SECTION 1200 SUBGRADE PREPARATION

1201 SCOPE. This section governs the furnishing of all labor, equipment, tools, and materials, and performance of all work connected with subgrade preparation, prior to constructing pavements for streets, alleys, parking areas, sidewalks, drive approaches and the construction of concrete curb and curb and gutters. **This section does not include the construction of any base courses.**

1202 DEFINITIONS.

A. Subgrade. Subgrade is defined as a well-graded and compacted surface, constructed as specified herein to the grades, lines and cross-section shown, bladed and compacted to the specified density, preparatory to constructing pavements, or other improvements thereon as shown in the typical sections.

B. Subgrade Preparation. Subgrade preparation is the repeated operation of fine grading and compacting the subgrade until the specified lines, grades, and cross-sections have been obtained and the materials are compacted to the specified depth and density.

1203 CONSTRUCTION REQUIREMENTS.

A. General. All underground work contemplated, including clearing, grubbing, and demolition, shall be completed in accordance with the requirements of Section 1100 "Grading" prior to commencement of any subgrade preparation.

The subgrade surface shall be brought to the specified lines, grades, and cross-sections by repeatedly adding or removing material and compacting to the specified density with suitable equipment to perform these operations. Tolerance allowed on all lines, grades and cross-sections shall be a compensating maximum deviation of 1/4 inch.

B. Subgrade Scarifying. This work shall consist of loosening the surface of the roadbed and removing all rock larger than 4 inches. This work shall also consist of tilling and manipulating the subgrade to achieve the specified optimum moisture content. Scarifying shall be considered subsidiary to work done in connection with subgrade preparation.

Scarifying of the subgrade shall be required in the preparation of the roadbed regardless of whether it is in a cut or fill area unless otherwise allowed by the City Engineer. The Contractor shall perform all work necessary, with a disc or tiller, to loosen and manipulate the roadbed over its full width to a depth up to 18 inches below the finished grading section. After adequate drying, oversize materials shall be removed and the roadbed shall be brought back to a satisfactory grade and cross-section by the addition of or removal of extra material, if needed, and re-compacted to 90%.

C. Subgrade Compaction. The soil below grade line shall be scarified, broken up,

adjusted to a moisture content within the designated moisture range and compacted to the designated type of compaction.
The top 6 inches of subgrade for pavements shall be compacted to 95% of the maximum density for the material used as determined by ASTM D-698 and within a tolerance of plus 2% and minus 3% of the optimum moisture at maximum density as determined by the moisture density curve obtained.

Prior to laying base or setting paving forms, the subgrade shall conform to the moisture and density requirements for compaction. Soft spots and unsuitable material shall be removed to a depth not to exceed 18 inches and backfilled with an approved stable material at the expense of the Contractor.

D. Sub-Grade Stabilization. It is recognized that, in some areas, efforts to compact sub-grade to the moisture and density requirements may result in "pumping" subsurface water to the surface. In such areas where initial compaction efforts clearly indicate, in the opinion of the Engineer, that further compactive effort, including scarification and aeration, would be useless and detrimental, then such compactive efforts shall be halted.

Unsuitable earth may be encountered in areas where it may or may not be practicable to replace with suitable materials from excavation on the work site.

For conditions described above to a depth of 18" below the top of the finished subgrade, the Contractor shall stabilize the sub-grade, at his own expense. The sub-grade shall be stabilized to at least the extent necessary to support paving equipment and delivery vehicles to be operated thereon without undue deformation of the sub-grade and so that the paving can be constructed in accordance with the requirements of the Specifications. Methods used may be any of those described in Section 1105, subject to the concurrence of the Engineer and which will provide adequate support.

E. Moisture Control Requirements. The moisture content of the soil at the time of compaction shall be as necessary to obtain the density as designated on the contract drawings unless it is determined by the Engineer that the soil is unstable with that moisture content.

When the moisture content of the soil is not satisfactory to the Engineer, water shall be added or the material aerated, whichever is needed to adjust the soil to the proper moisture content. In no case, shall water be added without the consent of the Engineer.

F. Compaction Control Requirements. Roadway embankment earth (fill) materials shall be placed in horizontal layers not exceeding twelve (12) inches unless otherwise approved by the Engineer and shall be compacted as specified in Section 1205 "Compaction Requirements" before the next layer is placed. Effective spreading equipment shall be used on each lift to obtain uniform thickness prior to compaction. Water shall be added or removed on the approval of the Engineer, in order to obtain the required density.

1204 MOISTURE CONTENT REQUIREMENTS. The moisture content of the soil at the time of compaction shall be uniform and shall be such that the soil can be compacted to the requirements of the type of compaction as designated on the contract drawings or as directed by the Engineer.

1205 COMPACTION REQUIREMENTS.

A. Pavements. The subgrade for pavements shall be compacted to a density of at least ninety-five (95) percent of the maximum density for the material used for a depth of at least six (6) inches below the finished subgrade elevation and within the tolerance of the moisture for the type of material at ninety-five (95) percent of maximum density, as determined by the standard proctor test (ASTM D698) for cohesive soils. Any further compacted layers shall be accomplished in the same manner as specified.

The compacted density is to be such that the tamping or sheepsfoot roller, while rolling the layer or lift will walk out of the material and ride the top portion of the lift.

Compaction of low plasticity or non-plastic, fine-grained material shall be considered adequate when additional passes of the roller do not bring the tamping feet closer to the surface of the lift, provided the entire weight of the roller is supported on the tamping feet and none by material directly in contact with the drum.

Sand and gravel which cannot be compacted satisfactorily with a sheepsfoot roller shall be rolled with a pneumatic-tired roller.

Each lift shall be rolled until no further consolidation is evident.

B. Sidewalks. The subgrade for sidewalk pavements shall be compacted to a density equivalent to the density of the immediately surrounding soil in areas not requiring fill. In areas where fill is required, the subgrade shall be compacted to ninety-five (95) percent of the maximum dry density as determined by ASTM D698.

C. Drive Approaches and Concrete Curb & Gutter. The subgrade for drive approaches and concrete curb and gutter shall be compacted to the same requirements as stated above in part A Pavements.

1206 PROTECTION AND MAINTENANCE OF SUBGRADE. The newly finished subgrade shall be repaired from action of the elements or others. Any settlement or erosion that occurs prior to placing the pavement thereon, shall be repaired and the specific lines, grades and cross-section reestablished.

Any subgrade that has become unacceptable shall be reworked as necessary to restore the subgrade to shape, tolerance, density, and moisture content range for such density, immediately prior to the

placing of the pavement.

The Contractor shall protect all existing improvements from damage resulting from his subgrade operation. Any improvement damaged shall be repaired or replaced by the Contractor at his own expense.

1207 CLEAN-UP. Subgrade clean-up shall follow the work progressively. The Contractor shall remove from the project site all rubbish, equipment, tools, surplus or discarded material and temporary construction items.

1208 COMPACTION TESTING. Compaction testing shall be performed in the field. Testing may be performed using a nuclear density-moisture measuring devise to determine the density of the subgrade. If as a result of this field testing the Engineer determines that further compaction is required, the Contractor shall revise his methods or procedures to obtain the specified density. Certified results of testing shall be submitted to the City within 5 working days of the testing. Copies of field testing results shall be submitted upon completion of the tests.

1209 PROOF ROLLING. Proof rolling with a heavy rubber-tired roller will be required. Proof rolling shall be done after specified compaction has been obtained. Areas found to be weak (exhibit excessive pumping and those areas which fail shall be ripped, scarified, wetted or dried if necessary and re-compacted to the requirements for density and moisture at the contractor's expense. The operating weight of the roller shall be not less than 12-1/2 tons per wheel. Tires shall be inflated to a minimum pressure of 70 pounds per square inch and a maximum pressure of 90 pounds per square inch.

Proof rolling may also be accomplished by use of a tandem wheeled dump truck loaded with not less than 20 tons of material. Any weaknesses revealed by this method shall be immediately removed and re-compacted. At least two (2) passes shall be accomplished over the entire roadway area.