

1 GENERAL

1.1 RELATED SECTIONS

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 03 30 00 - Cast-In-Place Concrete.
- .3 Section 03 41 00 - Precast Structural Concrete.
- .4 Section 31 05 16 - Aggregate Materials.
- .5 Section 31 23 33.01 - Excavating, Trenching and Backfilling.
- .6 Section 31 24 13 - Temporary Roadway Embankment.

1.2 REFERENCES

- .1 American Society for Testing and Materials International, (ASTM)
 - .1 ASTM C1433-136, Standard Specification for Precast Reinforced Concrete Box Section for Culverts, Storm Drains and Sewers.
 - .2 ASTM C877-08 External Sealing Bands for Concrete Pipe, Manholes and Pre-Cast Box Sections.
 - .3 ASTM C 117-13, Standard Test Method for Material Finer Than 0.075 mm (No. 200) Sieve in Mineral Aggregate by Washing.
 - .4 ASTM C 136-06, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 - .5 ASTM C 144-11, Standard Specification for Aggregate for Masonry Mortar.
 - .6 ASTM D 698-12, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft² (600 kN-m/m²)).
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.
- .3 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-S6 Canadian Highway Bridge Design Code.
 - .2 CSA A3000-08, Cementitious Materials Compendium.
 - .3 CSA A257 Series-09, Standards for Concrete Pipe and Manhole Sections.

1.3 DESIGN CRITERIA

- .1 Live Loading: CL-625 Truck.
- .2 Design unit weight of soil of 22 kN/m³.
- .3 Width: as indicated. Rise: as indicated.
- .4 Seismic acceleration ratio = 0.10g.
- .5 Design height of cover as indicated, considering both finished road grade

and temporary travel grades.

- .6 Design Precast Elements to CSA-A23.3 and CSA-A23.4 to carry handling stresses.

1.4 SUBMITTALS

- .1 Submittals to be in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Inform Departmental Representative at least 4 weeks prior to beginning Work, of proposed source of bedding materials and provide access for sampling.
- .3 Submit manufacturer's test data and certification at least 4 weeks prior to beginning Work. Refer to Section 03 41 00 - Precast Structural Concrete.
- .4 Submit manufacturer's instructions, printed product literature and data sheets for pipes and backfill and include product characteristics, performance criteria, physical size, finish and limitations.
- .5 Certification to be marked on culvert.
- .6 Shop drawings in accordance with Section 03 41 00 - Precast Structural Concrete.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Manufacturer's written instruction and Section 01 61 00 - Common Product Requirements.
- .2 Carefully lower culvert sections into trench in such a manner as to prevent damage to them. Under no circumstances shall culvert sections be dropped into a trench.

1.6 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper plastic, polystyrene and corrugated cardboard packaging material in appropriate on-site bins for recycling.
- .4 Divert unused metal materials from landfill to metal recycling facility as approved by Departmental Representative.
- .5 Divert unused concrete materials from landfill facility as approved by Departmental Representative.
- .6 Divert unused aggregate materials from landfill to quarry facility for reuse as approved by Departmental Representative.
- .7 Fold up metal banding, flatten and place in designated area for recycling.

2 PRODUCTS

2.1 PRECAST CONCRETE BOX CULVERTS

- .1 Reinforced concrete culverts: Manufactured in accordance with CSA A23.4 and to Section 03 41 00 - Precast Structural Concrete.
- .2 Width: as indicated.
- .3 Rise: as indicated.
- .4 Joints: bell and spigot type with rubber gasket. This is a push-on joint and must be watertight.
- .5 Rubber gaskets for joints: to CSA A257.
- .6 Cement mortar joint filler:
 - .1 Portland cement: to CSA A3000, Type 10.
 - .2 Sand: to ASTM C144.
 - .3 Mortar: one part by volume of cement to two parts of clean, sharp sand mixed dry. Add sufficient water after mixing to give optimum consistency for hand application.

2.2 TENSION BAR ASSEMBLY

- .1 Tension bars shall span three joints, as shown on Drawings.
- .2 Steel shall be per CSA G40.12 300W
- .3 Tension bars, nuts and washers shall be galvanized per CSA G164-M92 to a minimum mass of 610 g/m².
- .4 Tension bar shall be used as template for Contractor to field drill holes in installed pipe.
- .5 Nuts shall not be overtightened.
- .6 Bolt length protruding more than 25 mm beyond tightened nut shall be cut off flush with nut.

2.3 FOUNDATION BEDDING AND BACKFILL

- .1 Concrete mixes and materials for foundation bedding, cradles, encasement, supports to Section 03 30 00 - Cast-in-Place Concrete.
- .2 Granular bedding and backfill material to Section 31 05 16 - Aggregate Materials, 32 11 16.01 - Granular Sub-base, and Section 31 23 33.01 - Excavating, Trenching and Backfilling.

2.4 HEAD WALLS

- .1 Precast head walls:
 - .1 To Section 03 41 00 - Precast Structural Concrete.
 - .2 Required geometry: as indicated.
- .2 Cast in place head walls:
 - .1 To Section 03 30 00 - Cast In Place Concrete
 - .2 Required geometry: as indicated on structural drawings.

3 EXECUTION

3.1 GENERAL

- .1 Any culverts shown on the Drawings and required to be removed for the purpose of accommodating pipeline installation shall be removed in accordance with the requirements of this Section.
 - .1 There will be no separate payment for such culvert pipe removals as this will be considered incidental to the work.

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for culvert installation in accordance with manufacturer's written instructions.
- .2 Visually inspect substrate in presence of Departmental Representative.
- .3 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
- .4 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.1 EXCAVATION

- .1 Do excavation Work in accordance with Section 31 23 33.01 - Excavating Trenching and Backfilling.
- .2 Obtain Departmental Representative's approval of excavation extents and depth prior to placing foundation or culvert.
- .3 Dewater excavation, as necessary, to allow placement of culvert in dry condition.
- .4 Prior to placing the precast culvert section in the trench, inspect each section

for defects. Remove all defective sections from the site and replace with sound material. All dirt and gravel must be kept out of the joint and gaskets kept clean.

3.2 FOUNDATION AND BEDDING

- .1 Connect or anchor culvert and headalls to cast-in-place concrete foundation in accordance with manufacturer's instructions.
- .2 Footings to be founded on competent bearing stratum consisting of dry base of compact to dense glacial till or bedrock. Footings to be underlain directly by layer of Clean Rock Fill in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.
- .3 Backfill with lean concrete to level indicated.
- .3 Bearing stratum to be inspected by professional geotechnical engineer designated by Departmental Representative, as required.
- .4 Shape bedding to fit bottom of culvert exterior, free from sags or high points.
- .5 Place Clean Rock Fill on a firm, dry base, in lifts not exceeding 300 mm and compacted to a minimum of 100% of Maximum Dry Density in accordance with ASTM D698.

3.3 LAYING CONCRETE BOX CULVERT

- .1 Begin at downstream end of culvert with flanged end of first culvert section facing upstream unless otherwise indicated.
- .2 Ensure bottom of each section is in contact with foundation throughout its length.
- .3 Do not allow water to flow through culverts during construction except as permitted by Departmental Representative.
- .4 Utilize laser beam instrumentation and techniques to determine intermediate line and grade for all culvert sections except where and when the Departmental Representative may allow other methods to be used.
- .5 Install new culvert pipes according to the sizes, locations, and grades indicated on the drawings.
- .6 Construct new headwalls of the materials and to the dimensions shown on the Drawings. Connect to the culvert pipe to make a tight connection that will not permit soil or debris to wash into the pipe behind the headwall.
- .7 Install culvert pipes to manufacturer's recommendations and in accordance with recognized good practice. Provide and use proper implements, tools and facilities for safe and efficient execution of the work.
- .8 Inspect culvert pipes in the field before and after laying. Remove any defective or damaged culvert pipe and replace with new sound material at the Contractor's expense.

- .9 Until there is at least 300 mm of cover over new culvert, no heavy equipment shall be permitted to cross, except as necessary for backfilling the trench and compaction of the bedding material.

3.4 JOINTS: CONCRETE CULVERTS

- .1 Units joined in accordance with manufacturer's shop drawings.
- .2 Supply and place non-shrink grout in the footing key way in accordance with manufacturer's instructions.
- .3 Seal joints: apply primer and membrane in accordance with manufacturer's instructions.
- .4 Ensure that tapered ends are fully entered into flanged ends.

3.5 BACKFILLING

- .1 Backfill around and over culverts as indicated or as directed by Departmental Representative.
- .2 Place Fill Against Structure, as approved by Departmental Representative, in 200 mm compacted thickness layers to full width, alternately on each side of culvert, so as not to displace it laterally or vertically.
- .3 Compact each layer to 98% of Standard Proctor Maximum Dry Density to ASTM D 698.
- .4 Place backfill in unfrozen condition.

END OF SECTION