

SPECIFICATIONS FOR SUPPLY AND INSTALLATION OF
STRUCTURAL PLATE CORRUGATED STEEL PIPES

1075. 1. DESCRIPTION

The work will consist of supplying and fabricating corrugated structural steel plate sections including nuts and bolts as called for on the plans; excavating, dewatering and preparing the bed for pipe and cutoff walls if required; supplying, placing and compacting granular backfill as specified; erecting and bolting plate sections; and backfilling of the pipe to a depth of 300 mm above the top of the pipe, or as shown on the plans.

1075. 3. SUPPLY OF MATERIALS

3.1 Material to be Supplied by the Contractor

- (a) Corrugated structural plate sections, nuts and bolts shall be fabricated and supplied in accordance with the plans and the Corrugated Steel Pipe Institute's "Specification for Corrugated Steel Pipe Products" Designation 501 (latest edition). Circular structural plate pipes shall be ellipsed.
- (b) Granular backfill shall: (i) consist of tough, durable pebbles or rock fragments, sand and fine soil particles, (ii) be free from sod, roots, or other organic matter, and (iii) conform to the following grading requirements:

Passing 75 mm sieve	100%
Passing 4.75 mm sieve	45 - 70%
Passing 425 um sieve	10 - 35%
Passing 75 um sieve	5 - 15%

All material supplied by the Contractor will be subject to inspection by the Department's representative.

1075. 7. CONSTRUCTION METHODS

7.1 Excavation

The Contractor shall excavate the base of the excavation to the lines of excavation and to the depths below the invert elevations as shown on the plans. The length of the base shall extend 1.25 m beyond each end of the pipe, or pipes, and the excavation shall be transitioned to meet the existing channel slopes. If cutoff walls are shown on the plans, the excavations for them shall be done "neat" to the given dimensions of these walls. The excavation shall be dewatered in order to prevent disturbing the natural soil conditions at the base of the excavation and to allow for the placing and compacting of the granular backfill in the dry.

Dewatering shall be accomplished by constructing cutoff trenches around the outside perimeter of the culvert bed and by excavating sump pits to a depth of not less than 600 mm below the bottom of the culvert base, or by such other means as may be deemed necessary by the Contractor and approved by the Engineer. When trenches and sump pits are used, these excavations shall be shored or braced with cribs so built as to permit pumping therefrom. The Contractor shall provide sufficient pumping capacity to lower and maintain the ground water at least 300 mm below the base of the excavation.

1075. 7. CONSTRUCTION METHODS (Cont'd)

7.1 Excavation

The equipment used for excavation or backfilling purposes may travel or move on the base of the excavation only if it is of such a nature that the base of the excavation is not disturbed. All additional excavation and backfilling required, as a result of improper equipment being used for excavation or backfilling purposes, shall be done at the Contractor's expense.

The excavated base will be inspected by the Engineer prior to the Contractor being allowed to begin backfilling with granular backfill. In the event that the Engineer deems further excavation to be required below the bottom of the excavation line shown on the plans, the Contractor shall excavate such additional material as directed by the Engineer.

The work involved in doing this additional work will be classed as Extra Work and will be paid for as such in accordance with the General Conditions.

Excavated material not required for backfill or deemed to be unsuitable backfill material by the Engineer, will be classed as "Surplus Material".

Unless otherwise shown on the plans or specified in the Special Provisions, "Surplus Material" shall become the property of the Contractor and shall be removed by him from and out of sight of the right-of-way.

7.2 Backfill

All backfilling between the base of the excavation and the spring line of an arch or the 1/3 "D" of a circular pipe shall be done using granular backfill. In addition, all cutoff trenches, sump holes and additional excavated areas shall also be backfilled with granular material.

The Contractor shall supply, place and compact the granular backfill below the invert elevations prior to assembly and erection of the pipe. The granular backfill shall be deposited in horizontal, uniform and even layers not exceeding 150 mm before compaction, and each layer shall be compacted to a relative compaction of not less than 95% standard Proctor.

The quantity of granular backfill shown in the tender is only an estimate. The final quantity may be smaller or greater than that shown.

The backfill above the spring line of an arch or the 1/3 "D" of a circular pipe shall be done using excavated material or borrow material or both if it is deemed suitable for that purpose by the Engineer.

Excavated and borrow material shall be deposited in horizontal uniform and even layers not exceeding 300 mm before compaction, and every layer shall be compacted to a relative compaction of not less than 90% standard Proctor.

Borrow material, if required, will be made available by the Department to the Contractor in an as is, where is condition within a 2 km radius of the site. The Contractor shall ensure that borrow material taken out of the borrow pit supplied by the Department is free from rocks or lumps exceeding 75 mm in their greatest dimension, vegetable matter, frozen fill, sod, cinders and earth containing a high percentage of organic matter. The borrow pit shall be left in a neat and orderly condition satisfactory to the Engineer.

1075. 7. CONSTRUCTION METHODS (Cont'd)

7.2 Backfill (Cont'd)

Compaction equipment or methods that produce horizontal or vertical earth pressures which may cause excessive displacements or which may damage the installation, shall not be used. The use of equipment such as sheepfoot, wobblers or other equipment of a similar mass and nature will not be allowed within 1 m of the sides of the pipes or within the 300 mm of the backfill over the top of the pipes.

The granular backfill and excavated or borrow material placed after the pipe or pipes have been bedded and erected, shall be placed and compacted alternately and progressively on both sides of the pipe. Mechanical compaction shall be supplemented by hand compaction in the areas between the culvert bed and 1/3 "D" or the spring line to ensure intimate contact between the bottom surfaces and sides of the pipes and the granular backfill.

7.3 Installation and Assembly

Plate sections shall be hauled to the site and, after preparation of the bed, the Contractor shall assemble the plate sections in accordance with the manufacturer's instructions.

A copy of the manufacturer's assembly instructions shall be furnished to the Engineer prior to assembling the structural plates.

Concrete cutoff walls, if shown on the plans, shall be constructed in accordance with the "Specifications for Reinforced Concrete".

All galvanizing that has been chipped off or damaged in handling or transporting shall be repaired as outlined in the CSPI Specification 501 (latest edition).

Ellipsed circular structural plate pipes shall be placed with the major axis vertical.

Only a sufficient number of temporary bolts shall be used to hold the plates loosely in position until assembly has been completed for four or more rings. When all plates are in position and the remaining permanent bolts in place, the temporary bolts used in drawing the plates together shall be replaced with permanent bolts. All nuts shall be tightened progressively throughout the structure to a torque of not less than 200 J nor more than 400 J. When a power wrench is used to tighten the bolts, care shall be taken to make sure that the wrench is always in proper adjustment. Every twentieth bolt shall be checked by the Contractor with a calibrated torque wrench to be furnished by him. Where the tests indicate loose bolts, the bolts in that area shall be properly tightened and additional tests made. Bolts that have been tightened and then undone shall be replaced with new bolts and torqued to the required torque. The bolts shall be fitted so that their heads bear fully on the corrugation of the plates, thereby ensuring full bearing areas and tight seams. The short bolts shall be placed where two plates lap and the long bolts shall be placed where three plates lap. All bolts shall be of sufficient length to provide for a full nut.

1075. 9. METHOD OF MEASUREMENT

9.1 Excavation

Excavation will be paid for on a lump sum basis and no measurements will be taken of this work.

1075. 9. METHOD OF MEASUREMENT (Cont'd)

9.1 Excavation (Cont'd)

All costs incurred in the dewatering of the excavation and the disposal of excavated surplus material shall be included in the Contract Lump Sum Price for "Lump Sum Excavation" and no additional compensation will be allowed, except as noted in Section 7.1 of this Specification.

9.2 Backfill (Other than Granular Backfill)

All backfill other than granular backfill, used in backfilling the structure, will be paid for on a lump sum basis and no measurements will be taken of this work.

9.3 Granular Backfill

Granular backfill will be measured in cubic metres of material delivered to the area being backfilled at the time of placing. The capacity of vehicles hauling will be derived from measurements made by the Engineer. These measurements will be used to establish the box capacity to the nearest 0.1 m³ and the capacity of a vehicle box so determined, shall not be changed while in use on the project without the consent of the Engineer. Loads will be measured at the point of dumping at the site. The Contractor shall level all loads before they are measured by the Engineer. Measurements will not be made for material heaped above the water level capacity of the box and deductions will be made in 0.1 m³ increments for loads which do not contain full water level capacity.

9.4 Pipe

9.4.1 Supplying and Fabricating

Supplying and fabricating of the corrugated structural plate pipe will be measured on a lineal metre basis. The quantity to be paid for will be the total number of lineal metres fabricated and accepted by the Engineer. Measurements will be taken along the actual invert centreline of the pipe.

9.4.2 Hauling and Installation

The hauling to the site and installation of the corrugated structural plate pipe will be measured on a lineal metre basis. The quantity to be paid for will be the total number of lineal metres installed in place and accepted by the Engineer. Measurements will be taken along the actual invert centreline of the pipe.

1075. 11. BASIS OF PAYMENT

11.1 Excavation

Excavation will be paid for at the Contract Lump Sum Price for "Lump Sum Excavation", which price will be payment in full for performing all operations herein described for excavation and all other items incidental to the work included in this Specification.

1075. 11. BASIS OF PAYMENT (Cont'd)

11.2 Backfill (Other than Granular Backfill)

Backfill, other than granular backfill, will be paid for at the Contract Lump Sum Price for "Lump Sum Backfill", which price will be payment in full for performing all operations herein described for this class of backfill and all other items incidental to the work included in this Specification.

11.3 Granular Backfill

The supply and placing of granular backfill will be paid for at the Contract Unit Price per cubic metre for "Supplying and Placing Granular Backfill", measured as specified herein, which price will be payment in full for performing all operations herein described for this class of backfill and all other items incidental to the work included in this Specification.

11.4 Pipe

11.4.1 Supplying and Fabricating

Supplying and fabricating the corrugated structural plate pipes will be paid for at the Contract Unit Price for "Supplying Structural Plate Pipe", measured as specified herein, which price will be payment in full for performing all operations herein described for this class of work and all other items incidental to the work included in this Specification.

11.4.2 Hauling and Installation

Hauling and installation of the corrugated structural plate pipe will be paid for at the Contract Unit Price for "Hauling and Placing Structural Plate Pipe", measured as specified herein, which price will be payment in full for performing all operations herein described for this class of work and all other items incidental to the work included in this Specification.