SECTION 312000 - EARTHWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Earthwork associated with placing, grading and compacting Backfill and Fill at the Project Site.

B. The Contractor shall provide the necessary Backfill and Fill to the fill all voids created from the demolition and removal of the structures, utilities, pavement, trees, and all other site improvements designated for removal.

C. No topsoil, crushed concrete, brick, or block, unsatisfactory material or foundry sand can be used to achieve the proposed grades.

1.3 DEFINITIONS

A. Backfill: Satisfactory soil materials used to fill an excavation.

B. Base Course: Aggregate layer placed between the sub-base course and asphalt paving.

C. Bedding Course: Layer placed over the excavated sub-grade in a trench before laying pipe.

D. Borrow: Satisfactory soil imported from off-site for use as fill or backfill.

E. Excavation: Removal of material encountered above sub-grade elevations.

F. Fill: Satisfactory soil materials used to raise existing grades.

G. MDOT: Michigan Department of Transportation.

H. Pavement: Walks, drives, roads, parking areas, and athletic courts to include all asphalt, concrete, brick and aggregate pavement.

I. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

J. Subbase Course: Aggregate layer placed between the sub-grade and base course for asphalt paving, or layer placed between the sub-grade and a concrete pavement or walk.

K. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below sub-base, drainage fill, or topsoil materials.

L. Utilities: Include on-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.4 SUBMITTALS

A. 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/off-site borrow soil material proposed for fill and backfill.
2. Laboratory compaction curve according to ASTM D 1557 for each on-site/off-site, borrow soil material proposed as Fill and Backfill.
3. Gradation test reports according to ASTM C 136.05 to determine compliance with the gradation requirements stated herein.

B. Field Compaction Test Reports: From a qualified testing agency indicating and interpreting test results for the compliance with the compaction of Backfill and Fills requirement of 95% of modified proctor.

1. All test reports shall be provided to the Owner Representative prior to payment for the backfill related work.

1.5 QUALITY ASSURANCE

A. Geotechnical Testing Agency Qualifications: An independent testing agency qualified according to ASTM E 329 to conduct soil materials and rock-definition testing, as documented according to ASTM D 3740 and ASTM E 548.

1.6 PROJECT CONDITIONS

A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner's Representative or others unless permitted in writing by Project Manager and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Owner not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Owner's and Utility's (if different) written permission.
3. Contact utility-locator service for area where Project is located before excavating.

B. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with Owner and/or utility companies to shut off services if lines are active.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS DEFIITIONS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

B. Satisfactory Soils: ASTM D 2487 soil classification groups GW, GP, GM, SW, SP, and SM, or a combination of these group symbols; free of rock or gravel larger than 1 ½ inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.

C. Unsatisfactory Soils: Except where noted above, ASTM D 2487 soil classification groups GC, SC, ML, MH, CL, CH, OL, OH, and PT, or a combination of these group symbols.

1. Unsatisfactory Soils also include Satisfactory Soils not maintained within 2 percent of optimum moisture content at the time of compaction.

D. Sub-base Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2- inch (38-mm) sieve and not more than 10 percent passing a No. 200 (0.075-mm) sieve.

E. Base Course: Provide as shown on plans. For asphalt and concrete pavement sections: MDOT 21AA, 21A, or 22A aggregate according to the 2012 Standard Specifications for Construction, Section 302.

F. Bedding: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; except with 100 percent passing a 1-inch (25-mm) sieve and not more than 8 percent passing a No. 200 (0.075-mm) sieve.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and all other improvements indicated to remain or located within public right-of-way, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

B. Protect subgrades and foundation soils against freezing temperatures or frost. Provide protective insulating materials as necessary.

C. Provide erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

3.2 GENERAL EXCAVATION

A. Contractor shall excavate the site in order to remove the concrete foundations, slabs,

tunnels, utilities, stumps, and other below-grade improvements identified for removal.

B. Contractor shall be responsible for the removal and proper disposal of Unsatisfactory Soils excavated to meet the finished grades as shown of the Contract Drawings.

3.3 DEWATERING

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

B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.

1. 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.
2. Install a dewatering system to keep sub-grades dry and convey ground water away from excavations. Maintain until dewatering is no longer required.
3. Cover excavations to prevent the accumulation of storm water.

3.4 EXPLOSIVES

A. Explosives: Do not use explosives.

3.5 APPROVAL OF SUBGRADE

A. Notify Owners Representative when excavations have reached required sub-grade.

B. Proof roll sub-grade with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof roll wet or saturated sub-grades (remove material to expose dry soil).

C. Reconstruct sub-grades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by the Owners Representative.

3.6 STORAGE OF SOIL MATERIALS

A. Stockpile satisfactory excavated soil materials. Stockpile materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent wind blown dust. The Owner's Representatives, prior to implementation, shall approve stockpile area locations.

1. Stockpile materials away from edge of excavations.
2. Stockpiles with more than 10 cubic yards need to be kept a minimum of 25 feet from adjacent properties.
3. Erosion control methods and stockpile materials shall conform to all erosion control requirements and methods identified by the Contract Documents.

3.7 BACKFILL

A. Contractor shall be responsible for all costs associated with obtaining and placing Satisfactory Soils to fill all voids within the demolition limits.

B. Place Backfill material in 8" loose layers and compact to required elevations, but not before completing the following:

1. Surveying locations of existing and abandoned underground utilities for record documents.
2. Inspecting and testing underground utilities.
3. Removing concrete formwork.
4. Removing trash and debris.
5. Removing temporary shoring and bracing, and sheeting.
6. Installing permanent or temporary horizontal bracing on horizontally supported walls.

3.8 UTILITY MANHOLE STRUCTURE, VAULT, AND PIT BACKFILL

A. Unless otherwise noted on the Contract Drawings, Contractor shall remove all utility manhole structures, vaults, and pits in their entirety.

3.9 FILL

A. Preparation: Remove vegetation, topsoil, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface before placing Fills.

B. Contractor shall be responsible for all costs associated with obtaining and placing Satisfactory Soils as Fill to meet final grades. Place Fill material in 8” loose layers and compact to required elevations.

C. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so Fill will bond with existing material.

3.10 MOISTURE CONTROL

A. Uniformly moisten or aerate sub-grade and each subsequent Fill or Backfill layer before compaction to within 2 percent of optimum moisture content.

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 otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight, only as directed by the Owners Representative.

3.11 COMPACTION OF BACKFILLS AND FILLS

A. Place Backfill and Fill materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

B. Place Backfill and Fill materials evenly and uniformly, to required elevations, in the excavated areas.

C. Compact soil to not less than 95 percent of maximum dry unit weight according to ASTM D 1557 modified proctor.

3.12 GRADING

A. General: 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.

1. Provide a smooth transition between adjacent existing grades and new grades.
2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.
3. Provide Backfill and Fill materials as required to achieve the proposed grades as shown on the Contract Drawings.

B. Finished Grading:

1. Base Bid – Lawn or Unpaved Areas: Plus or minus 4 inches

3.13 SUBBASE AND BASE COURSES UNDER PAVEMENTS AND WALKS

A. Place Subbase Course on sub-grades free of mud, frost, snow, or ice.

B. Subbase Course on prepared Subgrade as follows:

1. Place Base Course material over Subbase Course under pavements and walks.
2. Shape Base Course to required crown elevations and cross-slope grades.
3. Place Base Course 6 inches or less in compacted thickness in a single layer.
4. Place Base Course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
5. Compact Subbase and Base Courses at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 698.

3.14 FIELD QUALITY CONTROL

A. Testing Agency: The Owner will engage a qualified independent geotechnical engineering testing agency to perform field quality-control testing.

B. Allow testing agency to inspect and test Sub-grades, each Fill or Backfill layer, the sub base, and the base course. Proceed with subsequent earthwork only after test results for previously completed work comply with requirements.

C. Excavation Sub-grade: At excavation Sub-grades, at least one test of each soil stratum will be performed to verify compaction. Subsequent verification and approval of other footing Sub-grades may be based on a visual comparison of Sub-grade with tested Sub-

grade when approved by Owners Representative.

D. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable. Tests will be performed at the following locations, frequencies, and each Fill and Backfilled layer:

1. General excavation areas
   a. At sub-grade and at each compacted Fill and Backfill layer, at least one test for every 5,000 sq. ft.

2. Under Paved Areas
   a. Each compacted sub base and base course layer, at least one test per every 1,000 sq. ft.

E. When testing agency reports that Sub-grades, Fills, Backfills, Sub Base, or Base have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil to depth required; re-compact and retest until specified compaction is obtained. Tests shall be performed by an independent testing agency.

3.15 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic 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 Owner, reshape and re-compact. Additional Compaction tests may be required for repaired or reestablished grades as determined by the Owner. Tests shall be performed by an independent testing agency at the Contractors expense.

C. Where settling occurs before work correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.

1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to the greatest extent possible.

3.16 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Contractor shall remove and properly dispose of all waste materials, unsatisfactory soils, trash, and debris in accordance with all local, state and federal regulations.

END OF SECTION 311200