



CONSTRUCTION SPECIFICATION FOR EMBANKMENTS OVER SWAMPS AND COMPRESSIBLE SOILS

TABLE OF CONTENTS

| | |
|---------------|--|
| 209.01 | SCOPE |
| 209.02 | REFERENCES |
| 209.03 | DEFINITIONS |
| 209.04 | DESIGN AND SUBMISSION REQUIREMENTS - Not Used |
| 209.05 | MATERIALS |
| 209.06 | EQUIPMENT |
| 209.07 | CONSTRUCTION |
| 209.08 | QUALITY ASSURANCE - Not Used |
| 209.09 | MEASUREMENT FOR PAYMENT |
| 209.10 | BASIS OF PAYMENT |

209.01 SCOPE

This specification covers the requirements for the construction of embankments over swamps and compressible soils using the excavation, floatation, or displacement method.

209.02 REFERENCES

This specification refers to the following standards, specifications, or publications:

Ontario Provincial Standard Specifications, Construction

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| OPSS 201 | Clearing, Close Cut Clearing, Grubbing, and Removal of Surface and Piled Boulders |
| OPSS 206 | Grading |
| OPSS 212 | Earth Borrow |

Ontario Provincial Standard Specifications, Material

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|-----------|--|
| OPSS 1010 | Aggregates - Base, Subbase, Select Subgrade, and Backfill Material |
| OPSS 1860 | Geotextiles |

209.03

DEFINITIONS

For the purpose of this specification, the following definitions apply:

Displacement Method means to build the embankment directly on the swamp such that the underlying swamp material is displaced away from the embankment fill.

Earth means earth as defined in OPSS 206.

Floatation Method means to build the embankment directly on the swamp minimizing the displacement of the swamp material.

Hydraulic Backhoe Reach means the distance from the bottom of the tracks to the tip of the bucket teeth when measured vertically with the bucket at the lowest point of the bucket swing path.

Rock means rock as defined in OPSS 206.

Swamp Material means the material within the swamp excavation, floatation, or displacement limits, except rock, masonry, natural wood, and manufactured products. Wood that has decomposed and breaks down readily upon handling shall be considered swamp material.

Swamp Wave means the swamp material that is displaced as a result of placement of embankment material.

209.05

MATERIALS

209.05.01

Embankment Material

Embankment material shall consist of earth, rock, select subgrade material, or other material specified in the Contract Documents.

209.05.01.01

Earth Borrow

Earth borrow shall be according to OPSS 212.

209.05.01.02

Select Subgrade Material

Select subgrade material shall be according to OPSS 1010.

209.05.02

Geotextiles

Geotextiles shall be according to OPSS 1860 and be of the type, class, and filtration opening size (FOS) range specified in the Contract Documents.

209.06

EQUIPMENT

209.06.01

Rented Swamp Excavator

The type of swamp excavator equipment shall be as specified in the Contract Documents.

All buckets shall be suitable for swamp excavation.

Dragline minimum operating weight shall be determined using the manufacturer's standard operating dragline configuration, boom length, counterweights and manufacturer's specified bucket.

The minimum size and requirements of the excavator(s) shall be as specified in the Contract Documents.

209.06.02 Spreading, Levelling, and Compacting Equipment

When the floatation method is used, spreading, levelling, and compacting equipment shall be restricted to a gross weight that is not detrimental to the structural integrity of the root mat.

209.07 CONSTRUCTION

209.07.01 General

The work of embankment construction shall be carried out using one or more of the following methods specified in the Contract Documents:

- a) Excavation Method
- b) Floatation Method
- c) Displacement Method

209.07.02 Clearing and Close Cut Clearing

Prior to beginning embankment construction, the required clearing and close cut clearing shall be completed according to OPSS 201.

209.07.03 Excavation Method

The work shall include the excavation of all material, except rock from within the limits specified in the Contract Documents and the handling, placing, shaping, trimming and hauling of excavated material.

Excavation shall be to the full width and full depth. The excavation and backfilling shall be a controlled operation and carried out simultaneously.

Excavated material shall be placed clear of the sides of the embankment limits and any drainage facilities.

209.07.03.01 Embankment Construction and Backfill

Backfill shall be placed according to OPSS 206. However, when wet conditions exist, backfill material other than rock may be placed up to 600 mm above water level without compaction.

Embankment material placed subsequent to the backfill material shall be placed according to OPSS 206.

209.07.04 Floatation Method

The work shall consist of controlled placement of embankment material, removal of surcharges specified in the Contract Documents from above the subgrade, and hauling and incorporating of the surcharge material into the work according to OPSS 206.

209.07.04.01 Swamp Waves

Swamp waves shall not be excavated or otherwise disturbed.

209.07.04.02 Embankment Construction

The embankment shall be constructed according to OPSS 206, except that vibratory compaction equipment shall not be used within 1.0 m of the original surface of the swamp.

Each layer shall be built using an outside to inside sequence by keeping the outer one-third portions of the layer at least 30 m ahead of the centre portion.

209.07.04.03 Geotextile

When geotextile is to be placed, the area specified in the Contract Documents for geotextile shall be close cut cleared and cleared of objects that may damage the geotextile. Close cut clearing shall be carried out in such a manner as not to damage the structural integrity of the root mat.

The placement operation shall be such that the geotextile is not exposed to daylight for more than 72 hours.

Adjacent sections of the geotextile shall be overlapped a minimum of 1.0 m or shall be sewn together according to OPSS 1860.

Should the geotextile be damaged, it shall be repaired by placing a piece of geotextile large enough to cover the damaged section meeting the above requirements for overlapping.

If the geotextile is damaged due to the Contractor's operation during embankment construction, the embankment material shall be removed from the geotextile.

209.07.05 Displacement Method

The work shall consist of controlled placement of the embankment material, excavation of swamp waves and displaced material, removal of surcharges specified in the Contract Documents, and hauling and incorporating of this material into the work according to OPSS 206.

209.07.05.01 Embankment Construction

The embankment shall be built in such a manner as to displace as much of the material underlying the embankment as possible. An inside to outside construction sequence shall be used, keeping the inside one-third portion 30 m ahead of the outside portions.

When a stable platform has been established, embankment material placed 300 mm above original ground shall be placed according to OPSS 206.

209.07.06 Management of Excess Material

Management of excess material shall be according to the Contract Documents.

Manufactured products shall not be used in the right-of-way.

Excavated swamp material shall be used as much as possible within the right-of-way adjacent to an embankment and conforming to standard right-of-way offset. This shall be done by widening embankments, flattening side slopes, and constructing modified cross-sections as specified in the Contract Documents. Such material shall be trimmed to provide smooth contours and to provide drainage.

The volume of excavated material to be used within the Contract limits or designated areas shall be as specified in the Contract Documents.

209.09 MEASUREMENT FOR PAYMENT

209.09.01 Actual Measurement

209.09.01.01 Excavation

Measurement shall be by volume in cubic metres by the method of average end areas. The quantity for payment shall be the lesser of the following:

- a) Actual excavation.
- b) Excavation to the length, width, and depth as specified in the Contract Documents.

209.09.01.02 Rental of Swamp Excavation Equipment

Measurement shall be by time in hours that the equipment is in effective operation. The equipment shall not be considered in effective operation when there are no trucks ready for loading, when hauling is required.

When the excavated material has been placed in a location that will not interfere with subsequent excavation, measurement shall not be made for the handling required in grading, levelling, and trimming of such material.

209.09.01.03 Select Subgrade Material

Measurement shall be by mass in tonnes or by volume in cubic metres as specified in the Contract Documents.

209.09.01.03.01 Cubic Metre Measurement

When measurement of select subgrade material is in cubic metres, one of the following methods, as specified in the Contract Documents, shall be used to calculate the volume of the material:

a) End Area Method

Volume of material shall be measured in their original location and computed in cubic metres by the method of average end areas.

Original cross-sections shall be taken after the area has been cleared, grubbed, and stripped of unsuitable surface material. These operations shall be completed a minimum of 3 Working Days in advance of excavation to allow for the required cross-sectioning.

b) Truck Box Method

Material shall be measured in cubic metres, loose, by predetermined truck box capacities. The predetermined capacity of each truck shall be that computed from its box dimensions.

Each truck shall be uniquely and readily identifiable.

209.09.01.04 Geotextile for Swamp Treatment

Measurement shall be by area, in place, in square metres, with no allowance for overlaps.

209.09.02 Plan Quantity Measurement

When measurement is by Plan Quantity, such measurement shall be based on the units shown in the clauses under Actual Measurement.

209.10 BASIS OF PAYMENT

209.10.01 Excavation

Payment for swamp excavation shall be at the Contract price for the tender item Earth Excavation, Grading, according to OPSS 206.

Payment shall not be made for the removal of materials that slide or slough inside the excavation limits.

**209.10.02 Rental of Swamp Excavation Equipment, Dragline - Item
Rental of Swamp Excavation Equipment, Hydraulic Backhoe - Item**

Payment at the Contract price for the above items shall be full compensation for furnishing and operating the minimum size equipment specified, including mats when necessary, for the excavation.

Payment for drainage of water in swamps prior to excavation is included in these tender items unless otherwise specified elsewhere in the Contract Documents.

When the Contract Administrator approves the use of larger equipment, the Contract price per hour will be adjusted by adding to the Contract price the difference between the rate set out in the Contract Documents for the minimum size equipment specified and the rate set out in the Contract Documents for the larger equipment to be employed. Where the standard operating weight for the equipment falls between increments and listed categories shown in the Contract Documents the lower rate shall apply. No interpolation between categories of standard operating weights will be made to determine payments. When larger equipment is approved for use, the estimated hours of swamp excavation equipment rental will be adjusted down by the Contract Administrator.

Payment shall be made only for the time in which the equipment is in effective operation.

209.10.03 Floatation and Displacement Method

Payment shall not be made for swamp material displaced by floatation or displacement.

**209.10.04 Select Subgrade Material - Item
Geotextile for Swamp Treatment - Item**

Payment at the Contract price for the above tender items shall be full compensation for all labour, Equipment, and Material to do the work.

Repairs to geotextile damaged by the Contractor's operation shall be at no additional cost to the Owner.

209.10.05 Management of Swamp Material Excavated by Equipment Rental

All costs associated with the management of material, except trucking, are deemed to be included in the Contract unit price for rental of swamp excavation equipment.