

**SECTION 31 00 00 – EARTHWORK**

**PART 1 - GENERAL**

**1.01: Section Includes**

- A. Staking and grades
- B. Existing utilities
- C. Earthwork general requirements
- D. Subsurface extraction
- E. Excavation
- F. Subgrade preparation
- G. Foundation preparation
- H. Compaction
- I. Backfilling
- J. Finish grading
- K. Field quality control

**1.02: Related Sections**

- A. Trenching and Backfilling for Utilities is specified in Section 33 05 28 - Trenching and Backfilling for Utilities.

**1.03: References**

- A. American Society for Testing and Materials (ASTM):
  - 1. ASTM C 131 Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
  - 2. ASTM C 136 Test Method for Sieve Analysis of Fine and Coarse Aggregates
  - 3. ASTM C 535 Test Method for Resistance to Degradation of Large-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
  - 4. ASTM D422 Method for Particle-Size Analysis of Soils
  - 5. ASTM D653 Terminology Related to Soil, Rods, and Contained Fluids

6. ASTM D1140 Test Method for Amount of Material in Soils Finer Than the 200 (75-urn) Sieve
7. ASTM D1557 Test Methods for Moisture-Density Relations of Soils and Soil- Aggregate Mixtures Using 10-lb (4.54-kg) Rammer and 18-in. (457-mm) Drop
8. ASTM D2216 Test Method for Laboratory Determination of Water (Moisture) Content of Soil, Rock, and Soil-Aggregate Mixtures.
9. ASTM D2487 Test Method for Classification of Soils for Engineering Purposes
10. ASTM D2922 Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
11. ASTM D2974 Test Method for Moisture, Ash, and Organic Matter of Peat and Other Organic Materials
12. ASTM D3017 Test Method for Moisture Content of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
13. ASTM D4253 Test Methods for Maximum Index Density of Soils Using a Vibratory Table
14. ASTM D4254 Test Methods for Minimum Index Density of Soils and Calculation of Relative Density
15. ASTM D4318 Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

#### **1.04: Definitions**

- A. Earthwork Terminology: Terms used in this Section and not defined herein shall be interpreted in accordance with the definitions given in ASTM D653.
- B. Soil Classification: Soil classification is based on the Unified Soil Classification system given in ASTM D2487. Group symbols, when used, conform with the symbols of ASTM D2487.
- C. Fill: Soil or soil-rock material placed to raise the subgrade or natural grade of the site.
- D. Backfill: Soil or soil-rock material used to backfill excavations and to backfill excavated spaces around foundation walls, building walls, retaining walls, head walls, and abutments.
- E. Embankment: Soil or soil-rock material for embankment construction. Embankment construction includes constructing embankments and dikes, including the preparation of the areas upon which they are to be placed; and the construction of temporary surcharge embankment above the grading plane.
- F. Borrow: Soil or soil-rock material used for fill, backfill, embankment, or other construction that is excavated from an off-site location and hauled in.
- G. Unsuitable Material: Excavated material or material below the natural ground surface in embankment areas or below sub grade elevation in excavated areas, which is unsuitable for its planned use. Unsuitable material is further defined as material determined to be:
  1. Of such unstable nature as to be incapable of being compacted to specified density using ordinary

- methods at optimum moisture content; or
2. Too wet to be properly compacted and circumstances prevent suitable drying prior to incorporation into the work; or
  3. Otherwise unsuitable for the planned use.
- H. The presence of excessive moisture in a material is not, by itself, sufficient cause for determining that the material is unsuitable. The existence of unsuitable material may be indicated in the Contract Documents or may be determined by the Engineer during the progress of the work.
- I. **Relative Compaction:** The ratio, expressed as a percentage, of the in-place dry density of material as compacted in the field to the maximum dry density of the same material as determined by laboratory test ASTM D1557.
- J. **Optimum Moisture Content:** The water content at which a soil can be compacted to a maximum dry unit weight by a given compactive effort
- K. **Relative Density:** Mass per unit volume as specified in ASTM D4253 and ASTM D4254, as applicable to the soil and test method employed.

### **1.05: Classification of Earthwork**

- A. For specification purposes, earthwork shall be classified as follows:
1. **Excavation-Common:** All excavation involved for demolition of the existing walls and construction of new retaining walls is classified as common excavation. Excavation- Common includes excavation of pavements and other obstructions visible on ground surface and other items indicated to be demolished and removed; together with earth and other materials encountered that are not classified as rock or unauthorized excavation.
  2. **Excavation - Rock:** Includes removal of material in place which cannot be loosened or broken down with one pass of a crawler tractor weighing not less than 55,000 pounds, with a maximum draw-bar pull of not less than 56,000 pounds-force, pulling a single 24-inch hydraulic ripper tooth approved by the tooth manufacturer for use with the tractor under full hydraulic down pressure, or equipment of equivalent ripping capacity at one mile per hour (Caterpillar D8K or larger) or excavated by a front-end loader with a minimum bucket breakout force of 25,600 pounds (Caterpillar 977 or larger).
    - a. Typical of materials classified as rock are solid rock, rock in ledges, and rock-hard continuous aggregate deposits.
    - b. Intermittent drilling or ripping performed to increase production and not necessary to permit excavation of material encountered will be classified as earth excavation.
    - c. Do not perform rock excavation work until material to be excavated has been cross-sectioned and classified by Owner. Such excavation will be paid on basis of contract conditions relative to changes in work.
    - d. Rock payment lines are limited to the following:
      1. Two feet outside of concrete work for which forms are required, except footings.

2. One foot outside perimeter of footings.
  3. In pipe trenches, 6" below invert elevation of pipe and 2 ft. wider than inside diameter of pipe, but not less than 3 ft. minimum trench width.
  4. At outside dimensions of concrete work where no forms are required.
  5. Under slabs on grade, 6" below bottom of concrete slab.
3. **Structure Backfill:** Structure backfill includes furnishing structural fill material, and placing and compacting structural fill material around structures to the lines and grades indicated. Structure backfill includes borrow excavation and material when required.
  4. **Fill for Raising Grade:** Includes raising of sub grade or grade to indicated elevation with structural fill, including moisture conditioning and compaction of placed fill material. Structural fill material includes borrow excavation and material when required.
  5. **Pervious Backfill:** Includes furnishing, placing, and compacting pervious backfill material behind abutments, wingwalls, and retaining walls, as indicated.
  6. **Salvaging Topsoil:** Salvaging topsoil is the removal of topsoil, stockpiling the material on-site, and maintaining the stockpile until the material is reused in the work. Salvaging of topsoil shall be classified as Excavation - Common.
  7. **Unauthorized excavation** consists of removal of materials beyond indicated subgrade elevations or dimensions without specific direction of Owner. Unauthorized excavation, as well as remedial work directed by Owner, will be at Contractor's expense.
    - a. Under footings, foundation bases, or retaining walls, fill unauthorized excavation by extending indicated bottom elevation of footing or base to excavation bottom, without altering required top elevation. Lean concrete fill may be acceptable if approved by Owner.
    - b. Elsewhere, backfill and compact unauthorized excavations as specified for authorized excavations of same classification, unless otherwise directed by Owner.

### **1.06: Description**

- A. Provide excavation for pavement; excavation and placement of compacted fill and backfill for structures and subsurface and surface drainage; placement of pervious backfill; construction of embankments; sub grade and foundation preparation; subsurface extraction of miscellaneous structures and facilities indicated or required to be removed; and finish grading.

### **1.07: Submittal**

- A. **General:** Refer to Section 01 33 23 □ Shop Drawings, Product Data and Samples for submittal requirements and procedures.
- B. **Test Reports:** Contractor shall coordinate quality control testing to be performed by Testing Laboratory engaged by the Owner.
- C. **Samples:** Furnish and deliver samples of fill and backfill materials for testing and analysis.

- D. Delivery Tickets: Submit a delivery ticket with each load of imported borrow material delivered to the site, stating the type of fill material and the quantity.

**1.08: Quality Control**

- A. Quality Control: The Contractor shall provide proper quality control measures to assure compliance with specified requirements. Foundation and sub grade preparation and the placement and compaction of fills shall be performed under the surveillance of a Georgia registered geotechnical engineer employed by the Owner. Contractor shall coordinate quality control inspections and testing to be performed by Testing Laboratory engaged by the Owner.
- B. Tests: The Owner shall engage the services of an approved independent soil testing laboratory to perform tests.
  - 1. Testing Requirements:
    - a. Compaction tests in accord with ASTM D-698.
    - b. Field density tests for area fills for each 1'-0" lift, in accord with ASTM D-698, one test for each 2,500 sq. ft. of fill. A minimum of three (3) tests for fill placed in isolated areas.
    - c. Field density tests for trench excavations for each 1'-0" lift, in accord with ASTM D-698, one test for each 100 linear feet of trench under buildings and pavement, one test for each 200 linear feet otherwise.
    - d. Inspection and testing subgrades and proposed fill materials.
    - e. Inspection of excavation bracing system, including furnishing, installing and monitoring slope indicator devices and settlement gauges.
    - f. Contractor's duties relative to testing include:
      - 1. Provide representative fill soil samples to Testing Agency for test purposes. Provide 50 lb. samples of each fill soil.
      - 2. Advise Testing Agency sufficiently in advance of operations to allow for completion of quality tests and for assignment of personnel.
      - 3. Be responsible for paying costs of additional testing if initial tests reveal nonconformance with specified requirements.
        - a. Test report on borrow material.
        - b. Verification of each footing subgrade.
        - c. Field density test reports.
        - d. Verification of classification of soil type used in fill and backfill.
        - e. One optimum moisture-maximum density curve for each type of soil encountered.
        - f. Report of actual unconfined compressive strength and/or results of

bearing tests of each strata tested.

C. Tolerances:

1. Construct finished surfaces to plus or minus 1/2-inch of the elevations indicated.
2. Complete embankment slopes to plus or minus 6 inches of the slope line indicated. Do not encroach on the roadbed.
3. Maintain the moisture content of fill material as it is being placed within plus or minus two percent of the recommended moisture content of the material.

**1.09: Site Conditions**

A. Unfavorable Weather Conditions:

1. Excavating, filling, backfilling, and grading work shall not be performed during weather conditions which might damage or be detrimental to the condition of existing ground, in-progress work, or completed work. When the work is interrupted by rain, excavating, filling, backfilling, and grading work shall not resume, until the site and soil condition (moisture content) are suitable for compaction.
2. Sub grade shall be free from mud, snow, ice, and deleterious material when work is resumed.
3. Soil material that is too wet for compaction shall be left to drain, to be aerated and dried by disking and harrowing or other approved methods until the moisture content of the area is uniform and within the specified limits.

B. Prevention of Erosion: Comply with requirements specified in Section 31 25 00 □Erosion and Sediment Controls, and the following:

1. Prevent erosion of stockpiles, ditches, embankments, filled, backfilled, and graded areas until such time as permanent drainage and erosion control measures have been installed.
2. Perform □protective grading□to provide positive drainage and to minimize ponding of surface water.
3. Any repairs or mitigation due to erosion will be the responsibility of the Contractor.

**PART 2 - PRODUCTS**

**2.01: Fill and Backfill Materials – General Requirements**

A. Material used for fill, backfill, and embankment construction shall be an inert, inorganic soil, free from deleterious substances, and of such quality that it will compact thoroughly without the presence of voids when watered and rolled. (Inorganic soil is defined as soil containing less than two percent by weight of organic material when tested in accordance with ASTM D2974.) Excavated on-site material will be considered suitable for fill, backfill, and embankment construction if it is free from organic matter and other deleterious substances and conforms to the requirements specified herein.

1. Satisfactory soil materials are defined as those with no organics, a plasticity index of less than 20

and a maximum particle size of four inches, with not more than 30% greater than 3/4 inch. It shall be clean material and rock no larger than 1/2 cu. ft. Fill material shall be tested and approved by Testing Agency for degree of compaction required by its intended use.

2. Unsatisfactory soil materials are defined as those complying with ASTM D 2487 soil classification groups OH and PT or soil materials not capable of being compacted to density and moisture requirements of this section, debris, organic material and soil containing organic material.
- B. Excavated material that is suitable for fill, backfill, and embankment construction shall be conditioned for reuse and properly stockpiled for later filling and backfilling operations. Conditioning shall consist of spreading material in layers not to exceed 8 inches and raking free of debris and rubble. Rocks exceeding 6 inches in largest dimension and deleterious material shall be removed from the site and disposed of as specified herein under Disposal of Surplus Material.
- C. Where conditions require the importing of fill or backfill material, the material shall be an inert soil or soil-rock material free of organic matter and meeting or exceeding the minimum requirements specified herein for the location.
- D. All material to be used for filling, backfilling, and embankment construction requires written approval of the Engineer.

## **2.02: Source Quality Control**

- A. Fill, backfill, and embankment materials proposed to be used in the work shall be tested in the laboratory for compliance with specified requirements as follows:
1. Moisture-Density Relationship: ASTM D1 557.
  2. Moisture Content: ASTM D2216.
  3. Liquid Limit: ASTM D4318.
  4. Plastic Limit and Plasticity Index: ASTM D43 18.
  5. Percentage of Wear: ASTM C131 or C535 as applicable.
  6. Sieve Analysis: ASTM D422, and ASTM C136, as applicable.
  7. Percent Passing No 200 sieve: ASTM D1 140.
  8. Sand Equivalent: California Test 217.
  9. Organic Content of Soils: ASTM D2974.
- B. Where classification of soils is necessary to meet specified requirements, perform laboratory tests in accordance with ASTM D2487.
- C. Submit certified test reports of all tests as herein specified under Submittals.
- D. Provide samples as requested by the Engineer for preparing checklists. Provide three samples of each type of material proposed for use from locations selected by the Engineer.

## **PART 3 - EXECUTION**

### **3.01: Staking and Grades**

- A. Lay out the work, establish all necessary markers, benchmarks, grading stakes, and other stakes as required. Layout work shall be done under the supervision of an engineer or land surveyor, registered in the State of Georgia, familiar with construction layout work, at no additional cost to the Owner.
- B. Protect all grade stakes during the grading and filling operations, and reset any grade stakes and line stakes

destroyed.

- C. Verify and flag all property corners and bench marks within 50 feet of any clearing or grading operations. Protect same during construction. If disturbed or destroyed, replace. If found at variance with Drawings, notify Owner before proceeding to layout work.

### **3.02: Existing Utilities**

- A. Verify on site the location and depth (elevation) of all existing utilities and services before performing any excavation work. Excavation within 2 feet of an active utility line shall be performed by hand. If utilities are to remain in place, provide adequate means of support and protection during earthwork operations.
  - 1. Do not interrupt existing utilities serving facilities occupied and used by Owner or others, during occupied hours, except when permitted in writing by Engineer and then only after acceptable temporary utility services have been provided.
    - a. Provide minimum of 48-hour notice to Owner, and receive written notice to proceed before interrupting any utility. Utility service to be provided to the facility at all times.
- B. Abandoned sewers, piping, and other utilities encountered in the progress of the excavating shall be removed and the ends plugged. Coordinate with utility companies for shut-off of services if lines are active. All trench excavations resulting from removal of utility lines shall be backfilled with Structural Fill.
- C. Active utility lines encountered, which are not indicated in the Contract Documents, shall be reported immediately to the Engineer and utility owners involved. The Engineer and utility owners shall be permitted free access to determine the measures deemed necessary to repair, relocate, or remove the utility. Cooperate with Owner and utility companies in keeping respective services and facilities in operation. Repair damaged utilities to satisfaction of utility owner.

### **3.03: Earthwork General Requirements**

- A. Dust Control: Refer to Section 31 25 00 □Erosion and Sedimentation Controls, for dust control requirements.
- B. Erosion Protection: Prevent erosion of the site at all times. Construct temporary berms and dikes and cut temporary swales to promote natural drainage of site. Refer to Section 31 25 00 □Erosion and Sedimentation Controls, for additional requirements.
- C. On-Site Excavation or Borrow Pits: Do not excavate or remove any material from the project site or right-of-way which is not within the designated excavation, as indicated by the slope and grade lines, without written authorization from the Engineer.
- D. Salvaging Topsoil:
  - 1. Salvage topsoil from stripped and excavated areas, and stockpile on the site at appropriate locations. Prevent topsoil from contamination by other materials, and provide adequate drainage and erosion protection.
  - 2. Place stockpiled topsoil in areas to be landscaped as indicated on the Contract Drawings.
- E. Stockpiling of Fill and Backfill Material:
  - 1. Excavate and separately stockpile suitable fill and backfill material, as indicated, during the progress of the excavation work. Save sufficient suitable excavated material, if available, for later filling,



- backfilling, and embankment construction. Place, grade and shape stockpiles for proper drainage.
2. Store materials from required excavations that are suitable for fill, backfill, and embankment as excavated, in stockpiles segregated by type.
  3. Establish excavated material stockpiles on site only in locations where they will not interfere with the progress of the work.
  4. Locate and retain soil materials away from edge of excavations. Do not store within drip line of trees indicated to remain.
- F. Maintenance of Excavations, Slopes, and Embankments:
1. Excavate and remove material outside the limits of the excavation which is unstable and constitutes potential slides, and material which comes into excavations for any reason including from the driving of piles.
  2. Maintain slopes and embankments until substantial completion and acceptance of the work. Promptly repair slides, slipouts, washouts, settlements, and subsidences that occur for any reason, and refinish the slope or embankment to the indicated lines and grades. Any settlement or washing that occurs during and until completion of project and prior to acceptance of the work shall be repaired immediately and grades reestablished to the required elevations and slopes. Fill to required subgrade levels any areas where settlement occurs.
  3. Temporary Grading and Drainage: Provide effective drainage at all times. No impoundment of water shall be permitted except as provided. Pools, puddles or inundated excavations shall be drained immediately. The Contractor is fully responsible for any and all water damage within the Limit of Work and all water damage to the site or installed work.
  4. Safeguarding of Structure Walls: Heavy equipment shall not be operated within 4 feet of structure walls.
- G. Use of Explosives: The use of explosives is not permitted unless approved by the Owner.
- H. Protection of Persons and Property:
1. Barricade open excavations occurring as part of this work and post with warning lights.
  2. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout and other hazards created by earthwork operations.
- I. Codes and Standards: Perform excavation work in compliance with applicable requirements of Standard Building Code (International Building Code) with Georgia Amendments.

### **3.04: Subsurface Extraction**

- A. Remove subsurface facilities and obstructions to the extent indicated.
- B. When subsurface facilities are encountered during excavation which interfere with new construction, and such facilities are not indicated, notify the Engineer promptly for corrective determination.

**3.05: Excavation**

A. General Excavation Requirements:

1. Perform excavating as indicated and required for roadway and parking lot beds, for concrete footings, foundations, retaining walls, exterior paving, floor slabs, concrete walks, and for site levels and grading, and provide shoring, bracing, underpinning, cribbing, pumping, and planking as required.
2. The bottoms of excavations shall be level, firm, undisturbed earth, clean and free from loose material, debris, and foreign matter.
3. Excavate to the lines and grades indicated on the Contract Drawings;
4. Excavations shall be supported and maintained by providing structural support of earth walls as specified in Section 31 50 00 - Excavation Support and Protection, so that sides are stable and will not move. Excavations may be maintained by sloping cut faces where space permits, if calculations, sealed and signed by a civil or structural engineer currently registered in the State of Georgia, show that the slopes are safe. Calculations shall consider all existing conditions, including adjacent traffic, construction loading, and other local effects.
5. Limits of excavations shall allow for adequate working space for installing forms, wall waterproofing, and as required for safety of personnel. Cut excavations in solid rock accurately to the lines indicated on the Contract Drawings, or to the width of the ductbank or concrete encasement.
6. Dewater excavation as specified in 3.06.C. - Dewatering. Construct berms around excavations as required to prevent surface water and runoff from entering the excavation.
7. Remove unstable bottom material. Remove large stones, debris, and compressible soils from excavation bottoms to a minimum depth of 12 inches. Where required to excavate to rock, it shall be understood to mean sound bedrock. Remove loose and unsound material.
8. Except as otherwise indicated, preserve the material below and beyond the lines of excavations. Where an excavation is carried below the indicated grade, backfill to the indicated grade as herein specified.
9. Place excavated material at a sufficient distance from edge of excavation so as not to cause cave-ins or bank slides, but in no case closer than 3 feet from the edge of excavations.
10. Unauthorized over excavations for footings and foundations shall be filled with lean concrete to indicated elevations.
11. Excavated earth material that is suitable for fill, backfill, or embankment shall be conditioned for re-use and properly stockpiled for later filling and backfilling operations as herein specified. Test, screen, and mix as necessary to meet specified requirements.

B. Rock Excavation:

1. Rock, which cannot be broken up and removed by ripper equipment, shall be excavated and removed by drilling and blasting. The use of explosives requires written approval of the Engineer.
2. Where footings or foundations are to be placed on rock which is not horizontal, key the center of the foundation approximately 12 inches in depth throughout an area approximately equal to the dimensions of the column or footing to be placed on the rock, or the entire width of the slab, at not

- more than 10-foot intervals. Remove loose fragments, and clean and fill all seams with lean concrete.
3. Rock excavation beyond or below the indicated cross section shall be at the Contractors expense. Fill overbreakage to required invert with lean concrete at no additional expense to the Owner.
  4. Leave the side slopes of rock cuts with reasonably uniform faces whether the excavation is carried beyond the specified side slopes or not. Remove all loose rock on cut slopes immediately after blasting. Sloped surfaces shall conform to the typical section indicated or to natural cleavage planes, where these are compatible with the typical section.
  5. Exposed rock faces shall be mapped by a Contractor-employed, Georgia-registered geotechnical engineer or engineering geologist. If structural mapping indicates that unstable planes or other features are exposed which jeopardize the stability of the slope, the Contractor shall modify the slope as required.
- C. Dewatering: Prevent surface water and subsurface or ground water from flowing into excavations and from flooding project site and surrounding area.
1. Do not allow water to accumulate in excavations. Remove water to prevent softening of foundation bottoms, undercutting footings and soil changes detrimental to stability of subgrades and foundations. Provide and maintain pumps, well points, sumps, suction and discharge lines, and other dewatering system components necessary to convey water away from excavations.
  2. Establish and maintain temporary drainage ditches and other diversions outside excavation limits to convey rain water and water removed from excavations to collecting or run-off areas. Do not use trench excavations as temporary drainage ditches.

### **3.06: Subgrade Preparation**

- A. Remove vegetation, unsuitable soil materials, obstructions and deleterious materials from ground surface prior to placement of fills. Break up sloped surfaces steeper than one vertical to four horizontal so that fill material will bond with existing surface.
- B. Perform all cutting, blading, and shaping as required to cut and shape the sub grade to the grades and elevations indicated. Sub grade preparation includes fine grading, reworking as necessary, and preparation of cut, fill, or embankment upon which the structure will be placed.
- C. Finish sub grade to straightedge or template within specified tolerances with the finished surface bladed to a uniform, dense, smooth texture.

### **3.07: Foundation Preparation**

- A. Complete construction of the excavation support and dewatering systems prior to construction of structure and equipment foundations.
- B. Avoid disturbing bottom of excavation. If bottom is disturbed, restore and stabilize the bearing foundation with compacted pervious backfill material as specified herein.
- C. If material at bottom of the excavation is rock, remove loose material and roughly level the bearing foundation to indicated elevation. If the bottom contains occasional rock outcroppings or rock in only a portion of the area, remove such rock to a depth of 6 inches below indicated sub grade and backfill with lean concrete.
- D. Where unsuitable material is encountered at the elevations indicated for foundations, all soft, loose, or

unsuitable material shall be removed. The area shall be scarified to a minimum depth of 12 inches, and the planned elevation shall be re-established by backfilling with structural backfill, moisture-conditioning, and compacting to a minimum dry density of 95 percent of the maximum laboratory dry density as determined in accordance with ASTM D 1557.

### **3.08: COMPACTION**

- A. Compaction Density: Compact each layer of embankment, fill, and backfill material to not less than the indicated or specified compaction. Required compactions are defined as Class I and Class II, as follows:
  - 1. Class I Compaction: 95 percent relative compaction as determined by ASTM D698.
  - 2. Class II Compaction: 98 percent relative compaction as determined by ASTM D698.
- B. Required Compactions:
  - 1. Embankment or Fill where the Surface will be Bearing Foundation: Class II for full depth. Where embankment construction exceeds 8 feet in depth, provide minimum Class I compaction below the top 8 feet.
  - 2. Backfill around Structures: Class I below top 36 inches; Class II for top 36 inches.
  - 3. Where not otherwise indicated or specified and where structures are not involved, provide Class I compaction to minimize settlement.
- C. Moisture Control: Where subgrade or layer of 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.
  - 1. Remove and replace, or scarify and air dry, soil material that is too wet to permit compaction to specified density.
  - 2. 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 disking, harrowing or pulverizing until moisture content is reduced to a satisfactory value.
  - 3. Perform moisture density determinations for each soil type used, to provide data for quality control. The natural moisture content at the time of compaction must be within moisture content limits that will allow the specified compaction to be obtained, but not in excess of 3% above or below the optimum moisture content.

### **3.09: Compaction (Non Structural Fill)**

- A. Perform compaction of soil materials for fills using mechanical soil compaction equipment for type and size materials to be compacted. Hand compact materials in areas inaccessible to machinery and within 5'-0" of below grade walls.
- B. Percentage of Maximum Density Requirements: Provide not less than the following percentages of maximum dry density by the Standard Proctor test, ASTM D698.
  - 1. Lawn or Unpaved Areas: Compact top 6" of subgrade & each layer of backfill or fill material at 90% maximum dry density.

- C. Moisture Control: Where subgrade or soil layer must be moisture conditioned before compaction, apply water to surface of subgrade or soil layer. Scarify and air dry soil material that is too wet to permit compaction to specified density. Control soil moisture content of in place fill to within 3% of optimum moisture content.
- D. Soil material that has been removed because it is too wet to permit compaction may be stockpiled or spread where directed by Owner and permitted to dry, until moisture content is reduced to satisfactory value, as determined by moisture density relation tests. When accepted by Testing Agency, soil material may be used in compacted backfill or fill.

### **3.10: Backfilling**

- A. Use materials removed from site excavations if such material meets specified requirements.
- B. Backfilling is required around all substructures. Fill all abandoned vaults, shafts, airways, holes, pits, and other voids.
- C. Place backfill in layers not to exceed eight inches of loose material, and compact each layer to specified density before the next layer is placed.
- D. Place backfill material in such manner that unbalanced horizontal loads will not be applied to a newly placed structure or portion of structure, utility, or pipeline. Do not backfill around portions of structures requiring backfill on only one side or on less than all sides, until the concrete has reached the specified 28-day strength to withstand the earth pressures on structures.
- E. When placing material for backfill around waterproofed structures, protect such structures and the waterproofing thereof with a shield when necessary to prevent displacement or injury by stones or other hard substances in the backfill.
- F. Do not backfill on or against structural concrete until the specified 28-day concrete strength has been attained.

### **3.11: Finish Grading**

- A. Finish grade all areas to elevations and grades indicated. In areas to receive topsoil and landscape planting, finish grading shall be performed to a uniform 7 to 8 inches below the grades and elevations indicated.
- B. Place and spread stockpiled topsoil to a uniform thickness, approximately 1/2 inch below finish grades indicated.
- C. Coordinate with the requirements of Section 32 90 00 - Planting.
- D. Finish grade entire site obtaining uniform levels or slopes between points where elevations are shown or between such points and existing grades.
- E. At completion of finish grading operation, entire site is to be ready for grassing.
- F. Where finish grading meets or abuts curbs, walks or pavements, uphill grades are to be slightly higher than pavements to permit drainage.
- G. Protection of graded areas: Protect newly graded surfaces from traffic and erosion. Keep free of debris. Where graded or compacted surfaces are damaged by subsequent operations, return to indicated grade and state of compaction.

### **3.12: Field Quality Control**

- A. Regulatory Requirements: In compliance with the International Building Code, the Contractor's earthwork operations shall be performed under the observance and inspection of an Owner employed geotechnical engineer currently registered in the State of Georgia, as follows:
1. Site preparation, cutting and shaping, excavating, filling, backfilling, and embankment construction shall be carried out under the inspection of the geotechnical engineer, who will perform appropriate field and laboratory tests, as determined by the geotechnical engineer, to evaluate the suitability of fill and backfill material, the proper moisture content for compaction, and the degree of compaction achieved. Fill or backfill that does not meet the specified requirements shall be removed or recompacted until the requirements are satisfied.
  2. Cutting and shaping, excavating, conditioning, filling, backfilling, and compacting procedures require approval of the geotechnical engineer as they are successively performed. Work found to be unsatisfactory or work disturbed by subsequent operations before approval is granted shall be corrected in an approved manner as approved by the geotechnical engineer.
- B. Density Tests: Compacted fill, backfill, and embankment shall be tested to verify compliance with specified requirements in accordance with ASTM D2922. Frequency of tests shall be in accordance with the Contractor's Quality Plan, but not less than the following:
- C. Compaction Tests: Tests for compaction shall be performed in accordance With test procedures specified in ASTM D1557, Method D, as applicable. Field-testing of soils or compacted fill in place shall be performed in accordance with applicable requirements of ASTM D2922.
- D. Moisture Content Tests: Compacted fill, backfill, and embankment shall be tested to verify compliance with specified requirements in accordance with ASTM D3017. Minimum frequency of tests shall be as specified above for density tests.

#### **PART 4 - PAYMENT**

- A. Payment for items covered under this Section of the Specifications will be included in the lump sum price bid for the completed work and constitutes full compensation for furnishing all labor, equipment, materials, and incidentals necessary, in accordance with the drawings, and as may be required.

**\*\*\*End of Section 31 00 00\*\*\***

## **SECTION 31 10 00 – SITE CLEARING**

### **PART 1 – GENERAL**

#### **1.01: Related Documents**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### **1.02: Summary**

- A. Section Includes:
  - 1. Protecting existing vegetation to remain.
  - 2. Removing existing vegetation.
  - 3. Clearing and grubbing.
  - 4. Stripping and stockpiling topsoil.
  - 5. Removing above- and below-grade site improvements.
  - 6. Disconnecting, capping or sealing, site utilities.
  - 7. Temporary erosion and sedimentation control.
- B. Related Requirements:
  - 1. Section 015000 "Temporary Facilities and Controls" for temporary erosion- and sedimentation-control measures.
- C. Related Requirements:
  - 1. Section 01500 "Temporary Facilities and Controls" for temporary erosion- and sedimentation-control measures.

#### **1.03: Definitions**

- A. Subsoil: Soil beneath the level of subgrade; soil beneath the topsoil layers of a naturally occurring soil profile, typified by less than 1 percent organic matter and few soil organisms.
- B. Surface Soil: Soil that is present at the top layer of the existing soil profile. In undisturbed areas, surface soil is typically called "topsoil," but in disturbed areas such as urban environments, the surface soil can be subsoil.
- C. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil; the zone where plant roots grow.
- D. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil; the zone where plant roots grow. Its appearance is generally friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects larger than 2 inches (50 mm) in diameter; and free of weeds, roots, toxic materials, or other nonsoil materials.

- E. Plant-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction and indicated on Drawings.
- F. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction.
- G. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

#### **1.04: Material Ownership**

- A. Except for materials indicated to be stockpiled or otherwise remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

#### **1.05: Field Conditions**

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.
  - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
  - 2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.
- B. Improvements on Adjoining Property: Authority for performing site clearing indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.
  - 1. Do not proceed with work on adjoining property until directed by Engineer.
- C. Salvageable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises.
- D. Utility Locator Service: Notify LA One Call:1-800-272-3020 for area where Project is located before site clearing.
- E. Do not commence site clearing operations until temporary erosion- and sedimentation-control measures are in place.
- F. Soil Stripping, Handling, and Stockpiling: Perform only when the soil is dry or slightly moist.

### **PART 2 – PRODUCTS**

#### **2.01: Materials**

- A. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Section 312000 "Earth Moving."
  - 1. Obtain approved borrow soil material off-site when satisfactory soil material is not available on-site.

### **PART 3 – EXECUTION**

#### **3.01: Preparation**

- A. Protect and maintain benchmarks and survey control points from disturbance during construction.



- B. Verify that trees, shrubs, and other vegetation to remain or to be relocated have been flagged and that protection zones have been identified and enclosed according to requirements in Section 015639 "Temporary Tree and Plant Protection."
- C. Protect existing site improvements to remain from damage during construction.
  - 1. Restore damaged improvements to their original condition, as acceptable to Owner.

### **3.02: Temporary Erosion and Sedimentation Control**

- A. Provide temporary erosion- and sedimentation-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings and requirements of authorities having jurisdiction.
- B. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.
- C. Inspect, maintain, and repair erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
- D. Remove erosion and sedimentation controls, and restore and stabilize areas disturbed during removal.

### **3.03: Existing Utilities**

- A. Owner will arrange for disconnecting and sealing indicated utilities that serve existing structures before site clearing, when requested by Contractor.
  - 1. Verify that utilities have been disconnected and capped before proceeding with site clearing.
- B. Locate, identify, disconnect, and seal or cap utilities indicated to be removed or abandoned in place.
  - 1. Arrange with utility companies to shut off indicated utilities.
  - 2. Owner will arrange to shut off indicated utilities when requested by Contractor.
- C. Locate, identify, and disconnect utilities indicated to be abandoned in place.
- D. Interrupting Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others, unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
  - 1. Notify Engineer not less than two days in advance of proposed utility interruptions.
  - 2. Do not proceed with utility interruptions without Engineer's written permission.
- E. Excavate for and remove underground utilities indicated to be removed.
- F. Removal of underground utilities is included in earthwork sections; in applicable fire suppression, plumbing, HVAC, electrical, communications, electronic safety and security, and utilities sections; and in Section 024116 "Structure Demolition" and Section 024119 "Selective Demolition."

**3.04: Clearing and Grubbing**

- A. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.
  - 1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches (200 mm), and compact each layer to a density equal to adjacent original ground.

**3.05: Topsoil Stripping**

- A. Remove sod and grass before stripping topsoil.
- B. Strip topsoil to depth of 6 inches (150 mm) in a manner to prevent intermingling with underlying subsoil or other waste materials.
  - 1. Remove subsoil and nonsoil materials from topsoil, including clay lumps, gravel, and other objects larger than 2 inches (50 mm) in diameter; trash, debris, weeds, roots, and other waste materials.
- C. Stockpile topsoil away from edge of excavations without intermixing with subsoil or other materials. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust and erosion by water.
  - 1. Limit height of topsoil stockpiles to 72 inches (1800 mm).
  - 2. Do not stockpile topsoil within protection zones.
  - 3. Dispose of surplus topsoil. Surplus topsoil is that which exceeds quantity indicated to be stockpiled or reused.
  - 4. Stockpile surplus topsoil to allow for respreading deeper topsoil.

**3.06: Site Improvements**

- A. Remove existing above- and below-grade improvements as indicated and necessary to facilitate new construction.

**3.07: Disposal of Surplus and Waste Materials**

- A. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.
- B. Separate recyclable materials produced during site clearing from other nonrecyclable materials. Store or stockpile without intermixing with other materials, and transport them to recycling facilities. Do not interfere with other Project work.

**\*\*\*End of Section 31 00 00\*\*\***

## **SECTION 31 23 33 – EXCAVATION, TRENCHING & BACKFILLING**

All excavation will meet the most current OSHA Regulations. See SECTION 31 50 50 – TRENCH SAFETY for trench safety requirements.

### **PART 1 - GENERAL**

#### **1.01: Description**

- A. The work to be performed under this Specification shall consist of furnishing all labor, equipment and materials and performing all operations in connection with the excavating, trenching, and backfilling for pipelines as shown on the plans and as specified herein.

#### **1.02: Measurement and Payment**

- A. All trench excavation, backfill and compaction are not considered pay items. Payment for these items shall be included in the unit price laid in the Proposal for each size of pipe at their respective depths. This unit price shall be full remuneration for performing the trench and backfill complete including grading, bell holes, sheeting, dewatering, tamping, and water soaking; and including the furnishing of sewer pipe, all equipment, labor, materials, power, teams, tools, and transportation necessary or incidental thereto; but not including tunneling, or boring, all of which will be paid for extra.

### **PART 2 – PRODUCTS**

#### **2.01: Materials**

- A. Materials for pipe embedment will meet LDHH Regulations for depth of bury and class of pipe and local requirements for embedment.
- B. Concrete (For encasement or blocking) See SECTION 32 13 13 - CONCRETE.  
Material shall conform to ASTM C94. The compressive strength of the concrete shall be at least 2,000 psi and shall contain at least four (4) sacks of cement per cubic yard.
- C. Cement stabilized sand. See SECTION 31 23 23.53 – CEMENT STABILIZED SAND BACKFILL.

#### **2.02: Testing Requirements**

- A. Compaction tests for all backfill may be required for every 200 linear feet of trench and for each twelve-inches (12”) vertically. Density tests, shall be measured as one unit for each test. The Owner shall pay for Geotechnical tests ordered that meet the requirements of the plans and specifications. Failed tests shall be charged to the Contractor. Refer to City Standard Trench Detail for compaction effort requirements.

### **PART 3 – EXECUTION**

#### **3.01: Construction Methods**

- A. CONTROL OF WATER

Provide sufficient pumping equipment, in good working order, available at all times to remove any water that accumulates in excavations. When the excavation crosses a drainage pathway, the contractor shall provide for means of alternate drainage. The discharge of dewatering equipment shall not cause damage to private or public property.

**B.    SHEETING, SHORING, AND BRACING**

See SECTION 31 50 50 – TRENCH SAFETY.

In caving ground, or in wet, saturated, or flowing materials, the contractor shall sheet, shore, or brace the sides of the trench so as to maintain the excavation properly in place. When excavations are made adjacent to existing building or other structures or in paved streets, particular care must be taken to adequately sheet, shore, and brace the sides of the excavation to prevent undermining of, or settlement beneath, the structures or pavement. Underpinning of adjacent structures or pavement shall be done by the Contractor at his own cost and expense, in a manner satisfactory to the Engineer and when required by the Engineer. The pavement shall be removed, the void satisfactorily refilled and compacted, and the pavement replaced by the Contractor. The entire expense of such removal and subsequent replacement thereof shall be borne by the Contractor. Sheeting, shoring, and bracing shall not be left in place, unless otherwise provided for in the contract or authorized by the Engineer. The removal of sheeting, shoring and bracing shall be done in such a manner as not to endanger or damage either new or existing structure, private or public properties, and so as to avoid cave-ins or sliding of the banks. All holes or voids left by the removal of the sheeting, shoring, or bracing shall be immediately and completely filled and compacted with suitable materials.

**C.    GUARANTEE**

1.    Guarantee the backfilling of excavation and trenches against settlement for a period of one (1) year after the final completion of the contract under which the work is performed.
2.    Make all repairs or replacements made necessary by settlement, including refilling, compacting, and reseeded or resodding the upper portion of the ditch and repairing broken or settled pavements, driveways, and sidewalks within five (5) days after notice from the Engineer.

**D.    PREPARATION**

1.    Site Preparation

Prepare the construction site for construction operations by removing and disposing of all obstructions and objectionable materials in accordance with contract documents.

2.    Alignment, Grade and Minimum Cover

a.    General

The water and sewer mains shall be laid and maintained to lines and grades established by the plans and specifications with fittings, valves, hydrants, manholes and clean-outs at the required locations, unless otherwise pre-approved by the Engineer. Valve-operating stems shall be oriented in a manner to allow proper operation. Hydrants shall be installed plumb.

- b.    Cut sheets shall be provided to the Inspector. The contractor shall determine the alignment and grade or elevation of the pipeline from offset stakes. The contractor shall also provide a continuous chalk line along the alignment of the trench for use by the operator of the excavating equipment. The contractor shall provide a laser beam and grade pole to assist in grading the ditch to the proper elevation.

- c. Should the ditch be graded below the required elevation, bring subgrade to the required elevation with cement stabilized sand or rounded pea gravel. The use of excavating materials for this application will not be allowed.
- d. Where pipe grades or elevations are not definitely fixed by contract drawings, trenches shall be excavated to a depth sufficient to provide a minimum depth of backfill cover over the pipe. Greater pipe cover depths may be necessary for clearance beneath existing pipes, conduits, drains, drainage structures, or other obstructions encountered at normal pipe grades. Measurement of pipe cover depth shall be made vertically from the outside top of pipe to finished ground or pavement surface elevations.

3. Prior Investigation

Prior to excavation, investigation shall be made to the extent necessary to determine the location of existing underground structures and conflicts. Care should be exercised by the Contractor during excavation avoid damage to existing structures.

4. Unforeseen Obstructions

When obstructions that are not shown on the plans are encountered during the progress of work and interfere so that an alteration of the plans is required, the Engineer will alter the plans or order a deviation in line and grade or arrange for removal, relocation or reconstruction of the obstructions.

5. Clearance

When crossing existing pipelines or other structures, alignment and grade shall be adjusted as necessary, with the approval of the Engineer, to provide clearance as required by federal, state or local regulations or as deemed necessary by the Engineer to prevent future damage or contamination of either structure.

E. EXCAVATION

**All excavation shall meet the most current OSHA regulations.**

1. Classification

Excavation of trenches for pipelines is unclassified. Soils will be classified utilizing OSHA Standards and Regulations. The Contractor shall assume that the site contains the worse type of soils and make provisions for shoring the work area.

2. Trench Excavation

a. General

The trench shall be excavated to the required alignment, depth and width and in conformance with all federal, state and local regulations for the protection of the workmen.

b. Trench Preparation

i) Trench preparation shall proceed in advance of pipe installation for only as far as pipe will be laid that day.

ii) The contractor shall keep the trench dry from both storm water and seepage from the sides of the trench. Discharge from any trench dewatering pumps shall be conducted to natural drainage channels, storm sewers or a pre-approved reservoir. Do not discharge into any municipal sewer system without municipal approval. The contractor shall

be responsible for cleaning any storm drain system, which was used for dewatering discharge.

- iii) Excavated material shall be placed in a manner that will not obstruct the work nor endanger the workmen, obstruct sidewalks, driveways, or other structures and shall be done in compliance with federal, state, or local regulations.

3. Pavement Removal

Removal of pavement and road surfaces shall be a part of the trench excavation, and the amount removed shall depend upon the width of trench required for installation of the pipe and the dimensions of area required for the installation of valves, hydrants, specials, manholes or other structures. The dimensions of pavement removed shall not exceed the dimensions of the opening required for installation of pipe, valves, hydrants, specials, manholes and other structures by more than twelve (12") inches in any direction, unless otherwise required or pre-approved by the Engineer.

4. Width

See LDOTD Standard Bedding and Trench Detail.

5. Bell Holes

Holes for the bells shall be provided at each joint, but shall be no larger than necessary for joint assembly and assurance that the pipe barrel will lie flat on the trench bottom. Other than noted previously, the trench bottom shall be true and even in order to provide support for the full length of the pipe barrel, except that a slight depression may be provided to allow withdrawal of pipe slings or other lifting tackle.

6. Subgrade in Earth

- a. Where a firm and stable foundation for the pipe can be obtained in the natural soil, and where special embedment is not shown on the plans, or specified herein, carefully and accurately trim the bottom of the trench to fit the lower portion of the pipe barrel. The bottom of the trench shall be firm, stable and free of standing water.
- b. If water is allowed to collect in an originally dry trench after a reasonable time has passed to complete the embedment of the pipe, as determined by the Engineer, the contractor shall place a minimum of four (4") inches of clean rounded pea gravel in the ditch and pump out all accumulated water before placing the pipe. No deleterious materials will be allowed in the gravel. No extra compensation will be allowed for this work.
- c. Where wet, soft, or spongy material is encountered in the excavation at subgrade level, the contractor shall remove such material at the direction of the Engineer and replace it with crushed stone of sufficient quantity such that when fully compacted, the subgrade is firm and stable.

7. Subgrade in Rock

- a. When excavation of rock is encountered, all rock shall be removed to provide a clearance of at least six (6") inches below and on each side of all pipe, valves and fittings for pipe sizes twenty-four (24") inches or smaller, and nine (9") inches for pipe sizes thirty (30") inches and larger. When excavation is completed, the proper embedment material shall be placed on the bottom of the trench to the previously mentioned depths, leveled and tamped.
- b. These clearances and bedding procedures shall also be observed for pieces of

concrete or masonry and other debris or subterranean structures, such as masonry walls, piers or foundations that may be encountered during excavation.

- c. The installation procedures specified in this section shall be followed when gravel formations containing loose boulders greater than eight (8") inches in diameter are encountered.
- d. In all cases, the specified clearances shall be maintained between the bottom of all pipe and appurtenances and any part, projection or point of rock, boulder or stones of sufficient size and placement, which, in the opinion of the Engineer, could cause a fulcrum point.

F. CONCRETE ENCASEMENT

The Contractor shall place 2,000 psi concrete encasement under and around pipe as shown on the embedment detail, and provide necessary anchors to prevent the pipe from floating out of place. The contractor shall remove and relay any pipes that are floated out of proper position

G. BACKFILLING

1. General

- a. The Contractor shall not begin backfilling until approval has been obtained from the Inspector. Backfilling includes refilling and consolidation of the fill in trenches and excavations up to the natural ground surface or road grade.
- b. Backfill shall be accomplished in accordance with the specified laying condition as shown on the plans.

2. Backfill Material

- a. All backfill material shall meet latest edition of ASTM D2321 unless otherwise specified by the Engineer.
- b. If excavated material is indicated on the drawings or specified for backfill, and there is a deficiency due to a rejection of part thereof, the contractor shall provide the required amount of sand, gravel or other pre-approved material.

3. Do not leave trenches open overnight without backfilling to the natural ground level. Steel plates (1/2" in thickness) may be used to cover open trenches only with the approval of the Engineer.

4. Compaction

Compaction requirements are as specified on the plans.

**\*\*\*End of Section 31 23 33\*\*\***

## **SECTION 31 25 13 – EROSION CONTROLS**

### **PART 1 GENERAL**

#### **1.01: Summary**

- A. Section includes installing, maintaining and removing:
  - 1. Silt Fence
  - 2. Temporary Construction Entrances
  - 3. Diversion Channels
  - 4. Sediment Traps
  - 5. Rip Rap
  - 6. Stone Check Dams
  - 7. Inlet Protection
  - 8. Site Stabilization
  
- B. Related Sections:
  - 1. Section 31 10 00 - Site Clearing.
  - 2. Section 31 23 16 - Excavation and Fill.
  - 3. Section 31 37 00 - Riprap.
  - 4. Section 32 91 19 - Landscape Grading.
  - 5. Section 32 92 19 - Seeding and Soil Supplements.

#### **1.02: References**

- A. American Association of State Highway and Transportation Officials:
  - 1. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-pound) rammer and a 457-mm (18-inch) drop.
  
- B. ASTM International:
  - 1. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup> (600 kN-m/m<sup>3</sup>)).
  - 2. ASTM D1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (6,000 ft-lbf/ft<sup>3</sup> (2,700 kN-m/m<sup>3</sup>)).
  - 3. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
  - 4. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).
  
- C. LDOTD Standard Specifications:
  - 1. Standard Specifications for Roads and Bridges, 2006, published by the Louisiana



Department of Transportation.

### **1.03: Submittals**

- A. Section 01 33 00 - Submittal Procedures: Requirements for submittals.
- B. Product Data: Submit data on geotextile, posts, woven wire, concrete mix design, and pipe.
- C. Manufacturer's Certificate: Certify products and aggregates meet or exceed specified requirements.
- D. Closeout Submittals: Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.

### **1.04: Quality Assurance**

- A. Standard of quality shall conform to the standards and practices set forth in: "Louisiana Storm water Management and Sedimentation Control Handbook for Land Disturbance Activities", February 1998 or latest edition.
- B. Maintain one copy of document on site.

### **1.05: Pre-Installation Meetings**

- A. Section 01 30 00 - Administrative Requirements: Pre-installation meeting.
- B. Convene minimum one week prior to commencing work of this Section.

## **PART 2 PRODUCTS**

### **2.01: Geotextile Materials**

- A. Engineering Fabric Materials: Non-biodegradable conforming to Section 815.02 of LDOTD Standard Specifications:
  - 1. Silt Fence: Type 3, Class A or B Engineering Fabric.
  - 2. Under Rip Rap or Construction Entrances: Type 2 Engineering Fabric.

### **2.02: Stone, Aggregate, and Soil Materials**

- A. Stone for Sediment Trap and Check Dam: Class B erosion control stone conforming to Division 800 of the LDOTD Standard Specifications. Minimum size 5 inches, midrange size 8 inches, and maximum size 12 inches equally distributed.
- B. Stone for Rip Rap: Class 1 erosion control stone conforming to Division 800 of the LDOTD Standard Specifications. Minimum size 5 inches, midrange size 10 inches, and maximum size 17 inches equally distributed.
- C. Washed Stone: Coarse aggregate, Gradation No. 57 conforming to Division 800 of the LDOTD Standard Specifications.

- D. Aggregate for Construction Entrance: Coarse aggregate, Gradation No. 4 or larger with maximum size of 3 inch, conforming to Division 800 of the LDOTD Specifications.
- E. Soil Fill: Clean natural soil with a plasticity index of 15 or less that is free of clay, rock, or gravel lumps larger than 2 inches in any dimension; debris; waste; frozen material; and any other deleterious material that might cause settlement. Suitable material excavated from the site may be used as soil fill under optimum moisture conditions.

### **2.03: Planting Materials**

- A. General: Conform to rules and regulations as specified in the LDOTD Standard Specifications for seed, agricultural ground limestone, fertilizers, and mulch.
- B. Temporary Seed Mixture:
  - 1. Late winter and early spring: Rye and Annual Lespedeza (Kobe)
  - 2. Summer: German Millet.
  - 3. Fall: Rye.
- C. Fertilizer: Commercial grade; recommended for grass.
- D. Lime: ASTM C602, Class O agricultural ground limestone containing a minimum 80 percent calcium carbonate equivalent.
- E. Mulch: Oat or wheat straw, free from weeds, foreign matter detrimental to plant life, and dry. Hay or chopped cornstalks are not acceptable.

### **2.04: Concrete**

- A. Concrete: Class B concrete conforming to Section 701 of the LDOTD Standard Specifications.
  - 1. Compressive strength of 2,500 psi at 28 days.
  - 2. Air entrained.
  - 3. Water cement ratio of 0.488 with rounded aggregate and 0.567 with angular aggregate.
  - 4. Maximum slump of 2.5 inches for vibrated concrete and 4 inches for non-vibrated concrete.
  - 5. Minimum cement content of 508 lbs per cubic yard for vibrated and 545 lbs per cubic yard for non-vibrated concrete.

### **2.05: Pipe Materials**

- A. Pipe: Corrugated steel pipe and fittings conforming to Section 715.2.3 of LDOTD Standard Specifications.

### **2.06: Accessories**

- A. Posts for Silt Fence and Inlet Protection: Steel posts 5 feet long, 1-3/8 inches wide,

minimum weight 1.25 lbs/ft. conforming to Section 815.4.6 of the LDOTD Standard Specifications.

- B. Woven Wire Fence for Silt Fence: Minimum 32 inches high, minimum 5 horizontal wires, vertical wires spaced 12 inches apart, minimum 10 gage top and bottom wires, and minimum 12-1/2 gage; all other wires conforming to Section 815 of the LDOTD Standard Specifications.
- C. Attachment Devices for Silt Fence: No. 9 staple, minimum 1-1/2 inches long, or other approved attachment devices.
- D. Hardware Cloth for Inlet Protection: 24 gage, 1/4-inch mesh opening hardware cloth.
- E. Trash Rack for Pipe Riser: Cone shaped with #4 bars welded at each intersection of bars and sized to fit pipe riser. Conform to Division 800 of the LDOTD Standard Specifications.

### **2.07: Source Quality Control (And Tests)**

- A. Section 01 40 00 - Quality Requirements: Testing, inspection, and analysis requirements.
- B. Perform tests on cement, aggregates, and mixes to ensure conformance with specified requirements.
- C. Make rock available for inspection at producer's quarry prior to shipment. Notify Architect/Engineer at least seven days before inspection is allowed.
- D. Allow witnessing of inspections and tests at manufacturer's test facility. Notify Architect/Engineer at least seven days before inspections and tests are scheduled.

## **PART 3 EXECUTION**

### **3.01: Examination**

- A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.
- B. Verify compacted subgrade is acceptable and ready to support devices and imposed loads.
- C. Verify gradients and elevations of base or foundation for other work are correct.

### **3.02: Silt Fence**

- A. Install in accordance with Section 815 of the LDOTD Standard Specifications at locations shown on Drawings.
- B. Use wire fence with Class A fabric.
- C. Class B fabric may be used without woven wire backing subject to the following:
  - 1. Fabric is approved by Architect/Engineer.
  - 2. Maximum post spacing is 6 feet.

3. Posts are inclined toward runoff source not more than 20 degrees from vertical.

### **3.03: Temporary Construction Entrances**

- A. Excavate and compact subgrade as specified in Section 31 23 16.
- B. Install construction entrances to the dimensions and locations as shown on Drawings. Minimum thickness is 6 inches.
- C. Mound aggregate near intersection with public road to prevent site runoff entering road.
- D. Periodically dress entrances with 2-inch thick course aggregate when aggregate becomes clogged with soil.

### **3.04: Diversion Channels**

- A. Excavate channel as specified in Section 31 23 16.
- B. Windrow excavated material on low side of channel.
- C. Compact to 95 percent maximum density.
- D. On entire channel area, apply soil supplements and sow seed as specified in Section 32 92 19.
- E. Mulch seeded areas with hay as specified in Section 32 92 19.

### **3.05: Sediment Traps**

- A. Clear site as specified in Section 31 00 00.
- B. Construct trap by excavating and forming embankments as specified in Section 31 23 16.
- C. Place coarse aggregate or rock at outlet as indicated on Drawings.
- D. Place geotextile fabric as specified for rock lining.
- E. On entire sediment trap area, apply soil supplements and sow seed as specified in Section 32 92 19.
- F. Mulch seeded areas with hay as specified in Section 32 92 19.
- G. Clean trap of accumulated sediment when directed but no less than when trap is half full of sediment.

### **3.06: Rock Lining (Rip Rap)**

- A. Excavate to depth of rock lining as indicated on Drawings or nominal placement thickness as follows. Remove loose, unsuitable material below bottom of rock lining and replace with suitable material. Thoroughly compact and finish entire foundation area to firm, even surface.
- B. Lay and overlay geotextile fabric over substrate. Lay fabric parallel to flow from upstream to downstream. Overlap edges upstream over downstream and upslope over downslope. Provide a minimum overlap of 3 feet. Offset adjacent roll ends a minimum of 5 feet when lapped. Cover fabric as soon as possible and in no case leave fabric exposed more than 4 weeks.

- C. Carefully place rock on geotextile fabric to produce an even distribution of pieces with minimum of voids and without tearing geotextile.
- D. Unless indicated otherwise, place full course thickness in one operation to prevent segregation and avoid displacement of underlying material. Arrange individual rocks for uniform distribution.

### **3.07: Stone Check Dam**

- A. Determine length required for ditch or depression slope and excavate, backfill, and compact foundation area to firm, even surface.
- B. Place Class B erosion control stone in an even distribution of rock pieces with minimum voids to the indicated shape, height, and slope.
- C. Construct washed stone filter blanket against upstream face of stone check dam to the thickness indicated on Drawings.

### **3.08: Inlet Protection**

- A. Install four posts around drainage structure and attach hardware cloth as indicated on Drawings.
- B. Place Class B erosion control stone at base of fabric and mound at approximately 2:1.
- C. Place washed stone filter blanket on upstream side(s).

### **3.09: Site Stabilization**

- A. Incorporate erosion control devices indicated on the Drawings into the Project at the earliest practicable time.
- B. Construct, stabilize, and activate erosion controls before site disturbance within tributary areas of those controls.
- C. Stockpile and waste pile heights shall not exceed 35 feet. Slope stockpile sides at 2:1 or flatter.
- D. Stabilize any disturbed area of affected erosion control devices on which activity has ceased and which will remain exposed for more than 20 days.
  - 1. During non-germinating periods, apply mulch at recommended rates.
  - 2. Stabilize disturbed areas which are not at finished grade and which will be disturbed within one year in accordance with Section 32 92 19 at 75 percent of permanent application rate with no topsoil.
  - 3. Stabilize disturbed areas which are either at finished grade or will not be disturbed within one year in accordance with Section 32 92 19 permanent seeding specifications.
- E. Stabilize diversion channels, sediment traps, and stockpiles immediately.

**3.10: Field Quality Control**

- A. Section 01 40 00 - Quality Requirements: Field inspecting, testing, adjusting, and balancing.
- B. Inspect erosion control devices on a weekly basis and after each runoff event. Make necessary repairs to ensure erosion and sediment controls are in good working order.
- C. Perform laboratory material tests in accordance with ASTM D1557 or AASHTO 180.
- D. Perform in place compaction tests in accordance with the following:
  - 1. Density Tests: ASTM D1556, ASTM D2167, or ASTM D2922.
  - 2. Moisture Tests: ASTM D3017.
- E. When tests indicate Work does not meet specified requirements, remove Work, replace, and retest.
- F. Frequency of Tests: Twice per lift for every 10,000 square feet.

**3.11: Cleaning**

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for cleaning.
- B. When sediment accumulation in sedimentation structures has reached a point one-half depth of sediment structure or device, remove and dispose of sediment.
- C. Do not damage structure or device during cleaning operations.
- D. Do not permit sediment to erode into construction or site areas or natural waterways.
- E. Clean channels when depth of sediment reaches approximately one-half channel depth.

**3.12: Schedules**

- A. Erosion Control Schedule:

<b>Erosion Control Element</b>	<b>Location</b>	<b>Size</b>
Silt Fence		
Temporary Construction Entrance		
Diversion Channel		
Sediment Trap		
Rock Lining (Rip Rap)		
Stone Check Dams		
Inlet Protection		
Sediment Pond		

\*\*\*End of Section 31 25 13\*\*\*

## **SECTION 31 31 16 – CHEMICAL TERMITE CONTROL**

### **PART 1 GENERAL**

#### **1.1 RELATED DOCUMENTS**

Drawings and General Provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to work of this Section.

#### **1.2 SUMMARY**

A. This Section includes the following:

1. This Section includes soil treatment for termite control around and under all building slabs.
2. This application is for “pre-treatment” for control of termites prior to construction.

B. Related Sections: The following Sections contain requirements that relate to this Section.

1. “Section 02000 – Site Clearing” for site stripping, grubbing, topsoil removal, etc.

#### **1.3 SUBMITTALS**

A. General: Submit the following according to Conditions of Contract and Division 1 Specification Sections.

1. Toxicant/Termiticide: Product Data and MSDS on the substance to be applied including all related materials.
2. The applicator shall provide application instructions and techniques that will be used including all governmental restrictions and requirements. .

B. Certification that products used comply with all state and federal regulations for termiticides.

#### **1.4 QUALITY ASSURANCE**

A. Regulatory Requirements:

1. Comply with all State of Louisiana and City of Baton Rouge requirements for notification, product restrictions, and application or re-treatment conditions.
  - a. The applicator or material provider shall notify the board of within the designated time limits prior to application.
  - b. The applicator or material provider shall provide the State required Disclosure Documents.
  - c. All products shall be acceptable to the State of Colorado for use and application in commercial and school applications.
2. All products shall comply with all requirements of the U.S. Environmental Protection Agency (EPA) for termiticides and pesticides.

B. In addition to requirements of these specifications, comply with manufacturer's instructions and recommendations for preparing substrate and application.

C. Engage a professional pest control operator who is licensed according to regulations of governing authorities to apply soil treatment solution.

- D. Use only termiticides that bear a federal registration number of the EPA and are approved by local authorities having jurisdiction.

#### 1.5 JOB CONDITIONS

- A. Restrictions: Do not apply soil treatment solution until excavating, filling, and grading operations are completed, except as otherwise required in construction operations.
- B. To ensure penetration, do not apply soil treatment to frozen or excessively wet soils or during inclement weather. Comply with handling and application instructions of the soil toxicant manufacturer.

#### 1.6 WARRANTY

- A. Warranty: Furnish written warranty, executed by Applicator and Contractor, certifying that applied soil termiticide treatment will prevent infestation of subterranean termites. If subterranean termite activity is discovered during warranty period, Contractor shall re-treat soil and repair or replace damage caused by termite infestation.
- B. Warranty Period: Five (5) years from date of Substantial Completion. The warranty shall be extendable at the Owner's option for an additional three years.
- C. The warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under requirements of the Contract Documents.

### PART 2 - PRODUCTS

#### 2.1 SOIL TREATMENT SOLUTION

- A. General: Use an emulsible, concentrated termiticide that dilutes with water, specially formulated to prevent termites infestation. Fuel oil will not be permitted as a diluent. Provide a solution consisting of one of following chemical elements.
- B. Available Products: Products shall be acceptable to EPA and SPCB for application. The products listed below may or may not be currently acceptable to the authorities having jurisdiction (local, state and federal). The applicator or supplier shall verify with each jurisdiction the acceptability of all product prior to purchase and application. Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:
  - 1. Chloropyrifos: Dursban TC, Dow Chemical Co.
  - 2. Permethrin: Dragnet FT, FMC Corp.  
Torpedo, ICI Americas, Inc.
  - 3. Cypermethrine: Prevail FT, FMC Corp.  
Demon, ICI Americas, Inc.
  - 4. Fenvalerate: Gold Coast Tribute, Du Pont.
  - 5. Isofenphose: Pryfon, Mobay Corp.
- C. Dilute with water to concentration level recommended by manufacturer.
- D. Other solutions may be used as recommended by Applicator if approved for intended application by local



authorities having jurisdiction. Use only soil treatment solutions that are not harmful to plants.

### **PART 3 - EXECUTION**

#### **3.1 APPLICATION**

- A. Surface Preparation: Remove foreign matter that could decrease treatment effectiveness on areas to be treated. Loosen, rake, and level soil to be treated, except previously compacted areas under slabs and foundations. Toxicants may be applied before placing compacted fill under slabs if recommended by toxicant manufacturer.
- B. Application Rates: Apply soil treatment solution as follows:
  - 1. Under slab-on-grade structures, treat soil before concrete slabs are placed, using the following application rates:
    - a. Apply 4 gallons of chemical solution per 10 linear feet to soil in critical areas under slab, including entire inside perimeter of foundation walls, along both sides of interior partition walls, around plumbing pipes and electric conduit penetrating slab, and around interior column footers.
    - b. Apply 1 gallon of chemical solution per 10 sq. ft. as an overall treatment under slab and attached slab areas where fill is soil or unwashed gravel. Apply 1-1/2 gallon of chemical solution per 10 sq. ft. to areas where fill is washed gravel or other coarse absorbent material.
  - 2. After slab on grade foundation is complete, apply 4 gallons of chemical solution per 10 linear feet of foundation for each 12 inches of depth from finish grade to bottom of footing, along outside edge of building. Dig a trench 6 to 8 inches wide along outside of foundation to a depth of not less than 12 inches. Punch holes to bottom of footing at not more than 12 inches o.c. and apply chemical solution. Mix chemical solution with the soil as it is being replaced in the trench.
  - 3. At expansion joints, control joints, and areas where slabs will be penetrated, apply at rate of 4 gallons per 10 linear feet of penetration.
- C. Post signs in areas of application to warn workers that soil termiticide treatment has been applied. Remove signs after areas are covered by other construction.
- D. Reapply soil treatment solution to areas disturbed by subsequent excavation, landscape grading, or other construction activities following application.

**\*\*\*End of Section 31 31 16\*\*\***

**SECTION 31 32 13 – LIME SOIL STABILIZATION**

**PART 1 – GENERAL**

**1.01: Section Includes**

- A. Excavating, treatment, and placement of lime treated subsoil mix.

**1.02: Related Requirements**

- A. Section 31 32 16 – Excavation: General site and building excavation.

**1.03: Price and Payment Procedures**

- A. See Section 01 22 00 – Unit Prices, for additional unit price requirements.
- B. Measurement Method: By “Lump Sum.”

**1.04: Reference Standards**

- A. AASHTO M 216 – Standard Specification for Lime for Soil Stabilization; American Association of State Highway and Transportation Officials; 2005.
- B. ASTM C977 – Standard Specification for Quicklime and Hydrated Lime for Stabilization; 2010.

**1.05: Submittals**

- A. See Section 01 30 00 – Administrative Requirements, for submittal procedures.
- B. Samples: Submit 10 lb sample of subgrade soil in air tight containers, to testing laboratory.

**1.06: Quality Assurance**

- A. Perform Work in accordance with State of Louisiana Highways standards.

**1.07: Field Conditions**

- A. Do not mix subgrade and lime in wind in excess of 10 mph or when temperature is below 40 degrees F.

**PART 2 – PRODUCTS**

**2.01: Mix Materials**

- A. Subsoil: Existing reused.
- B. Lime: AASHTO M 216 hydrated lime.

**2.02: Accessories – N/A**

**2.03: Equipment**

- A. Equipment: Capable of excavating subsoil, mixing and placing materials, wetting, consolidation, and compaction of material.

**2.04: Lime/Soil Mix**

- A. Mix materials in accordance with State of Louisiana Highway standard.
- B. Carefully add water to the mix to achieve a consistent mixture without lumping yet not create a wet plastic consistency.

**PART 3 – EXECUTION**

**3.01: Examination**

- A. Do not place fill over frozen or spongy subgrade surfaces.

**3.02: Preparation – N/A**

**3.03: Excavation**

- A. Protect adjacent structures from damage by this work.
- B. Proof roll subgrade to identify soft areas; excavate those areas.
- C. Notify Engineer of unexpected subsurface conditions. Discontinue affected Work in area until notified to resume work.
- D. Stockpile excavated material in area designated on site.

**3.04: Soil Treatment and Backfilling**

- A. Site mix subsoil, back fill and compact.
- B. Maintain optimum moisture content of mix materials to attain required stabilization.
- C. Compact to 95 percent of maximum density determined in accordance with ASTM D698.
- D. Shape to required line, grade and cross section.

**3.05: Curing – N/A**

**3.06: Tolerances**

- A. Top surface of Fill: Plus or minus one-half inch from required elevations.

**3.07: Field Quality Control**

- A. Field inspection and testing will be performed under provisions of Section 01 40 00.
- B. Compression test and analysis of hardened fill material will be performed in accordance with ASTM D698.
- C. Frequency of Tests: Four (4) evenly spaced density tests of subgrade.

**\*\*\*End of Section 31 25 13\*\*\***