# ONTARIO PROVINCIAL STANDARD SPECIFICATION

## CONSTRUCTION SPECIFICATION FOR EMBANKMENTS OVER SWAMPS

### TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>209.01</td>
<td>SCOPE</td>
</tr>
<tr>
<td>209.02</td>
<td>REFERENCES</td>
</tr>
<tr>
<td>209.03</td>
<td>DEFINITIONS</td>
</tr>
<tr>
<td>209.04</td>
<td>Not Used</td>
</tr>
<tr>
<td>209.05</td>
<td>MATERIALS</td>
</tr>
<tr>
<td>209.05.01</td>
<td>Embankment Materials</td>
</tr>
<tr>
<td>209.05.01.01</td>
<td>Earth or Rock</td>
</tr>
<tr>
<td>209.05.01.02</td>
<td>Earth or Rock Borrow</td>
</tr>
<tr>
<td>209.05.01.03</td>
<td>Select Subgrade Material</td>
</tr>
<tr>
<td>209.05.02</td>
<td>Geotextiles</td>
</tr>
<tr>
<td>209.06</td>
<td>EQUIPMENT</td>
</tr>
<tr>
<td>209.06.01</td>
<td>Swamp Excavator</td>
</tr>
<tr>
<td>209.06.02</td>
<td>Spreading, Levelling and Compaction Equipment</td>
</tr>
<tr>
<td>209.07</td>
<td>CONSTRUCTION</td>
</tr>
<tr>
<td>209.07.01</td>
<td>General</td>
</tr>
<tr>
<td>209.07.02</td>
<td>Clearing and Close Cut Clearing</td>
</tr>
<tr>
<td>209.07.03</td>
<td>Method 'A' - Excavation</td>
</tr>
<tr>
<td>209.07.03.01</td>
<td>Embankment Construction and Backfill</td>
</tr>
<tr>
<td>209.07.04</td>
<td>Method 'B' - Floatation</td>
</tr>
<tr>
<td>209.07.04.01</td>
<td>Swamp Waves</td>
</tr>
<tr>
<td>209.07.04.02</td>
<td>Embankment Construction</td>
</tr>
<tr>
<td>209.07.04.03</td>
<td>Geotextile</td>
</tr>
<tr>
<td>209.07.05</td>
<td>Method 'C' - Displacement</td>
</tr>
<tr>
<td>209.07.05.01</td>
<td>Embankment Construction</td>
</tr>
</tbody>
</table>
209.07.06  Management of Excavated Material

209.09  MEASUREMENT FOR PAYMENT

209.09.01  Actual Measurement

209.09.01.01  Excavation
  .02  Rental of Swamp Excavation Equipment
  .03  Select Subgrade Material

209.09.01.03.01  Tonne Measurement
  .02  Cubic Metre Measurement

209.09.01.04  Geotextile

209.09.02  Plan Quantity Measurement

209.09.02.01  Excavation Geotextile

209.10  BASIS OF PAYMENT

209.10.01  Excavation
  .02  Rental of Swamp Excavation Equipment - Item
  .03  Floatation and Displacement Method
  .04  Select Subgrade Material - Item
  .05  Geotextile - Item
  .05  Management of Swamp Material Excavated by Equipment Rental

209.01  SCOPE

This specification covers the requirements for the construction of embankments over swamps.

209.02  REFERENCES

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

**Ontario Provincial Standard Specifications, General:**

OPSS 102  Weighing of Materials
OPSS 127  Schedule of Rental Rates for Construction Equipment Including Model and Specification Reference
OPSS 180  Management and Disposal of Excess Material

**Ontario Provincial Standard Specifications, Construction:**

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

**Ontario Provincial Standard Specifications, Material:**

OPSS 1010  Aggregates - Granular A, B, M and Select Subgrade Material
OPSS 1860  Geotextiles
209.03 DEFINITIONS

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

**Floatation:** means to build the embankment directly on the swamp, minimizing the displacement of the swamp material.

**Displacement:** means to build the embankment directly on the swamp, in such a manner as to displace as much of the underlying swamp material as possible.

**Swamp Material:** means the materials within the swamp excavation, floatation or displacement limits, except rock, masonry, natural wood and manufactured products.

209.05 MATERIALS

209.05.01 Embankment Materials

Embankment materials shall consist of earth, rock, or select subgrade material as specified.

209.05.01.01 Earth or Rock

Earth or rock shall be as defined in OPSS 206.

209.05.01.02 Earth or Rock Borrow

Earth or rock borrow shall be according to OPSS 212.

209.05.01.03 Select Subgrade Material

Select subgrade material shall be according to OPSS 1010.

209.05.02 Geotextiles

Geotextiles shall be according to OPSS 1860.

209.06 EQUIPMENT

209.06.01 Swamp Excavator

Where the item Rental of Swamp Excavation Equipment is used, the minimum size of a swamp excavator shall be a 40,000 kg crawler mounted dragline with a 1.3 m³ bucket.

209.06.02 Spreading, Levelling and Compaction Equipment

Where the floatation method is used, spreading, levelling and compaction equipment shall be restricted to a gross weight which is not detrimental to the 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 as specified:

- Method ‘A’ - Excavation
- Method ‘B’ - Floatation
- Method ‘C’ - Displacement

209.07.02 Clearing and Close Cut Clearing

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

209.07.03 Method ‘A’ - Excavation

The work shall include the excavation of all materials from within the designated limits, except those defined as rock and the handling, placing, shaping, trimming, and hauling of excavated material.

Excavated material shall be placed clear of the sides of the embankment limits and any drainage facilities. The operations of excavation and backfilling shall be carried out simultaneously, except where excavation results in a relatively stable trench. In such cases, the excavation and backfilling may be carried out as separate operations with the prior written approval of the Contract Administrator.

209.07.03.01 Embankment Construction and Backfill

When conditions permit, backfill shall be placed according to OPSS 206. However, when wet conditions exist, backfill material may be placed up to 300 mm above original ground without compaction.

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

209.07.04 Method ‘B’ - Floatation

The work shall consist of the controlled placing of the embankment material, and the removal of surcharges as designated from above the subgrade and the hauling and incorporating of this 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 metres ahead of the centre portion.

209.07.04.03 Geotextile

Where geotextile is to be placed, the area designated for geotextile shall be close cut cleared and cleared of objects that might damage the geotextile. Close cut clearing shall be carried out in such a manner that the integrity of the root mat is not damaged.
Adjacent sections of the geotextile shall be overlapped a minimum of 500 mm or shall be sewn together according to OPSS 1860.

Should the geotextile be damaged, that section shall be repaired by placing a piece of geotextile large enough to cover the damaged section and meeting the overlap requirement above.

The placement operation shall be such that the geotextile is not exposed to daylight for more than 3 days.

If the geotextile is damaged due to the Contractor's operation during the embankment construction, the embankment material shall be removed from the geotextile, and the damaged area repaired at no additional cost to the Owner.

209.07.05 Method 'C' - Displacement

The work shall consist of the controlled placing of the embankment materials, the excavation of swamp waves and displaced material, the removal of surcharges and other material as designated from above the subgrade and related side slopes, and the 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 materials placed 300 mm above original ground shall be placed according to OPSS 206.

209.07.06 Management of Excavated Material

Excavated swamp material shall be utilized as much as possible within the right of way, adjacent to the 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. Such materials shall be trimmed to provide smooth, sightly contours and to provide drainage.

The volume of excavated material that is possible to be used within the contract limits or designated areas is that specified in the contract documents. Excess excavated swamp material shall be managed according to OPSS 180.

To distinguish between wood and swamp material for the purposes of management of excess material, wood that has decomposed and breaks down readily upon handling shall be considered swamp material.

209.09 MEASUREMENT FOR PAYMENT

209.09.01 Actual Measurement

209.09.01.01 Excavation

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

a. actual excavation, or

b. excavation to the length, width, and depth as specified.
209.09.01.02 Rental of Swamp Excavation Equipment

Measurement for payment of rental equipment will be by the number of hours that the equipment is actually engaged in the work.

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

209.09.01.03 Select Subgrade Material

209.09.01.03.01 Tonne Measurement

Should the Contract require payment by the tonne, the method of determining the mass of materials for payment shall be according to OPSS 102.

209.09.01.03.02 Cubic Metre Measurement

Should the Contract require payment by the cubic metre, one of the two following methods will be employed, as specified.

1. End Area Method

   - Volume of materials will be measured in their original position and computed in cubic metres by the method of average end areas.

   Original cross sections will be taken after the area has been cleared, grubbed and stripped of unsuitable material. These operations shall be completed a minimum of three working days in advance of excavation to allow for the required cross sectioning.

2. Truck Box Method

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

   Each truck shall be uniquely and readily identifiable.

209.09.01.04 Geotextile

Geotextile will be measured in square metres in place, with no allowance for overlaps.

209.09.02 Plan Quantity Measurement

209.09.02.01 Excavation Geotextile

When measurement is by Plan Quantity, such measurement will 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 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 - Item**

Payment at the contract price for the above item shall be full compensation for furnishing and operating the minimum size equipment specified, including mats when necessary, for the excavation and for the management of the material adjacent to the excavation. Where 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 OPSS 127 for the minimum size equipment specified, and the rate set out in OPSS 127 for the larger equipment to be employed.

**209.10.03 Floatation and Displacement Method**

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

**209.10.04 Select Subgrade Material - Item**

Geotextile - Item

Payment at the contract price for the above items shall be full compensation for all labour, and material required to do the work.

**209.10.05 Management of Swamp Material Excavated by Equipment Rental**

The management of material which cannot be accommodated adjacent to the excavation shall be paid as Extra Work, and shall include:

- a. loading and hauling when the material has been piled on the right of way and could not have been loaded originally or
- b. hauling only when the material is loaded directly into trucks from the excavation, and
- c. unloading and grading the material to smooth and sightly contours.