SECTION 02205 - EARTHWORK FOR BUILDING FOUNDATIONS AND UTILITIES WITHIN BUILDINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Excavation and backfill for building foundations.
2. Preparing of subgrade for building slabs.
3. Drainage fill course for support of building slabs is included as part of this work.
4. Excavating and backfilling of trenches within building lines.
5. Excavation, backfilling, and compaction of trenches for installation of water piping, sanitary sewer, refrigerant conduit and electrical conduit within building and extending five (5)-feet outside building lines.
6. Excavation, backfilling, and compaction of electrical and telephone conduits shown on electrical site plans and for power to building.
7. As indicated below, removal/disposal of all excess and/or unsuitable material, from the site, resulting from any and all excavation operations (including foundations).

1.3 DEFINITIONS

A. Definitions in this Section include the following:

1. Excavation consists of the removal of material encountered to subgrade elevations and the reuse or disposal of materials removed.
2. Subgrade: The uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, or topsoil materials.
3. Borrow: Soil material obtained off site when sufficient approved soil material is not available from excavations.
4. Subbase Course: The layer placed between the subgrade and surface pavement or walk.
5. Drainage Fill: Course of washed granular material placed under slab on grade to cut off upward capillary flow of pore water toward slab.
6. Unauthorized excavation consists of removing materials beyond indicated subgrade elevations or dimensions without direction by the Architect. Unauthorized excavation, as well as remedial work directed by the Architect, shall be at the Contractor's expense.
7. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man made stationary features constructed above or below ground surface.
8. Utilities include on site underground pipes, conduits, ducts, cables, and underground services within building lines.

1.4 CODES AND STANDARDS:

A. Codes and Standards: Perform earthwork complying with requirements of authorities with jurisdiction.

1.5 TESTING AND INSPECTION SERVICE

A. Owner will employ a qualified independent geotechnical engineering testing agency to classify proposed on site and borrow soils to verify that soils comply with specified requirements and to perform required field and laboratory testing.

1.6 SUBMITTALS

A. Test Reports: Submit the following reports directly to Architect from the testing services:

1. Test reports on borrow material, if required.
2. Verification of suitability of each footing subgrade material, in accordance with specified requirements.
3. Field reports; in place soil density tests.
4. Photographs of existing adjacent structures and site improvements.

1.7 EXISTING UTILITIES

A. Existing Utilities: Do not interrupt existing utilities serving facilities occupied by the Owner or others except when permitted in writing by the Architect and then only after acceptable temporary utility services have been provided.

PART 2 - PRODUCTS

A. Soil Materials: Provide approved borrow soil materials from off site when sufficient approved soil materials are not available from excavations.

B. Satisfactory Soil Materials: soils approved by the Geotechnical Engineer consisting of low plasticity materials with a soil classification type ML, SC, SM, SW, GC, CM, GP, or GW, free of rock or gravel larger than two (2)-inches in any dimension, organics, debris, waste, frozen materials, vegetation, or other deleterious matter. Additionally, type OH, MH and CH materials are <u>not</u> acceptable.

C. Backfill and Fill Materials: Satisfactory soil materials.

D. Subbase Material: Naturally or artificially graded mixture of washed natural or crushed gravel or crushed stone meeting #57.

E. Bedding Material: Subbase materials with 100-percent (100%) passing a one (1)-inch sieve and not more than eight (8)-percent (8%) passing a No. 200 sieve.

F. Drainage Fill: Washed, evenly graded mixture of crushed stone, or crushed or uncrushed

gravel, ASTM D 448, coarse aggregate grading size 57, with 100-percent (100%) passing a 1-1/2-inch sieve and not more than two (2)-percent (2%) passing a No. 200 sieve.

G. Detectable Warning Tape: Polyethylene film warning tape encasing a metallic core, six (6)-inches wide and four (4)-mils thick minimum, continuously inscribed with a description of the utility.

PART 3 - EXECUTION

A. Protection of Persons and Property: Barricade open excavations occurring as part of this Work and post with warning lights.

B. Preparation: Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

C. Provide erosion and sedimentation control measures.

D. Prevent surface water and subsurface or ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.

E. Protect subgrades and foundation soils from softening and damage by rain or water accumulation and from freezing temperatures or frost.

F. Rock excavation includes removal and disposal of rock material and obstructions encountered that cannot be removed by a CAT Model 345 L Track Hoe with rock teeth for trench/pit excavations.

G. Unclassified Excavation: Excavation is unclassified and includes excavation to required subgrade elevations regardless of character of materials and obstructions encountered.

H. Excavate for structures, pavements, and walks to indicate elevations and dimensions. Widen excavations to permit placing and removing concrete formwork, installing services and other construction, and for inspections. Trim subgrades to required lines and grades to leave solid base to receive other work.

I. Excavate utility trenches to indicated slopes, lines, depths, and invert elevations of uniform widths to provide a maximum 12-inches of working clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12-inches higher than the top of pipe or conduit.

1. Excavate and shape trench subgrade to provide uniform bearing and continuous support for pipe and conduit. Where encountering rock or other unyielding bearing surface, carry trench excavation six (6)-inches below invert elevation to receive bedding course.

J. Stability of Excavations:

1. General: Comply with local codes, ordinances, and requirements of agencies having jurisdiction.
2. Slope sides of excavations to comply with local codes, ordinances, and requirements of

agencies having jurisdiction. Shore and brace where sloping is not possible because of space restrictions or stability of material excavated. Maintain sides and slopes of excavations in safe condition until completion of backfilling.

3. Shoring and Bracing: Provide materials for shoring and bracing, such as sheet piling, uprights, stringers, and cross braces, in good serviceable condition. Maintain shoring and bracing in excavations regardless of time period excavations will be open. Extend shoring and bracing as excavation progresses.

    a. Provide permanent steel sheet piling or pressure creosoted timber sheet piling wherever subsequent removal of sheet piling might permit lateral movement of soil under adjacent structures. Cut off tops a minimum of two (2)-feet – six (6)-inches (2' – 6") below final grade and leave permanently in place.

K. Approval of Subgrade: When Geotechnical Engineer determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.

1. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities at no additional cost to the Owner.

L. Fill unauthorized excavation under foundations or wall footings by extending indicated bottom elevation of concrete foundation or footing to excavation bottom, without altering required top elevation. Fill unauthorized excavations under other construction as directed by Architect.

M. Store excavated and borrow soil materials acceptable for backfill and fill in shaped, graded, drained, and covered stockpiles. Locate stockpiles away from edge of excavations and outside drip line of remaining trees.

N. Backfill excavations promptly following acceptance of affected work below final grade.

O. Utility Trench Backfill: Place, compact, and shape bedding course to provide continuous support for pipes and conduits and to fill unauthorized excavations.

1. Place and compact initial backfill of satisfactory soil material or subbase material, free of particles larger than one (1)-inch, to a height of 12-inches over the utility pipe or conduit. Place and compact final backfill of satisfactory soil material to final subgrade.
2. Coordinate backfilling with utilities testing.
3. Install warning tape directly above utilities, 12-inches below finished grade, except six (6) - inches below subgrade under pavements and slabs.

P. Fill Preparation: Plow strip or break up sloped surfaces steeper than one (1) vertical to four (4) horizontal so fill material will bond with existing surface.

1. When subgrade or existing ground surface to receive fill has a density less than that required for fill, break up ground surface to depth required, pulverize, moisture condition or aerate soil, and re-compact to required density.

Q. Uniformly moisten or aerate subgrade and each subsequent fill or backfill layer to within two (2)-percent (2%) of optimum moisture content before compaction.

1. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.

2. Remove and replace, or scarify and air dry, satisfactory soil material that is too wet to compact to specified density.
3. Stockpile or spread and dry removed wet satisfactory soil material.

R. Compaction: Place backfill and fill materials in layers not more than eight (8)-inches in loose depth for material compacted by heavy compaction equipment, and not more than four (4)-inches in loose depth for material compacted by hand operated tampers. Place evenly alongside structures and utilities to required elevations.

1. Compact each layer of backfill or fill to not less than ninety-five percent (95%) and the final foot beneath slabs and pavement to ninety-eight percent (98%) of maximum dry density according to ASTM D 698 and within 2% +/- of the optimum moisture content.

S. Grading: Uniformly grade areas to a smooth surface, free from irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated. Grade lawns, walks, and unpaved subgrades to tolerances of plus or minus 0.10-foot and pavements and areas within building lines to plus or minus ½-inch.

T. Subbase: Under pavements and walks, place subbase course material on prepared subgrades and compact at optimum moisture content to required grades, lines, cross sections, and thickness.

1. Place shoulders along edges of subbase to prevent lateral movement. Construct shoulders at least 12-inches wide of acceptable soil materials and compact simultaneously with each subbase layer.

U. Under slabs on grade, place drainage fill on prepared subgrade and compact to required cross sections and thickness.

V. Field Quality Control: Allow testing agency to inspect and test each subgrade and each fill or backfill layer. Do not proceed until test results for previously completed work verify compliance with requirements.

1. Perform field in place density tests according to ASTM D 1556 (sand cone method), ASTM D 2167 (rubber balloon method), ASTM D 2922 (nuclear method) or ASTM D 2937 (drive cylinder method), as applicable.
2. Footing Subgrades: Test each soil stratum to verify design bearing capacities.
3. Paved Areas and Building Slabs: At subgrade and at each compacted fill, backfill layer, and drainage course perform at least one field in place density test for every 2,000 square feet or less of paved area or building slab, but in no case fewer than three tests.

    a. Foundation Wall Backfill: At each compacted backfill layer, perform at least one field in place density test for each 100-feet or less of wall length, but in no case fewer than two (2) tests.
    b. Trench Backfill: In each compacted initial and final backfill layer, perform at least one field.
    c. When testing agency reports that subgrades, fills, or backfills are below specified density, scarify and moisten or aerate, or remove and replace soil to the depth required, re-compact, and retest until obtaining required density.

W. Protection: Repair and reestablish grades where completed or partially completed surfaces become eroded, rutted, settled, or lose compaction.

X. Settling: Where settling occurs during the Project correction period, remove finished surfacing, backfill with additional approved material, compact, and reconstruct surfacing.

Y. Disposal: Remove surplus satisfactory soil and waste material, including unsatisfactory soil, weathered rock, rock, trash, and debris, and legally dispose of it off the Owner's property.

END OF SECTION 02205