

1.0 GENERAL

1.1 REFERENCES

- .1 Provide precast concrete pipe in accordance with the following standards (latest revision) except where specified otherwise.
- .2 American Society for Testing and Materials (ASTM)
 - .1 ASTM C361 Standard Specification for Reinforced Concrete Low-Head Pressure Pipe.
- .3 Canadian Standards Association (CSA)
 - .1 CAN/CSA-A3000 Cementitious Materials Compendium.

1.2 SUBMITTALS

- .1 Provide the following submittals.
- .2 Structural design calculations and shop drawings for the precast concrete pipe, stamped and signed by a Professional Engineer registered with the Association of Professional Engineers, Geologists and Geophysicists of Alberta, at least 20 days prior to manufacture.
- .3 Shop drawings showing dimensions and details of the pipe joint including the allowable installation tolerances for the joint gap between adjacent pipe units at least 20 days prior to manufacture.
- .4 Certified copies of the results of the tests specified in clause 1.3 prior to delivering any pipe to the Site.
- .5 Manufacturer's written instructions for unloading, handling, and storing materials prior to unloading.

1.3 QUALITY CONTROL

- .1 During manufacture, perform the following tests in accordance with ASTM C361 for each diameter and class of pipe:
 - .1 Concrete compressive strength tests.
 - .2 Rubber gasket compound tests.
 - .3 Hydrostatic tests of at least [3] pipe units.
 - .4 Hydrostatic tests of at least [2] pipe joints.
- .2 Notify the Minister at least 5 days prior to performing any hydrostatic test.

Tender No. []

1.4 DELIVERY, STORAGE, AND HANDLING

- .1 Inspect each shipment of material and timely replace any damaged material.
- .2 Unload, handle, and store pipe units in accordance with the manufacturer's recommendations, and in a manner that prevents damage. Replace damaged units.
- .3 Store rubber gaskets in a warm and dark location until immediately prior to use.

2.0 PRODUCTS

2.1 MATERIALS

- .1 Provide materials in accordance with the following.
- .2 Precast concrete pipe:
 - .1 In accordance with ASTM C361, [Strength Class A, B, C, or D and Hydrostatic Pressure Class 75, 150, 225, or 375] as outlined in Table 1 of ASTM C361.
 - .2 Designed to resist the governing combination of loads and pressures, installation, and bedding conditions as specified below:
 - .1 Earth load based on the depth of cover and installation condition shown in the Contract Documents. Use a saturated unit weight of [21] kN/m³ for the backfill.
 - .2 Live load due to a [] truck] or compaction equipment that will be used for backfilling, whichever is greater.
 - .3 Excavation, backfill, and bedding conditions as specified in the Contract Documents.
 - .4 Internal hydrostatic pressure of [] m of head.
 - .5 External Hydrostatic pressure of [] m of head with the pipe completely dewatered.
 - .3 Concrete: Minimum compressive strength of 31 MPa at 28 days in accordance with ASTM C361 with Type HS or HSb Sulphate Resistant Cement in accordance with CAN/CSA-A3000.
 - .4 Joints: Flexible, watertight, bell and spigot pipe joints complete with confined O-ring rubber gaskets in accordance with ASTM C361. At the joints, provide formed concrete surfaces, upon which the gasket will be in contact, that are free of airholes, chipped or spalled concrete, laitance, or other defects.
 - .5 Gasket lubricants: As recommended by the manufacturer.
 - .6 Clearly mark the pipe class, size, date of manufacture, and location of the minor axis of elliptical reinforcement, if provided, on each pipe.

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, and to a sufficient width to permit assembly of the pipe and the operation of compaction equipment adjacent to the pipe.
- .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 beneath the entire length of the pipe.
- .5 Construct the pipe bedding as specified in the Contract Documents. Shape the bedding to conform to the bell joint for uniform support.

3.2 INSTALLATION

- .1 Install the pipe with the bell end of the pipe located upstream.
- .2 Inspect the sealing surfaces at the bell and spigot ends and the gasket for any damage or defects.
- .3 Install and join pipe units in strict accordance with the manufacturer's written instructions. Provide a uniform gap all around the pipe joint, and without any deflections at the joints unless specified otherwise. Maintain the gap within the manufacturer's specified tolerances.
- .4 Clean and lubricate the bell and spigot ends. Lubricate and fit the gasket properly so that it is uniformly stretched around the pipe. Do not twist, displace, or damage the gasket.
- .5 Install the pipe at the locations, of the sizes, and to the lines, grades, slopes, and elevations specified in the Contract Documents.
- .6 Provide a completed installation that is watertight, free of depressions, and drains freely.
- .7 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.
- .8 Remove lifting hooks or pins from pipes as required by the Minister. Grout pockets at lifting points when no longer required. Use [cement grout consisting of of 1 part Type HS or HSb Sulphate Resistant Cement to 2 parts sand with sufficient water to produce a stiff paste].

3.3 FILL AND BACKFILL

- .1 Do not commence fill [or cast-in-place concrete] placement operations until the installed pipes have been inspected by the Minister. Rectify defects, including any identified by the Minister.
- .2 Provide fill [and cast-in-place concrete bedding], 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 from the fill material. Place fill in lifts not exceeding 100 mm in thickness, and compact using pneumatic or other mechanical hand tamping equipment.
- .4 Compact each lift of fill at the moisture content and to the density specified in Section 02331 – Fill Placement.
- .5 Prevent damage to the pipe during fill placement. Do not permit compaction equipment to come into direct contact with the pipe.
- .6 Bring fill [and cast-in-place concrete] 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.
- .7 Prevent displacement of the pipe during fill [and cast-in-place concrete] placement operations or through floatation.
- .8 Maintain the interior of the pipes free of foreign material.
- .9 Provide cast-in-place concrete bedding in accordance with [Section [] – Cast-in-Place Concrete].

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 gradually a rate of not more than 5 mm per metre length of pipe. For greater departures, remove and reinstall pipe.

3.5 FIELD TESTING

- .1 Air test each individual pipe joint for leakage at a pressure of [] using a testing device acceptable to the Minister.

END OF SECTION