1. EXCAVATION AND PREPARATION OF SUBGRADE

1.1 DESCRIPTION

.1 Excavation includes loading, hauling, dumping and satisfactory disposal of all surplus and unsuitable material from the areas within the limits of the work. It shall consist of spreading and grading fill material as specified by the Engineer and shall include building stockpiles and borrowing materials.

.2 Preparation of subgrade shall include ploughing, compacting, and fine grading.

.3 All the above to be carried out in accordance with these specifications and the lines, grades, and dimensions shown on the plans or as staked by the Engineer.

2. MATERIALS

2.1 COMMON EXCAVATION

.1 Shall consist of topsoil, clay, sand, gravel, or gravelly mixtures from existing streets, or any material not specifically classified otherwise. The materials shall be used for embankment construction and to replace unsuitable material excavated from the subgrade subject to approval of the Engineer.

3. CONSTRUCTION

3.1 EQUIPMENT

.1 All proposed routes for hauling equipment other than trucks must be approved by the Engineer prior to commencement of the work. Rubber tired motor scrapers shall not be used to haul over improved streets. When any traveled roadway is being entered or crossed by hauling equipment, traffic must be controlled by flagmen and sufficient warning signs to ensure the safety of the public.

.2 Trucks must be loaded in such a manner that no spillage occurs, and care must be taken to prevent dragging clay onto improved streets in the dual tires.

.3 Haul routes must be kept clear and free from dust by grading and sprinkling with moisture wherever, if in the opinion of the Engineer, conditions warrant this treatment.

.4 All excavating and hauling equipment must be equipped with suitable muffling systems.

3.2 RESERVATION OF MATERIAL

.1 Whenever gravel, sand, topsoil, or any other material suitable for special use is encountered, it shall be deemed to be the property of the City and shall be used as fill or any special purpose, or otherwise disposed of as directed by the Engineer.

.2 Where layers of gravel or gravelly mixtures are encountered, they shall be excavated separately from other excavation and shall be stockpiled or incorporated into the work as base or sub-base material, or otherwise disposed of as directed by the Engineer.

3.3 DISPOSAL OF MATERIAL

.1 Excavated material shall be utilized as fill if required on any portion of the work being carried out under this Contract or any other City work. Where excavated material is specifically directed to be used as fill or for any other purpose, the Contractor will be required to haul the material as part of the unit of excavation.

.2 Sufficient material will be kept on the site for backfill of curbs and boulevard areas. Overhaul will not be paid to haul back to an area which contained a surplus of excavated soil suitable for this purpose.

.3 The excavated material shall be hauled and dumped at the fill area as part of the unit of excavation. Any materials required to be used in boulevard areas or for rounding at the base of cuts or fills shall be placed, spread in lifts not exceeding 150mm, and fine graded as part of the unit of excavation. No special compaction will be required.

.4 All materials deemed to be in excess of requirements or unsuitable shall be disposed of by the Contractor in dump areas approved by the Engineer. Where private property is being used for this purpose, proper arrangements shall be made by the Contractor with the Owner in writing, and a record of such locations shall be supplied to the Engineer. The Contractor shall assume full responsibility for any damages resulting from dumping fill.

3.4 FINISHING AND COMPACTING SUBGRADE

.1 The excavated sections shall be ploughed to a depth of at least 150 mm below the surface of the subgrade and replaced and compacted to a minimum of ninety eight percent (98%) of Standard Proctor Density. The cut shall be left sufficiently high so that the surface after compaction can be trimmed to the final grade, and any loose material resulting from this operation removed. All depressions caused by the finishing rollers shall be removed during the final blading operation.

3.5 EXCAVATION BELOW GRADE

.1 **Unsuitable Materials**: When topsoil, muskeg, or other soft areas are encountered below the finished subgrade, which in the opinion of the Engineer require removal, the area shall be undercut and the suitable material excavated, loaded, and disposed of at sites designated in accordance with instructions from the Engineer. These materials shall be replaced with suitable common excavation.

.2 **Placing Fill**: Fill material shall be placed in successive horizontal layers not exceeding 150 mm. Suitable spreading and leveling equipment shall be kept in continuous operation at all times.

.3 **Red Shale Fill**: Red shale is to be used to replace unsuitable material below subgrade elevation where authorized by the Engineer. Remove defective subgrade to limits and depths directed and replace with layers of red shale not to exceed 300 mm in depth and to the limits as directed by the Engineer. Placing and compacting to be completed as outlined in this section. Dry density 1350 kg/m at optimum moisture plus or minus five (5%) percent, minimum ninety (90%) percent or Standard Proctor Density.

.4 **Compaction**: The compaction will be sufficient to obtain a minimum density of 98% of maximum dry density in accordance with ASTM D698 (Method C or D), unless otherwise stated in the special provisions. Where it is necessary to add or remove moisture from the soil to obtain the compaction, it shall be done as part of the requirements of this section.

.5 **Finishing**: The fill section shall be compacted to a level slightly above the specified grade, and cut back to the final elevation. All loose material shall be removed from the surface of the subgrade.

The finishing subgrade shall not vary more than 10 mm from the elevations and grades indicated on the plans or stakes by the Engineer, and in no case shall be higher than such grades.

3.6 THE FOLLOWING TESTS SHALL BE EMPLOYED TO ESTABLISH COMPACTION PROCEDURES:

The maximum density of the soil shall be determined by ASTM procedure D-698 (Moisture Density Relationships of soils). To be determined for each soil type. The optimum moisture content of the soil shall be determined from the laboratory compaction curve established by the procedure outlined in 3.6.1 of this Section.

The field density of soils shall be determined by A.S.T.M. D-2922 - Determining density of soil and soil aggregate in place by nuclear methods (shallow depth).

3.7 NORMAL COMPACTED THICKNESSES OF LIFTS

Equipment Type	Cohesive Soils	Non-Cohesive Soils
Vibratory Sheepsfoot Packer	300 mm	300 mm
Sheepsfoot Packer	200 mm	-
Pneumatic Tire	200 mm	200 mm
Vibratory Roller	150 mm	300 mm
Pneumatic Tamper (Contact Area less than 130 sq cm)	100 mm	100 mm
Pneumatic Tamper (Contact Area greater than 130 sq cm)	100 mm	100 mm
Mechanical Tamper (Diesel or Gas - Jumping Jack)	100 mm	200 mm

.1 Thickness of lifts for other equipment shall be determined by laboratory testing procedures during the construction process. The Engineer may grant approval in writing to alter lift thickness upon evidence of satisfactory compaction at other lift thicknesses.

4.0 METHOD OF MEASUREMENT

4.1 EXCAVATION AND EXCAVATION BELOW GRADE

.1 **Common Excavation**: Wherever possible, the volume of excavated material will be measured in place by the average end method, based on cross section obtained by field surveys.

.2 **Truck Haul:** Where excavated material cannot be measured by cross sections, it shall be measured by counting the number of truckloads and multiplying by two-thirds (2/3) of the level volume of each truck. The trucks shall be fully loaded.

4.2 FINISHING AND COMPACTING

.1 The finishing and compacting of subgrade in cut areas shall be measured by the square metre of finished subgrade cut extending to the back of the curb and gutter, and the projected area of shallow fills which must be ploughed and compacted.

5.0 BASIS OF PAYMENT

5.1 COMMON EXCAVATION

.1 All accepted roadway and borrow excavation shall be paid for at the price bid per unit of measurement, which price and payment shall be full compensation for excavation to grade, separating materials if required, disposing of surplus materials, hauling and dumping material to be used in areas where unsuitable material has been removed, placing, spreading and grading material as required in boulevard areas or on slopes, traffic control, maintenance of haul roads, stockpiling selected materials, and any other work incidental to complying with the requirements of these specifications.

5.2 EXCAVATION BELOW GRADE

.1 Excavation of unsuitable materials below grade and the replacement of these materials with suitable common excavation shall be paid for at the unit price bid per unit of excavation below grade, which price and payment shall be full compensation for excavating, replacing and compacting of materials in accordance with the specifications and instructions from the Engineer.

5.3 FINISHING AND COMPACTING

.1 Compaction and finishing of all excavated areas shall be paid for at the price bid per unit of finishing and compacting which price and payment shall be full compensation of ploughing and compacting subgrade, drying, or adding water, fine grading, draining water, repairing subgrade damaged by rain and any other work incidental to complying with the requirements of these specifications.

5.4 METHOD OF MEASUREMENT AND PAYMENT FOR RED SHALE

.1 Red shale will be measured in cubic metres compacted in place. Payment shall include supply, haul, place and compact.