

## **PART 1 - GENERAL**

### **1.1 RELATED SECTIONS**

1. The works listed in this division are included for information purposes only and are not exhaustive. The list does not exclude the works described in other divisions of the specifications, shown in the drawings or necessary for the completion of the work as described in the plans.
2. Section 31 05 16 – Aggregate materials.
3. Section 31 23 33.01 –Excavating, Trenching and Backfilling.
4. Section 33 41 00 – Sewer piping.

### **1.2 REFERENCES**

1. American Society for Testing and Materials International (ASTM)
    1. ASTM C117-04, Standard Test Method for Materials Finer than 75- $\mu$ m (No. 200) Sieve in Mineral Aggregates by Washing.
    2. ASTM C136-05, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
    3. ASTM C139 05, Standard Specification for Concrete Masonry Units for Construction of Catch Basins and Manholes.
    4. ASTM C478M 06, Standard Specification for Precast Reinforced Concrete Manhole Sections Metric.
    5. ASTM D698 00a, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft lbf/ft<sup>3</sup>(600 kN m/m<sup>3</sup>)).
  2. Canadian General Standards Board (CGSB).
    1. CAN/CGSB-8.1-88, Sieves, Testing, Woven Wire, Inch Series.
    2. CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.
  3. Canadian Standards Association, (CSA International)
    1. CAN/CSA-A23.1-04/A23.2-04, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
    2. CAN/CSA-G30.18-M92 (R2002), Billet-Steel Bars for Concrete Reinforcement.
    3. CAN/CSA-G164-M92 (R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.
  4. Ministère des Transports - Cahier des charges et devis généraux (CCDG) – Latest edition.
  5. Bureau de Normalisation du Québec (BNQ)
    1. NQ 1809-300 - Latest edition.
  6. Health Canada - Workplace Hazardous Materials Information System (WHMIS).
    1. Material Safety Data Sheets (MSDS).
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### **1.3 SUBMITTALS**

1. Submittals in accordance with Section 01 33 00 - Submittal Procedures.
2. Datasheets
  1. Submit manufacturer's product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
  2. Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets.
3. Quality assurance submittals: Submit the following in accordance with Section 01 45 00 - Quality Control.
  1. Certificates: Submit the certificates signed by manufacturer, attesting that products, materials and equipment comply with the specified performance characteristics and physical properties.

### **1.4 QUALITY ASSURANCE**

1. Pre-installation Meeting: Convene a pre-installation meeting one week prior to beginning the work of this Section, with the Contractor's representative and Departmental Representative in attendance. Address the following items:
  1. Project requirements.
  2. Installation and substrate conditions.
  3. Co-ordination with other building sub-trades.
  4. Manufacturer's installation instructions and warranty requirements.

### **1.5 DELIVERY, STORAGE AND HANDLING**

1. Packing, shipping, handling and unloading:
  1. Deliver, store and handle materials in accordance with manufacturer's written instructions.
2. Waste Management and Disposal
  1. Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

1. Precast manhole units: in accordance with ASTM C478M requirements, circular or egg-shaped.
    1. Precast reinforced concrete manhole units must be in accordance with NQ 2622-420 requirements and must have, among other, sealing gaskets made of rubber with characteristics that meet the requirements set out in appendix A of the NQ 2622-420 standard or ASTM C C443M standard.
    2. Butyl cords are only allowed in places where sealing gaskets made of rubber are used due to the geometry of the structures. The physical characteristics of butyl must comply either with the requirements of Appendix C of the NQ 2622-420 standard or ASTM C 990M standard. Cords butyl diameter must be specified by manufacturer of manholes and must be installed as recommended.
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3. The sealing gaskets in the pipe connecting joints to precast reinforced concrete manholes must be made of a rubber whose physical characteristics must comply either with requirements of appendix B of the standard NQ 2622-420 or ASTM C 923 M standard.
  4. The Contractor must check with the manufacturer if the gaskets are lubricated or not (see Figures 55a, 55b, 55c and 57 of the BNQ 1809-300 standard).
  5. The Contractor must install around each manhole a geomembrane with a minimal height of 1.8 meter, to protect the structures against uplift due to freezing. The geomembrane will be attached to the manhole with 2 pins.
    - a. Acceptable products:
      - 1) Tex-O-Flex from Solmax or equivalent.
      - 2) Geoflex from Innovex or equivalent.
      - 3) Substitute materials or products: approved as per addenda in accordance with the Instructions to Bidders.
  6. Parts for frames and buffers must be cast gray iron or ductile iron, as required by the NQ 3221-500 standard. Frames and buffers must be from the same manufacturer.
  7. The collar's framework must be cast gray iron or ductile iron. 50 mm collars are required on the works of cast iron installed in a surface made of concrete paving blocks.
  8. The frames and buffers of precast reinforced concrete manholes underneath the pavement must be self-adjusting with a buffer 775 mm in diameter, with two 25 mm lifting holes.
    - a. Acceptable products:
      - 1) Model C-50MS from Laperle or equivalent.
      - 2) Self-adjusting model 775 from Laroche or equivalent.
      - 3) Substitute materials or products: approved as per addenda in accordance with the Instructions to Bidders.
  9. The frames and buffers of precast reinforced concrete manholes located off the roadway must be standard with a buffer 775 mm in diameter, with two 25 mm lifting holes. The frames and buffer are gray cast iron.
    - a. Acceptable products:
      - 1) Model C-6S from Laperle or equivalent.
      - 2) Standard model 775 from Laroche or equivalent.
      - 3) Substitute materials or products: approved as per addenda in accordance with the Instructions to Bidders.
  10. Frames and grid of precast reinforced concrete catch manholes underneath the pavement must be self-adjusting with a buffer 775 mm in diameter
    - a. Acceptable products:
      - 1) Model C-50MS from Laperle (with a P-3V model grid) or equivalent.
      - 2) Self-adjusting model 775 from Laroche or equivalent.
      - 3) Substitute materials or products: approved as per addenda in accordance with the Instructions to Bidders.
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2. Catch basin structures in precast elements:
    1. Precast reinforced concrete catch basin must be in accordance with the requirements of the NQ 2622-420 standard and be fitted with seals made of rubber. Butyl cords are prohibited.
    2. The physical characteristics of the rubber must be in accordance with the requirements of either appendix A of the NQ 2622-420 standard or the ASTM C 443M standard.
    3. The sealing gaskets in the pipe connecting joints to the precast reinforced concrete catch basin must be made of a rubber with physical characteristics complying with either the requirements of appendix B of the NQ 2622-420 standard or the ASTM C 923 M standard.
    4. The Contractor must check with the manufacturer if the gaskets are lubricated or not (see Figures 60b, 61a and 61b of the BNQ 1809-300 standard).
    5. The Contractor must install around each catch basin a geomembrane with a minimal height of 1.8 m, to protect structures against uplift due to freezing. The geomembrane will be attached to the manhole with 2 pins.
      - a. Acceptable products:
        - 1) Tex-O-Flex from Solmax or equivalent.
        - 2) Geoflex from Innovex or edquivalent.
        - 3) Substitute materials or products: approved as per addenda in accordance with the Instructions to Bidders.
    6. The inside diameter of the catch basin must be 600 mm.
    7. The branch pipe must be PVC, class DR-28 and have a diameter of 150 mm.
    8. Frames must be cast gray iron and grids ductile iron. All these parts must comply with the requirements of the NQ 3221-500 standard. The frames, grid and extension collar must be from the same manufacturer.
      - a. Acceptable products:
        - 1) Model P-51A from Laperle (with a P-51AM model grid) or equivalent.
        - 2) Model SL-14-23 from Laroche (with a GSL-14-23-GO model grid) or equivalent.
        - 3) Substitute materials or products: approved as per addenda in accordance with the Instructions to Bidders.
    9. The frames and grids of precast reinforced concrete catch basin located under concrete paving blocks or off the roadway must be standard. The frames must be cast gray iron and grids ductile iron. All these parts must comply with the requirements of the NQ 3221-500 standard. The frames, grids and collars of frame (50 mm) must come from the same manufacturer.
      - a. Acceptable products:
        - 1) Model P-45A from Laperle or equivalent.
        - 2) 14 x 24 model with self-locking gate, high-capacity, from Laroche or equivalent.
        - 3) Substitute materials or products: approved as per addenda in accordance with the Instructions to Bidders.
  3. Granular materials seating and backfill: as specified in Section 31 05 16 - Aggregate materials.
  4. Dimensionally stabilized backfill: as specified in Section 31 23 33.01 - Excavation, trenching and backfilling.
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## **PART 3 - EXECUTION**

### **3.1 MANUFACTURER'S INSTRUCTIONS**

1. Compliance: Comply with the manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and data sheets.

### **3.2 EXCAVATION AND BACKFILL**

1. Excavate and backfill in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling, and as indicated.
2. Obtain approval of Departmental Representative before installing manholes or catch basins.

### **3.3 INSTALLATION**

1. Construct units in accordance with the details indicated, plumb and true to alignment and grade.
  2. Complete units as pipe laying progresses.
    1. Maximum of three units behind point of pipe laying will be allowed.
  3. Dewater the excavation to the satisfaction of the Departmental Representative and remove soft and foreign material before placing the concrete base.
  4. Place the precast concrete base on a granular bedding in accordance with the BNQ 1809-300 standard, latest edition.
  5. Precast manholes and catch basins:
    1. Install manholes and catch basins in accordance with standards.
    2. Make each successive joint watertight with rubber ring gaskets approved by the Departmental Representative.
  6. Sewers:
    1. Place stub outlets and bulkheads at elevations and position as indicated.
    2. The manhole base is to include a U-shaped channel.
      - a. The depth of this channel is to be equal to half of the diameter of the outlet pipe.
      - b. The manhole base is to be equipped with two adjacent benches, with a slope of 1:20.
      - c. Curve channel smoothly.
      - d. Slope channel to sewer grade.
  7. Compact backfill in accordance with Section 31 23 33.01 – Excavation, trenching and backfill of these specifications.
  8. Place frame and cover on top section to elevation as indicated.
  9. Clean units of debris and foreign materials.
    1. Remove fins and sharp projections.
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2. Prevent debris from entering the system.
10. Install safety platforms in manholes 5 m deep or deeper, as indicated.

### **3.4 ADJUSTING TOPS OF EXISTING UNITS**

1. Remove existing gratings and frames, and store for re-use at locations indicated by the Departmental Representative.
2. Sectional units:
  1. Raise or lower straight walled sectional units by adding or removing precast sections as required.
  2. Raise or lower tapered units by removing cone section, adding, removing, or substituting riser sections to obtain required elevation, then replace cone section.

### **3.5 SEALING OVER EXISTING UNITS**

1. Cut galvanized iron sheet to extend 50 mm beyond opening of existing manhole or catch basin grating.
  1. Center iron sheet over existing grating and spot or stitch weld to grating.
2. Fill with cast-in-place concrete.

### **3.6 FIELD QUALITY CONTROL**

1. The Departmental Representative will issue a Test Certificate for each manhole that has passed the test.
  2. Perform tests according to the NQ 1809-300 standard, latest edition. Also refer to the table at the end of Section 33 41 00 - Sewer pipe.
  3. Leak testing (article 11.2.2 of the NQ 1809-300 standard) :
    1. Perform tests as work progresses. If tests fail, make repairs and test again until specified criteria are met.
    2. Provide tight caps on the connections where privately owned sections are inexistent. When a privately owned section exists, submit the private party's working method. If the decision to install a lateral pipe and a section of pipe at street level to insert plugs during tests (NQ 1809-300, Figure 63), remove the section of pipe at the end of the tests up to the lateral pipe and seal with a tight cap.
    3. No mortar, grout or other coating or product will be applied to the works before testing. No product may be added to the water during soaking and leakage tests.
    4. Submit the method, and products selected for pipe and manhole repairs after a failed leak test to the Departmental Representative for acceptance.
    5. Repair defective seals in order to maintain original flexibility. Mortar or other rigid product is prohibited. Use only activated oakum, gels or approved equivalent.
  4. Additional video inspection or tests:
    1. The Departmental Representative reserves the right to carry out additional video inspections or tests at any time, from the since the end of the work up until final acceptance, at the Contractor's expense.
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**3.7 CLEANING**

1. Clean in accordance with Section 01 74 11 - Cleaning.
2. Upon completion of the work and performance tests, remove materials, surplus materials, rubbish, tools and equipment from the site.

**END OF SECTION**

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## **PART 1 - GENERAL**

### **1.1 RELATED SECTIONS**

1. The works listed in this division are included for information purposes only and are not exhaustive. The list does not exclude the works described in other divisions of the specifications, shown in the drawings or necessary for the completion of the work as described in the plans.
2. Section 01 33 00 - Submittal Procedures.
3. Section 01 74 21 – Construction/Demolition Waste Management and Disposal.
4. Section 31 23 33.01 – Excavating, Trenching and Backfilling.
5. Section 31 05 16 – Aggregate materials.
6. Section 33 05 13 – Manholes and Catch basin structures

### **1.2 SECTION INCLUDES**

1. Materials, equipment and installation methods relating to sewers.

### **1.3 REFERENCES**

1. American Society for Testing and Materials International (ASTM)
    1. ASTM C14M 99, Standard Specification for Concrete Sewer, Storm Drain and Culvert Pipe (Metric).
    2. ASTM C76M 02, Standard Specification for Reinforced Concrete Culvert, Storm Drain and Sewer Pipe (Metric).
    3. ASTM C117 95, Standard Test Method for Material Finer Than 0,075 mm (No. 200) Sieve in Mineral Aggregates by Washing.
    4. ASTM C136 01, Standard Method for Sieve Analysis of Fine and Coarse Aggregates.
    5. ASTM C428 97(2002), Standard Specification for Asbestos Cement Nonpressure Sewer Pipe.
    6. ASTM C443M 02, Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets (Metric).
    7. ASTM D698 00a, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft lbf/ft<sup>3</sup>(600 kN m/m<sup>3</sup>)).
    8. ASTM D1056 00, Standard Specification for Flexible Cellular Materials Sponge or Expanded Rubber.
    9. ASTM D1869 95(2000) Standard Specification for Rubber Rings for Asbestos Cement Pipe.
  2. Bureau de normalisation du Québec (BNQ)
    1. NQ 1809-300 – Latest edition.
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3. Ministère des Transports du Québec - Cahier des charges et Devis généraux (CCDG) – Latest edition
4. Canadian Standards Association, (CSA International)
  1. CAN/CSA-A3000-98 (April 2001), Cementitious Materials Compendium (Consists of A5-98, A8-98, A23.5-98, A362-98, A363-98, A456.1-98, A456.2-98, A456.3-98).
    - a. CAN/CSA-A5-F98, Portland Cement.
  2. CAN/CSA-A257 Series-M92 (R1998), Standards for Concrete Pipe.
5. Department of Justice Canada (Jus).
  1. Canadian Environmental Protection Act, 1999 (CEPA)
6. Transports Canada (TC)
  1. Transportation of Dangerous Goods Act, 1992 (TDGA)

#### **1.4 DEFINITIONS**

1. A pipe section is defined as length of pipe between successive catch basins and/or manholes.

#### **1.5 SUBMITTALS**

1. Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
2. Shop drawings are to indicate the proposed method to install protection piping under obstacles.
3. Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
4. Inform the Departmental Representative of the proposed source of bedding materials and provide access for sampling at least 4 weeks prior to commencing work.
5. Submit the manufacturer's test data and certification attesting that the pipes meet the requirements at least 2 weeks prior to commencing Work.
6. Pipe certification must be displayed on the pipes.
7. Submit one copy of manufacturer's installation instructions to the Departmental Representative.

#### **1.6 WASTE MANAGEMENT AND DISPOSAL**

1. Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

#### **1.7 WORK SCHEDULE**

1. Schedule work in such as way as to minimize existing service interruptions and to maintain the existing flow during construction.
  2. Submit a schedule of expected interruptions for approval and adhere to approved schedule, if necessary.
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## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

1. Reinforced concrete storm sewer pipes and fittings: in accordance with CAN/CSA-A257, ASTM C76M and NQ 2622-126 standards:
  1. Diameter of 300 mm and under: Class V
  2. Diameter of 375 mm and more: Class IV
2. Polyvinyl chloride (PVC) pipes for storm sewer pipes:
  1. Pipes and fittings of 150 mm and less: minimal resistance DR-28, minimum stiffness of 625 kPa.
  2. Pipes and fittings between 200 mm and 375 mm: minimal resistance DR-26, minimum stiffness of 790 kPa.
3. Polyvinyl chloride (PVC) pipes for sanitary sewer pipes:
  1. Pipes and fittings of 150 mm and less: minimal resistance DR-28, minimum stiffness of 625 kPa.
4. Foundation drain for roads and buildings:
  1. HDPE drains: smooth and corrugated perforated inner wall or equivalent, minimum stiffness of 320 kPa at 5% deflection.
    - a. Acceptable products:
      - 1) Solflo-Max with double bell with clips coupler from SOLENO.
      - 2) Substitute materials or products: approved as per addenda in accordance with the Instructions to Bidders.
  2. Geotextile: synthetic fiber nonwoven fabric consisting of polypropylene or polyester, in accordance with Section 31 32 19.01 – Geotextiles.

### **2.2 THERMAL INSULATION**

1. Insulation to be above the pipe:
  1. Acceptable products:
  2. HI-60 sheet 50 mm thick from DOW.
    - a. Substitute materials or products: approved as per addenda in accordance with the Instructions to Bidders.

### **2.3 MATERIALS AND SEAT COVER**

1. Granular materials: in accordance with Section 31 05 16 - Aggregate Materials.

### **2.4 BACKFILL MATERIAL**

1. As indicated.
  2. Backfill material: in accordance with Section 31 23 33.01 - Excavation, Trenching and Backfilling.
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3. Fill materials dimensionally stabilized: in accordance with Section 31 23 33.01 - Excavation, Trenching and Backfilling.

## **PART 3 - EXECUTION**

### **3.1 PREPARATIONS**

1. Clean pipes and fittings to remove debris and water before installation, and remove defective materials from site to the satisfaction of the Departmental Representative.

### **3.2 TRENCHING**

1. Perform trenching work in accordance with Section 31 23 33.01 - Excavating Trenching and Backfilling, as well as per CSST requirements.
2. Do not allow contents of sewer or sewer connection to flow into trenches.
3. Trench alignment and depth to be approved by the Departmental Representative prior to the placement of bedding material and pipes.

### **3.3 GRANULAR BEDDING**

1. Place bedding material that is not frozen.
2. Place granular bedding material based on manhole diameter. Refer to the BNQ 1809-300 standardized drawings for bedding thickness. Thickness indicated is after compacting.
3. Shape bed true to grade so as to create a continuous, even bearing surface for the pipe. Do not use blocks for pipe beds.
4. Create transverse depressions as required to fit the joints.
5. Compact each layer to the full width of the bed to at least 95% corrected maximum dry density.
6. Fill any excavation below the bottom of specified bedding near manholes or catch basins with compacted bedding material.

### **3.4 RESTRICTION ON USE OF 20 MM CLEAN STONE**

1. Notwithstanding the details of the plans and specifications for the bedding of pipes, manholes and catch basins, the Contractor will note that the use of 20 mm clean stone covered with a geotextile membrane to replace granular materials is permitted only if permission from the Departmental Representative has been granted. This restriction aims to reduce the use of this material in the works and to ensure that the usual dewatering methods have been implemented before considering this option to stabilize the excavation's cutting base (stable bed).

### **3.5 INSTALLATION**

1. Lay and join the pipe in accordance with the manufacturer's recommendations and to the satisfaction of the Departmental Representative.
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2. Handle the pipes using methods approved by the Departmental Representative.
    1. Do not use chains or cables passing through a rigid pipe so that the entire weight of the pipes bears down on pipe extremities.
  3. Lay the pipes on the prepared bed, true to line and grade with pipe inverts smooth and without low or high points.
    1. Ensure that the barrel of each pipe is in contact with the shaped bed throughout its full length.
  4. Begin laying at the outlet and proceed in the upstream direction with the female ends toward the top of the slope.
  5. Do not exceed the maximum joint deflection recommended by the pipe manufacturer.
  6. Do not allow water to flow through the pipes during construction unless expressly authorized by the Departmental Representative.
  7. Whenever work is suspended, install a removable watertight bulkhead at the open end of the last pipe laid to keep foreign materials from entering the pipe.
    1. Concrete pipes:
      - a. Install gaskets as recommended by the manufacturer.
      - b. Support the pipes with slings or with a crane as required to minimize lateral pressure on the gaskets and maintain the concentric alignment until the gasket is properly positioned.
      - c. Carefully align the pipes before joining.
      - d. Maintain pipe joints free from mud, silt, gravel and other foreign materials.
      - e. Avoid displacing the gaskets or contaminating them with dirt or other foreign materials. Remove disturbed or dirty gaskets; clean, lubricate and replace before joining is attempted.
      - f. Complete each joint before laying the next length of pipe.
      - g. Minimize joint deflection after joint has been made in order to avoid joint damage.
      - h. Apply sufficient pressure when joining pipes to ensure that the joint is achieved as outlined in the manufacturer's recommendations.
  8. When any stoppage of work occurs, restrain pipes as directed by the Departmental Representative in order to prevent creeping during down time.
  9. Plug lifting holes with Departmental Representative-approved prefabricated plugs, set in non-shrink grout.
  10. Cut pipes as required for special inserts, fittings or closure pieces, as recommended by the pipe manufacturer, without damaging the pipe or its coating and so as to leave smooth ends perpendicular to the axis of pipe.
  11. Make watertight connections to manholes and catch basins.
    1. Use non shrink grout when suitable gaskets are not available.
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12. Use prefabricated pipe ring saddles or approved connections made on site to connect pipes to existing sewer pipes.
  1. Joints are to be structurally sound and watertight.
13. Temporarily plug open upstream ends of pipes with removable watertight concrete, steel or plastic bulkheads.

### **3.6 CONCRETE THRUST BLOCKS FOR PIPE CONNECTIONS**

1. Make thrust blocks for sewer connections, as shown on the plans.
2. Place the two pipes at the same level. For pipes with a diameter of 300 mm or less, install a "Tridon" sleeve or approved equivalent before pouring the concrete thrust block. For pipes with diameters greater than 300 mm, use polythene tape extending each side of the joint by 300 mm instead of a "Tridon" sleeve.
3. Pour concrete with a minimum compressive strength of 25 MPa. The thrust block must be watertight.

### **3.7 PIPE DECOMMISSIONING**

1. Seal over pipes to be decommissioned in accordance with Article 10.6 (NQ 1809-300 standard) .
  1. When existing pipes are located within the boundaries of the trench, the Contractor will remove them and dispose of them in an appropriate site.
  2. When existing pipes are located outside the excavation trench, the Contractor will decommission them by filling them with a fluid cement-sand concrete mix.

### **3.8 THERMAL INSULATION**

1. Install insulation when minimum pipe cover is not achieved or at locations selected by the Departmental Representative, as per the details shown on the plans.
2. Install insulation above pipes or connections over a sufficient length to cover the entire section where the pipe cover is less than 2.1 meters.
3. Type 1 insulation is to be considered the minimum requirement included on the detailed plan. Increase the level of insulation based on the pipe cover, as shown on the detailed plan.

### **3.9 PIPE COVERING**

1. Place pipe covering material that is not frozen.
  2. Place layers evenly and simultaneously on either side of the pipe.
  3. Compact each layer from the pipe invert to the middle of the pipe to at least 95% corrected maximum dry density, in layers no more than 300 mm thick.
  4. Compact each layer from the middle of the pipe to the bottom of the backfilling material at least 90% maximum modified density per layer, no more than 300 mm thick or to the satisfaction of the Departmental Representative.
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### **3.10 BACKFILLING**

1. Place non-shrink backfilling material in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

### **3.11 FIELD TESTS**

1. Perform tests according to standard NQ 1809-300, latest edition. Also refer to the table at the end of this section.
  2. Repair or replace pipes, pipe joints or pipe bedding deemed defective.
  3. Flush water through the sewer pipes and related appurtenances to remove foreign materials.
  4. Leak testing (article 11.2.2 of the NQ 1809-300 standard) :
    1. Perform the tests as work progresses. If tests fail, make repairs and test again until specified criteria are met.
    2. Provide tight caps on the connections where privately owned sections are nonexistent. When a privately owned section exists, submit the private party's working method. If the decision to install a lateral pipe and a section of pipe at street level to insert plugs during tests (NQ 1809-300, Figure 63), remove the section of pipe at the end of the tests up to the lateral pipe and seal with a tight cap.
    3. No mortar, grout or other coating or product will be applied to the works before testing. No product may be added to the water during soaking and leakage tests .
  5. Additional video inspection or tests:
    1. The Departmental Representative reserves the right to carry out additional video inspections or tests at any time, from the since the end of the work up until final acceptance, at the Contractor's expense.
  6. Verifications using camera systems and carried out by a specialized company. The company will carry out CCTV inspections of the installed sewer pipes.
    1. Three (3) copies of the inspection results will be submitted to the Departmental Representative. The latter will carry out the quality control.
    2. Perform tests in accordance with the NQ 1809-300 standard, latest edition.
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**TABLE  
VERIFICATION OF WORKS (TESTS)**

Period		Combined or Sanitary Sewer				Stormwater Sewer			
		Pipes	Service connection	Manholes ≤ 900 ø	Manholes > 900 ø	Pipes	Service connection	Manholes	Catch basins
Before Substantial Performance of Work	- Cleaning (11.2.2.1 and 11.4.5)	√	√	√	√	√	√	√	√
	- CCTV inspection (11.2.2.1 and 11.4.1)	√		√	√	√		√	
	- Visual inspection (11.4.2)								√
	- Leak testing :								
	• Low air pressure leak test (11.2.4)	√	√						
	• Leak test by water exfiltration (11.2.5)			√					
	• Infiltration verification (11.2.3)	√	√	√	√				
	• Leak test on retention tank							√	
- Creep measurement to 5% accuracy level (11.5)	√				√				
Before finale payment	- Cleaning (11.5.2)	√	√	√	√	√			
	- Leak testing :								
	• Infiltration verification through flow measurements (11.2.1.8)	√	√	√	√				
- Creep measurement to 7,5% accuracy level (11.5)	√				√				

**END OF SECTION**