02005 Excavation and Embankment Construction

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02005-1 General

1.1 Description

This section specifies requirements for excavating earth materials, disposal of waste excavation and embankment construction within the limits of the Contract and in accordance with the Contract Documents. The work shall be completed to the lines, grades, dimensions and typical cross-sections shown on the plans or as designated by the Engineer.

1.2 Related Work Elsewhere

Subgrade Compaction: Section 02015.

1.3 Definitions

1.3.1 Subgrade

Top surface of the roadbed upon which the pavement structure is constructed.

Only five classes of excavation will be recognized; topsoil removal, excavation to waste, excavation to embankment (NSD) - no specified density, excavation to embankment and rock excavation. All classes shall include removal, free haul, dumping, and where specified, placement, spreading and compaction.

1.3.2 Topsoil Removal

Excavation of material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding.

1.3.3 Excavation to Waste

Excavation of all materials of whatever nature, excluding materials defined as topsoil or rock found by the Engineer to be unsuitable or in excess of requirements for embankment construction. These may include frozen materials, materials subject to frost action, organic material, spongy or yielding material, asphaltic rubble and wet or saturated materials.

1.3.4 Excavation to Embankment (NSD) - No Specified Density

Excavation of all materials of whatever nature, excluding materials defined as topsoil or rock found by the Engineer to be unsuitable or in excess of requirements for embankment construction. These may include frozen materials, materials subject to frost action, organic material, spongy or yielding material, asphaltic rubble and wet or saturated materials**.**

1.3.5 Excavation to Embankment

Excavation of all materials of whatever nature, excluding materials defined as topsoil, rock or waste, suitable for embankment construction. These may include sands, gravels, clays**,** silts and tills which can be excavated with heavy construction equipment and compacted. This item also includes sub-cut where directed by the Engineer.

1.3.6 Rock Excavation

Excavation of boulders or rock fragments having a dimension exceeding 600mm measured in any one direction.

02005-2 Materials

All material used for embankment construction shall be approved by the Engineer. If construction so necessitates the use of borrow material, it will be obtained from sources indicated or designated by the Engineer.

02005-3 Equipment

All tools, machinery, plant and equipment used in handling materials and executing any part of the work, shall be subject to the approval of the Engineer. All such equipment shall be maintained in efficient working order and where any of the machinery, plant or equipment is found to be unsatisfactory, it shall be improved or replaced by the Contractor to the satisfaction of the Engineer.

02005-4 Execution

4.1 General

Advise the Engineer sufficiently in advance of excavation operations for initial cross sections to be taken. Maintain crowns and cross slopes to provide good surface drainage.

All inferior material subject to frost action, soft, spongy or yielding spots, or organic material shall be entirely removed and disposed of as directed by the Engineer. Where such materials occur in cut or existing fill sections such that their removal will result in excavation below the subgrade elevation, such excavation will be authorized by the Engineer. These areas shall be backfilled with material approved by the Engineer. Inferior material shall be excavated and disposed of at the contract price for waste excavation or excavation to embankment (NSD). The Engineer will authorize and determine the quantity below the required cross section for the removal of inferior material.

4.2 Dust Control

It will be the responsibility of the Contractor to maintain control of dust at the worksite to ensure safety and to reduce public complaint. Dust control shall be done at the expense of the Contractor.

4.3 Topsoil Stripping

Strip topsoil from areas and to depths indicated or directed prior to beginning of excavation and embankment work. Avoid contamination of topsoil and underlying soil.

The topsoil shall be stockpiled on site for subsequent replacement on the side slopes unless otherwise directed by the Engineer.

4.4 Excavation

Completely use in embankments, suitable materials removed from excavations before taking material from borrow areas.

The Contractor shall be responsible to separate all concrete rubble, asphalt pavement, rock, rubbish, trees, etc., from the earth material and shall dispose of the material to the

satisfaction of the Engineer at the designated location. All such material will be classified as waste excavation. Silt soil conducive to objectionable frost heaving shall not be used in embankment areas where the fill is less than 600mm.

Earth materials containing objectionable organic matter shall be excavated and removed from those areas of the roadbed where the fill is less than 600mm in depth.

Where the existing soil in a cut is such that it is not suitable foundation material for the roadway, the unsuitable material shall be removed as waste excavation or excavation to embankment (NSD) or treated in accordance with instructions obtained from the Engineer.

Once the excavation has been completed to the required cross section, the subgrade shall be compacted as stated in specification section 02015 (Subgrade Compaction) and to the depths indicated on the drawings or as designated by the Engineer.

Construct side ditches to depths and widths indicated or directed, to permit ready flow of surface water. Maintain and keep ditches open and free from debris until final acceptance of work.

4.5 Embankment Construction

When directed, scarify or bench existing slopes in side hill or sloping sections to ensure a proper bond between new materials and existing surfaces. Obtain prior approval of method to be used.

Do not place material which is frozen or place material on frozen surfaces. Maintain a crowned surface during construction to ensure ready run-off of surface water.

Embankment shall be constructed of suitable material placed on successive layers not greater than 150mm in depth, distributed uniformly over the full width of the cross section. Each layer shall be spread and bladed evenly by means of a blade grader or other approved equipment at least twice so that rollers used for compaction will bear evenly at all times.

Compact each layer to a minimum 98% Standard Proctor density, ASTM D698 method except last 300mm up to finished subgrade elevation. Compact last 300mm to 100% Standard Proctor density, ASTM D698 method D.

The finished subgrade shall be proof-rolled with a piece of heavy equipment such as a fully loaded single or tandem axle truck of sufficient axle load to expose any soft spots in the subgrade. There will be no direct payment for proof-rolling, and it shall be an integral part of subgrade acceptance. Soft spots detected by proof-rolling shall be repaired at the Contractor's expense.

Boulders and rock fragments with dimensions exceeding 150mm not to be placed within 600mm of finished subgrade elevation.

Boulders and rock fragments with dimensions exceeding 75mm not to be placed within 150mm of finished subgrade.

Remove soft or other unstable material that will not compact properly and fill resulting depressions with approved material.

Shape and compact entire roadbed to within 30mm of design elevations but not uniformly high or low. This requirement must be fulfilled before the work will be accepted.

Do scarifying, blading, compacting or other methods of work as necessary to provide a thoroughly compacted roadbed shaped to grades and cross sections indicated or directed. Refer to Section 02015 Subgrade Compaction.

Finish side slopes to a neat condition, true to lines and grades indicated.

1. Remove boulders encountered in cut slopes and fill resulting cavities.

2. Hand finish slopes that cannot be finished satisfactorily by use of machine.

Place topsoil taken from stockpile or other sources, at locations and to depths directed. Remove surface stones, roots and other debris and leave surface in uniform condition. Trim to maintain embankment slopes.

02005-5 Testing

The Engineer will determine from the test results the section of the road to be considered for evaluation. All individual test results shall be greater than 98% of the Standard Proctor density, ASTM D698.

If excess moisture exists in the soil, the embankment shall be dried, to the optimum moisture content as determined by the Standard Proctor Compaction Test. In order to expedite compaction, the embankment shall be aerated. Aerating shall be carried out at the expense of the Contractor.

If the moisture existing in the soil is insufficient for compacting to the specified density and for finishing, the Contractor shall add water. The proper moisture content shall be the optimum moisture content, as determined by the Standard Proctor Compaction Test. The water shall be added uniformly by a pressure water sprayer.

The cost of adding water will be considered incidental to compaction and shall be included in the contract price for compaction.

02005-6 Embankment Protection

After the embankment is compacted and finished, all unnecessary traffic shall be kept off. Should it be necessary to haul material over the completed subgrade, the subgrade failures shall be repaired by the Contractor before placing the subbase.

02005-7 Measurement

Excavation (topsoil, waste and to embankment) will be measured in cubic metres in its original position. The volume will be determined from the cross section method, except that disposal pit, culvert, ditch block, and approach excavations may be determined from the average length, width and depth.

Topsoil replacement and dressing of slopes shall be measured in square metres of horizontal surface covered. This will include hauling from the stockpile and finish grading on slopes.

Rock excavation will be measured in cubic metres. Once all rocks have been removed from the embankment (or excavation) and stockpiled at the location designated by the Engineer, the stockpile volume will be obtained by measuring three maximum mutually perpendicular dimensions.

The limit of free haul will be a 1km radius from the point of excavation. For haul beyond the free haul limit, the unit of measurement for overhaul will be the cubic metre-kilometre. The cubic metre-kilometre is 1 cubic metre hauled 1 kilometre.

02005-8 Payment

Payment for Excavation to Embankment will be at the contract unit price per cubic metre. The unit price will be full compensation for excavating, loading, hauling for a distance of 1km, dumping, spreading, blading and compacting earth; and shaping and trimming of slopes and surfaces.

Payment for Excavation to Embankment - NSD will be at the contract unit price per cubic metre. The unit price will be full compensation for excavating, loading, hauling for a distance of 1km, dumping, spreading, blading and levelling earth.

Payment for Excavation to Waste will be at the contract unit price per cubic metre. The unit price will be full compensation for excavating, loading, hauling for a distance of 1km and dumping.

Payment for Topsoil Removal will be at the contract unit price per cubic metre. The unit price will be full compensation for excavating, loading, hauling for a distance of 1km and dumping.

Payment for topsoil replacement and dressing of slopes shall be at the contract unit price per square metre. The unit price shall be full compensation for loading, hauling, spreading to required depth, blading and trimming to the finished slopes and grades.

Payment for rock excavation shall be at the contract unit price per cubic metre. The unit price shall be full compensation for loading, hauling, stockpiling and/or burying of the rock material.

Payment for overhaul shall be at the contract unit price per cubic metre-kilometre.

End of Specification 02005