

SECTION 31 20 00 – EARTH MOVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes excavation, fill and backfill, compaction and grading for the following.
 - 1. Excavation, filling, and compaction regardless of type, nature or quantity of existing soils, to lines and elevations shown.
 - 2. Excavating and backfilling trenches within building lines.
 - 3. Excavating and backfilling trenches for buried mechanical and electrical utilities and pits for buried utility structures.
 - 4. Prevention of water accumulation in excavations.
 - 5. Removal and disposal of surplus materials from the Site.
- B. Excavation includes the removal of material encountered above subgrade elevations.
 - 1. Additional Excavation: Excavation below subgrade elevations as directed by Architect/Engineer. Additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
 - 2. Bulk Excavation: Excavations more than 10 feet in width and pits more than 30 feet in either length or width.
 - 3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated dimensions without direction by Architect/Engineer. Unauthorized excavation, as well as remedial work, shall be without additional compensation.

1.3 RELATED WORK

- A. Related Work of Other Sections:
 - 1. Division 01 Section – Testing Laboratory Services: Quality control testing.
 - 2. Division 03 Section – Cast-In-Place Concrete.
 - 3. Division 21 – Fire Protection Water Service.
 - 4. Division 22 – Water Service System, Sanitary Sewer System.
 - 5. Division 33 Section – Storm Sewer System: Underground storm sewer work.
 - 6. Division 33 Section – Sanitary Sewer System: Underground sanitary sewer work.

1.4 REFERENCES

- A. ASTM: American Society for Testing and Materials, 1916 Race Street, Philadelphia, Pennsylvania 19103, U.S.A.
 - 1. D 698 - Test Method Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 5.5-lb. (2.49-kg) Rammer and 12-in. (305-mm) Drop.
 - 2. D 4318 - Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
- B. TxDOT: Texas Department of Transportation.

1. Comply with the referenced provisions of the Texas State Department of Highways and Public Transportation "Standard Specifications for Construction of Highways, Streets, and Bridges", 1993 Edition, except where more stringent requirements are specified.
2. TxDOT Manual of Testing Procedures.

1.5 DEFINITIONS

- A. Additional Excavation: Excavation below subgrade elevations as directed by the Architect/Engineer. Additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
- B. Bulk Excavation: Excavations more than 10 feet in width and pits more than 30 feet in either length or width.
- C. Soil: Material which is not defined as Rock.
- D. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated dimensions without direction by the Architect/Engineer. Unauthorized excavation, as well as remedial work, shall be without additional compensation.

1.6 SUBMITTALS

- A. Promptly submit testing laboratory reports for tests conducted on each proposed borrow material and excavated material proposed for fill and backfill below building slabs and pavements.
- B. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated:
 1. Classification according to ASTM D 2487 of each on-site and borrow soil material proposed for fill and backfill.
 2. Laboratory compaction curve according to ASTM D 698 for each on-site and borrow soil material proposed for fill and backfill.

1.7 QUALITY ASSURANCE

- A. Use a soil test and inspection service acceptable to the Architect/Engineer, to perform a soils classification analysis (ASTM D 2487), Atterberg Limits (ASTM D 4318), and moisture-density curve (ASTM D 698) for each on-site and borrow material proposed for fill and backfill, and all fill and backfill placed in lifts 6-inches or more in thickness.

1.8 PROJECT CONDITIONS

- A. Contact utility locator service for area where Project is located before excavating.
- B. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted in writing by the Architect/Engineer and then only after arranging to provide temporary utility services according to requirements indicated.
 1. Notify the Architect not less than two days in advance of proposed utility interruptions.
 2. Do not proceed with utility interruptions without the Architect/Engineer's written permission.
 3. Contact utility-locator service for area where Project is located before excavating.
- C. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies to shut off services if lines are active.

- D. Texas Antiquities: Contractor is reminded to comply with provisions relative to the excavation, uncovering removal, altering, damaging, destroying, salvaging of items governed by the Texas Antiquities Code.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

- A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.
- B. Select Structural Fill (Backfill and Fill for Elevator Pit Pad): Low plasticity clean lean clay, sandy lean clay, or clayey sand soils having a maximum Liquid Limit of less than 42 and Plasticity Index ranging between 12 and 20; and free of roots, organic matter, and deleterious material. All borrow material proposed for fill or backfill shall be laboratory tested for compliance with requirements and approved prior to use.
1. Do not use manmade fills for fill and backfill below or adjacent to building pad and pavements or mix into subgrade or select structural fill material.
 2. Use only select structural fill under building pad and within a 5-foot wide zone immediately adjacent to building pad.
 3. Do not blend soils with a Plasticity Index greater than 20 with sands to form select structural fill without the approval of the Geotechnical Engineer Of Record.
- C. Cement Stabilized Sand Backfill Material (Utility and Service Trenches): Uniformly graded mixture of natural or crushed stone, crushed slag or natural or crushed sand (ASTM C 33, Fine Aggregate - Concrete Sand, 100% passing a 1/4" sieve and less than 15% passing a No. 200 sieve); not less than 1-1/2 sacks of Portland cement (ASTM C 150, Type 1) per cubic yard of mixture; and enough potable water to produce a mix suitable for mechanical hand compaction. Stamp batch tickets at plant with time of loading. Material not compacted in place 1-1/2 hours after loading or material, which has taken an initial set, will be rejected and shall be removed from the Project Site.

2.2 ACCESSORIES

- A. Detectable Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, minimum 6-inches wide and 4-mil thick, continuously inscribed with a description of utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30-inches deep; colored as follows:
1. Red: Electric.
 2. Yellow: Gas, oil, steam, and dangerous materials.
 3. Orange: Telephone and other communications.
 4. Blue: Water systems.
 5. Green: Sewer systems.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protection:

1. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.
 2. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.
 3. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.
 4. Install a dewatering system to keep subgrades dry and convey ground water away from excavations. Maintain until dewatering is no longer required.
- B. Erosion Control: Provide erosion control measures to prevent erosion or displacement or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways; and to comply with National Pollutant Discharge Elimination System (NPDES) permit as stated in Federal Register, Vol.57, No.175. In addition to NPDES requirements, Contractor shall:
1. Provide methods to control surface water, runoff, subsurface water, and water from excavations and structures to prevent damage to the Work, the site, or adjoining properties.
 2. Control fill, grade and ditch to direct water away from excavations, pits, tunnels, and other work areas; and to direct drainage to proper runoff courses to prevent erosion, sedimentation, or damage.
 3. Provide, operate, and maintain equipment and facilities of adequate size to control surface water.
 4. Dispose of drainage water in conformance with environmental requirements and in a manner to prevent flooding, erosion, or other damage to any portion of the site or to adjoining areas.
 5. Retain existing drainage patterns external to construction site by constructing temporary earth berms, sedimentation basins, retaining areas, and temporary ground cover as needed to control conditions.
 6. Plan and execute construction and earthwork by methods to control surface drainage from cuts and fills, and from borrow and waste disposal areas, to prevent erosion and sedimentation.
 - a. Hold the area of bare soil exposed at one time to a minimum.
 - b. Provide temporary control measures such as berms, dikes, and drains.
 7. Construct fills and waste areas by selective placement to eliminate surface silts or clays that will erode.
 8. Inspect earthwork periodically to detect any evidence of start of erosion. Apply corrective measures as required to control erosion.
- C. Utilities: Before starting any excavation work, establish the location and extent of all existing underground utilities occurring in the work areas.
1. Promptly notify the utility companies in order to remove and relocate the lines which are directly in the way of excavations.
 2. Maintain, reroute or extend as required, the existing utility lines that remain and which pass through the work areas.
 3. Pay costs for utility relocation work, except those costs covered by the utility Owners.
 4. Protect all utility services uncovered by excavations.
 5. Remove abandoned utility service lines from the areas of excavations; cap, plug or seal such lines and identify at grade.
 6. Locate and record accurately all abandoned and active utility lines, rerouted or extended, on the Project Record Documents.

7. If any uncharted utilities are encountered during excavation, promptly notify the Owner and the Architect/Engineer and await instructions before proceeding. If it is ascertained that the utility lines have been abandoned, cap the line properly and remove the portions of the lines below the finish grade within the excavated areas. If unknown utilities are encountered and the work is continued without contacting the Owner and the Architect/Engineer for instructions, and damage is caused to the utilities, then the Contractor shall repair, at his own expense, the damage to the satisfaction of the owner of the utility line concerned.

3.2 DEWATERING

- A. Grade disturbed areas of the Site to prevent surface water from flowing into excavations and area surrounding excavations. Intercept surface water and divert it away from excavations through use of dikes, ditches, curb walls, pipes, sumps, or other similar techniques.
 1. Provide and maintain dewatering system components to convey water away from excavations. Dewatering includes temporary works required to protect adjoining properties from surface drainage caused by construction operations. Divert surface water and seepage water into sumps and pump it into drainage channels or storm drains, when approved by the agencies having jurisdiction. Provide settling basins when required by such agencies.

3.3 EXPLOSIVES

- A. Explosives: Do not use explosives.

3.4 EXCAVATION, GENERAL

- A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include construction debris, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for construction debris or removal of obstructions.
- B. Stability of Excavations: Slope sides of excavations not steeper than 1-vertical on 2-horizontal or provide protection complying with requirements of the authorities having jurisdiction and Contract Documents.
 1. Excavations deeper than 5 feet and in soils that will not stand up in vertical excavations, provide shoring systems complying with requirements indicated and provide a break-out price for shoring systems within 48 hours of date and time for receipt of bids. See Section 01 35 26.13 - Trench Safety for additional requirements.
 2. Shore and brace trenches deeper than 4 feet and where sloping is not possible either because of space restrictions or excavated material stability and in soils that will not stand up in vertical excavations. Provide and maintain shoring and bracing materials in good serviceable condition. Maintain sides and slopes of excavations until completion of backfilling.
- C. Verification of Footing Subgrades: Arrange for the inspection of the bearing stratum of each footing subgrade by the Geotechnical Engineer as specified in Section 01 45 29 prior to placing concrete. Perform additional excavation only by the written authorization of the Owner.

- D. Protection of Foundation Soils: Protect exposed soils at the base of completed foundation excavations from being disturbed by construction activity and from changes in moisture content. The final foundation surface shall be free of all loose material, clean, and cut to a firm surface, moistened and compacted as specified. If footings cannot be poured the same day of excavation, place a seal slab of lean concrete to protect the exposed foundation soils. Contractor may, where bottom of foundation will be exposed to movement of crawler type heavy equipment, leave about 12 inches of undisturbed soil above indicated bottom of footing elevations until just prior to final excavation.
- E. Construction areas shall be stripped of all vegetation, organics, loose/soft topsoil, and unsuitable surface materials.

3.5 EXCAVATION, SUBGRADE PREPARATION, BACKFILL, FILL AND COMPACTION

- A. Excavation, General: After topsoil and other organic matter have been stripped, excavate to cross sections, elevations and grades shown, prepare exposed subgrade soils, place fill, backfill, and compact as specified. Excavate to the indicated elevations and dimensions within a tolerance of plus or minus 1 inch. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.
- B. Excavation, Fill, and Compaction for Elevator Pit Structure:
 - 1. Excavate and dispose of subgrade soils below elevator pit structure, measured 60 inches down from bottom of slab-on-grade elevation, to provide a level subgrade for subsequent construction.
 - 2. Scarify and compact the top 12 inches of exposed subgrade in elevator pit excavation. moisture condition at optimum moisture content (-2 percent to +2 percent), and compact to at least 95 percent of maximum dry unit weight in accordance with ASTM D 698.
 - 3. Place select structural fill material in loose lifts not exceeding 8 inches in depth in loose measure, moisture condition at optimum moisture content (-2 percent to +2 percent), and compact to at least 95 percent of maximum dry unit weight in accordance with ASTM D 698.
 - 4. Test compaction of each lift at a minimum of 12 locations.
 - 5. After fill has been compacted and complies with specified requirements, immediately install vapor retarder specified in Section 03 30 00 Poured-In-Place Concrete.
- C. Excavation, Fill, and Compaction for Utility and Service Trenches:
 - 1. For pipes or conduit 6 inches or larger in nominal size, tanks and other below grade mechanical/electrical work indicated to receive base material, excavate to base depth indicated, or, if not indicated, to 6 inches below bottom of work to be supported.
 - 2. Grade bottoms of trenches as indicated, notching under pipe bells to provide solid bearing for entire body of pipe.
 - 3. Backfill trenches with cement stabilized sand as shown on Civil Drawings and compact to at least 95% relative density (ASTM D 4254), except use poured in place concrete as specified in Section 03 30 00 where trench excavations pass within 18" of column or wall footings and which are carried below bottom of such footings, or which pass under wall footings. Place concrete to level of bottom of adjacent footing.
 - 4. Do not backfill trenches until tests and observations have been made and backfilling authorized by the Architect/Engineer. Use care in backfilling to avoid damage or displacement of pipe systems.

5. For piping or conduit less than 2'-6" below surface of roadways, provide 4 inches thick concrete base slab support. After installation and testing of piping or conduit, provide minimum 4 inches thick encasement (sides and top) of concrete prior to backfilling or placement of roadway base.
 6. For utility trenches within 5-feet of outside face of building, backfill entire trench excavation with impervious fill material place in loose lifts, not exceeding 8 inches deep for compaction with heavy equipment and 4 inches maximum depth for mechanical hand compaction equipment, moisture condition at optimum moisture content (-2% to +2%) and compact to not less than 95% of maximum dry unit weight (ASTM D 698) to obtain required subgrade elevations. The impervious clay fill shall completely surround the utility line and be compacted in accordance with the requirements specified.
- D. Excavation, Fill, and Compaction for Planting and Other Areas Not Specified:
1. Place select structural fill or satisfactory excavated material in loose lifts not exceeding 8 inches deep for compaction with heavy equipment and 4 inches maximum depth for mechanical hand compaction equipment, moisture condition at optimum moisture content (-2% to +2%) and compact to not less than 90% nor more than 92% of maximum dry unit weight (ASTM D 698) to obtain required subgrade elevations.
 2. Provide finish subgrades to allow for minimum 4 inches deep course of topsoil.
- E. Wet Subgrade (Moisture Content In Excess of Limits Specified):
1. Remove soil material that is too wet to permit compaction and stockpile or spread and allow to dry. Assist drying by discing, harrowing or pulverizing until moisture content is reduced to a satisfactory value.
 2. Removal of wet soil and replacement with compacted select structural fill as specified.

3.6 APPROVAL OF SUBGRADE

- A. Notify the Architect/Engineer and the Geotechnical Engineer when building excavations have reached the required sub-grade.
1. If Architect/Engineer determines that unsatisfactory soil is present, continue excavation and replace with compacted select fill material as directed.
 2. Authorized additional excavation and replacement material will be paid for according to the Contract provisions for changes in the Work.
- B. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed, without additional compensation.

3.7 UNAUTHORIZED EXCAVATION

- A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill may be used when approved by the Architect/Engineer.
1. Fill unauthorized excavations under other construction or utility pipe as directed.

3.8 FIELD QUALITY CONTROL

- A. When work or segments of the work of this Section are completed, notify the Independent Testing Laboratory to perform the pertinent density tests. Do not proceed with additional segments of the work until the results have been verified.

- B. Footings: The bearing stratum of each footing must be inspected and approved by the Geotechnical Engineer as specified in Section 01 45 29 before placing any concrete.
- C. Fill, Backfill and Compaction: Allow the testing laboratory to inspect and test subgrades and each fill or backfill layer more than 6-inch in thickness. Proceed with subsequent earthwork only when test results for previously completed work complies with the specified requirements.
- D. Correction of Non-Conforming Work: If, during the progress of the work, tests indicate that the compacted materials do not meet the specified requirements, remove the defective work, replace, recompact, and retest at no cost to the Owner.
- E. Sequence and Scheduling: Proceed with subsequent construction only when test results for previously completed work complies with the specified requirements.

3.9 PROTECTION

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.
- B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
 - 1. Scarify or remove and replace soil material to depth as directed by the Architect/Engineer; reshape and recompact.
- C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
 - 1. Restore appearance, quality, and condition of the finished surfacing to match the adjacent work, and eliminate evidence of restoration to the greatest extent possible.

3.10 DISPOSAL OF SURPLUS SOIL AND WASTE

- A. Remove surplus soil and waste material, including soil, trash, and debris and legally dispose of it off the Owner's property.

END OF SECTION 31 23 00