

1.0 GENERAL

1.1 REFERENCES

- .1 Provide Polyvinyl Chloride (PVC) pressure pipe in accordance with the following standards (latest revision) except where specified otherwise.
- .2 American Society for Testing and Materials (ASTM)
 - .1 ASTM F477 Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
- .3 American Water Works Association (AWWA)
 - .1 ANSI/AWWA C900 Standard for Polyvinyl Chloride (PVC). Pressure Pipe and Fabricated Fittings, 4 in. through 12 in. (100mm through 300 mm), for Water Transmission and Distribution.
 - .2 ANSI/AWWA C905 Standard for Polyvinyl Chloride (PVC). Pressure Pipe and Fabricated Fittings, 14 in. through 48 in. (350 mm through 1,200 mm).
- .4 Canadian Standards Association (CSA)
 - .1 CSA-B137 SERIES Thermoplastic Pressure Piping Compendium.

1.2 SUBMITTALS

- .1 Provide the following submittals.
- .2 Hydrostatic test results no later than 24 hours after the test is completed.

1.3 DELIVERY, STORAGE, AND HANDLING

- .1 Inspect each shipment of material and timely replace any damaged material.
- .2 Unload pipe by hand or using canvas slings to avoid scratching the pipe. Do not use individual chains or single cables.
- .3 When handling pipe, avoid impact blows, abrasion damage, and gouging or cutting by abrasive surfaces or sharp objects. Replace pipe with deep scratches as required by the Minister.
- .4 Do not stack pipe higher than 1500 mm, and provide support for the barrel to prevent bending of the pipe. Do not expose stockpiled pipe to direct sunlight. Provide for air circulation through the stockpiled pipe.
- .5 Store rubber gaskets in a warm dark location until immediately prior to use.

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2.0 PRODUCTS

2.1 MATERIALS

- .1 Provide materials in accordance with the following.
- .2 PVC pressure pipe:
 - .1 Rigid PVC pressure pipe including fittings in accordance with B137 SERIES, [ANSI/AWWA C900 and ANSI/AWWA C905], with a dimension ratio (DR) of [41].
 - .2 Bell and spigot type joints complete with rubber gaskets that are in accordance with CSA-B137 SERIES and ASTM F477.
 - .3 Cylindrical and straight pipe with ends cut square to the longitudinal axis, and with pipe walls that have a smooth finish free from imperfections such as grooves or ripples. Bevel the pipe ends as required for joining.
- .3 Thrust Blocks: Fill concrete with a compressive strength of 20 MPa at 28 days using Type 50 Sulphate Resistant Portland Cement with an air content between 4% and 7%, and a maximum slump of 100 mm.
- .4 Polyethylene membrane: 0.15 mm thick polyethylene.
- .5 Insulated Tracer Wire: [] gauge []

3.0 EXECUTION

3.1 EXCAVATION AND PREPARATION OF THE FOUNDATION

- .1 Excavate the pipe foundation to the lines, grades, slopes, and elevations specified in the Contract Documents.
- .2 Provide care of water to permit the work to be carried out in the dry.
- .3 The Minister will identify unsuitable bearing soils when encountered at the earth foundation level. Perform [excavation, as classified by the Minister,] [Authorized Structure Over-Excavation] to remove unsuitable bearing soils and replace with [fill materials] [Authorized Fill Placement] as directed by the Minister.
- .4 Compact the base of the excavation to provide a firm foundation of uniform density throughout the entire length of the pipe.
- .5 Construct pipe bedding as specified in the Contract Documents. Shape the pipe bedding to conform to the bell joint for uniform support.

3.2 INSTALLATION

- .1 Do not install pipe when the ambient temperature is below -5°C or above 32°C . Shield the ends to be joined from direct sunlight prior to and during the laying operation.

- .2 Inspect the gasket, gasket groove, and sealing surfaces for any damage or deformation. Both the bell and spigot ends must be free of irregularities. Strictly adhere to the manufacturer's written instructions for cleaning, setting the gasket, lubricating the end of the pipes, and jointing.
- .3 Install pipes with joints close and abutting all around, and without any deflections at the joints unless specified otherwise.
- .4 Install the pipe at the locations, of the sizes, and to the lines, grades, slopes, and elevations specified in the Contract Documents. Provide a completed installation that is watertight, and install the pipes so that they are free of depressions and are free draining.
- .5 When a laser beam is used to maintain grade, use manual survey methods to check the pipe invert at several intermediate locations and at the termination points.
- .6 Provide concrete thrust blocks at all pipe bends deflecting 30° or more. Wrap the fitting with 2 plies of polyethylene membrane sheeting before placing concrete for the thrust block. Place the concrete thrust block between the fitting and competent ground and to the dimensions specified in the Contract Documents. Do not allow concrete to cover any portion of any pipe joint.

3.3 FILL AND BACKFILL

- .1 Do not commence fill placement operations until the installed pipes have been inspected by the Minister. Rectify defects, including any identified by the Minister.
- .2 Provide the fill, as specified in the Contract Documents, so that direct and continuous contact between the pipe wall and the fill material is attained.
- .3 Within 600 mm of the pipe, remove stones larger than 80 mm diameter, and place fill in layers not exceeding 100 mm in thickness.
- .4 Compact each lift of fill at the moisture content and to the density specified using pneumatic or other mechanical hand tamping equipment.
- .5 Bring fill and compaction layers up simultaneously and evenly on both sides of the pipe and in firm contact with the haunches of the pipe. Do not allow construction equipment to pass over the pipe until a minimum cover of 600 mm, or greater if necessary to prevent damage to the pipe, of compacted fill has been placed.
- .6 Place the insulated tracer wire 300 mm above and along the centre line of the pipe.
- .7 Prevent displacement of the pipe during fill placement operations or through floatation.
- .8 Maintain the interior of the pipe free of foreign material.

3.4 INSTALLATION TOLERANCES

- .1 The installation tolerance from the specified lines, grades, slopes, and elevations is +/-15 mm. Where departures occur that are within the specified tolerance, return to the specified lines, grades, slopes, and elevations at a rate of not more than 5 mm per metre length of the pipe. For greater departures, remove and reinstall the pipe.

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- .2 Provide a completed pipe installation with a vertical deflection no greater than 3% of the pipe diameter specified in the Contract Documents.

3.5 HYDROSTATIC TESTING

- .1 Hydrostatically test the pipeline after backfilling, and no sooner than 7 days after the last concrete thrust block was placed.
- .2 Notify the Minister at least 24 hours prior to performing the hydrostatic test.
- .3 Slowly fill the pipe with water, and expel all air from the pipeline using specified air release assemblies or, if required, by installing a main tap as authorized by the Minister.
- .4 Hydrostatically test the pipe using a minimum test pressure of [150% of the normal working pressure, 345 KPa above the normal working pressure, or 1000 KPa whichever is greatest at the lowest elevation in the test section; and, 125% of the normal working pressure, 175 KPa above the normal working pressure, or 860 KPa whichever is greatest at the highest elevation] in the test section. Do not exceed the pipe manufacturer's recommended maximum test pressure.
- .5 After filling the pipe with water, maintain the test pressure for a minimum of 1 hour before the test period begins to compensate for any initial pipe stretch and to expel all air.
- .6 Pressure test the pipe for a minimum of 1 hour or as authorized by the Minister. Inspect all exposed pipes, fittings and valves and the site for signs of leakage.
- .7 Determine the actual leakage rate by measuring the volume of makeup water that must be added to return the pipe to the test pressure.
- .8 [Allowable leakage is calculated using the following equation:

$$L = \frac{ND\sqrt{P}}{130,280}$$

Where: L = Allowable leakage measured in litres per hour
D = Nominal diameter of the pipe in millimetres
N = Number of pipe joints in the pipeline being tested
P = Average test pressure in kilopascals.]

- .9 Repair defects, and repeat the hydrostatic test until all visible leakage has stopped, and the actual leakage is below the specified allowable leakage.

END OF SECTION