

PART 1 - GENERAL

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| <u>1.1 RELATED REQUIREMENTS</u>                | .1 | Section 31 23 33 - Excavation Backfilling and Trenching   |
|  | .2 | Section HRWC Design and Construction Specifications   |
|  | .3 | Section Standard Specification for Municipal Services   |
| <u>1.2 REFERENCES</u>                          | .1 | American National Standards Institute/American Water Works Association (ANSI/AWWA)  |
|  | .1 | ANSI/AWWA B300-10, Standard for Hypochlorites.  |
|  | .2 | ANSI/AWWA B301-10, Standard for Liquid Chlorine.  |
|  | .3 | ANSI/AWWA B303-10, Standard for Sodium Chlorite.  |
|  | .4 | ANSI/AWWA C651-05, Standard for Disinfecting Water Mains.   |
|  | .5 | ANSI/AWWA C800-05, Standard for Underground Service Line Valves and Fittings.   |
|  | .2 | ASTM International  |
|  | .1 | ASTM B88M-05(2011), Standard Specification for Seamless Copper Water Tube.  |
|  | .3 | CSA International   |
|  | .1 | CAN/CSA-B137 Series-09, Thermoplastic Pressure Piping Compendium. (Consists of B137.0, B137.1, B137.2, B137.3, B137.4, B137.4.1, B137.5, B137.6, B137.8, B137.9, B137.10, B137.11 and B137.12). |
|  | .2 | CAN/CSA-B137.1-09, Polyethylene Pipe, Tubing, and Fittings for Cold-Water Pressure Services.  |
|  | .3 | CAN/CSA-B137.3-09, Rigid Polyvinyl Chloride (PVC) Pipe for Pressure Applications.   |
| <u>1.3 ACTION AND INFORMATIONAL SUBMITTALS</u> | .1 | Submit in accordance with Section 01 33 00 - Submittal Procedures.  |

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- .2 Product Data:
    - .1 Submit manufacturer's instructions, printed product literature and data sheets for distribution piping materials and include product characteristics, performance criteria, physical size, finish and limitations.
    - .2 Pipe certification to be on pipe.
- 1.4 CLOSEOUT  
SUBMITTALS
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- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
  - .2 Submit data to produce record drawings, including directions for operating valves, list of equipment required to operate valves, details of pipe material, location of air and vacuum release valves, hydrant details.
    - .1 Include top of pipe, horizontal location of fittings and type, valves, valve boxes, valve chambers and hydrants.
  - .3 Operation and Maintenance Data: submit operation and maintenance data for pipe, valves and valve boxes, for incorporation into manual.
- 1.5 DELIVERY,  
STORAGE AND HANDLING
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- .1 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
  - .2 Storage and Handling Requirements:
    - .1 Store materials in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
    - .2 Store and protect water distribution piping from nicks, scratches, and blemishes.
    - .3 Replace defective or damaged materials with new.
- 1.6 SCHEDULING OF  
WORK
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- .1 Schedule Work to minimize interruptions to existing services.
  - .2 Submit schedule of expected interruptions for approval and adhere to interruption schedule as approved by Departmental Representative.

- .3 Notify Departmental Representative and building occupants minimum of 24 hours in advance of interruption in service.
- .4 Do not interrupt water service for more than 3 hours unless otherwise authorized.
- .5 Notify fire department of planned or accidental interruption of water supply to hydrants.
- .6 Provide and post "Out of Service" sign on hydrant not in use.
- .7 Advise local police department of anticipated interference with movement of traffic.

PART 2 - PRODUCTS

2.1 SERVICE CONNECTIONS

- .1 Copper tubing: to ASTM B88M type K, annealed.
- .2 Ductile iron pipe: to ANSI/AWWA C151/A21.51 pressure class 52 cement mortar lined to ANSI/AWWA C104/A21.4.
- .3 Polyvinyl chloride pressure pipe: to CAN/CSA-B137.3, type 1120 series 160.
- .4 Copper tubing joints: compression type suitable for 1 MPa working pressure.
- .5 PVC joints: solvent welded in accordance with manufacturer's specifications.
- .6 Joints for ductile iron pipe: push-on joints to ANSI/AWWA C111/A21.11. Rubber gaskets to ANSI/AWWA C111/A21.11. Requirement to maintain electrical conductivity between pipes.
- .7 Brass corporation stops: compression type having threads to ANSI/AWWA C800.
- .8 Brass inverted key-type curb stops: red brass to ASTM B62, compression type.
  - .1 Curb stops to have adjustable cast iron service box with stem to suit depth of bury.
  - .2 Top of cast iron box marked "WATER".

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- .9 Service connections for PVC pipe:
    - .1 Service connections less than 100 mm: corporation stop, tapped to main using AWWA threads, complete with stainless service saddle. Service saddle to consist of circumferential band type complete with side bars and fingers, keeper bar, stud bolts, nuts, washers and gaskets.
    - .2 Service connections 100 mm and over: use tee fitting.
  - .10 Bronze type service clamps: for PVC pipe service connections.
    - .1 Service clamps to be of strap-type, with confined "O" ring seal cemented in place.
    - .2 Clamps to be tapped with threads to ANSI/AWWA C800.
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- 2.2 INSULATION
- .1 Insulation to ULC 701, type 4, for extruded polystyrene.
  - .2 Polyethylene Water Service Connection insulation
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- 2.3 PIPE BEDDING AND SURROUND MATERIAL
- .1 Granular material to: Section 31 23 33 - Excavating, Trenching and Backfill.
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- 2.4 BACKFILL MATERIAL
- .1 As indicated. 31 23 33 - Excavating, Trenching and Backfilling.
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- 2.5 PIPE DISINFECTION
- .1 Sodium hypochlorite to ANSI/AWWA B300 or liquid chlorine to ANSI/AWWA B301 to disinfect water mains.
  - .2 Disinfect water mains in accordance with Standard Specifications for Municipal Services.

PART 3 - EXECUTION

- 3.1 EXAMINATION .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for distribution piping installation in accordance with manufacturer's written instructions.
- .1 Visually inspect substrate in presence of Departmental Representative.
  - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
  - .3 Proceed with installation only after unacceptable conditions have been remedied.
- 3.2 PREPARATION .1 Clean pipes, fittings, valves, hydrants, and appurtenances of accumulated debris and water before installation.
- .1 Inspect materials for defects to approval of Departmental Representative.
  - .2 Remove defective materials from site as directed by Departmental Representative.
- 3.3 TRENCHING .1 Do trenching work in accordance with Section 31 23 33 - Excavating, Trenching and Backfilling.
- .2 Ensure trench depth allows coverage over pipe as indicated on drawings.
- 3.4 GRANULAR BEDDING .1 Place granular bedding material in uniform layers not exceeding 150 mm compacted thickness to depth as indicated.
- .2 Do not place material in frozen condition.
  - .3 Shape bed true to grade to provide continuous uniform bearing surface for pipe.
  - .4 Shape transverse depressions in bedding as required to suit joints.

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- .5 Compact each layer full width of bed to 95 % maximum dry density to ASTM D698.
  - .6 Fill authorized or unauthorized excavation below design elevation of bottom of specified bedding in accordance with Section 31 23 33 - Excavating, Trenching and Backfilling with compacted bedding material.
- 3.5 PIPE  
INSTALLATION
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- .1 Terminate building water service as indicated.
    - .1 Cap or seal end of pipe and place temporary marker to locate pipe end.
  - .2 Lay pipes to ANSI/AWWA C600 manufacturer's standard instructions and specifications.
    - .1 Do not use blocks except as specified.
  - .3 Join pipes in accordance with ANSI/AWWA C600 and manufacturer's recommendations.
  - .4 Bevel or taper ends of PVC pipe to match fittings.
  - .5 Handle pipe by methods recommended by pipe manufacturer. Do not use chains or cables passed through pipe bore so that weight of pipe bears on pipe ends.
  - .6 Lay pipes on prepared bed, true to line and grade.
    - .1 Ensure barrel of each pipe is in contact with shaped bed throughout its full length.
    - .2 Take up and replace defective pipe.
    - .3 Correct pipe which is not in true alignment or grade or pipe which shows differential settlement after installation greater than 10 mm in 3 m.
  - .7 Face socket ends of pipe in direction of laying. For mains on grade of 2% or greater, face socket ends up-grade.
  - .8 Do not exceed permissible deflection at joints as recommended by pipe manufacturer.

- .9 Keep jointing materials and installed pipe free of dirt and water and other foreign materials.
  - .1 Whenever work is stopped, install a removable watertight bulkhead at open end of last pipe laid to prevent entry of foreign materials.
- .10 Position and join pipes with equipment and methods approved by Departmental Representative.
- .11 Cut pipes in approved manner as recommended by pipe manufacturer, without damaging pipe or its coating and to leave smooth end at right angles to axis of pipe.
- .12 Align pipes before jointing.
- .13 Install gaskets to manufacturer's recommendations. Support pipes with hand slings or crane as required to minimize lateral pressure on gasket and maintain concentricity until gasket is properly positioned.
- .14 Avoid displacing gasket or contaminating with dirt or other foreign material.
  - .1 Remove disturbed or contaminated gaskets.
  - .2 Clean, lubricate and replace before jointing is attempted again.
- .15 Complete each joint before laying next length of pipe.
- .16 Minimize deflection after joint has been made.
- .17 Apply sufficient pressure in making joints to ensure that joint is completed to manufacturer's recommendations.
- .18 Ensure completed joints are restrained by compacting bedding material alongside and over installed pipes or as otherwise approved by Departmental Representative.
- .19 When stoppage of work occurs, block pipes in an approved manner to prevent creep during down time.

- .20 Recheck plastic pipe joints assembled above ground after placing in trench to ensure that no movement of joint has taken place.
- .21 Do not lay pipe on frozen bedding.
- .22 Do hydrostatic and leakage test and have results approved by Departmental Representative before surrounding and covering joints and fittings with granular material.
- .23 Backfill remainder of trench.

3.6 VALVE  
INSTALLATION

- .1 Install valves to manufacturer's recommendations at locations as indicated.
- .2 Support valves located in valve boxes or valve chambers by means of bedding same as adjacent pipe. Valves not to be supported by pipe.

3.7 SERVICE  
CONNECTIONS

- .1 Terminate building water service 1.5 m outside building wall opposite point of connection to main.
  - .1 Install coupling necessary for connection to building plumbing.
  - .2 If plumbing is already installed, make connection, otherwise cap or seal end of pipe and place temporary marker to locate pipe end.
- .2 Construct service connections at right angles to water main unless otherwise directed. Locate curb stops 1 m from main.
- .3 Tappings on ductile iron pipe, may be threaded without service clamps.
  - .1 Double strap service connections with galvanized malleable iron body and neoprene gasket cemented in place may be used.
- .4 Employ only competent workmen equipped with suitable tools to carry out tapping of mains, cutting and flaring of pipes.

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- .5 Install single and multiple tap service connections on top half of main, between 45 degrees and 90 degrees measured from apex of pipe.
  - .6 Tap main at 2:00 o'clock or 10:00 o'clock position only; not closer to joint nor closer to adjacent service connections than recommended by manufacturer, or 1 m minimum, whichever is greater.
  - .7 Leave corporation stop valves fully open.
  - .8 In order to relieve strain on connections, install service pipe in "Goose Neck" form "laid over" into horizontal position.
  - .9 Install curb stop with corporation box on services NPS 2 or less in diameter.
    - .1 Equip larger services with gate valve and castiron box.
    - .2 Set box plumb over stop and adjust top flush with final grade elevation.
    - .3 Leave curb stop valves fully closed.
  - .10 Place temporary location marker at ends of plugged or capped unconnected water lines.
    - .1 Each marker to consist of 38 x 89 mm stake extending from pipe end at pipe level to 600 mm above grade.
    - .2 Paint exposed portion of stake blue.
  - .11 All Water Service Connections fitted with Zinc 24-48 anode.
  - .12 All Water Service Connections are to be installed with pipe sleeve insulation.
  - .13 No joints between the shut-off valve and the building. Services greater than 20 metres are permitted one compression fitting every 20 metres.
- 3.8 HYDROSTATIC AND LEAKAGE TESTING
- .1 Do tests in accordance with Standard Specifications for Municipal Services.
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- .2 Provide labour, equipment and materials required to perform hydrostatic and leakage tests hereinafter described.
- .3 Notify Departmental Representative at least 24 hours in advance of proposed tests.
  - .1 Perform tests in presence of Departmental Representative.
- .4 Where section of system is provided with concrete thrust blocks, conduct tests at least 5 days after placing concrete or 2 days if high early strength concrete is used.
- .5 Test pipeline in sections not exceeding 365 m in length, unless otherwise authorized by Departmental Representative.
- .6 Upon completion of pipe laying and after Departmental Representative has inspected Work in place, surround and cover pipes between joints with approved granular material placed to dimensions indicated.
- .7 Leave valves, joints and fittings exposed.
- .8 When testing is done during freezing weather, protect valves, joints and fittings from freezing.
- .9 Strut and brace caps, bends, tees, and valves, to prevent movement when test pressure is applied.

### 3.9 PIPE SURROUND

- .1 Upon completion of pipe laying and after Departmental Representative has inspected Work in place, surround and cover pipes as indicated.
- .2 Hand place surround material in uniform layers not exceeding 150 mm compacted thickness as indicated.
- .3 Place layers uniformly and simultaneously on each side of pipe.

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- .4 Do not place material in frozen condition.
  - .5 Compact each layer from pipe invert to mid height of pipe to at least 95% of corrected maximum dry density.
  - .6 Compact each layer from mid height of pipe to underside of backfill to at least 90% of corrected maximum dry density.
- 3.10 BACKFILL
- .1 Place backfill material, above pipe surround, in uniform layers not exceeding 150 mm compacted thickness up to grades as indicated.
  - .2 Do not place backfill in frozen condition.
  - .3 Under paving and walks, compact backfill to at least 95% maximum density to ASTM D698.
    - .1 In other areas, compact to at least 90 % maximum density to ASTM D698.
- 3.11 FLUSHING AND DISINFECTING
- .1 Flushing and Disinfection operations as per Standard Specifications for Municipal Services.
  - .2 Flushing and disinfecting operations: witnessed by Departmental Representative and carried out by contractor.
  - .3 Notify Departmental Representative at least 2 days in advance of proposed date when disinfecting operations will begin.
- 3.12 SURFACE RESTORATION
- .1 After installing and backfilling over water mains, restore surface to original condition as directed by Departmental Representative.

END OF SECTION

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PART 1 - GENERAL

- 1.1 Related Requirements
- .1 Section 31 23 33- Excavating Trenching and Backfill
  - .2 Section Standard Specifications for Municipal Services.
- 1.2 References
- .1 American National Standards Institute/American Water Works Association (ANSI/AWWA)
    - .1 ANSI/AWWA C111/A21.11-07, Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
    - .2 ASTM International
      - .1 ASTM D3034-0, Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
      - .3 CSA International
        - .1 CSA-B182.1-11, Plastic Drain and Sewer Pipe and Pipe Fittings.
        - .2 CSA-B182.2-11, PSM Type Polyvinylchloride PVC Sewer Pipe and Fittings.
- 1.3 Administrative Requirements
- .1 Scheduling:
    - .1 Schedule Work to minimize interruptions to existing services and maintain existing sewage flows during construction.
    - .2 Submit schedule of expected interruptions for approval and adhere to approved schedule.
    - .3 Notify Departmental Representative and building occupants 24 hours minimum in advance of any interruption in service.
- 1.4 Action and Informational Submittals
- .1 Product Data:
    - .1 Submit manufacturer's instructions, printed product literature and data sheets for pipes and include product characteristics, performance criteria, physical size, finish and limitations.

- .2 Shop Drawings:
  - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Nova Scotia, Canada.
- .3 Certificates:
  - .1 Certification to be marked on pipe.
- .4 Test and Evaluation Reports:
  - .1 Submit manufacturer's test data and certification 2 weeks minimum before beginning Work.
- 1.5 Delivery, Storage and Handling
  - .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
  - .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
  - .3 Storage and Handling Requirements:
    - .1 Store materials in accordance with manufacturer's recommendations.
    - .2 Store and protect pipes from damage.
    - .3 Replace defective or damaged materials with new.

PART 2 - PRODUCTS

- 2.1 Plastic Pipe
  - .1 Type PSM Polyvinyl Chloride (PVC) for Gravity Laterals: to ASTM D3034
    - .1 Standard Dimensional Ratio (SDR): 28
    - .2 Nominal lengths: 6 m.
- 2.2 Service Connections
  - .1 Type PSM Poly (Vinyl) Chloride: to CSA-B182.2.
- 2.3 Pipe Bedding and Surround Materials
  - .1 Granular material to Section 31 23 33 Excavation, Trenching and Backfill.
- 2.4 Backfill Material
  - .1 As indicated.

PART 3 - EXECUTION

- 3.1 Examination .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for sewer pipe installation in accordance with manufacturer's written instructions.
- .1 Visually inspect substrate in presence of Departmental Representative.
  - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
  - .3 Proceed with installation only after unacceptable conditions have been remedied.
- 3.2 Preparation .1 Temporary Erosion and Sedimentation Control:
- .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways,
  - .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
  - .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.
- .2 Clean pipes and fittings of debris and water before installation, and remove defective materials from site to approval of Departmental Representative. Clean and dry pipes and fittings before installation.
- .3 Obtain Departmental Representative's approval of pipes and fittings prior to installation.
- 3.3 Trenching .1 Do trenching Work in accordance with Section 31 23 33 - Excavating, Trenching and Backfilling.

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- .2 Protect trench from contents of sewer or sewer connection.
  - .3 Trench alignment and depth require approval of Departmental Representative prior to placing bedding material and pipe.
- 3.4 Granular Bedding
- .1 Place bedding in unfrozen condition.
  - .2 Place granular bedding materials in uniform layers not exceeding 150 mm compacted thickness to depth as indicated.
  - .3 Shape bed true to grade and to provide continuous, uniform bearing surface for pipe.
    - .1 Do not use blocks when bedding pipe.
  - .4 Shape transverse depressions as required to suit joints.
  - .5 Compact each layer full width of bed to at least 95% corrected maximum dry density.
  - .6 Fill excavation below bottom of specified bedding adjacent to manholes or structures with compacted bedding material.
- 3.5 Installation
- .1 Lay and join pipes to: ASTM C12.
  - .2 Lay and join pipes in accordance with manufacturer's recommendations and to approval of Departmental Representative.
  - .3 Handle pipe using methods approved by Manufacturer.
    - .1 Do not use chains or cables passed through rigid pipe bore so that weight of pipe bears upon pipe ends.

- .4 Lay pipes on prepared bed, true to line and grade, with pipe invert smooth and free of sags or high points.
  - .1 Ensure barrel of each pipe is in contact with shaped bed throughout its full length
- .5 Begin laying at outlet and proceed in upstream direction with socket ends of pipe facing upgrade.
- .6 Joint deflection permitted within limits recommended by pipe manufacturer.
- .7 Whenever Work is suspended, install removable watertight bulkhead at open end of last pipe laid to prevent entry of foreign materials.
- .8 Install plastic pipe and fittings in accordance with CSA-B182.11.
- .9 Pipe jointing:
  - .1 Install gaskets in accordance with manufacturer's written recommendations.
  - .2 Support pipes with hand slings or crane as required to minimize lateral pressure on gasket and maintain concentricity until gasket is properly positioned.
  - .3 Align pipes before joining.
  - .4 Maintain pipe joints free from mud, silt, gravel and foreign material.
  - .5 Avoid displacing gasket or contaminating with dirt or foreign material. Gaskets so disturbed to be removed, cleaned and lubricated and replaced before joining is attempted.
  - .6 Complete each joint before laying next length of pipe.
  - .7 Minimize joint deflection after joint has been made to avoid joint damage.
  - .8 At rigid structures, install pipe joints not more than 1.2 m from side of structure.

- .9 Apply sufficient pressure in making joints to ensure that joint is complete as outlined in manufacturer's recommendations.
- .10 When stoppage of Work occurs, block pipes to prevent creep during down time.
- .11 Plug lifting holes with pre-fabricated plugs approved by Manufacturer set in shrinkage compensating grout.
- .12 Cut pipes as required for special inserts, fittings or closure pieces as recommended by pipe manufacturer, without damaging pipe or its coating and to leave smooth end at right angles to axis of pipe.
- .13 Make watertight connections to manholes.
  - .1 Use shrinkage compensating grout when suitable gaskets are not available.

### 3.6 Pipe Surround

- .1 Place surround material in unfrozen condition.
- .2 Upon completion of pipe laying, and after Departmental Representative has inspected pipe joints, surround and cover pipes as indicated.
  - .1 Leave joints and fittings exposed until field testing is completed.
- .3 Hand place surround material in uniform layers not exceeding 150 mm compacted thickness as indicated.
- .4 Place layers uniformly and simultaneously on each side of pipe.
- .5 Compact each layer from pipe invert to mid height of pipe to at least 95% corrected maximum dry density.
- .6 Compact each layer from mid height of pipe to underside of backfill to at least 95% corrected maximum dry density.
- .7 When field test results are acceptable to Departmental Representative, place surround material at pipe joints.

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- 3.7 Backfill
- .1 Place backfill material in unfrozen condition.
  - .2 Place backfill material, above pipe surround in uniform layers not exceeding 150 mm compacted thickness up to grades as indicated.
  - .3 Under paving and walks, compact backfill to at least 95% corrected maximum dry density
    - .1 In other areas, compact to at least 90% corrected maximum dry density.
- 3.8 Field Testing
- .1 Field Testing as per Standard Specifications for Municipal Services.
  - .2 Repair or replace pipe, pipe joint or bedding found defective.
  - .3 Remove foreign material from sewers and related appurtenances by flushing with water.
  - .4 Perform infiltration and exfiltration testing as soon as practicable after jointing and bedding are complete, and service connections have been installed.
  - .5 Do infiltration and exfiltration test to Standard Specifications for Municipal Services.
  - .6 Carry out tests on each section of sewer between successive manholes including service connections.
  - .7 Repair and retest sewer line as required, until test results are within limits specified.
  - .8 Repair visible leaks regardless of test results.
  - .9 Television and photographic inspections:
    - .1 Carry out inspection of installed sewers by video camera, digital camera or by other related means.
    - .2 Provide means of access to permit Departmental Representative to do inspections.

- .3 Payment for inspection services in  
accordance with Measurement and  
Payment.

END OF SECTION

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