

PART 1      GENERAL

1.1          Measurement for Payment

- .1          Manholes requiring adjustment shall be measured per manhole and paid as per bid item 15 – Manhole Adjustments
- .2          Where specified, the height of existing manhole, catch basin and water valve frames and covers shall be adjusted to match the elevation of a new surface by means of bricks and mortar or precast risers and mortar or cast iron extension rings as directed by the Departmental Representative. The maximum amount of adjustment allowed using bricks, risers or extension rings is 300 mm. Adjustments in excess of 300 mm will require alterations of the manhole, catch basin or water valve barrel in conjunction with adjustment of the frame and cover as described above.
- .3          Payment for adjusting the elevation of manholes, catch basins and water valves will be made at the unit price bid per unit for Manhole Adjustments and will be considered full compensation for all materials, equipment, labour, tools and incidentals necessary to complete the Work to the satisfaction of the Departmental Representative.

1.2          Quality Assurance

- .1          Pre-Installation Meetings: convene pre-installation meeting one week prior to beginning manhole adjustments with Departmental Representative in accordance with Section 01 32 16.07 - Construction Progress Schedule - Bar (GANTT) Chart to:
  - .1          Verify project requirements.
  - .2          Review installation and substrate conditions.
  - .3          Co-ordination with other building subtrades.
  - .4          Review manufacturer's installation instructions and warranty requirements.

PART 2      PRODUCTS

2.1          Material

- .1          Cement: to CAN/CSA-A3001, Type [GU].
- .2          Concrete mix design to produce 30 MPa minimum compressive strength at 28 days and containing 20 mm maximum size coarse aggregate, with a maximum water/cement ratio of 0.45 and 60±20 mm slump at time and point of deposit as per City of Edmonton specification 03055 – Portland Cement Concrete.
- .3          Water: clean, potable, free from foreign matter.
- .4          Precast manhole units: to ASTM C 478M, circular or oval.
  - .1          Top sections eccentric cone or flat slab top type with opening offset for vertical ladder installation.

PART 3      EXECUTION

3.1          Adjusting Existing Manholes

- .1          Remove existing gratings, frames and I beams and store for re-use at locations designated by Departmental Representative.

- .2 Sectional units:
  - .1 Raise or lower straight walled sectional units by adding or removing precast sections as required.
  - .2 Raise or lower tapered units by removing cone section, adding, removing, or substituting riser sections to obtain required elevation, then replace cone section.
    - .1 When amount of raise is less than 600 mm use standard manhole brick, moduloc or grade rings.

END OF SECTION

PART 1 GENERAL

1.1 Measurement for Payment

- .1 Measurement and payment of pipe culverts shall be made per linear metre and charged under the bid item 8 – Pipe Culverts-600mm C.S.P.
- .2 The work includes:
  - .1 Survey and staking
  - .2 Transportation, storage, common excavation, bedding, backfilling, riprap, geotextile, installation of couplings and bolts, labour and equipment.
  - .3 Installation of a complete culvert assembly, including elbows and end sections, riprap complete with geotextile at inlet and outlet, installed as specified herein or as required by the Departmental Representative.
  - .4 Repair and regrading of roads, walkways, ditches or other areas disturbed for the installation of the culvert.
  - .5 Remove and dispose of existing culverts to be replaced.
  - .6 All other incidentals necessary to complete the work.

PART 2 PRODUCTS

2.1 Corrugated Steel Pipe (CSP)

- .1 Culverts shall be corrugated steel pipe, manufactured in accordance with CAN3-G401 and will be zinc coated by a hot dip galvanizing process. The wall thickness will be 1.6 mm in all the culvert sizes, and the corrugation pattern will be 68 mm pitch and 12 mm depth. The pipe sections will be connected with corrugated band couplings, also conforming to CAN3-G401.

2.2 Culvert Granular Bedding

- .1 Material for granular bedding shall be a mixture of clean sand and gravel, free from frozen clay lumps, cementation, organic material, or other deleterious materials. The granular bedding shall meet City of Edmonton's Designation 5, Class 80 gradation as outlined in the City of Edmonton Construction Specifications Section 02060 – Aggregate and shown in the table below.

Sieve Size (mm)	Percent Passing (by weight)
75	100
19	85-100
4.75	70-90
0.85	40-80
0.075	0-15

2.3 Culvert Backfill

- .1 Material for culvert backfill shall be a mixture of the excavated material obtained from the excavations for site grading. Use of random culvert backfill shall be subject to the inspection of the Departmental Representative.

2.4 Riprap

- .1 Riprap shall consist of low slump concrete bagged in 30 litre burlap sacks. Fill each burlap sack with low slump concrete to 70% capacity and close by sewing or stapling to a straight seam. Place bag immediately into position. Knead, ram and pack the filled bag to conform to ground and adjacent bags previously placed. Low slump concrete shall meet the following specification.

Minimum 28 Day Compressive Strength (MPa)	Slump (mm)	Entrained Air Limits % By Volume	Maximum Aggregate Size (mm)	Maximum Water/ Cementing Materials Ratio	Minimum Type 50 Cement (kg/m <sup>3</sup> )
30	40 +/- 10	5.0 – 7.0	14	0.45	335

- .2 Place bags in a staggered manner to form a running bond pattern on each layer and between layers. Remove foreign matter from bag surfaces during placement.
- .3 Riprap face shall appear closely packed and uniform, with each horizontal layer of bags averaging 125 mm thick.

2.5 Filter Fabric

- .1 The geotextile will be a non-woven geotextile filter fabric and will conform to the following specifications:
- .1 Grab Tensile strength: 711 N
  - .2 Elongation (failure): 50%
  - .3 Puncture strength: 400 N
  - .4 Burst strength: 2.4 MPa
  - .5 Trapezoidal tear: 285 N
  - .6 Minimum fabric lap to be 300 mm.

PART 3 EXECUTION

3.1 Trenching and Excavation

- .1 Obtain the Departmental Representative's approval of trench line and depth prior to placing bedding material or pipe.

3.2 Culvert Bedding

- .1 Dewater excavation, as necessary, to allow placement of culvert bedding in dry condition.
- .2 Place a minimum thickness of 200 mm of approved granular material on bottom of excavation. Place material in uniform layers not exceeding 150 mm thickness, and compact each layer to at least 95% Standard Proctor Density before placing succeeding layer. Any soft and yielding or other unsuitable material below this level will be removed to the depth required by the Departmental Representative and backfilled with approved granular material compacted to a uniform density of 95% of Standard Proctor Density throughout the entire length of the culvert.

- .3 Shape bedding to fit lower segment of pipe exterior so that width of at least 50% of pipe diameter is in close contact with bedding and to camber as indicated or as directed by the Departmental Representative, free of sags or high points.
- .4 Place bedding in unfrozen condition.
- .5 Do not backfill until pipe grade and alignment are checked and accepted by the Departmental Representative.

### 3.3 Laying Corrugated Steel Pipe Culverts

- .1 Begin placing pipe at downstream end.
- .2 Ensure bottom of pipe is in contact with shaped bed or compacted fill throughout its length.
- .3 Lay pipe with outside circumferential laps facing upstream and longitudinal laps or seams at side or quarter points.
- .4 Do not allow water to flow through pipes during construction except as permitted by the Departmental Representative.

### 3.4 Joints

- .1 Match corrugations or indentations of coupler with pipe sections before tightening.
- .2 Tap couplers firmly as they are being tightened, to take up slack and ensure snug fit.
- .3 Insert and tighten bolts.
- .4 Repair spots where damage has occurred to spelter coating by applying two (2) coats of asphalt paint approved in writing by Departmental Representative.

### 3.4 Culvert Backfill

- .1 Backfill around and over culverts as shown on Drawings or as directed by the Departmental Representative.
- .2 Place backfill material in 150 mm layers to full width, alternately on each side of culvert, so as not to displace it laterally or vertically.
- .3 Compact each layer to 95% maximum dry density to ASTM D698 taking special care to obtain required density under haunches.
- .4 Protect installed culvert with minimum 300 mm cover of compacted fill before heavy equipment is permitted to cross. During construction, width of fill, at its top, to be at least twice diameter or span of pipe and with slopes not steeper than 1:2.
- .5 Place backfill in unfrozen conditions.

END OF SECTION