SECTION 02221

EXCAVATING, BACKFILLING, AND COMPACTION FOR UTILITIES

PART 1 GENERAL

1.01 SUMMARY

A. Related Sections:

1. 02200 - Earthwork.
2. 02660 - Water Systems.
3. 02720 - Storm Drainage System.
4. 02731 - Sanitary Sewer System.
5. 15047 - Identification.
7. Division 16 - Electrical Work.

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. D1556-90(96) Test Method for Density of Soil in Place by the Sand-Cone Method.
2. D1557-91 Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort
3. D2487-93 Classification of Soils for Engineering Purposes (Unified Soil Classification System).

B. Occupational Safety and Health Administration (OSHA):
Trench Safety Act.

1.03 DEFINITIONS

A. "Satisfactory Fill Materials" include materials classified in ASTM D2487 as GW, GP, SW, and SP properly worked by Contractor to obtain optimum moisture and compaction. Maximum size of rock limited to 6 inches. Use 2 inch maximum size for the top 2 feet below the finish indicated grade.

1.04 SUBMITTALS

A. Submit copies of tests and records performed as specified to A/E for review before starting work.
1.05 QUALITY ASSURANCE


1.06 PROJECT CONDITIONS

A. Excavation, filling, and backfilling for utilities complete for underground utility lines and structures as specified and as shown on the drawings.

B. Sidewalks and Streets:

1. Take precautions to guard against movements, settlement, or collapse of sidewalks or street passages on site or on adjoining property.
2. Be liable for any such movement, settlement, or collapse.
3. Repair promptly such damage.
4. Install shoring, including sheet piling, as may be required during excavation to protect trench banks, adjacent paving, structure, and utilities.

C. Existing Utilities:

1. Protect existing utilities from movement, settlement, or other damages according to Instructions to Bidders and General Conditions.

D. Trench Safety Act: Provide trench safety systems at all trench excavations where workers may be exposed to moving ground or cave-ins regardless of depth of trench. All trenches more than 5 feet in depth shall comply with OSHA "Trench Safety Act".

PART 2 PRODUCTS

2.01 MATERIALS

A. Trench Backfill Materials: Either satisfactory excavated material or fill materials as specified.

B. Pipe Bedding Material: Bedding material shall be selected or satisfactory backfill material and free of any rocks or
stones larger than 2 inches in diameter for cast iron and PVC pipe. Limerock screenings or sand shall be used for copper tubing. (Underground copper lines are 3 inch diameter or less.)

PART 3 EXECUTION

3.01 INSPECTION

A. Do not proceed with the work of this section until conditions detrimental to the proper and timely completion of the work have been corrected in an acceptable manner.

3.02 EXCAVATION

A. General:

1. Perform excavating of every description and of whatever substance encountered to depths indicated or specified.
2. Pile materials suitable for backfilling a sufficient distance from banks of trenches to prevent slides or cave-ins.
4. Remove excavated materials not required nor suitable for backfill from site.
5. Remove water by pumping or other acceptable method and discharge at a safe distance from excavation. Continue dewatering until deemed proper or desirable for the installation of utility lines.
6. Comply with the applicable standards and regulations of Miami-Dade County and the city where building is located.
7. Sheeting and shoring shall be done as is necessary for protection of work and for safety of personnel. Excavating shall be by open cut.

B. Trench Excavations:

1. Make trench of necessary width and depth for proper laying of pipe, with bank as vertical as practical.
2. Coordinate trench excavation to avoid open trenches for prolonged periods.
3. Grade bottom of trenches accurately to provide uniform bearing and support for each section of pipe on undisturbed soil at every point along their entire length, except portions of pipe sections where it is...
necessary to excavate for couplings and for proper making of pipe joints or where unsatisfactory materials incapable of properly supporting pipe and utility structures are encountered at bottom of trench.

4. Dig holes and depressions for joints after trench bottom has been graded of length, depth, and width required for properly making the particular type of joint.

5. When unsatisfactory soil, incapable of properly supporting pipe, is encountered at the bottom of the trench, remove such soil to a minimum depth of 12 inches, or 1/4 of the pipe diameter, whichever is greater, below the bottom of pipe and backfill material specified.

6. Over-depths in unstable soil excavation and unauthorized over-depths shall be at the expense of Contractor.

C. Special requirements relating to specific utilities are as follows:

1. Storm Drains and Sanitary Sewers:
   a. Where shown on drawings, make width of trench at and below top of pipe adequate to allow space for workers to place and properly joint pipe.
   b. Clear space between the barrel of the pipe and trench wall shall not exceed 8 inches on either side of the pipe.
   c. Width of the trench above the level may be as wide as necessary for sheeting and bracing and proper performance of the work.
   d. For plastic pipe, where shown on drawings, make depth of trench to allow a minimum of 24 inches of cover over the top of 2-1/2" or less pipe and a minimum of 36 inches of cover over the top of 3 inch or larger pipe from finished grade unless otherwise indicated or required by local utility. Install metallic detection tape 4 inches - 6 inches below finish grade. See Section 15047 - Identification.
   e. Round the bottom of the trench so at least the bottom quadrant of the pipe shall rest firmly on undisturbed soil or select bedding for as nearly the full length of the barrel as proper joining operations will allow.
   f. Trenches for plastic pipe shall be cut to an over-
2. Water Lines, Force Mains, and Gas Lines:

a. Where shown on drawings, make depth of trench to allow a minimum of 24 inches of cover over the top of the pipe from finished grade unless otherwise indicated or required by local utility.

b. For plastic pipe, install metallic detection tape 4 inches – 6 inches below finish grade. See Section 15047 - Identification.

c. Avoid interference of water lines with other utilities, grade water lines to avoid air pockets.

d. Trenches for plastic pipe shall be cut to an over-depth of not less than 6 inches and a cushion of rock free soil or coarse sand used for not less than 6 inches bedding and 12 inches backfill over the plastic pipe.

3. Electrical Conduit or Cables:

a. Trenches for plastic conduits shall be a depth providing not less than 24 inches of cover from finished grade or 12 inches or greater of cover from underside of slabs to accommodate bending radii, unless otherwise indicated. Install warning tape 8 inches below finish grade or underside of slab. See Section 15047 - Identification.

b. Trenches for plastic conduit and cables shall be cut to an over-depth of not less than 3 inches and a cushion of rock free soil or coarse sand used for not less than 3 inches bedding and 3 inches backfill over the plastic conduit and cable.

4. Excavating for Appurtenances:

a. Excavations for structures shall be sufficient to leave at least 12 inches in the clear between their outer surfaces and the embankment or shoring used.

b. Whenever unstable soil is incapable of properly supporting the structure is encountered in the
bottom of the excavation, such soil shall be removed and excavation backfilled as specified herein in paragraph "Trench Excavation".

c. Unauthorized over-depths or under-depths in wet or otherwise unstable soil shall be filled with selected backfill material or concrete, as directed, at the expense of the Contractor.

3.03 EXCAVATION OF UNCLASSIFIED MATERIAL

A. Materials encountered during the excavating to the depth and extent specified and indicated on drawings may include rock, concrete, masonry, or other similar materials.

1. No adjustment will be made in the Contract Price because of the presence (or absence) of rock, concrete, masonry, or other similar materials.

3.04 PROTECTION OR REMOVAL OF UTILITY LINES

A. Protection:

1. Protect existing utility lines indicated on drawings (or the locations of which are made known to Contractor before excavating and trenching) specified to remain, including utility lines constructed during trenching operations, from damage during trenching, backfilling, and compacting operations.

   a. If such new or existing utility lines are damaged during trenching, backfilling, and compacting operations, repair or replace at no cost to A/E.

2. When utility lines specified to be removed or replaced are encountered within the area of operations, issue notices in ample time for measures to be taken to coordinate necessary interruption of services.

B. Repair of Damage to Unknown Existing Utility Lines:

1. Existing utility lines not shown on drawings (or the location of which is not known to Contractor in time to avoid damage) damaged during trenching operations shall be repaired by Contractor and an adjustment to the Contract Price will be made according to Instructions to Bidders and General Conditions.
3.05 BACKFILLING

A. General:

1. Coordinate backfilling with testing of utilities. Leave sheeting in place where damage is likely to result from withdrawal.
2. Carefully backfill trenches with satisfactory specified materials.
3. Bring backfill up evenly in 9 inch maximum layers, loose depth, and thoroughly and carefully compact with mechanical or hand tampers until pipe has a minimum cover of one foot. Take care not to damage the pipe.
4. Deposit remainder on the satisfactory backfill material in the trench in one foot layers and compact by mechanical means to percentages as specified.
   a. Trenches and excavation pits improperly backfilled or where settlement occurs shall be reopened to the depth required for proper compaction, refilled and compacted, with the surface restored to the specified grade and compaction.
5. Keep excavations free of ground and surface water until backfilling operation is complete.

B. Appurtenances:

1. At structures, remove forms and trash before backfilling.
   a. Place satisfactory backfill materials symmetrically on all sides in 9 inch maximum loose depth layers.
   b. Moisten each layer, if necessary, and compact with mechanical or hand tamper, taking care not to injure the structure by excessive tamping.
2. Materials and density shall be as previously specified for trenches depending upon location of the structure.

C. Compaction:

1. Material may be compacted by a hand tamper, a powered hand tamper, a vibrating tamper, or mechanized power tamper provided such compaction percentages meet the required density as specified below.
2. Backfilling and compacting by means of hydraulic methods will not be allowed except as may be approved by A/E.

   a. Compact each layer to not less than the percentage of maximum density specified below, determined according to ASTM D1557, Method D:

<table>
<thead>
<tr>
<th>Fills and Backfill</th>
<th>Cohesionless Soil</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under slabs and pavement</td>
<td>95%</td>
</tr>
<tr>
<td>Under walk areas, top 12 inches</td>
<td>95%</td>
</tr>
<tr>
<td>Under walk areas, below top 12 inches</td>
<td>90%</td>
</tr>
<tr>
<td>Under landscape areas</td>
<td>85%</td>
</tr>
<tr>
<td>Under other areas noted on Site Plan</td>
<td>85%</td>
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</tbody>
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3.06 TESTING

A. Notify, through A/E, the Board contracted Testing Laboratory to perform specified tests at the Board's expense.

B. Tests of Materials shall be as follows:

1. Laboratory Tests for Moisture Content and Density:

   a. According to ASTM D1557, one test for each material encountered or proposed to be used.

2. Field Tests for Moisture Content and density:

   a. According to ASTM D1556, one test per layer per 100 linear feet of ditch.

END OF SECTION