SECTION 02315  
EXCAVATION, BACKFILLING AND COMPACTING FOR  
PAVEMENT, UTILITIES & STRUCTURES  

PART 1 - GENERAL  

1.01  SECTION INCLUDES  

A. Excavate to line, grade and configuration as shown in the plans and specifications for proposed and future pavement areas.  

B. Fill to line, grade and configuration as shown in the plans and specifications for proposed and future pavement areas.  

C. Compacting fill materials in an acceptable manner as stated herein.  

1.02  RELATED SECTIONS  

A. Section 02300 - Earthwork  

B. Section 02740 - Asphalritic Concrete Paving  

C. Construction Drawings  

1.03  REFERENCE STANDARDS  


D 422 Method for Particle Size Analysis of Soils  
D 698 Test for Moisture-Density Relations of Soils Using 5.5 lb. (2.5 kg) Rammer and 12-inch (304.8 mm) Drop (Standard Proctor)  
D 1556 Test for Density of soil in Place by the Sand Cone Method  
D 1557 Test for Moisture-Density Relations of Soils Using 10-lb (4.5 Kg) Rammer and 18-inch (457 mm) Drop (Modified Proctor)  
D 2167 Test for Density of Soil in Place by the Rubber Balloon Method  
D 2216 Laboratory Determination of Moisture content of Soil  
D 2487 Classification of Soils for Engineering Purposes  
D 2922 Tests for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)  
D 3017 Test for Moisture Content of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)  
D 4318 Test for Plastic Limit, Liquid Limit, and Plasticity Index of Soils  
C 25 Chemical Analysis of Limestone, Quicklime and Hydrated Lime  
C 110 Physical Testing for Quicklime and Hydrated Lime, Wet Sieve Method  
C 618 Specification for Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete  
C 977 Quicklime and Hydrated Lime for Soil Stabilization
B. American Association of State Highway and Transportation Officials (AASHTO) latest edition

   T 88 Mechanical Analysis of Soils

C. All excavation sidewalls shall be in accordance with applicable rules and regulations established for construction by the Department of Labor, OSHA and by local ordinances.

1.04 QUALITY ASSURANCE

   Independent testing laboratory selected and paid by owner shall be retained to perform construction testing on filling operations and subgrade analysis as specified in Section 02300 and as stated herein.

1.05 SUBMITTALS

   A. Shop drawings or details pertaining to excavating and filling for pavement, utilities and structures are not required unless otherwise shown on the drawings or specifications or if contrary procedures to the project documents are proposed.

   B. Submit a sample of each type of off-site fill material that is to be used in backfilling in an air-tight, 10 lb. container for the testing laboratory or submit a gradation and certification of the aggregate material that is to be used to the testing laboratory for review.

PART 2 - PRODUCTS

2.01 MATERIALS

   A. Fill material from on-site as specified in Section 02300 and approved by the owner or owner’s representative.

   B. Fill material from off-site as specified in Section 02300 and approved by the owner or owners representative.

PART 3 - EXECUTION

3.01 PREPARATION

   A. Identify all lines, elevations and grades necessary to construct pavements, curb and gutter, bases, walkways and roadways as shown in the plans and specifications.

   B. Carefully protect benchmarks, property corners, monuments or other reference points.
C. Locate and identify all site utilities that have previously been installed and may be in danger of damage by grading operations.

D. Locate and identify all existing utilities that are to remain and protect them from damage.

E. When existing ground surface has a density less than that specified herein for each area classified with a specific percent maximum density requirement, break up ground surface pulverize, adjust moisture condition to optimum moisture content, and compact to required depth and percentage of maximum dry density or relative dry density.

3.02 EXCAVATION

A. Excavate roadway, pavement, utility and structure areas to line and grade as shown in the plans and specifications.

B. Engage all suitable material into the project fill areas as specified in Section 02300.

C. Unsuitable excavated material is to be disposed of in a manner and location that is acceptable to the owner and local governing agencies.

D. Perform excavation using capable, well maintained equipment and methods acceptable to the owner and the project document requirements.

E. If unsuitable bearing materials are encountered at required subgrade elevations, carry excavation deeper and replace excavated material as specified herein, to the satisfaction of the Owner, the Engineer, and representatives of the municipal agencies having jurisdiction.

F. Prevent surface water from flowing into trenches or other excavations by temporary grading or other methods, as required. Remove accumulated water in trenches or other excavations by pumping or other acceptable methods.

G. Trench depth requirements measured from finished grade or paved surface shall meet the following requirements or applicable codes and ordinances.

   1. Water Mains: 54” to top of pipe barrel.

   2. Sanitary Sewer: Elevations and grades as indicated on Drawings, (48” minimum to top of pipe barrel).

   3. Storm Sewer: Depths, elevations and grades as shown on Drawings.

   4. Electrical Conduits: 30” minimum to top of conduit or as required by NEC 300-5, NEC 710-36 codes, or the local utility company requirements, whichever is deeper.

   5. TV Conduits: 18” minimum to top of conduit or as required by the local utility company, whichever is deeper.
6. Telephone Conduits: 30” minimum to top of conduit, or as required by the local utility company, whichever is deeper.

7. Gas Mains and Service: 30” minimum to top of pipe, or as required by the local utility company, whichever is deeper.

8. Provide sheeting and bracing, when necessary, in trenches and other excavations where protection of workmen required. Sheetimg may be removed after sufficient backfilling to protect against damaging or injurious caving.

3.03 PIPE BEDDING

A. Accurately cut trenches for pipe or conduit that is installed to designed elevations 4” below bottom of pipe and to width as specified. Place 4” of bedding material, compact in bottom of trench, and accurately shape to conform to lower portion of pipe barrel. After pipe installation, place backfill as specified and compact in maximum 8” layers measured loose to the top of the trench.

3.04 FILLING AND SUBGRADE PREPARATION

A. Areas exposed by excavation or stripping and on which subgrade preparations for paving are to be performed, including future pavement areas, shall be scarified to minimum depth of 6” and compacted to minimum of 95% of optimum density, in accordance with ASTM D 698 (or 92% of optimum density, in accordance with ASTM D 1557), at a moisture content of not less than 1% below and not more than 3% above the optimum moisture content. These areas shall then be proofrolled to detect any areas of insufficient compaction. Proofrolling shall be accomplished by making a minimum of two (2) complete passes with a fully-loaded tandem-axle dump truck, or approved equivalent, in each of the two perpendicular directions under the supervision and direction of a field geotechnical engineer. Areas of failure shall be excavated and recompacted as stated above.

B. Fill materials used in preparation of subgrade shall be placed in lifts or layers not to exceed 6” loose measure and compacted to a minimum density of 95% of optimum density, in accordance with ASTM D 698, (or 92% of the optimum density, in accordance with ASTM D 1557) at a moisture content of not less than 1% below and not more than 3% above the optimum moisture content.

C. The following table stipulates maximum allowable values for plasticity index (PI) and liquid limit (LL) of suitable fill materials to be used in the specified areas, unless specifically stated otherwise on the Drawings:

<table>
<thead>
<tr>
<th>*Paving Area, below upper two feet</th>
<th>PI</th>
<th>LL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>20</td>
<td>50</td>
</tr>
<tr>
<td>*Paving Area, upper two feet</td>
<td>15</td>
<td>40</td>
</tr>
</tbody>
</table>

(*References to Depth are to Proposed Subgrade Elevations)
D. Criteria: Trenches shall not be backfilled until required tests are performed and the utility systems comply with and are accepted by applicable governing authorities. Backfill trenches as specified. If improperly backfilled, reopen to depth required to obtain proper compaction. Backfill and compact, as specified, to properly correct condition in an acceptable manner.

E. Backfilling: After pipe or conduit has been installed, bedded, and tested as specified, backfill trench or structure excavation with specified material placed in 8” maximum loose lifts.

F. Backfill trenches to the contours and elevations shown on the plans with unfrozen materials.

G. Systematically backfill to allow minimum time for natural settlement. Do not backfill over porous, wet, frozen or spongy subgrade surfaces.

3.05 COMPACTION

A. Maintain optimum moisture content of fill materials to attain required compaction density.

B. All materials shall be tested in accordance with Section 02300.

C. Exercise proper caution when compacting immediately over top of pipes or conduits.

D. Maintain optimum moisture content of fill materials to attain required compaction density.

E. An independent testing laboratory shall perform testing at intervals not exceeding 200’ of trench for the first and every other eight-inch (8”) lift of compacted trench backfill and furnish copies of test results as specified. Compact to minimum density of 95% of optimum density in accordance with ASTM D 698 or 92% of optimum density in accordance with ASTM D1557.

F. If unsuitable bearing materials are encountered at required subgrade elevations, carry excavation deeper and replace excavated material as specified herein, to the satisfaction of the Owner, the Engineer and the Geotechnical Consultant.

G. An independent testing laboratory selected and paid by the owner, shall be retained to perform testing on-site.

H. Compaction test will be as specified in Section 02300 together with the following for paving areas:

1. In cut areas not less than one compaction test for every 10,000 square feet.

2. In fill areas, same rate of testing for each 6” lift (measured loose).

I. If compaction requirements are not complied with at any time during construction process, remove and recompact deficient areas until proper compaction is obtained at no additional expense to owner.
3.06 MAINTENANCE OF SUBGRADE

A. Finished subgrades shall be verified to ensure proper elevation and conditions for construction above subgrade.

B. Protect subgrade from excessive wheel loading during construction including concrete trucks and dump trucks.

C. Remove areas of finished subgrade found to have insufficient compaction density to depth necessary and replace in a manner that will comply with compaction requirements by use of material equal to or better than best subgrade material on-site. Surface of subgrade after compaction shall be hard, uniform, smooth, stable, and true to grade and cross-section.

3.07 FINISH GRADING

A. Finish grading shall be in accordance with Section 02300 and as more specifically stated herein.

B. Grading of paving, utility and structure areas shall be checked by string line from grade stakes (blue tops) set at not more than 50’ centers. Tolerances of 0.10 feet, more or less, will be permitted. Contractor to provide engineering and field staking necessary for verification of lines, grades, and elevations.

END OF SECTION