

**THE REGIONAL MUNICIPALITY
OF PEEL
STANDARD SPECIFICATIONS
FOR
SANITARY SEWERS**

**The Regional Municipality of Peel
Standard Specifications for Sanitary Sewers**

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S.1 GENERAL

The Regional Municipality of Peel, Public Works (PW) Design, Specifications & Procedures Manual shall form a part of these Contract Documents.

The following Ontario Provincial Standard Specifications shall also form a part of the contract documents:

- OPSS 415 Tunneling
- OPSS 416 Jacking and Boring
- OPSS 503 Site Preparation for Pipelines
- OPSS 504 Preservation, Protection and Reconstruction of Existing Facilities
- OPSS 514 Trenching, Backfilling and Compacting
- OPSS 515 Rock Excavation for Pipe Lines and Associated Structures
- OPSS 516 Excavation, Backfilling and Compaction for Manholes and Valve Chambers
- OPSS 517 Dewatering
- OPSS 538 Shoring and Bracing

S.2 SCOPE

The Contractor shall furnish all the necessary materials, labour, tools, plant and equipment to construct sewage works in accordance with the Contract Documents and Drawings.

S.3 MATERIALS

S.3.1 General

Pipe size and class shall conform to the requirements shown on the contract drawings and/or specified in the Special Provisions. Pipe material shall be selected in accordance with the Material Specifications unless otherwise specified on the contract drawings and/or in the Special Provisions.

S.3.2 Non-Pressure Pipe

Supply type and class of pipes specified in the Special Provisions section and/or indicated on the drawings. The pipe shall conform to the Regional Municipality of Peel – Material Specification, Sanitary Sewer/Forcemains.

S.3.3 Pressure Pipe

Supply type and class of pipe specified in the Special Provisions and/or indicated on the drawings. The pipes shall conform to the Regional Municipality of Peel - Material Specification, Sanitary Sewer/Forcemains.

Tees, bends, valves shall be as specified and shall conform to the Regional Municipality of Peel - Material specification - Material Specification, Sanitary Sewer/Forcemains.

S.3.4 Pre-cast Maintenance Holes

Pre-cast maintenance holes shall be constructed to the Region of Peel standards in accordance with Standard Drawings.

All maintenance holes shall be manufactured to the current applicable A.S.T.M. specifications.

The Contractor shall submit to the Project Manager or designate Shop Drawings for cast-in place manholes for approval.

S.3.5 Cement Mortar

Cement mortar shall be composed of one part portland cement to three parts of sand by volume, mixed dry with enough water added subsequently to give the proper consistency. Mortar shall be freshly mixed for the work on hand and no mortar shall be used that has become hard or that has aged one hour. The cement shall be of a brand that shall meet all the requirements of the specifications for portland cement, as set forth in the current A.S.T.M. specification. The sand used shall consist of clean, sound, sharp and durable grains, free from dirt, dust or clay or other harmful substances. It shall be uniformly graded from 100% passing No. 4 sieve and not more than 10% passing the No. 100 sieve and when tested by the colourimetric method, shall not show a darker colour than a very light amber. The water used shall be clean and free from oil, acids, salts and other injurious substances.

S.3.6 Concrete

Concrete for benching or blocking shall conform to the requirements of OPSS 1350 with a nominal minimum twenty-eight (28) day compressive strength of 15 MPa.

Concrete for precast manholes to conform to the requirements of OPSS 1351.

S.3.7 Pipe Bedding Materials

Bedding material shall be placed as per Standard Drawings unless otherwise specified on the Contract Drawings.

All granular bedding and material shall conform to the requirements of OPSS 1010.

All concrete bedding material shall conform to the requirements of OPSS 1350 with a nominal minimum twenty-eight (28) day compressive strength of 15 MPa.

All approved native material shall be free from frozen lumps, cinders, ashes, asphalt refuse, organic matter, rocks and boulders or other deleterious materials.

S.4 CONSTRUCTION

S.4.1 Transporting, Unloading and Storing Pipe

Delivery and unloading of pipes and fittings at the job site shall cause the least possible delay to traffic.

All pipes, specials, fittings and gaskets that are unsound or damaged shall be removed from the site and replaced. Faded and discoloured PVC pipe are unacceptable and shall be removed from site and replaced.

Mechanical equipment shall be used to unload the pipe.

Materials shall be placed in a safe storage location and the manufacturer's handling and storage recommendations shall be followed.

S.4.2 Installation of Pipes

Pipes shall, at all times, be handled with care to avoid damage. Damaged pipe shall be removed and replaced at the Contractor's expense.

Pipe shall be lowered into the trench carefully and shall be laid with Bell ends facing the direction of laying, unless otherwise directed by the Engineer.

Pipes shall be handled with special care during temperatures below freezing and as required by the manufacturer. All work shall be protected from freezing. Pipes and bedding materials shall not be laid on frozen ground.

Pipes shall be laid on the prepared bed, true to the line and grade as shown on the Contract Drawings. The barrel of each pipe shall be in contact with the shaped bed throughout its full length.

Pipe shall be kept clean as work progresses. Water shall not be allowed to flow through the pipe during construction. The trench shall be kept in dry condition and pipe shall not be laid in water. A removable watertight bulkhead (not applicable for sanitary sewer

replacement) shall be installed at the open end of the last pipe laid whenever work is suspended.

Pipe shall not be laid until the preceding pipe joint has been completed and the pipe is carefully embedded and secured in place.

S.4.3 Pipe Bedding and Backfill

Bedding materials shall be placed as shown on the Standard drawing 2-3-1 unless otherwise shown on the Contract Drawings. The bed shall be shaped true to line and grade, free from depressions and high points. Bedding materials shall be placed in the trench to the grades of the bottom of the pipe. The pipe shall then be lowered to the trench and laid on the bedding material which shall be shaped to conform to the bell end of the pipe. The remaining bedding material shall be placed simultaneously on each side to the spring line of the pipe.

Where concrete bedding is specified, the pipe shall be supported on grade and alignment by solid concrete block having the same minimum compressive strength as the specified bedding, spaced so that no movement of the pipe occurs during placement of concrete.

At pipe joints, bedding materials shall be left clear of the joints to permit their completion as specified elsewhere. After the connection has been completed, approved bedding material shall be placed under the joint and thoroughly tamped to the compaction specified.

Pipe bedding and backfill shall be compacted as follows:

- | | |
|---|-------------------------------|
| a) Bedding Material | 100% Standard Proctor Density |
| b) Backfill Material | |
| i) Under pavement, gravel road, driveway gravel shoulder, sidewalk, curb and within 1.5 m of the edge of pavement | 100% Standard Proctor Density |
| ii) Other areas | 95% Standard Proctor Density |

Unshrinkable fill is to be used when specified by the Special Provisions and/or Road Cut Permit and/or shown on drawings. It shall conform to OPSS 1359.

Trench excavations backfilled with unshrinkable fill shall be covered with:

- a) Steel plates rated for minimum of H-20 loading in paved areas, driveways and areas used by vehicles, as per STD DWG 5-1-4.
- b) Wood planks or other approved material in areas used by pedestrians.

S.4.4 Jointing Pipes

S.4.4.1 General

Joint surfaces shall be clean. Pipe ends shall be lubricated with material recommended by the pipe manufacturer.

Manufacturer's instructions for jointing pipes shall be followed.

Pipes shall be aligned to previously laid pipe.

Pipe shall be pulled or pushed only by hand or power operated winch. A backhoe shall not be used for pushing pipe.

Joints shall be prevented from opening after the pipe has been laid.

S.4.4.2 Jointing Polyvinyl Chloride (PVC)

If gaskets are supplied separately; clean gaskets shall be inserted into the clean groove of the bell end of the pipe.

The spigot shall be lubricated. The spigot end shall be inserted and pushed into the bell up to but not beyond the depth of the stop reference mark.

Field cut pipe shall be uniform and square; bevel and insertion distance mark shall be same, corresponding to that of the factory pipe of the same diameter.

S.4.4.3 Jointing Concrete Pipe

Clean both the bell and spigot.

Place gasket on the end of the spigot and lubricate as per manufacturer's specifications.

Insert the spigot end into the bell until seated as per manufacturer's specifications.

S.4.5 Cutting of Pipe

Whenever cutting of pipe is required, the pipe shall be cut in conformance with the recommendations of the pipe manufacturer.

S.4.6 Construction of Maintenance Holes

Maintenance holes shall be constructed wherever shown on the drawings and as directed by the Project Manager or designate in accordance with the Standard Drawings.

Care should be taken to place maintenance hole frames and covers securely and to exact grade as set out by the Project Manager or designate. All maintenance hole frames shall be thoroughly imbedded and held in place by cement mortar.

Moduloc shall be installed as required between the concrete and the cast iron maintenance hole frame and the frame shall be set in cement mortar at least 12 mm thick. Benching shall be composed of 20 MPa concrete; it shall be located as shown on the drawings and in accordance with Standard Drawing 2-1-4 and shall be carefully finished so that the final surface is smooth. Not more than two maintenance holes shall remain incomplete behind the point of pipe laying. Adequate protection and provision for traffic around incomplete maintenance holes must be provided.

S.4.7 Branches and Saddles

The Contractor shall supply and build into the sewer the number of branches and saddles required for sewer connections as shown on the drawings or as directed by the Project Manager or designate. Open ends of branches and saddles shall be sealed with approved stoppers. Notwithstanding the above, saddles may only be used with the written permission of the Project Manager or designate.

S.4.8 Installation of New Sewer Service Connections

The sanitary sewer connection shall be installed from the sewer to the property line or easement limit at the locations as indicated on the contract drawings or as directed by the Project Manager or designate in accordance with Standard Drawings. Sizes and types of fittings shall be as specified. The invert elevation or depth of the test fitting shall be furnished by the Project Manager or designate. Connections to the main sewer shall be made only with manufactured tees or approved saddles.

The ends of all connections shall be left exposed at the streetline for the inspector to inspect and to tie in the clean out for location and elevation. The Contractor shall place a length of 38 mm x 38 mm lumber of sufficient length to run vertically from the clean out to 150 mm below the ground surface.

No drilling or boring will be allowed except in special circumstances and only after obtaining the approval of the Project Manager or designate.

S.4.9 Bulkheads

The sewers under construction shall be bulkheaded, as required, in such a manner as to prevent infiltration or flushing water entering existing sewers. Installation of required bulkheads and their subsequent removal on completion of the work shall be at the Contractor's expense.

S.4.10 Sanitary Sewer Replacement

S.4.10.1 Sewage Flow

The Contractor shall take careful note that existing sanitary sewers and connections contain a steady flow of sanitary sewage. The volume of sewage flow may increase during wet weather. The Contractor shall take this matter under advisement when bidding for the contract.

The Contractor shall have on the site at all times pumping equipment in good working condition, for the purpose of maintaining the sewage flow. No sewer or service connection shall be blocked or partially blocked without

written permission from the Region of Peel Engineer. No separate payment shall be allowed to meet the requirements of this clause.

S.4.10.2 Disposal of Existing Material

The Contractor shall remove and dispose off site the existing sewer and maintenance holes as shown on contract drawings. Existing material shall be taken to an approved dump site rather than a Regional facility.

S.4.10.3 Service Connections

The Contractor shall remove and replace the existing sanitary lateral from the main to the property line. A new clean out tee is to be installed at the property line.

Any abandoned sections of services shall be plugged with concrete and capped at main.

Services shall be installed in accordance with Standard Drawings and in the location as shown on the contract drawings or as directed by the Engineer.

Existing sanitary sewer connections have to be transferred to the main sewer at the time the sewer is installed to maintain the service. Before the connection is transferred to the proposed sewer, the Contractor is required to allow and assist the Agency to inspect the condition of the sewer connection. No extra payment will be allowed for this.

If the condition of an existing sewer connection is unacceptable, the Agency will authorize the Contractor to replace the sewer connection, and the Contractor will receive payment for the replacement according to the tender price.

No drilling or boring will be allowed except in special circumstances and only after obtaining the approval of the Project Manager or designate.

The Contractor shall note that the locations of connections shown on the drawings are approximate only.

S.4.11 Boring/Tunneling

Notify the appropriate authority (Railway, MTO, etc.) and schedule work accordingly.

Meet all requirements of the applicable Road Cut Permit Conditions.

Furnish and install welded steel casing pipe of the diameter, length and wall thickness specified, shown on drawings. Casing pipe shall be manufactured from structural grade steel conforming to CSA Specification G-40.1 and G-40.4 with electrically welded joints.

Supply the Project Manager or designate with detail drawings showing excavation, shaft, bracing, shoring and full description of the proposed tunnel construction procedure. Shaft drawings, bracing and shoring shall be certified by a Professional Engineer.

Tunnel/auger and jack the casing, advancing liner as materials are removed to complete crossing.

When installing sanitary sewer within steel liners, the following shall apply:

- 1) All casing spacers are to be made of T-304 stainless steel;
- 2) Bearing surfaces (runners) shall be ultra high molecular weight polymer or equivalent;
- 3) Positioning of spacers along the sanitary sewer is to be as per the manufacturer's specifications;
- 4) Position of pipe within liner to be centered and restrained, sufficient enough to provide no less than 19 mm ($\frac{3}{4}$ inch) clearance between the casing pipe and the outside diameter of the bell;
- 5) The sanitary sewer shall be restrained laterally for the entire length of the liner;
- 6) Liner to be sealed using wrap around rubber ends complete with stainless steel (T-304) banding.

Where the Contract, Project Manager or designate specifies, supply material and grout the sanitary sewer pipe inside the casing. Assure that grout fills all spaces between the sanitary sewer pipe and the casing shown on the contract drawings

Complete surface restoration at bore pit locations including any granular material asphalt, concrete, sod, topsoil, etc., to match existing or as specified.

S.5 FLUSHING AND TESTING

S.5.1 Flushing

The Contractor shall flush and thoroughly clean all sewers. The Contractor shall provide all equipment and water required for this operation. Access to water through approved meter permit or bulk water station only.

S.5.2 Test Requirement

S.5.2.1 Deflection Test

P.V.C. pipe shall be tested for any deflection after installation and prior to acceptance.

In the presence of the Project Manager or designate, the Contractor shall pull a plug or a ball through the installed pipe line not sooner than 24 hours after completion of backfilling. The plug or ball shall not be less than 95% of the minimum internal diameter of the new pipe.

Any deficiency shall be corrected at the Contractors expense and the sewer line shall be re-tested.

S.5.2.3 Field Testing

Field tests described in this subsection shall be conducted when specified in the Contract Documents and applied to sanitary and storm pipe sewers. All tests shall be carried out in the presence of and accepted by the Contract Administrator.

When specified in the Contract Documents, leakage tests shall be carried out on completed pipe sewers 1,200 mm in diameter and smaller. There shall be no visible leakage for pipe sewers larger than 1,200 mm in diameter.

Testing shall be carried out from maintenance hole to maintenance hole, including house service connections as work progresses.

The construction of new mainline sewers shall not proceed when three previously placed sections of the pipe have not been tested or have been tested and are unsatisfactory.

Leakage up to 25% in excess of the calculated limits shall be approved in any test section provided that the excess is offset by lower leakage measurements in adjacent sections such that the total leakage is within the allowable limits for the combined sections.

Pipe sections shall be repaired and retested, as required, until the test results are within the limits specified in this specification. Visible leaks shall be repaired regardless of the test results.

No part of the work will be accepted until the pipe sections are satisfactorily tested following completion of installation of service connections and backfilling.

S.5.2.4 Prequalification Leakage Tests

When specified in the Contract Documents, prequalification leakage tests shall be carried out as either infiltration or exfiltration tests as required.

The test shall be performed on the first section of the pipe sewer of each size, not less than 100 m in length, installed by each crew in order to prequalify the crew and the material. Tests may be carried out prior to service connections being installed in the section being tested.

When tests are unsatisfactory, the test shall be repaired and retested until satisfactory results are obtained.

S.5.2.5 Infiltration Test

Discontinue dewatering operations at least three days before conducting the test and allow the groundwater level to stabilize. Infiltration tests shall be conducted where the groundwater level at the time of testing is 600 mm or more above the crown of the pipe for the entire length of the test section. The test section is normally between adjacent maintenance holes.

A watertight bulkhead is constructed at the upstream end of the test section. All service laterals, stubs, and fittings are

plugged or capped to prevent water from entering at these locations. A V-notch weir or another suitable measuring device shall be installed at the downstream end of the test section. Infiltrating water is allowed to build up behind the weir until flow through the V-notch has stabilized. The rate of flow is then measured. The rate of flow shall not exceed the maximum allowable infiltration calculated for the test section. Allowable infiltration is calculated as 0.075 litres/millimeter diameter/100 metres of pipe sewer/hour.

S.5.2.6 Exfiltration Test

Exfiltration tests shall be conducted where the groundwater level is lower than 600 mm above the crown of the pipe or the highest point of the highest service connection included in the test section.

The test section is normally between adjacent maintenance holes. The test section of the pipe sewer shall be isolated by temporarily plugging the downstream end and all incoming pipes of the upstream maintenance holes. All service laterals, stubs, and fittings are plugged or capped to prevent water from entering at these sections.

S.5.2.7 Testing with Water

The test section shall be slowly filled with water making sure that all air is removed from the line. A period of 24 hours for absorption or expansion shall be allowed before starting the test, except if exfiltration requirements are met by a test carried out during the adsorption period.

Water shall be added to the pipeline prior to testing until there is a head in the upstream maintenance hole of 600 mm minimum over the crown of the pipe or at least 600 mm above the existing groundwater level, whichever is greater. The maximum limit of the net internal head on the line is 8 m. In calculating net internal head, allowance for groundwater head, if any, shall be made.

The distance from the maintenance hole frame to the surface of the water shall be measured. After allowing the water to stand for one hour, the distance from the frame to the surface of the water shall again be measured. The leakage shall be calculated using volumes.

The leakage at the end of the test period shall not exceed the maximum allowable calculated for the test section. Allowable leakage is calculated as 0.075 litres/millimetre diameter/100 metres of pipe sewer/hour.

An allowable of 3.0 litres per hour per metre of head above the invert for each maintenance hole included in the test section shall be made.

Maintenance holes shall be tested separately, if the test section fails.

S.5.2.8 Low Pressure Air Testing

The Contract Administrator may allow or require testing by use of air where water is not readily available or the differential head in the test section is greater than 8 m or freezing temperatures exist.

Air control equipment that includes a shut off valve, safety valve, pressure regulating valve, pressure reduction valve and monitoring pressure gauge with pressure range from 0 to 35 kPa with minimum divisions of 0.5 kPa shall be recorded.

The time taken for a pressure drop of 3.5 kPa shall not be less than the time shown in Table 1 for the appropriate size pipe.

If the results of an air test are marginal, the Contract Administrator may require the section to be retested using water.

S.5.2.9 Deflection Testing of Pipe Sewers

Ring deflection testing shall be performed on all pipe sewers constructed using plastic pipe. The allowable deflected pipe diameter is calculated as:

Pipes 100 to 750 mm:	7.5% of the Base Inside Diameter of the Pipe
Pipes Greater Than 750 mm:	5.0% of the Base Inside Diameter of the pipe

Where:

Base Inside diameter is defined in the C.S.A or A.S.T.M standard to which the pipe is manufactured.

A suitably designed device as defined shall be pulled through the pipe sewer to demonstrate that the pipe deflection does not exceed the allowable deflected pipe diameter. The device shall be pulled manually through the pipe not sooner than 30 days after completion of backfilling and installation of service connections.

The suitably designed device shall be a mandrel, cylindrical in shape, and constructed with an odd number of evenly spaced arms or prongs, minimum 9 in number. The minimum diameter of the circle scribed around the outside of the mandrel shall be measured between the points of contact on the mandrel arm or between sets of prongs. This length shall not be less than that shown in table 2.

The mandrel shall be checked with a go-no-go proving ring. The proving ring shall have a diameter equal to the allowable deflected pipe diameter ± 0.1 mm. An acceptable mandrel shall not pass through the proving ring. The proving ring shall be fabricated from steel a minimum of 6 mm thick.

Any section of the pipe that does not allow the mandrel to pass shall be considered to have failed the deflection test.

All section of the pipe that fail the deflection test shall be repaired and retested.

S.5.2.10 Cleaning and Flushing of Pipe Sewers

When specified in the Contract Documents, all pipe sewers shall be cleaned and flushed just prior to inspection and acceptance.

S.5.2.11 Clay Seals

Clay seals shall be placed as specified in the Contract Documents and compacted to 95% of the maximum dry density.

S.5.2.12 Concrete Appurtenances

Concrete appurtenances shall be constructed as specified in the Contract Documents. Concrete in concrete

appurtenances shall be placed according to OPSS 904. Steel reinforcement shall be placed according to OPSS 905. Steel grading shall be installed, when specified in the Contract Documents.

S.5.2.13 Maintenance Hole Inspection

Maintenance hole inspection is to completed once the base asphalt is layed.

S.5.2.14 Site Restoration

Site restoration shall be according to OPSS 507.

S.6 C.C.T.V. INSPECTION

S.6.1 Flushing

The sewer sections and maintenance holes must be clean before inspection.

If not, they shall be thoroughly flushed and all silt, debris, grease. Solid or semisolid material shall be removed at the down stream maintenance hole and disposed of at an authorized site. A high velocity truck mounted sewer flusher complete with its own water tank shall be used. A hydrant permit must be obtained for water tank filling for the procedure.

Precautions shall be taken to ensure that flooding or damage does not occur due to water pressures or the debris build-up resultant from flushing operations.

The flusher may also be used to draw down flows in instances where the pipe invert or entire pipe cannot be seen, but when the flusher is used for this purpose it must be noted when ponding problems are present.

S.6.2 Plugging/Blocking or By-Pass Pumping

Before plugging, blocking or by-passing of a section of sewer the Agency must approve the location and duration of the operation. Plugging, blocking or by-pass pumping is only to be used when the inspection is hampered by excessive flows of over 1/2 pipe. The Contractor must continually monitor flows so that no surcharging of the sewers in question occurs. (If flows are excessive, see by-pass pumping).

S.6.3. Plugging/Blocking

A sewer plug shall be inserted into the line at a maintenance hole upstream from the section to be inspected when sewer flows are above the minimum of 1/2 pipe and/or the inspection is impeded by heavy flows. The plug is required to substantially shut-off flows to permit inspection of the pipe. After the inspection is completed, flows will be returned to normal and the Project Manager shall be informed that the procedure is completed. Blocked flows must not be permitted to exceed existing building foundations or ground

levels. Where risk of property damage or environmental impact is high, trucking or by-pass pumping must be used.

S.6.4. Pumping or By-Passing

When adequate flow control cannot be obtained by plugging methods, pumps or siphons shall be used to divert all or a portion of the flows as may be necessary to perform the specified inspection. Excess sewage flows shall be transported through closed pipeline to a downstream manhole or by tank truck to the nearest approved disposal area. The Project Manager shall be informed once the procedure is completed and flows have returned to normal.

S.6.5 Inspection

Sewer inspections shall be performed to observe and record structural conditions, service defects and construction features, to assess thoroughness of cleaning, and to verify and assess the quality of new installations and rehabilitation works prior to acceptance.

- The inspection shall be a continuous unedited examination of the entire length of sewer main. The face of the start maintenance hole shall be clearly visible at the start of the inspection and the picture shall be in focus from the point of observation to a minimum of two pipe diameters ahead.
- The inspection will be performed on a single maintenance access chamber run, and is to begin and end in the center of a maintenance access chamber and shall be accurate to 1% of the actual sewer length as verified by a steel tape measurement in the field by the Contractor. Agency personnel, at its sole discretion, may check as to the accuracy of these measurements and payment will be adjusted accordingly.
- The inspection DVD recording will have a continuous chainage indicated and the maintenance access chamber numbers of the section being inspected on the screen at all times.
- The CCTV inspection of each sewer shall be done in the same direction as the sewer flow unless circumstances prevent this. If this occurs, the sewer main shall then be inspected against the flow, and this action shall be noted in the report and on the video at the beginning only.
- Prior to commencing an inspection, the Contractor will ensure that 75% of the diameter of the pipe is visible. The Contractor will be expected to camera inspect the entire length of the pipe.

Multiple attempts to camera inspect a section will be done at the Contractor's expense.

- The Contractor shall provide all necessary equipment to produce "fog free" conditions in the sewer. The Contractor will ensure the camera lens is free from debris to ensure high picture quality.
- Video with excessive fog will not be accepted and the sewer lines must be re-inspected at the Contractor's expense.
- The speed with which the inspection is performed must ensure that a clear image of the inside periphery of the pipe is provided. The maximum camera speed during inspection shall follow NAAPI specifications.
- If a fault or lateral is noted, the camera is to halt and a detailed (pan-and-tilt) inspection of the area is to be recorded. Pan and tilt operations will be done slowly so that all details of items noted in the report are fully captured. All connections are to be viewed as far as possible into the service.
- The Contractor shall provide all necessary equipment and labour to access locked down/bolted down maintenance holes, including proper securing of maintenance hole lids after completion of inspection.
- If inspection of an entire sewer cannot be completed due to collapse, excessive deformation or solid debris, intruding connections, obstructions, or large displaced joints, the equipment shall be moved to the downstream maintenance hole and inspection again attempted. If complete inspection still cannot be performed, the Contract Administrator shall be immediately advised. Jointly, the Contract Administrator shall decide to:
 - a) Abandon the inspection
 - b) Re-perform the inspection subsequent to:
 - i. Cleaning of sewer
 - ii. Performing solid debris cutting
 - iii. Removing intruding connections.
- The Contractor shall take careful note that the Region of Peel "Safety Procedures" requirements exceeds the minimum requirements of the Ontario Health and Safety Act. A minimum of one member of the Contractor's staff performing work at each work site on this contract shall possess a certificate of completion of a safety course equivalent to the Agency requirements. A proof of compliance with this clause shall be submitted at a meeting prior to the commencement of the Contract.
- For all work in and around the sanitary maintenance access chambers, a person qualified in Confined Space Entry shall be present. Proof of atmospheric testing of each maintenance access chamber where work was performed shall be submitted to the Agency on the Region of Peel Confined Space Entry form.

- The Contractor will ensure that all staff have been trained in the WRC format and that they are providing clear and accurate interpretations of this data.

S.6.6 Reports – Specifications

The Vender shall submit to the Agency the completed “TV Inspection Report” (as stipulated below) of work completed.

Each report shall contain:

- Exact distance from the starting maintenance hole to defects, abnormalities and general condition of the sewer line. All observations shall be coded in accordance with latest applicable version of WRC “Manual of Sewer Condition Classification”;
- The service connections with reference to the distance from starting maintenance hole and the periphery using standard clock position, i.e. 1 o'clock;
- The condition, type and depth of the maintenance hole and appurtenances in the system. Each report submitted shall include the Region of Peel designated maintenance hole numbers and zones;
- The on-screen display which will indicate the Contractor's name, the DVD Identification number, the job description (i.e. maintenance hole number to maintenance hole number etc.), the video recording chainage in metres, the location (street name and municipality), the date, pipe size and type of sewer, the maintenance hole type and condition, the compass direction of the flow, and if the inspection is being done against the flow.

S.6.6.1 Digital Video and Viewing Software Specifications

The inspection shall be captured in colour MPEG format (minimum video compression as provided by MPEG-2 standard) from the live video source to the computer hard drive with no frame loss. One complete single digital file shall be submitted for each inspection.

Digital video files shall meet the following minimum requirements:

- MPEG-2 Requirements:
Picture Size: NTSC 720 x 480 @ 29.97 frames per second
Data/Bit Rate: 4000 kbps
- Optional MPEG-4 Requirements:
Picture Size: NTSC 704 x 480 @ 29.97 frames per second
Data/Bit Rate: 4000 kbps

S.6.7 Equipment Requirements

S.6.7.1 Camera System

A pan-and-tilt closed circuit colour television self-contained camera capable of radial rotation of 360° and a lateral rotation of 270° and produce a continuous picture resolution of no less than 400 lines, equipped with a self-contained lighting system compatible with the camera lens angle, that will not create “shadows” or “hot spots”. It will be capable of inspecting sewers 200 mm to 1200 mm diameter for a minimum distance of 300 metres without reversal.

S.6.7.2 Monitoring System

A digital video recording system(s) synchronized micro-computer data recording equipment and an electronic distance encoding device. The individual recording, monitoring and distance measurement components will be appropriately interconnected to provide a totally integrated inspection system. The video recording equipment must also be capable of producing imbedded video overlays and indexing video chainage in metres. A Digital Video File must be available at all times for Emergency Works.

S.6.7.3 Displays

The displays shall be suitable character size, type, style, and colour to be clearly visible and easily readable. The display shall be placed in such a manner as not to interfere with the image of the video.

S.6.7.4 Electronic Distance Encoder

The sewer chainage will be measured simultaneously with the camera travel and recorded automatically using an electronic encoder.