

**CITY OF WHITEHORSE SERVICING STANDARDS MANUAL
PART 3 – CONSTRUCTION SPECIFICATIONS
SECTION 3.3 – CULVERTS**

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SECTION 3.3 - CULVERTS

3.3.1 SCOPE

The work described in this section pertains to the supply and installation of culverts.

3.3.2 MATERIALS

All work described in this section is to be carried out in strict accordance with manufacturer's recommendations unless otherwise noted.

3.3.2.1 CULVERTS

All culverts are to be a minimum diameter of 400 mm, 16 minimum gauge (1.63 mm) galvanized spiral corrugated steel culvert pipe (CSP-Helical) in accordance with CSA CAN 3-G401-M-81 Specification No. 501-M. The Engineer reserves the right to inspect and test the pipe after its delivery to the worksite, and if defects are found which make it unserviceable, the pipe may be rejected on the project.

3.3.2.2 BEDDING AND BACKFILL MATERIALS

The Consultant is to approve the type of granular material used for compacted bedding for culverts. It is to be free from rocks larger than 20 mm in size. It should not contain any frozen material, sod, cinders, or organic matter. Culverts are to be backfilled with selected native materials free of rocks and cobbles greater than 80 mm in size.

3.3.2.3 ROCK RIP-RAP

Stones for rock riprap are to consist of fieldstones or rough unhewn quarry stone as near rectangular as practicable. Broad flat stones are to be preferred to rounded or cubic stones. Stones for rock riprap are to consist of the following:

- Smaller than 450 mm or 130 kg 100%
- Larger than 350 mm or 70 kg 20%
- Larger than 300 mm or 40 kg 50%
- Larger than 250 mm or 10 kg 75%

3.3.2.4 BAGGED CONCRETE RIP-RAP

Bagged concrete riprap is to consist of burlap bags, of approximately 0.03 m³ capacity, filled to approximately 70% full with freshly mixed low slump, 25 MPa concrete. The bags are then to be folded over and firmly closed.

3.3.2.5 GEOTEXTILES

Non-woven Polypropylene, min 1.7 mm thickness in accordance with CAN / CGSB-148.1-M85, opening size 100 micrometers with a tensile strength of 700 N.

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3.3.3 INSTALLATION

3.3.3.1 TRENCHES

Where the foundation for a culvert is below the natural ground, a trench is to be excavated in which to form the bed and place the culvert in accordance with the standard drawings in Section 4.

The bedding surface for pipe culverts is to provide a firm foundation of uniform density throughout the entire length of the culvert and are to be slightly cambered in the direction parallel to the pipe centerline in order to correct for expected settlement and ensure tight joints in the lower half of the pipe.

3.3.3.2 CONTROL OF WATER

If a culvert is installed in a watercourse then appropriate permits must be obtained. Some culverts may require a permit from the Water Board. The Developer is to provide for the uninterrupted flow of existing watercourses during culvert installation, including temporary channel redirection and pumping if necessary. The Developer is to remove any water accumulated in the excavation by pumping or other means approved by the Consultant.

3.3.3.3 BEDDING

The culverts are to be bedded in a compacted granular foundation to 95% Standard Proctor Density, carefully shaped, as shown on the standard drawings in Section 4, and set to the desired grade. Geotextile should be used to improve foundation support if required.

All unsuitable materials encountered are to be removed below grade and replaced with suitable granular material in such a manner as to provide a compacted cushion having a thickness of not less than 150 mm.

Where a firm foundation is not encountered at the grade established, due to soft, spongy, or other unstable soil, all of such unstable soil under the culvert is to be removed and replaced with granular material properly compacted to provide adequate support for the culverts, as detailed on the standard drawings in Section 4.

3.3.3.4 INSTALLATION OF CORRUGATED STEEL CULVERTS

The pipe is to be laid in the lengths and locations shown on the drawings, with the separate sections joined firmly and with coupling bands as specified by the manufacturer. Any metal in the joint, which is not protected thoroughly by galvanizing, is to be coated with a suitable asphaltic or approved rust preventative paint. For extension to existing culverts, the Developer is to be responsible for preparing the existing end of the culvert to ensure a proper joint.

The installation of grates on the end of a culvert is allowed if deemed necessary by the City Engineer. Grates are to be rotated so bars are located horizontally.

Proper facilities are to be provided for lowering the pipe in the trench. The pipe is to be laid carefully and set to lines and grades as given, minimum grade 1.0%. Any pipe, which is not in true alignment after being laid, is to be taken up and re-laid. All damaged pipe is to be replaced, or repaired if approved by the Engineer. Any such repair is to be re-painted with an approved asphaltic or rust preventative paint.

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3.3.3.5 BACKFILL

Culverts -be backfilled with selected native materials free of rocks and cobbles greater than 75 mm in size. Backfill surrounding the pipe shall be placed in maximum 150 mm lifts and carefully compacted to 98% of Standard Proctor Density at optimum moisture content, using a hand tamper if necessary, to a level indicated on the standard drawings in Section 4.

3.3.3.6 ROCK RIP-RAP

Rock riprap is to be placed on the surface to be covered as shown on the standard drawings in Section 4 or as directed by the Consultant, on a slope not exceeding 1.5: 1, starting with the larger stones on the bottom row. Each stone is to be hand placed with the broad flat surface resting on a horizontal earth bed prepared in such a way that the earth and not the underlying stone carry the weight of the stone. Stones are to be laid in successive rows, or layers, proceeding upwards, with the joints staggering those of the adjacent rows to secure a shingled effect, evenly stepped. Voids between stones are to be filled with smaller stones conforming to Section 3.3.2.3, rammed into place.

3.3.3.7 BAGGED CONCRETE RIP-RAP

Where bagged concrete riprap is to be used, it is to be immediately be placed on the area to be riprapped in a manner conforming to Section 3.3.3.6 to form a shingled effect, evenly stepped with joints staggered. The bagged concrete riprap is to, when laid, be flattened and tamped into close contact and care is to be taken to eliminate any dirt and debris between bags. The surface so formed is to have an average thickness of not less than 150 mm. The bagged concrete riprap is to be kept moist for a period of not less than 24 hours. No placement of bagged concrete rip-rap is to be permitted during temperatures colder than 1 degree Celsius without the approval of the Consultant, and adequate precautions are to be taken for the protection or heating of the concrete.