SECTION 02225

EARTHWORK FOR UTILITY WORK

PART 1 GENERAL

1.1 DEFINITIONS

A. Rock: Stratified material in place which rings under the flow of a hammer; boulders having a volume of one-half (1/2) cubic yard or more. Shale, slate, soapstone, and chert are not classified as rock.

B. Utility: Any buried pipe, conduit, or cable.

1.2 REFERENCES

A. ASTM C33 - Concrete Aggregates.

B. ASTM C94 - Ready-Mixed Concrete.

C. ASTM C150 - Portland Cement.

D. ASTM D698 - Moisture-Density Relations of Soils and Soil-Aggregate Mixture Using 5.5 lb (2.49 kg) Rammer and 12 inch (305 mm) Drop.

E. ASTM D1556 - Density of Soil in Place by the Sand Cone Method.

F. ASTM D2167 - Density of Soil in Place by the Rubber Balloon Method.

G. ASTM D4253 - Maximum Index Density of Soils Using a Vibratory Table.

1.3 APPLICABLE SECTIONS

A. Section 02660, Water Distribution System

B, Section 02730, Sanitary Sewer System

1.4 SUBMITTALS

A. Submit two (2) copies of following test reports when requested by the WSD:
   1. Test reports on borrow material.
   2. Verification of each footing subgrade.

1.5 QUALITY ASSURANCE

A. Codes and Standards: Perform work in compliance with requirements of governing authorities having jurisdiction.

B. Inspection and Testing: Provide inspection and testing under provisions of Section 01410.

C. Excavator: Engage an experienced excavator, experienced in rock removal, sheeting, bracing, soil stabilization, dewatering, well pointing, backfilling, and similar operations commonly encountered in major excavation projects.

1.6 JOB CONDITIONS

A. Existing Utilities: Locate existing underground utilities in areas of work. Protect utilities indicated to remain in place.
   1. If uncharted or mischarted utilities are encountered, immediately notify the WSD and utility owner. Keep services and facilities in operation under direction of utility Owner.

B. Repair damaged utilities to satisfaction of utility owner.

C. The WSD will not be responsible for non-City mischarted utilities.

D. Do not interrupt existing utilities that are in use without written permission of the WSD and the non-City Utility Owner so affected and then only after temporary services have been provided.

1.7 EXISTING CONDITIONS

A. Perform a pre-construction survey prior to beginning work in easement or streets. Document pre-construction conditions by video or pictures along any route of new water and sewer lines outside the property of the developer (i.e. offsite facilities). Provide copy of documentation the WSD.

1.8 EXPLOSIVES

A. Use of explosives is permitted only with the prior written approval of the WSD and Fire Marshall.

1.9 PROTECTION OF PERSONS AND PROPERTY

A. Barricade open excavations occurring as part of this work and post warning lights. Operate warning lights as recommended by authorities having jurisdiction.

B. Protect structures, utilities, sidewalks, pavements, and other facilities indicated to remain in place from damage caused from possible settlement, lateral movement, undermining, washout and other hazards created by excavation.

C. Protect plant growth and trees scheduled to remain. Do not excavate or store material within drip line of trees.

D. Restore property to a condition similar or equal to that existing before construction and to the satisfaction of the WSD.

1.10 COORDINATION

A. Verify work associated with lower elevation utilities are complete before placing higher elevation utilities.

B. Where excavation and backfill for utility work passes through or occurs in a landscaped area, repair or replace the landscape work to match original condition and quality of work.

C. Where excavation and backfill for utility work passes through or occurs in an area of paving, restore construction and finish of paving to match original condition and quality of work.

D. Coordinate excavations with weather conditions, to minimize the possibility of washouts, settlements and other damages and hazards.

E. Coordinate with utility owner for shutdown of service. Provide notice as required by the owner of utility before interrupting any utility.

1.11 SCHEDULING AND SEQUENCING

A. Do not excavate for utility work until the work is ready to proceed without delay, so that the total time lapse from excavation to completion of backfilling will be minimal.

B. At street and road crossings, with no exception of public streets and roads excavate only 1/2 of crossing width before placing temporary bridges over side excavated, for convenience of traveling public.

1.12 MAINTENANCE

A. Where subsidence is measurable or observable at utility work excavations during warranty period, remove surface (pavement, lawn or other finish), add backfill material, compact, and replace surface treatment.

B. Restore appearance, quality and conditions of surface or finish to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

PART 2 PRODUCTS

2.1 BEDDING AND BACKFILL

A. Soil Backfill and Bedding: Soil to be free of roots and organic material, debris and other material considered deleterious by WSD. Soil selected shall consist of residual clay occurring within designated borrow areas, or which occurs within on-site areas which are to be excavated. Soil shall be free of rock fragments greater than 2 inches in maximum dimension.

B. Stone Bedding and Backfill Material: Only Tennessee Department of Transportation (TDOT) specified grade stone material is permitted.

C. Roadway Base Material: Material shall conform to TDOT 303-01.

D. Topsoil: Only natural, fertile, agricultural soil capable of sustaining plant growth; free of subsoil, slag, rocks, clay, sticks, and roots to a depth of 18 inches is permitted.

E. Lean Concrete: Provide concrete in accordance with the following:
1. Cement: ASTM C150 normal - Type 1 Portland.
2. Fine and Coarse Aggregates: ASTM C33.
3. Water: Clean and not detrimental to concrete.
4. Mix concrete in accordance with ASTM C94 with a compressive strength (28 days) of 3,000 psi and a 4-inch slump.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine areas to be excavated, and conditions under which work is to be performed, and notify WSD in writing of conditions detrimental to the proper completion of the Work.

B. Do not proceed with excavating until unsatisfactory conditions have been corrected in an acceptable manner by the WSD.

3.2 PREPARATION

A. Identify required lines, levels, contours, and datum.

B. Strip topsoil and stockpile separate from all other material on site for respreading. Do not pile over 8 feet and protect from erosion.

C. In cases where other utilities or other pipe is encountered, pipe shall not be displaced nor disturbed unless necessary, in which case replace it in good condition as soon as possible.

3.3 EXCAVATION

A. Excavate for piping with clearance on both sides of pipe as shown in the appropriate detail drawings. Excavate for other utility work to provide minimum clearances as required by these documents or as practical and adequate for working clearances.

B. Hand trim for bell and spigot pipe joints if necessary. For stone bedding installations, shape bedding to fit shape of bottom half pipe including bell end, for uniform continuous support.

C. Depth for Direct Support: For work to be supported directly on undisturbed soil, do not excavate beyond indicated depths, and hand-excavate the bottom cut to accurate elevations. Support cast-in-place concrete on undisturbed soil at the bottom of the excavations:

D. Depth for Bedding Support: For large piping (6-inch pipe size and larger), tanks and where indicated for other utility work, excavate for installation of bedding material in the depth indicated or, if not otherwise indicated, six (6) inches below bottom of work to be supported.

E. Depth for Unsatisfactory Soil Conditions: Where unsatisfactory soil conditions at bottom of indicated excavation are encountered, excavate additional depth to reach satisfactory soil-bearing condition. Backfill with bedding material as directed by the WSD and compact to indicated excavation depth.

F. Cover for Piping: Excavate for water and sewer pressure pipe so that top of piping will not be less than 2'-6" measured as a vertical distance below finished grade. Excavate for gravity sewer lines so that top of piping will not be less than 2'-6" in open fields and 4'-0" in roadways measured as a vertical distance below finished grade.

G. When excavating within drip line of large trees, perform the work by hand, and protect the root system from damage or dryout to the greatest extent possible. Maintain moist condition for root system and cover exposed roots with burlap. Paint root cuts of 1-inch diameter and larger with asphaltic tree paint.

H. Correct areas over excavated. Correct unauthorized rock removal with lean concrete fill.

I. Previous Excavations: Where piping crosses over an area more than 5'-0" wide which has been previously excavated to a greater depth than required for piping installation, provide suitable subsidence-proof support for piping.

J. Comply with the details shown. Where not otherwise shown excavate to undisturbed soil, in a width equal to pipe diameter plus 2'-0". Install 8 inch courses of bedding material, each compacted to 95% of maximum density, as required to fill excavation and support piping.

K. Excavate to subgrade elevations directed by the WSD, regardless of character of materials and obstructions encountered.

L. Unauthorized excavation includes removal of material beyond elevations or dimensions without direction of the WSD.
   1. Backfill and compact unauthorized excavations as specified for authorized excavations of same classification, unless otherwise directed by WSD.

M. Stability of Excavations: Slope sides of excavations to comply with applicable codes. Shore and brace where sloping is not possible. Maintain sides and slopes in safe condition until completion of backfilling.

N. Shoring and Bracing: Comply with applicable code and regulatory requirements for shoring and bracing. Provide materials that are in good serviceable condition. Carry down shoring and bracing as excavation progresses and maintain in place as long as excavations are open.

O. Material Storage: Stockpile satisfactory material where directed until required for backfill or fill. Place, grade, and shape stockpiles for proper drainage. Do not stockpile material at edge of excavation. Dispose of excess soil and waste material. Do not store under trees within the drip line.

3.4 COMPACTION

A. Before compacting and filling, proofroll area. Remove soft spots, fill and compact to required density.

B. Control soil compaction during construction providing minimum percentage of density specified for each area classification indicated below.

C. Percentage of Maximum Density Requirements: Compact soil to not less than the listed percentages of dry density for soils which exhibit a well-defined moisture density relationship determined in accordance with

ASTM D698 (Standard Proctor); and not less than listed percentages of relative density, determined in accordance with ASTM D4253, for soils which will not exhibit a well-defined moisture-density relationship.

1. Pavements: Compact top 12 inches of subgrade and each layer of backfill or fill material at 98% maximum dry density or 90% relative dry density for cohesive soil material.
2. Roadways: 90% for cohesive soils; 95% for cohesionless soils.
3. Lawn or Unpaved Areas: Compact top 6 inches of subgrade and each layer of backfill or fill material at 90% maximum dry density.
4. Walkways: Compact top 6 inches of subgrade and each layer of backfill or fill material at 95% maximum dry density.

D. Moisture Control: Where subgrade or layer soil material must be moisture conditioned before compaction, uniformly apply water to surface of subgrade, or layer of soil material, to prevent free water appearing on surface during or subsequent to compaction operations.

E. Remove and replace, or scarify and air dry, soil material that is too wet to permit compaction to specified density.

1. Soil material that has been removed because it is too wet to permit compaction may be stockpiled or spread and allowed to dry. Assist drying by discing, harrowing or pulverizing until moisture content is reduced to a satisfactory value. Reuse stockpiled material only after dried to proper moisture content.

3.5 BEDDING AND BACKFILL

A. Refer to Sections 02660 and 02730 as appropriate for bedding and backfill requirements of water and sanitary sewer.

3.6 GRADING

A. Uniformly grade areas within limits of grading under this Section, including adjacent transition areas. Smooth finished surface within specified tolerances, compact with uniform levels or slopes between points where elevations are indicated, or between such points and existing grades.

B. Grading Outside Building Lines: Slope grade away from buildings to drain away water and prevent ponding.

C. Grading Tolerances: Finish surfaces free from irregular surface changes and to the following tolerances above or below required subgrade elevations.

1. Top Surface of Backfilling Under Paved Areas: Plus or minus 1 inch (0.08) feet from required elevations.

2. Top Surface of General Backfilling: Plus or minus 1 inch (0.08) feet from required elevations.

D. Compaction: After grading, compact subgrade surfaces to depth and percentage of maximum density for each area classification.

E. Time: After completion of the installation, lawns and unpaved areas shall be restored within14 days.

3.7 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Section 01410.

B. Testing During Construction: When applicable, testing agency shall inspect and approve subgrades and fill layers before continuing with construction.
1. Perform testing in accordance with ASTM D1556 (sand cone method) or D2167 (rubber balloon method).

C. If compacted subgrade or fills which have been placed do not meet specified densities, provide additional compaction and testing.

3.8 MAINTENANCE

A. Protection of Graded Areas: Protect newly graded areas from traffic and erosion. Keep free of trash and debris.

B. Repair and re-establish grades in settled, eroded, and rutted areas to specified tolerances.

C. Reconditioning Compacted Areas: Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, re-shape, and compact to required density prior to further construction.

3.9 DISPOSAL OF EXCESS AND WASTE MATERIALS

A. Remove excess excavated material, trash, debris and waste materials and dispose of it properly.

B. Excess materials excavated shall be disposed of so as to interfere as little as possible with public travel and, in all cases, the disposition of excavated material shall be satisfactory to the WSD.

3.10 PROTECTION OF FINISHED WORK

A. Protect finished Work under provisions of Section 01500.
   1. Do not walk on or work on top of finished piping until trench has been backfilled.

B. Reshape and re-compact fills subjected to vehicular traffic during construction period. Add mineral aggregate base course as required to maintain trenches in asphaltic concrete areas in a safe and passable condition.

END OF SECTION 02225 - EARTHWORK FOR UTILITY WORK