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5.22 SUPPLY AND INSTALL SMOOTH WALL STEEL PIPES**5.22.1 GENERAL**

The Contractor shall supply and install smooth wall steel pipe culvert through the existing highway as shown on the mosaic/plan-profile sheets and as directed by the Consultant.

Centerline steel pipe culvert installation shall consist of augering of the steel pipe through the existing highway embankment and installing the remainder of the steel pipe culvert by the trenched or open cut method as shown on the drawings (CB6-2.4M19).

The abbreviation for Smooth Wall Steel Pipe when indicated on the plans or used in the specifications is S.W.S.P.

5.22.2 MATERIALS**5.22.2.1 Culvert Material**

Smooth Wall Steel Pipe (9.5 mm wall thickness) shall be supplied by the Contractor and shall meet ASTM Specification A252 Grade 2. Any variation from the specified requirements for the Smooth Wall Steel Pipe shall be subject to the approval of the Consultant. The Consultant has the sole right to reject material that in his opinion will not adequately meet the expected longevity of this new culvert installation. The Contractor shall have no claim against the Department for all or part of material rejected and shall remove and dispose of rejected material at his own expense.

5.22.2.2 Material for Bedding, Backfill and Sealing

The Contractor shall either use approved native material or produce granular material for bedding and backfill in trenched areas in accordance with Specification 3.2, Aggregate Production and Stockpiling for the designation and class of materials specified. The Contractor shall supply aggregate in accordance with Specification 5.2, Supply of Aggregate.

The Contractor shall also supply the required clay material for the clay seals at both ends of the installation.

5.22.3 CONSTRUCTION**5.22.3.1 Length of Pipe Required for Installation**

The Contractor shall determine the total length of Smooth Wall Steel Pipe required for both the coring and trenched or open cut installations based on the design cross-sections available from the Consultant.

Prior to commencing the installation, the Contractor shall liaise with the Consultant to determine the exact length of pipe required, depending on landowner requirements and onsite inspection.

5.22.3.2 Coring and Pushing

The installation shall be carried out by coring and pushing a steel pipe through the highway embankment without disturbing the existing pavement structure and in a manner approved by the Consultant. The invert elevations, pipe length and pipe diameter shall be as shown on the mosaic plan-profile drawings or as determined in consultation with the project Consultant. The Contractor shall cut sections and join sections with a continuous butt weld to provide the necessary overall length as part of the coring and pushing operations.

The Contractor shall be responsible for correcting and repairing, at his own expense, any roadway slides or failures that occur as a result of activities associated with the coring operations.

The coring machine shall be capable of excavating to a diameter not greater than 25 mm of the outside diameter of the pipe.

In the event that adverse soil conditions are encountered during coring operations which necessitate a change in construction methods, the method of construction for the affected portion shall be approved by the Consultant prior to proceeding with further construction.

5.22.3.3 Coring

The Consultant will provide line and grade at each end of the pipe from which the Contractor shall accurately control the coring.

The Contractor shall block, shim or construct rails as required to ensure that the finished pipe meets the tolerance requirements for alignment and grade.

Line and grade shall be continuously checked by the Contractor using a laser. The laser must be sufficiently capable of shooting the entire length of each operation and have a beam deviation not greater than 6 mm. If the laser does not meet the requirements of the project, the Contractor shall replace it with a unit approved by the Consultant, at the expense of the Contractor.

The Consultant may also monitor the installation by performing quality assurance testing of the line and grade. The Contractor shall co-operate by making the workings available for checking at suitable intervals during regular working hours as required by the Consultant.

Discrepancies found by the Consultant shall be corrected by the Contractor immediately. The return to established line or grade shall be at a rate not exceeding 50 mm per 10 m.

Such checks or lack of them shall not relieve the Contractor of full responsibility for constructing the pipe to the line and grade as specified by the Consultant.

5.22.3.4 Installation by Trench or Open Cut Method

The pipe shall be installed on the prepared base, true to the designed lines and grades unless otherwise established by the Consultant. Separate sections shall be securely joined together with a continuous butt weld. The Contractor shall cut bevelled end sections (3:1 or 4:1 slope as applicable) as directed by the Consultant.

The Contractor shall use due care when installing pipe to avoid damaging the pipe. Damaged pipe shall be removed and replaced by the Contractor at his expense.

5.22.3.4.1 Bedding and Backfill

Bedding and backfill material shall be placed as shown on the plans and shall consist of approved suitable native material or imported select gravel or soil material as directed by the Consultant. All bedding and backfill material shall be free from frozen lumps and organic material. Backfill within 300 mm of the pipe wall shall be free from stones of diameter larger than 80 mm.

5.22.3.5 **Hand-Laid Riprap**

Immediately following completion of the pipe installation, hand-laid riprap shall be placed in accordance with Specification 2.5, Riprap.

5.22.3.6 **Cleanup**

After the installation has been completed, the Contractor shall cleanup the site to a condition similar to the surrounding area or as directed by the Consultant. This includes but is not limited to, removal and disposal of all discarded utility lines, tracks, coring equipment, and unused construction materials and debris from the pipe and construction area.

The Contractor shall leave the pipe in a clean reasonably dry condition suitable for inspection by the Consultant.

5.22.3.7 **Final Acceptance Inspection**

The final installation shall be subject to the Consultant's inspection. All damages such as bent or deformed edges or undulations of the pipe shall be corrected at the Contractor's expense.

The finished pipe culvert installation shall not deviate from grade and alignment by more than 50 mm.

Any pipe placed which does not comply with these requirements shall be corrected to the satisfaction of the Consultant, at the Contractor's expense.

5.22.4 MEASUREMENT AND PAYMENT

Measurement for the supply and installation of smooth wall steel pipes will be made in metres based on the total invert length of pipe installed including sloped end sections. The Contractor shall have no claim for extra payment over the tendered unit price resulting from any difference between the estimated quantity as shown in the unit price schedule and the final length of pipe required.

Payment will be made at the unit price bid per metre for "Smooth Wall Steel Pipe - Supply and Install" for the applicable size of pipe specified. This payment will be full compensation for excavation required to facilitate the coring operation, supplying and installing the requisite smooth wall steel pipe materials, preparing the culvert bed in the trenched sections, supplying and placing of bedding and backfill materials, supply and construction of clay seals and the supply and placement of hand-laid riprap.

When the Contract contains a bid item for "Channel Excavation," excavation for the open cut of the trenched portion of the culvert installation as determined by the Consultant, will be paid for as "Channel Excavation" in accordance with Specification 2.3, Grading. When the Contract does not contain a bid item for "Channel Excavation", all excavation will be considered included in the unit price bid for "Smooth Wall Steel Pipe - Supply and Install."