

**CW 3170 – EARTHWORK AND GRADING**

**TABLE OF CONTENTS**

1.	GENERAL CONDITIONS.....	1
3.	DESCRIPTION.....	1
5.	MATERIALS.....	1
	5.1 General.....	1
	5.2 Handling and Storage of Materials.....	1
	5.3 Testing and Approval.....	1
	5.4 Fill Material.....	1
	5.5 Sub-base Material.....	2
8.	EQUIPMENT.....	2
9.	CONSTRUCTION METHODS.....	2
	9.1 Clearing and Grubbing.....	2
	9.2 Excavation.....	2
	9.3 Removal of Existing Pavement.....	3
	9.4 Disposal of Material.....	3
	9.5 Preparation of Existing Ground Surface.....	3
	9.6 Embankment.....	4
	9.7 Compaction.....	4
	9.8 Finishing and Maintaining.....	4
	9.9 Boulevard Grading.....	4
10.	QUALITY CONTROL.....	4
	10.1 Inspection.....	4
	10.2 Access.....	5
	10.3 Materials.....	5
	10.4 Quality of Sub-grade and Embankment Materials.....	5
	10.5 Corrective Action.....	5
12.	METHOD OF MEASUREMENT.....	5
	12.1 Excavation.....	5
	12.2 Fill Material.....	6
	12.3 Preparation of Existing Ground Surface.....	6
13.	BASIS OF PAYMENT.....	6
	13.1 Topsoil Excavation.....	6
	13.2 Common Excavation.....	6
	13.3 Fill Material.....	7
	13.4 Preparation of Existing Ground Surface.....	7

**CW 3170 - EARTHWORK AND GRADING****1. GENERAL CONDITIONS**

The General Conditions and Standard Provisions attached hereto shall apply to and be a part of this Specification.

**3. DESCRIPTION**

This Specification shall cover all phases of removal and/or placement of all materials necessary for the construction and preparation of embankments, slopes, drainage works, and approaches.

The work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies and all other things necessary for and incidental to the satisfactory performance and completion of all work as hereinafter specified.

**5. MATERIALS****5.1 General**

The Contractor shall be responsible for the supply, safe storage and handling of all materials set forth in this Specification.

**5.2 Handling and Storage of Materials**

All materials shall be handled and stored in a careful and workmanlike manner, to the satisfaction of the Contract Administrator.

**5.3 Testing and Approval**

All materials supplied under this Specification shall be subject to inspection and testing by the Contract Administrator or by the Testing Laboratory designated by the Contract Administrator. There shall be no charge to the City for any materials taken by the Contract Administrator for testing purposes.

The Contract Administrator shall approve all materials at least ten (10) days before any construction is undertaken. If, in the opinion of the Contract Administrator, such materials, in whole or in part, do not conform to the Specification detailed herein or are found to be defective in manufacture or have become damaged in transit, storage or handling operations, then such material shall be rejected by the Contract Administrator and replaced by the Contractor at his own expense.

**5.4 Fill Material**

Fill material for embankment construction shall be obtained from site excavation, from borrow sites as specified in the Specifications for the Work or shall be imported material, of a type approved by the Contract Administrator.

Approved clay fill material shall consist of low to medium plastic clays or of mixtures of sand and clay, uniform in texture and suitable for compaction.

**5.5 Sub-base Material**

Sub-base material shall conform to Section 5.4 of Specification CW 3110.

**8. EQUIPMENT**

All equipment shall be of a size and type as required to complete the work in reasonable time as approved by the Contract Administrator, and shall be kept in good working order.

**9. CONSTRUCTION METHODS****9.1 Clearing and Grubbing**

No earthwork and grading shall commence until clearing and grubbing operations have been completed in accordance with Specification CW 3010 and the Drawings, and have been approved by the Contract Administrator.

**9.2 Excavation**

Excavation shall consist of topsoil excavation, common excavation and borrow excavation, which shall be understood to mean the following:

**a) Topsoil Excavation**

The excavation of surface soil, organic growth, or other material designated by the Contract Administrator as overburden, the stockpiling of topsoil for re-use on site, and the satisfactory disposal of unsuitable material such as brush, grass, weeds and all other organic growth and any surface topsoil, unless otherwise specified herein or in the Specifications for the Work.

**b) Common Excavation**

The excavation of all material encountered within the limits of grading following topsoil excavation, the on-site placement or the stockpiling of suitable site material, and the satisfactory disposal of unsuitable site material such as frost heaving clays, silts, rock, rubble, rubbish and any surplus suitable site material, unless otherwise specified herein or in the Specifications for the Work.

**c) Borrow Excavation**

The excavation and placing of excavated material, obtained from designated borrow locations. The widening of roadway cuts and ditches will not be considered as borrow.

The excavation procedure shall be subject to the approval of the Contract Administrator. Excavation shall continue in as nearly a continuous manner as possible. Excavation at multiple locations at the same time shall be subject to the approval of the Contract Administrator.

The Contractor shall conduct his excavation procedure in such a manner as to enable the Contract Administrator to inspect the separation of materials and determine which materials are to be disposed of and which materials are to be used.

The Contractor shall excavate as required to reach sub-grade levels of pavement and landscaping, and rough grade levels for areas to be graded only.

During the course of common excavation, the Contractor will be advised by the Contract

Administrator as to which areas have an unsuitable sub-grade. In the areas of unsuitable sub-grade, whether in a homogeneous mass or in isolated pockets, the excavation shall be extended either to the lower limit of the unsuitable material or to a depth of one metre below the elevation of the bottom of base course for a Portland cement concrete pavement, or to a depth of 600 mm below the elevation of the bottom of sub-base for an asphaltic concrete pavement, whichever is lesser, unless otherwise specified on the Drawings or in the Specifications for the Work. Additional excavation of unsuitable material may be required as specified by the Contract Administrator.

In areas of excavation of unsuitable material, the side of the excavation may be sloped into the excavation provided that the sides remain at least 150 mm outside of the limits of the proposed pavement at the bottom of the excavation. The longitudinal slope shall not be steeper than 1:1.

Excavation of solid bedrock, glacial till, boulders, loose rock, concrete rubble and foundations which are located within the limits of excavation and which require the use of additional or unconventional excavation equipment shall be measured and paid for in addition to the unit prices for excavation.

### **9.3 Removal of Existing Pavement**

Removal of existing pavement shall conform to the requirements of Specification CW 3110.

### **9.4 Disposal of Material**

Disposal of material shall be understood to mean the removal of a material from the site, hauling of the material along a route approved by the Contract Administrator, and the unloading and grading of the material in a manner satisfactory to the Contract Administrator at a legal disposal site.

If a disposal site is not otherwise indicated in the Specifications for the Work, the Contractor shall locate a legal disposal site and identify a haul route to be approved by the Contract Administrator.

Any material dropped or spilled on any streets during the hauling operation shall be promptly cleaned up by and at the expense of the Contractor, to the satisfaction of the Contract Administrator.

### **9.5 Preparation of Existing Ground Surface**

Before any embankment is placed on original ground having a smooth firm surface, the existing ground shall be scarified or ploughed so as to permit bonding with the new material.

Where the existing ground surface is sloped sufficiently to affect the bond between the old and new materials the original ground on which the embankment is to be placed shall be ploughed deeply or stepped before embankment construction is commenced, as directed by the Contract Administrator.

When embankment is being placed on an existing roadbed, the side slopes of the existing roadbed shall have vegetation removed and then be scarified or ploughed, as directed by the Contract Administrator, to ensure adequate bonding between the new embankment and the existing material.

Following the excavation and disposal of unsuitable material and the preparation of the side slopes, as described above, the surface of the existing roadbed shall be scarified to a depth of 150 mm, and compacted to the proper density, at the optimum moisture content.

Where existing roadbeds are being widened and existing embankments extended, the existing slopes shall be denuded of all vegetation and either stepped or ploughed so as to form a medium of contact with the new embankment. Vertical cuts for the full depths of embankment shall not be permitted.

**9.6 Embankment**

Embankment construction shall be understood to mean the placing of suitable earth fill to obtain the required lines, grades and cross-sections shown on the drawings.

Materials shall be deposited and spread in uniform layers of specified thickness, for the full width of the embankment. Each layer shall be shaped to line and cross-section and thoroughly compacted before the succeeding layer is placed.

Where embankment is being placed on side fill or sloping sections, the lower portion shall be constructed as above, until a full width surface of the specified cross-section is obtained. The embankment shall be completed thereafter with full width layers.

Flood protection embankment fill materials shall be clay fill material as specified in Clause 5.4.

**9.7 Compaction**

All material placed in embankments shall be spread and bladed smooth in successive layers not exceeding 150 mm in compacted thickness to the full width of the cross-section, unless otherwise directed by the Contract Administrator.

Each layer, including the existing sub-grade, shall be compacted to a minimum of ninety-five (95%) percent of Standard Proctor Density. The material shall be compacted at the optimum moisture content, or up to two (2%) percent higher than optimum, as directed by the Contract Administrator.

Where the grade line is in cut, the sub-grade shall be excavated to a minimum depth of 500 mm below the sub-grade line, or as directed by the Contract Administrator. The sub-grade shall then be reconstructed in layers as specified and compacted to ninety-five (95%) percent of Standard Proctor Density.

Where the moisture content of the embankment material is too high, the material shall be thoroughly worked until the optimum moisture content is achieved.

Where the moisture content of the embankment material is too low, the material shall be thoroughly disced and broken down, water added as required and the material thoroughly worked to mix the water throughout the material, prior to commencing compaction operations.

**9.8 Finishing and Maintaining**

The Contractor shall, as soon as practicable, bring the excavations and embankments to the correct widths, lines and grades as shown on the Drawings.

All surfaces shall be maintained to the specified grade and cross-section and to the specified density until the project or that portion of the project is accepted.

**9.9 Boulevard Grading**

Boulevard grading shall be done and paid for in accordance with Specification CW 3110.

**10. QUALITY CONTROL****10.1 Inspection**

All workmanship and all materials furnished and supplied under this Specification are subject to close

and systematic inspection and testing by the Contract Administrator including all operations from the selection and production of materials through to final acceptance of the specified work. The Contractor shall be wholly responsible for the control of all operations incidental thereto notwithstanding any inspection or approval that may have been previously given. The Contract Administrator reserves the right to reject any materials or works that are not in accordance with the requirements of this Specification.

#### **10.2 Access**

The Contract Administrator shall be afforded full access for the inspection and control testing of materials, both at the site of work and at any plant or borrow pit used for the supply of the materials, to determine whether the material is being supplied in accordance with this Specification.

#### **10.3 Materials**

All materials supplied under this Specification shall be subject to testing and approval by the Contract Administrator in accordance with Section 5.3 of this Specification.

#### **10.4 Quality of Sub-grade and Embankment Materials**

The Standard Proctor Density for the sub-grade and embankment materials shall be determined at the optimum moisture content in accordance with ASTM Standard D698. The field density of each layer shall be a percentage of the Standard Proctor Density, as specified in Section 9.7 of this Specification.

Quality control tests will be used to determine the acceptability of each layer, as placed and compacted by the Contractor, before the succeeding layer may be applied.

The field density of the compacted layers shall be verified by Field Density Tests in accordance with ASTM Standard D1556, Test for Density of Soil in Place by the Sand-Cone Method, or ASTM Standard D2922, Test of Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

The frequency and number of tests to be made shall be as determined by the Contract Administrator.

Holes made by the removal of samples from the layers shall be promptly filled by the Contractor with appropriate material and thoroughly compacted so as to conform in every way with the adjoining compacted material.

#### **10.5 Corrective Action**

The Contractor shall, at his own expense, correct such work or replace such materials found to be defective under this Specification in an approved manner to the satisfaction of the Contract Administrator.

### **12. METHOD OF MEASUREMENT**

#### **12.1 Excavation**

Excavation will be measured on a volume basis. The volume to be paid for shall be the total number of cubic metres that are excavated in accordance with this Specification acceptable to the Contract Administrator, as computed from measurements made by the Contract Administrator. No payment will be made for material removed outside of the limits of excavation.

The volume of the various types of excavation shall be as measured in its original position, and as determined by the method of Average End Areas.

**12.2 Fill Material****a) Suitable Site Material**

Suitable site material will be measured on a volume basis. The volume to be paid for shall be the total number of cubic metres compacted in place in accordance with this Specification acceptable to the Contract Administrator, as computed from cross-sections taken by the Contract Administrator using the method of Average End Areas. No payment will be made for material placed outside of the limits of placement as directed by the Contract Administrator.

**b) Clay Borrow Material**

Clay borrow material will be measured on a volume basis. The volume to be paid for shall be the total number of cubic metres compacted in place in accordance with this Specification acceptable to the Contract Administrator, as computed from cross-sections taken by the Contract Administrator using the method of Average End Areas. No payment will be made for material placed outside of the limits of placement as directed by the Contract Administrator.

**c) Imported Material**

Imported material will be measured on a volume basis. The volume to be paid for shall be the total number of cubic metres compacted in place in accordance with this Specification acceptable to the Contract Administrator, as computed from cross-sections taken by the Contract Administrator using the method of Average End Areas. No payment will be made for material placed outside of the limits of placement as directed by the Contract Administrator.

**12.3 Preparation of Existing Ground Surface**

Preparation of the existing ground surface will be measured on an area basis. The area to be paid for shall be the total number of square metres that are prepared in accordance with this Specification acceptable to the Contract Administrator, as computed from measurements made by the Contract Administrator.

**13. BASIS OF PAYMENT****13.1 Topsoil Excavation**

Topsoil excavation will be paid for at the Contract Unit Price per cubic metre for "Topsoil Excavation", measured as specified herein, which price shall be payment in full for performing all operations herein described and all other items incidental to the work included in this Specification.

**13.2 Common Excavation**

Common excavation will be paid for at the Contract Unit Price per cubic metre for the "Items of Work" listed here below, measured as specified herein, which price shall be payment in full for performing all operations herein described and all other items incidental to the work included in this Specification.

**Items of Work:**

- i. Common Excavation – Suitable Site Material
- ii. Common Excavation – Unsuitable Site Material

**13.3 Fill Material****a) Suitable Site Material**

The loading, hauling, placing and compaction of suitable site sub-base material will be paid for at the Contract Unit Price per cubic metre for "Placing Suitable Site Material", measured as specified herein, which price shall be payment in full for performing all operations herein described and all other items incidental to the work included in this Specification.

**b) Clay Borrow Material**

The supplying, placing and compaction of clay borrow sub-base material will be paid for at the Contract Unit Price per cubic metre for "Supplying and Placing Clay Borrow Material", measured as specified herein, which price shall be payment in full for performing all operations herein described and all other items incidental to the work included in this Specification.

**c) Imported Material**

The supplying, placing and compaction of imported material will be paid for at the Contract Unit Price per cubic metre for "Supplying and Placing Imported Material", measured as specified herein, which price shall be payment in full for performing all operations herein described and all other items incidental to the work included in this Specification.

**13.4 Preparation of Existing Ground Surface**

Preparation of the existing ground surface will be paid for at the Contract Unit Price per square metre for "Preparation of Existing Ground Surface", measured as specified herein, which price shall be payment in full for performing all operations herein described and all other items incidental to the work included in this Specification.