2.6 EMBANKMENT

2.6.1 Description

This work shall consist of the construction of embankment and fill by furnishing, placing, compacting and shaping suitable material of acceptable quality obtained from approved sources in accordance with these Specifications and to the lines, levels, grades, dimensions and cross sections shown on the Drawings or as required by the Engineer.

2.6.2 Materials

All fill materials shall be free from roots, sods or other deleterious material.

Materials for embankments shall be from sources which the Contractor shall propose and which shall be approved by the Engineer. Approval shall not normally be given to the use of material which, when compacted to 95% of maximum dry density determined in accordance with STP 4.3 has a 4 day soaked CBR value of less than 3%.

- Liquid limit of soil fraction passing 0.425 mm sieve not to exceed 50% (STP 3.2)
- Plasticity index of soil fraction passing 0.425 mm sieve not to exceed 25% (STP 3.2)

2.6.3 Construction Methods

2.6.3.1 Preparation of Foundations for Embankment

Prior to placing any embankment upon any area, all clearing and grubbing operations shall have been completed in accordance with Section 2.1 and excavation under carriageways shall be carried out in accordance with Section 2.2.

The original ground surface shall be disturbed as little as possible except for levelling of dikes, terraces and obsolete ditches.

Existing ditches etc., shall be closed at the embankment as described in Section 2.1.3.5. Embankments in swamps or water shall be constructed as indicated on the Drawings and as described in these Specifications. The Contractor shall, when ordered by the Engineer, excavate or displace swamp ground (Section 2.2.3.5) and backfill with river or beach sand unless otherwise directed by the Engineer.

2.6.3.2 Placing Embankment

A) General

Except as otherwise required by the Drawings, all embankments shall be constructed in layers approximately parallel to the finished grade of the roadbed. During construction of embankment, a smooth grade having an adequate crown shall be maintained at all times to provide drainage.

The placing of fill shall be carried out in successive layers for the full width of fill as shown on the Drawings with allowance being made for the placement of topsoil if applicable and in such lengths as are suited to the watering and compaction methods utilised. Each layer shall not exceed 150 mm in thickness on completion of compaction. The completed embankment shall have the required form, cross-section, grade and levels as detailed on the drawings or as directed by the Engineer with a surface tolerance of ±25mm from the specified levels.
Embankment fill placed adjacent to structures shall be in accordance with Section 2.5.3.6.

B) Placing Embankment over Swamppy Ground

Where new embankment will overlay existing canals, ditches, ponds or other waterways, these shall be filled in exclusively with sand in accordance with Section 2.4.3.3. Prior to filling, cofferdams shall be made to allow pumping, and the bed shall be left to dry until approved by the Engineer for filling.

The Works shall be performed in such a manner and at such times as to avoid interruption of or interference with the free flow of water in the canals.

Full compensation for conforming to these requirements shall be considered included in other rates within the Contract items, and no additional payment will be made.

C) Widening of Existing Embankment

Where embankment fill is being carried out to widen an existing embankment the new fill material shall be fully keyed into the old embankment by means of benching which shall be in steps each not less than 300 mm high and 600 mm wide. Steps shall be cut in advance of the filling. Material cut in benches may be used as fill if found to be suitable.

2.6.3.3 Compaction of Embankment.

The moisture content of the fill materials before compaction shall be within ±2% of the optimum moisture content as determined in accordance with STP 4.3(Standard Compaction). The achieved dry density of the embankment after compaction shall be not less than 95% of the maximum dry density determined earlier in accordance with STP 4.3.

One density test for each 1,000 square metres of a completed layer will be carried out according to STP 6.2, unless otherwise directed by the Engineer. If test results show that the density is less than the required density, the Contractor shall carry out further compaction to obtain at least the required density. The compacted layer shall be approved by the Engineer before the Contractor can commence a new layer.

Alternatively one Dynamic Cone Penetrometer (DCP) test for each 500 m² of a completed layer may be substituted in place of the density test. In this case the mm / blow from the DCP test should not exceed a penetration greater than 45 mm / blow.

When necessary, each layer, before being compacted, shall be mixed with dry material or otherwise processed to bring the moisture content sufficiently close to optimum to make possible its compaction to the required density. The material shall be so worked as to have a uniform moisture content through the entire layer.

Each layer of material shall be compacted uniformly by use of adequate and appropriate compaction equipment. The compaction shall be done in a longitudinal direction along the embankment and shall generally begin at the outer edges and progress toward the centre in such a manner that each section receives equal compactive effort.

Hauling equipment shall be operated over the full width of each layer in so far as practicable.
2.6.4 Measurement

Embankment shall be measured in cubic metres based on cross sections of accepted embankment constructed and completed in accordance with the Specifications, to the lines, levels and grades required or as directed by the Engineer.

The cross section to be used will be the area bound by the subgrade (below improved subgrade or sub-base) the side slopes or edge limits and the original ground line or the level after excavation of unsuitable material with the net volume being calculated by the End area method. A deduction of volume will occur when topsoil is placed in accordance with Section 6.6 of this Specification.

No allowance will be made for material cut in benching operations.

The final volume of embankment fill shall not include the voids for bridges and box-culverts, but the voids for pipes, manholes, catch basins and the like will however not be deducted.

Sand backfill to swampy ground shall be measured in cubic metres based on the net volumes backfilled as directed by the Engineer.

2.6.5 Payment

This work measured as provided above shall be paid for at the Contract unit prices per cubic metre. Payment shall be full compensation for performing the work, furnishing the materials and providing all labour, equipment, tools and incidentals necessary to complete the work.

Partial payment may be made on measured volumes of required embankment fill actually executed. The Engineer will set terms for deduction in this quantity to compensate for work not fully completed.

Pay items shall be:

2/6/1 Embankment Fill from Excavation on Site or Borrow Pit within the Right-of-Way Cubic Metre

2/6/2 Embankment Fill from Borrow Pit in Contractor’s Arranged Land Cubic Metre

2/6/3 Sand Backfill to Swamp Cubic Metre