CW 3610 – INSTALLATION OF CULVERTS

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1. DESCRIPTION

1.1 General

This Specification covers the supply and installation of culvert pipe, couplers and fittings for connections, removal, disposal, and abandonment of culvert pipe.

1.2 Definitions

.1 Foundation – The natural soil sub-grade or granular material to replace unsuitable soil.

.2 Bedding – Material placed over the Foundation to the centre elevation of the culvert.

.3 Backfill – Material placed over the Bedding and culvert to a minimum of 300mm above the top of the culvert or as directed by the Contract Administrator. This definition does not include pavements.

.4 CSP – Corrugated Steel Pipe

.5 HDPE - High Density Polyethylene

.6 PCP – Precast Concrete Pipe

1.3 Referenced Standard Construction Specifications

.1 CW 1130 – Site Requirements
.2 CW 2030 – Excavation, Bedding and Backfill
.3 CW 2130 – Gravity Sewers
.3 CW 2160 – Concrete Underground Structures and Works
.4 CW 3110 – Sub-grade, Sub-base, and Base Course Construction
.5 CW 3615 - Riprap
.6 Approved Products for Surface Works

2. MATERIALS

2.1 CSP and PCP Culverts, Fittings, and Accessories

.1 Supply CSP culvert, fittings and other accessories in accordance with this Specification and CSA Specification CAN/CSA-G40l.

.2 Supply PCP culvert and fittings in accordance with one of ASTM Specifications C-l4, C-76 or C-655.

2.2 High Density Polyethylene (HDPE) Pipe Culverts, Fittings and Accessories

.1 Supply HDPE culvert fittings and couplers in accordance with CSA B182.8.

.2 HDPE culvert fittings and couplers and shall be made of virgin high density polyethylene material. The HDPE culvert shall have a full circular cross section, be dual walled with a smooth inner liner and an outer corrugated pipe wall. HDPE culvert shall have a minimum

stiffness of 320kPa at 5 percent deflection in accordance with ASTM D2412.

.3 HDPE culvert lengths shall be coupled with a Type 3 Soil tight external split coupler or better.

2.3 Bedding and Backfill

.1 Supply Foundation, Bedding and Backfill material in accordance with Section 2 of CW 3110 and the Drawings.

.2 Clay, silt, or organic soil shall not be used as bedding or backfill material.

.3 Supply sand in accordance with Section 2 of CW 2030. Sand shall be used as a levelling course.

2.4 Capping for Side Slopes

.1 Supply impervious clay as capping for approach side slopes around the culvert.

2.5 Flowable Cement Stabilized Fill

.1 Supply flowable cement stabilized fill in accordance with Table 2160.1 in CW 2160.

2.6 Culvert End Markers

.1 Supply culvert end markers in accordance with the following:

.1 Culvert end markers shall be 1500 ± 100mm in height.

.2 Culvert end markers shall be HDPE, SDR 9.3, 30mm (1¼") in diameter, bright orange in colour with an adhesive backed reflective strip placed around the marker. The reflective strip shall be placed within 25mm of the top of the marker.

2.7 Approved Products

.1 Use only those products listed as Approved Products for Underground Use in the City of Winnipeg found on the City of Winnipeg, Materials Management web site at: http://www.winnipeg.ca/matmgt/info.stm

3. CONSTRUCTION METHODS

3.1 Excavation, Bedding and Backfill

.1 Excavate in accordance with CW 2030.

.2 Establish line and grade in accordance with the Drawings.

.3 Place and compact a Foundation below the proposed pipe and Bedding for commercial approaches and all other approaches as directed by the Contract Administrator.

.3 Place and compact Bedding material a minimum of 75mm below the invert grade of the

proposed pipe.

.4 Place sand as a levelling course over the Bedding material; sand is not to be used as Backfill.

.5 Place the culvert on the Bedding material to line and grade in accordance with Section 3.2 of this specification.

.6 Place and compact granular material on both sides of the culvert up to the center of the pipe, then Backfill and compact material in 150mm lifts.

.7 All Bedding and Backfill material shall be compacted to 95% Standard Proctor density.

.8 Place and compact Backfill to a depth above the top of the pipe in accordance with the manufacturer's specifications, excepting Section 3.2.4 of this Specification.

.9 Shape Backfill on the side slopes to be in accordance with SD-234 and SD-239.

3.2 Culvert Installation

3.2.1 General

.1 Use a minimum number of coupled sections to create one length.

.2 Install culvert to the line and grade on the Drawings or as set in the field by the Contract Administrator. Vertical variance from grade shall not exceed 25 mm and horizontal variance from line shall not exceed l00 mm without sharp bends.

3.2.2 Corrugated Steel Pipe (CSP) Culvert and Pipe Arch Culvert

.1 Install CSP culvert on the compacted Bedding with the separate sections securely joined together by means of tightly drawn coupling bands. For CSP culvert of the round or elongated type, and arch culvert, constructed from individual plates, lap the circumferential joints on the outside of the pipe section on the upstream end, and lap longitudinal seams at the side of the pipe.

.2 Install CSP culvert and pipe arch culvert with a two percent camber at its center.

3.2.3 Precast Concrete Pipe (PCP) Culvert

.1 Install PCP culvert installation in accordance with Specification CW 2130 for PCP pipe.

3.2.4 High Density Polyethylene Pipe (HDPE) Culvert

.1 Install HDPE culvert in accordance with the manufacturer's specifications except for private approaches, the minimum Backfill cover above the top of the pipe shall be 300mm or as directed by the Contract Administrator.

3.3 Connections to Existing Culverts

3.3.1 Corrugated Steel Pipe (CSP) and Pipe Arch Culvert

.1 Expose the end of the existing culvert without damaging the existing culvert for connection to an existing CSP culvert.

.2 Cut off sufficient length of sloped or damaged culvert to provide a straight end in acceptable condition for connection. Coat the end cut of the culvert with a galvanizing compound approved by the Contract Administrator.

.3 Connect new CSP culvert to existing CSP culvert in accordance with Clause 3.2.2 of this Specification.

3.3.2 Precast Concrete Pipe (PCP)

.1 Connect new PCP culvert to existing PCP culvert in accordance with Specification CW 2130 for PCP pipe.

3.3.3 Removal of Existing Culvert Pipe

.1 Remove existing culverts as directed by the Contract Administrator within the limits of the Contract.

.2 Separate coupled sections before removing culverts so as not to damage the culvert sections.

.3 Whenever a culvert is being removed but not replaced, backfill with suitable site material and compact in accordance with CW 3110.

3.4 Capping for Side Slopes

.1 Cap the side slopes around the culvert ends with impervious clay or as directed by the Contract Administrator or the Drawings.

3.5 Plugging and Abandonment of Existing Culvert

.1 Plug the ends of the culvert with concrete, mortar or sand bags, then pump in cement stabilized fill to fill the interior of the culvert.

3.6 Disposal of Existing Culvert

.1 Dispose of existing culvert in accordance with Section 3.4 and 3.5 of CW 1130.

3.7 Culvert End Markers

.1 Install culvert end markers on all new culverts and culvert end repairs.

.2 Anchor the culvert end markers to the top of both ends of the culvert by bolting with plated bolts, nuts and washers in field drilled mounting holes.

4. MEASUREMENT AND PAYMENT

4.1 Corrugated Steel Pipe (CSP)

.1 Supply and installation of CSP culvert shall be measured on a linear basis and paid for at the Contract Unit price per metre for the "Items of Work" listed below. The length to be paid for shall be the total number of metres of CSP culvert supplied and installed in accordance with this Specification, accepted and measured by the Contract Administrator.

Items of Work:

Corrugated Steel Pipe (CSP) Culvert
- i.) Supply*
- ii.) Install*

* Specify Diameter, Gauge, and the material type being either Galvanized, Aluminized Steel or Polymer Coat.

.2 Separate measurement shall be made for each diameter, gauge, and material type of culvert.

.3 The linear measurement of corrugated steel pipe shall be measured horizontally at grade above the centre line of the pipe culvert.

.4 Couplers and fittings shall be included in the payment for corrugated steel pipe (CSP) listed above.

.5 Excavation, Bedding and Backfill shall be included in payment for Corrugated Steel Pipe (CSP) Culvert and shall be incidental to the Contract.

4.2 Precast Concrete Pipe (PCP)

.1 Supply and installation of PCP culvert shall be measured on a linear measure basis and paid for at he Contract Unit Price per metre for the "Items of Work" listed below. The length of PCP culvert to be paid for shall be the total number of metres of PCP culvert supplied and installed in accordance with this Specification, accepted and measured by the Contract Administrator.

Items of Work:

Precast Concrete Pipe (PCP) Culvert
- i.) Supply*
- ii.) Install*

*Specify Diameter and Class of Culvert

.2 Separate measurement will be made for each diameter and class of culvert.

.3 The linear measurement of precast concrete pipe shall be measured horizontally at grade above the centre line of the pipe culvert.

.4 Gaskets, flexible rubber shall be included in the payment for precast concrete pipe listed above.

.5 Excavation, Bedding and Backfill shall be included in payment for supply and installation of Precast Concrete Pipe (CSP) culvert and shall be incidental to the Contract.

4.3 High Density Polyethylene Pipe (HDPE)

.1 Supply and installation of HDPE culvert shall be measured on a linear measure basis and paid for at the Contract Unit Price per metre for the "Items of Work" listed below. The length of HDPE culvert to be paid for shall be the total number of metres of HDPE culvert supplied and installed in accordance with this Specification, accepted and measured by the Contract Administrator.

Items of Work:

High Density Polyethylene Pipe (HDPE)
- i.) Supply*
- ii.) Install*

*Specify Diameter of Culvert

.2 Separate measurement will be made for each diameter of culvert.

.3 The linear measurement of High Density Polyethylene (HDPE) pipe shall be measured horizontally at grade above the centre line of the pipe culvert.

.4 Split couplers shall be included in the payment for High Density Polyethylene (HDPE).

.5 Excavation, Bedding and Backfill shall included in payment for "High Density Polyethylene Pipe and shall be incidental to the Contract.

4.4 Connections to Existing Pipe Culverts

.1 Connections to existing culverts shall be measured on a unit basis and paid for at the Contract Unit Price per unit for "Connections to Existing Culverts". The number of units to be paid for shall be the total number of connections installed in accordance with this specification, accepted and measured by the Contract Administrator.

.2 Couplers and necessary hardware, and removal and disposal of damaged or otherwise unacceptable lengths of existing culvert and excavation material shall be included in payment for "Connections to Existing Culverts".

.3 New culvert required to replace unacceptable existing culvert shall be measured and paid for in accordance with this Specification.

4.5 Plugging and Abandonment of Existing Pipe Culverts

.1 Plugging and abandonment of existing culverts shall be measured on a volume basis and paid for at the Contract Unit Price per cubic metre for "Plugging and Abandonment of Existing Culverts". The volume to be paid for shall be the total number of cubic metres of cement stabilized fill supplied and placed within the culvert in accordance with this specification, accepted and measured by the Contract Administrator.

.2 The volume of cement stabilized flowable fill will be calculated using the inside diameter and horizontal length of centre line of the existing culvert abandoned.

4.6 Removal of Existing Culverts

.1 Removal of existing culverts shall be measured on a linear measure basis and paid for at the Contract Unit Price per metre for "Removal of Existing Culverts". The length to be paid for shall be the total number of meters of existing culvert removed in accordance with this Specification, accepted and measured by the Contract Administrator.

.2 The linear measurement of existing culvert pipe shall be measured horizontally at grade above the centre line of the pipe culvert.

.3 Excavation and disposal of surplus material due to removal of existing culverts or portions of damaged culvert, and unacceptable lengths of existing culvert shall be included in the payment for "Removal of Existing Culverts".

.4 No payment shall be made for backfill of excavated area with suitable site material and shall be incidental to the Contract.

4.7 Disposal of Existing Culverts

.1 Disposal of existing culverts shall be measured on a linear measure basis and paid for at the Contract Unit Price per metre for "Disposal of Existing Culverts". The length to be paid for shall be the total number of meters of existing culvert disposed in accordance with this Specification, accepted and measured by the Contract Administrator.

.2 The linear measurement of existing culvert pipe shall be measured horizontally at grade above the centre line of the pipe culvert.

4.8 Capping for Side Slopes

.1 No payment shall be made for capping for side slopes using clay and shall be incidental to the Contract.

4.9 Culvert End Markers

.1 Supply and installation of culvert end markers shall be measured on a unit basis and paid for at the Contract Unit Price per unit for the "Culvert End Markers". The number of units to be paid for shall be the total number of culvert end markers supplied and installed in accordance with this Specification, accepted and measured by the Contract Administrator.

.2 No additional payment shall be made for culvert clamps, plated bolts, nuts and washers and are incidental to the Contract.

.3 One tube and set of hardware for installation to mark one end of a culvert is considered to be a culvert end marker.