TENDER DOCUMENTS

SUBSECTION 6.86
SEWERS AND DRAINAGE

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SUBSECTION 6.86 SEWERS AND DRAINAGE

6.86.1 GENERAL

6.86.1.1 This subsection describes the requirements relating to the sewer and drainage work covered by this Contract.

6.86.1.2 Any specific requirements pertaining to the sewer and drainage work covered by this Contract are set out on the drawings and in Section 4 *Special Technical Conditions*.

6.86.2 MEASUREMENT UNITS

6.86.2.1 The measurement units and respective symbols thereof used in this subsection are described as follows:

Measurement Unit	Designation	Symbol
length	meter	m
length	millimeter	mm
length	micrometer	µm
angle plan	degree	°
force	kilonewton	kN
pressure	megapascal	MPa

6.86.3 REFERENCE STANDARDS

6.86.3.1 The **Contractor** shall carry out all sewer and drainage work in accordance with the requirements of the following standards and documents to which the provisions of this Contract are added:

6.86.3.2 (ASTM) ASTM International:

- ASTM D3350 *Standard Specification for Polyethylene Plastics Pipe and Fittings Materials*.

6.86.3.3 (BNQ) Bureau de normalisation du Québec:

- BNQ 2560-114 – *Travaux de génie civil – Granulats* – Partie II : *Fondation, sous-fondation, couche de roulement et accotement*;
- BNQ 3624-120 – *Tuyaux et raccords en polyéthylène (PE) – Égout pluvial et drainage des sols;*
- BNQ 3624-135 – *Tuyaux et raccords en polychlorure de vinyle non plastifié (PVC-U) – Égouts souterrains et drainage des sols;*
- BNQ 3624-907 – *Tuyaux et raccords en polyéthylène (PE) – Protocole de certification;*

- BNQ 1809-300 – *Travaux de construction – Clauses techniques générales – Conduites d'eau potable et d'égout;*

- BNQ 2622-126 – *Tuyaux et branchements latéraux monolithiques en béton armé et non armé pour l'évacuation des eaux d'égout domestique et pluvial;*

- BNQ 2622-420 – *Regards d'égout, puisards, chambres de vannes et postes de pompage préfabriqués en béton armé;*

- BNQ 2622-951 – *Tuyaux et branchements latéraux monolithiques en béton armé et non armé, et regards d'égout, puisards, chambres des vannes et postes de pompage préfabriqués en béton armé – Protocole de certification;*

- BNQ 3624-110 – *Tuyaux en polyéthylène (PE) – Évacuation des eaux de ruissellement, le drainage des sols, les ponceaux*;

- CAN/BNQ 2501-255 – Sols – *Détermination de la relation teneur en eau-masse volumique sèche – Essai avec énergie de compactage modifié (2 700 KN-m/m^3)*.

6.86.3.4 (MTQ) Ministère des Transports du Québec:

- MTQ – *Cahier des charges et devis généraux* (CCDG);

- MTQ – *Normes – Ouvrages routiers* – Tome II – chapitre 3 – *Drainage;*

- MTQ – *Normes – Ouvrages routiers* – Tome III – chapitre 4 – *Ponceaux*;

- MTQ – *Normes – Ouvrages routiers* – Tome VII – chapitre 7 – *Tuyaux et accessoires*.

6.86.4 MATERIALS

6.86.4.1 PIPES

6.86.4.1.1 Concrete pipes

6.86.4.1.1.1 The reinforced concrete pipes, including the waterproof seals and the fittings, shall comply with standard BNQ 2622-126.

6.86.4.1.2 Polyvinyl chloride (PVC) or high-density polyethylene (HDPE) pipes

6.86.4.1.2.1 No plastic already used or recycled shall be used in the manufacture of the pipes.

6.86.4.1.2.2 The pipes, including the socket fittings and seals, shall comply with standard BNQ 3624-135 for the PVC pipes and with standard ASTM D3350 for the HDPE pipes.

6.86.4.1.3 Granular materials

6.86.4.1.3.1 The MG and CG type granular materials shall, after placement thereof, comply with standard BNQ 2560-114.

6.86.4.2 PERFORATED DRAIN AND GEOTEXTILE

6.86.4.2.1 Polyethylene pipes

6.86.4.2.1.1 The perforated polyethylene pipes, including the geotextile sock, the sockets and the couplings, shall comply with standard BNQ 3624-110.

6.86.4.2.2 Filter materials

6.86.4.2.2.1 The filter materials shall comply with the following standards:

6.86.4.2.2.1.1 the BC 5-20 and BC 80 µm – 5 materials and the aggregate shall comply with Table 1 of standard BNQ 2560-114;

6.86.4.2.2.1.2 the soil and the granular materials for the pad, covering, anti-contaminant layer and filter layer shall comply with standard BNQ 2560-114.

6.86.4.2.3 Granular materials for backfilling

6.86.4.2.3.1 The MG20 granular materials shall be used. They shall, after placement thereof, comply with standard BNQ 2560-114 and meet the intrinsic and complementary properties of a granular sub-base material.

6.86.4.3 MANHOLES, CATCH BASINS, MANHOLES-CATCH BASINS AND ACCESSORIES

6.86.4.3.1 Precast reinforced concrete manholes, catch basins and manhole-catch basins

6.86.4.3.1.1 The precast reinforced concrete manholes, catch basins and manhole-catch basins shall comply with standard BNQ 2622-420. They, as well as related accessories thereof, shall be watertight. The manholes and manhole-catch basins may require one or more levels, as indicated on the drawings. The implementation of the levels shall comply with standard BNQ 1809-300.

6.86.4.3.2 Accessories

6.86.4.3.2.1 The catch basin frames, grids, covers, riser rings and traps shall comply with MTQ standard 7202 *Cadres, grilles, tampons, cales de rehaussement et trappes de puisard*.

6.86.4.3.3 Granular materials

6.86.4.3.3.1 The MG type granular materials shall, after placement thereof, comply with standard BNQ 2560-114.

6.86.5 EXECUTION OF WORK

6.86.5.1 PIPES

6.86.5.1.1 The pipe implementation shall comply with standard BNQ 1809-300. The choice of the granular materials shall however comply with chapter IV of Tome III of MTQ.

6.86.5.1.2 The handling, storage and transportation of all elements shall be carried out so as to eliminate the risk of scaling, cracking and bending stress.

6.86.5.1.3 The elements shall be assembled and installed according to the alignments and levels indicated on the drawings, starting with the downstream end of the structure.

6.86.5.1.4 The **Contractor** shall execute the support cushion with the accuracy required to ensure the closure of the joints between all the structure components. Two (2) 600 mm wide layers of geotextile shall be placed at each joint.

6.86.5.1.5 The openings in the walls of a structure shall be drilled with a rotary tool. The hole diameter shall match that of the harness or coupling ring to ensure the joint tightness. The cutting of an element shall be carried out using a saw.

6.86.5.2 PERFORATED DRAIN AND GEOTEXTILE

6.86.5.2.1 The trenching shall be carried out from downstream to upstream, so as to be able to implement a drain according to the drawings. If the soil at the bottom of the trench is organic, unstable or saturated, it shall be removed and replaced with a filter granular material of the same type as the filter material to be used for the implementation of the drain in order that a sufficient load bearing capacity will be obtained after compaction.

6.86.5.2.2 In no case shall the installation of the filtering underground drain be carried out on frozen or muddy ground. The longitudinal profile shall strictly follow the lines and levels indicated on the drawings, starting with the drain outlet. The pipe joints shall be assembled according to the manufacturer's recommendations. The placement of the filter material shall be done with care around the perimeter of the pipe and shall be densified by uniform 300 mm thick layers or according to the thicknesses required for the confection of the filters.

6.86.5.2.3 The backfilling of the trench above the tile filter drain shall quickly follow the drain installation so that there is no release of the stresses of the trench walls in the ground. The trench filling materials shall be of the same kind as those from the excavation, or meet the requirements for the different pavement levels penetrated. The compaction shall be carried out to the compactness required for the different pavement levels penetrated, by uniform 300 mm thick layers. This work shall be carried out without damaging or displacing the pipe.

6.86.5.2.4 The installation of the filter drain shall be carried out in accordance with the drawings.

6.86.5.2.5 The construction at a drain outlet shall be carried out in accordance with the drawings.

6.86.5.3 MANHOLES, CATCH BASINS, MANHOLES-CATCH BASINS AND ACCESSORIES

6.86.5.3.1 The implementation of the manholes, catch basins, manholes-catch basins and accessories shall comply with standard BNQ 1809-300.

6.86.5.3.2 The support cushion of the manholes, catch basins, manholes-catch basins and accessories shall be made of MG 20 granular material, densified to 95% of the maximum dry density and according to standard CAN/BNQ 2501-255.

6.86.5.3.3 Excavation and preparation of the base

6.86.5.3.3.1 The natural base shall not contain any stone larger than 56 mm; it shall be free of frozen clumps and organic debris. A CG14 or MG20 support cushion shall be placed on a subgrade that is not granular material. The support cushion shall be implemented in uniform layers of a maximum thickness of 300 mm.

6.86.5.3.3.2 Unless otherwise indicated on the drawings, the natural base shall be densified to 90% of the maximum dry density according to standard CAN/BNQ 2501-255.

6.86.5.3.4 Installation

6.86.5.3.4.1 The connecting joints of the pipe to the catch basin (or manhole-catch basin) shall be watertight and installed at the plant by the catch basin manufacturer.

6.86.5.3.5 Backfilling

6.86.5.3.5.1 In the area adjacent to the structure, on a width of 1 m, the materials shall never be pushed perpendicular to the structure.

6.86.5.3.5.2 The compaction shall be carried out with light dynamic compactors producing a force not exceeding 50 kN.

6.86.5.3.5.3 The implementation of the catch basins and manholes shall be carried out according to the drawings and as directed by the Engineer.

6.86.6 QUALITY CONTROL

6.86.6.1 PIPES

6.86.6.1.1 Pipe certification

6.86.6.1.1.1 The reinforced concrete circular pipes shall be manufactured by a manufacturer whose factory holds a compliance certificate issued by the BNQ in accordance with certification protocol BNQ 2622-951.

6.86.6.1.1.2 For each delivery of precast concrete pipe sections and at least seven (7) days prior to use thereof, the **Contractor** shall provide the Engineer with a certificate of conformity containing the following information, without however being limited thereto:

6.86.6.1.1.2.1 name and address of the manufacturer;

6.86.6.1.1.2.2 element number that shall correspond to the shop drawings and be easily identifiable on the element;

6.86.6.1.1.2.3 list of defects and corrections taken following the inspection and correction of the surfaces;

6.86.6.1.1.2.4 The certificate signed by the manufacturer of the precast concrete pipe sections.

6.86.6.1.1.3 The polyvinyl chloride pipes shall be manufactured by a manufacturer whose plant holds a compliance certificate issued by the BNQ.

6.86.6.2 PERFORATED DRAIN AND GEOTEXTILE

6.86.6.2.1 The polyethylene pipes shall be manufactured by a manufacturer whose plant holds a compliance certificate issued by the BNQ in accordance with certification protocol BNQ 3624-907.

6.86.6.2.2 For each delivery of polyethylene pipes, the **Contractor** shall, at least seven (7) days prior to each delivery, provide the Engineer with a certificate of conformity stating that no plastic already used or recycled was used in the manufacture of the pipes. The certificate of conformity shall further, for each production batch, contain the following information, without however being limited thereto:

6.86.6.2.2.1 name and address of the manufacturer;

6.86.6.2.2.2 date and place of manufacture;

6.86.6.2.2.3 type (perforated), category and nominal dimensions;

6.86.6.2.2.4 production batch number.

6.86.6.2.3 A production batch consists of pipes of the same type, same category, having the same dimensions, and that were manufactured during a continuous total production and under the same conditions.

6.86.6.2.4 When a delivery control is conducted by the Engineer, the sampling consists of 1 m length of pipe randomly collected among those stored on site.

6.86.6.3 MANHOLES, CATCH BASINS, MANHOLES-CATCH BASINS AND ACCESSORIES

6.86.6.3.1 Certification

6.86.6.3.1.1 The precast reinforced concrete manholes, catch basins and manholes-catch basins shall be manufactured by a manufacturer whose plant holds a compliance certificate issued by the BNQ in accordance with certification protocol BNQ 2622-951.

6.86.6.3.2 Certificate of conformity

6.86.6.3.2.1 Accessories

6.86.6.3.2.1.1 For each delivery of accessories, the **Contractor** shall, for each production batch, provide the Engineer with a certificate of conformity containing the following information, without however being limited thereto:

6.86.6.3.2.1.1.1 name and address of the manufacturer of the catch basin frames, grids, covers, riser rings and traps;

6.86.6.3.2.1.1.2 date and place of manufacture;

6.86.6.3.2.1.1.3 quantities and nominal dimensions;

6.86.6.3.2.1.1.4 results of tests and analyses;

6.86.6.3.2.1.1.5 designation relating to the use, rain or sanitary;

6.86.6.3.2.1.1.6 production or heat batch number.

6.86.6.3.2.1.2 A production batch corresponds to a heat number.

6.86.6.3.2.2 Granular materials

6.86.6.3.2.2.1 Prior to the first delivery of granular materials, the **Contractor** shall submit to the Engineer a certificate of conformity containing the following information, without however being limited thereto:

6.86.6.3.2.2.1.1 name and address of the manufacturer;

6.86.6.3.2.2.1.2 date and place of manufacture;

6.86.6.3.2.2.1.3 complete results of the sieve analyses;

6.86.6.3.2.2.1.4 test results of each of the intrinsic, manufacturing and complementary properties;

6.86.6.3.2.2.1.5 The name of laboratory member of the *Association des firmes en genie-conseil – Québec* (AFG), responsible for conducting the sieve analyses and control tests.

6.86.6.3.3 Delivery control

6.86.6.3.3.1 When a delivery control is conducted by the Engineer, the sampling consists of catch basin frames, grids, covers, riser rings or traps that shall allow the conduct of the tests indicated in MTQ standard 7202.

6.86.6.4 CAST-IN-PLACE CONCRETE BLOCK JOINT FOR EXISTING PIPE

6.86.6.4.1 In the locations indicated on the drawings or by the Engineer, the **Contractor** shall construct a cast-in-place concrete 25 MPa block joint in order to carry out the connection of a new pipe with an existing pipe. The end of the pipes shall be sawed in order for the outer diameters to be parallel (90°) and into contact.

6.86.6.5 CAST-IN-PLACE CONCRETE BLOCK JOINT FOR EXISTING MANHOLE

6.86.6.5.1 In the locations indicated on the drawings or by the Engineer, the **Contractor** shall construct a cast-in-place concrete 25 MPa block joint in order to carry out the connection of a new pipe with an existing manhole according to standard BNQ 1809-300.

END OF SUBSECTION