManhole_Chainage_MainlineID_Direction of Lateral Ex. HK07E062_41.5_77230_R.pdf <b>V3: additional suffix to indicate a post-rehab video</b> Ex. HK07E062_41.5_77230_R_V3.pdf