

SPECIFICATIONS FOR
STRUCTURAL EXCAVATION

1.0 DESCRIPTION

The Work shall consist of:

- .1 Removing material for the placement of foundations, substructure units, approach slabs, transition slabs and culverts, including the disposal of surplus and unsuitable material, as shown on the Drawings and described in this Specification;
- .2 Water control including dewatering the excavation and maintaining stream flow through the site;
- .3 Preparing the base of excavation; and
- .4 Supplying, placing, compacting, finishing and heating of a concrete working base.

Cofferdams and shoring shall be completed in accordance with the Specifications for Temporary Works.

2.0 REFERENCES AND RELATED SPECIFICATIONS

All reference standards and related specifications shall be current issue or the latest revision at the date of tender advertisement.

2.1 References

- CSA A23.1, Concrete Materials and Methods of Concrete Construction

2.2 Related Specifications

- Specifications for Reinforced Cast-In-Place Concrete
- Specifications for Temporary Works

3.0 SUBMITTALS

The Contractor shall submit the following to the Engineer, in accordance with the Special Provisions:

- .1 A detailed Excavation Staging Plan and schedule clearly illustrating the method and sequence by which he proposes to stage the excavation, cofferdam and shoring Works in accordance with the Drawings, this Specification and the Special Provisions.
- .2 A detailed Water Control Plan and schedule clearly illustrating the method and sequence by which he proposes to handle dewatering the excavation, groundwater depressurization (if required) and maintaining the stream flow for the duration of the Work in accordance with the Drawings, this Specification and the Special Provisions.

4.0 MATERIALS

4.1 Working Base Concrete

The strength of working base concrete shall be a minimum compressive strength of 20 MPa at 28 days.

5.0 CONSTRUCTION METHODS

5.1 Excavation Requirements

The Contractor shall excavate only material that is necessary for the construction of the structure and shall not excavate outside the limits of excavation shown on the Drawings and in accordance with the following:

.1 Excavation for Concrete Culverts

Neat trenches shall be excavated for placing aprons, cut off walls and lower portions of headwalls or wingwalls. Where "neat" trenching is impractical for cut-off walls, headwalls or wingwalls, backfilling of these areas shall be done with lean-mix concrete. The excavation shall be dewatered to prevent disturbing the natural soil conditions at the base of the excavation and to permit completing all construction operations in the dry.

Dewatering shall be accomplished by constructing trenches around the outside perimeter of the culvert bed and by excavating sump pits to a depth of not less than 2.0 meters below the bottom of the culvert base, or by other means subject to the Engineer's approval. When trenches and sump pits are used, the excavation shall be shored or braced with cribs to permit pumping.

The equipment used for excavation purposes may travel or move on the base of the excavation only if it does not disturb the base of the excavation. All additional excavation and backfilling required as a result of the improper use of equipment for excavation purposes shall be done at the Contractor's own expense.

Cofferdams to isolate the excavation from the waterway shall be constructed in accordance with the Specifications for Temporary Works.

Excavations that are more than 1.5 metres deep and within a cofferdam in a watercourse shall be shored, sloped and/or stepped in accordance with the Manitoba Workplace Safety and Health Act and Regulations. The slopes or sides of the excavation shall be shored unless:

- (a) The excavation is cut in solid rock or other equally stable material, excluding frozen ground;
- (b) The excavation is cut in cohesive, granular or other material to a stable slope based on the material properties of the in-situ material and as determined by a geotechnical engineer. A maximum 1:1 slope (angle not greater than 45° measured from the horizontal plane) shall be provided; and
- (c) A combination of sloped and vertical faces are used for stabilizing the sides of the excavation where the vertical face shall not exceed 1.0 metres and the remaining sides are sloped in accordance with this Specification.

.2 Excavation for Abutments, Approach Piers and Retaining Walls

Excavation shall be kept to a minimum. The limits of the excavation shall not extend more than 1.0 meter beyond the footprint of the footings.

Excavations for abutments, approach piers and retaining walls that are more than 1.5 metres deep and outside of a watercourse channel shall be shored, sloped and/or stepped as approved by the

Engineer and shall meet the requirements of the Manitoba Workplace Safety and Health Act and Regulations. In areas where groundwater seepage is encountered, the excavation shall be dewatered to permit completing all construction operations in the dry.

.3 Excavation for River Piers

Excavation shall be kept to the minimum. The limits of the excavation shall not extend more than 1.0 meter beyond the footprint of the footings.

Excavation for river piers shall be isolated from the watercourse using sheetpiling cofferdams. Sheetpiling cofferdams shall be shored as approved by the Engineer and shall meet the requirements of the Specifications for Temporary Works and the Manitoba Workplace Safety Health Act and Regulations.

5.2 Cofferdams and Shoring

The Contractor shall construct cofferdams and shoring in accordance with Specification 1092: Temporary Works, the Shop Drawings and as specified herein.

Variations from the Shop Drawings will not be permitted, unless such variations are approved by the Professional Engineer responsible for the design and the Engineer is provided with revised Shop Drawings.

5.3 Depth of Excavation and Condition of Base

Excavations shall be completed to the elevations and dimensions as shown on the Drawings, or to the elevations directed by the Engineer in the field in order to obtain firm, stable foundations. If the Engineer determines that the required depth of increased excavation exceeds 1.0 meter below the bottom of excavation elevation shown on the Drawings, the additional work shall be done and will be paid for as Extra Work in accordance with the General Conditions.

Neat trenches shall be excavated for footing keys.

Under winter conditions, the Contractor shall remove frost from the base of the excavation and maintain the base and concrete working base in an unfrozen condition until the structural concrete can be placed. Hoarding and heating requirements will then apply as specified in Specifications for Reinforced Cast-In-Place Concrete.

5.4 Dewatering

Excavations shall be dewatered and maintained dewatered so that the material is excavated in its natural state and construction of the foundations is completed in the dry. The bottom of the excavation shall be kept free from excessive moisture and free-flowing water.

Underwater excavation will not be allowed other than under extreme conditions where the ingress of water from the bottom of the excavation is impossible to stop.

Pumping from the interior of any excavation shall be done so that the water is diverted from the footing base. The level of any water inside of the excavation shall be below the bottom of the footing elevation so that the foundations are placed in the dry. Pumping water from the excavation shall not be discontinued until the substructure unit is completed and backfilled unless otherwise allowed by the Engineer.

Pumping to dewater a sheetpiling cofferdam sealed with tremie concrete shall not commence until the concrete has sufficient strength to withstand the hydrostatic pressure.

The Contractor shall ensure that the point of discharge from surface water pumped from any excavation is a minimum of 25 metres from the edge of a watercourse. The Contractor shall ensure that water discharge

onto the vegetated channel bank or any other locations is done so in a manner that does not cause erosion of the ground and prevents water containing sediment from directly entering the watercourse. This shall be done to the satisfaction of the Engineer. Should the Engineer determine additional measures are required, the Contractor shall implement these measures immediately.

5.5 Maintaining Stream Flow

The Contractor shall maintain uninterrupted flow of water through the site during all stages of construction. The Contractor shall prepare and submit a Water Control Plan to the Department a minimum of ten (10) calendar days prior to commencing any work at the site. The Water Control Plan shall clearly illustrate and detail the method, location, size, sequence of operation, and other specific requirements for the measures proposed by the Contractor to handle and provide for the uninterrupted flow of water in the watercourse for the duration of the Work. This operation may include but not be limited to, the complete diversion of the watercourse during construction. Hydraulic requirements for maintaining stream flow will be provided to the Contractor by the Department.

The Water Control Plan shall also include specific measures for handling potentially sediment-laden water from excavation dewatering and groundwater depressurization activities to ensure that the turbid water is not discharged directly into the watercourse. These measures may include but not be limited to, the construction and maintenance of settling ponds for the duration of the Work.

5.6 Concrete Working Base

A concrete working base shall be placed in all excavations. The bottom of the excavation, with the exception of all cut-off trenches and sump pits, shall be covered with a layer of working base concrete having a minimum thickness of 75 mm. The concrete working base shall be placed immediately after the excavation is completed, and the Engineer has approved the depth of the excavation and the character and condition of the foundation material. The concrete shall be as dry as is practicable and shall be tamped and screeded to give a level working platform for setting up forms and placing reinforcing steel. The Contractor shall allow the concrete working base to cure for 24 hours before setting up forms or placing reinforcing steel.

5.7 Protection of Existing River Banks, Channel and Embankment Slopes

The Contractor shall not disturb the river banks, channel and embankment slopes outside of the excavation limits or beyond the profile shown on the Drawings.

The Contractor will not be allowed to dispose of excavated material within the project limits.

If the Contractor can demonstrate conclusively that there is no alternative to disturbing the banks, slopes, or channel, permission may be granted by the Engineer provided that the Contractor shall be responsible for restoring the banks, slopes and channel to the original profile and compaction at his own expense.

5.8 Excavated Material

Excavated material to be reused as backfill material shall be stockpiled within a suitable area approved by the Engineer. Examples of unsuitable areas include, but are not limited to, the following:

- (a) In the flood plain;
- (b) On the edge of an embankment creating slope stability issues; or
- (c) Locations impeding sight lines of the travelling public through or around the site.

Excavated material that is unsuitable for, or surplus to, the backfill requirements, or any other debris within the construction limits, shall become the property of the Contractor and shall be removed from the project limits immediately. During freezing weather, the excess material shall be disposed of before it freezes.

6.0 QUALITY MANAGEMENT

After each excavation is completed, the Engineer will inspect the base of the excavation before any further work can proceed. The Engineer can order test pits, test drilling, further excavation or other work as is necessary to obtain firm, stable foundations. The Contractor shall allow the Engineer unhindered access to the excavation and shall assist the Engineer in completing additional testing, drilling or any other work deemed necessary.

7.0 METHOD OF MEASUREMENT

7.1 Structural Excavation

Structural excavation will be paid for on a lump sum basis, and no separate measurement will be made for this work.

Supplying, placing, compacting, finishing and heating the concrete working base will be considered incidental to the excavation and no separate measurement will be made of this work.

7.2 Water Control

Water control will be paid for on a lump sum basis, and no separate measurement will be made for this work.

8.0 BASIS OF PAYMENT

8.1 Structural Excavation

Structural excavation will be paid for at the Contract Lump Sum Price for "Structural Excavation", measured as specified herein, and will be payment in full for performing all operations herein described and all other items incidental to the Work.

8.2 Water Control

Water Control will be paid for at the Contract Lump Sum Prices for "Dewatering" and "Stream Flow Management", measured as specified herein, and will be payment in full for performing all operations herein described and all other items incidental to the Work.