

RUSH COUNTY COURTHOUSE
SIDEWALK & SITEWORK IMPROVEMENTS

SECTION 31 20 00 - EARTHWORK

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Excavation, filling, backfilling and compacting.
 - 2. Trenching and trench backfilling.
 - 3. Mass earthwork and rough grading.
 - 4. Finish grading, including spreading of topsoil.
 - 5. Dewatering.
 - 6. Soil stabilization.
 - 7. Testing and inspection.
- B. Related Sections:
 - 1. Division 02 Section "Selective Site Demolition".
 - 2. Division 31 Section "Erosion Control".

1.2 QUALITY ASSURANCE

- A. Testing and Inspection:
 - 1. All testing and inspection shall be performed by an independent Geotechnical Engineering Consultant ("Geotechnical Engineer").
 - 2. The Geotechnical Engineer is responsible for all testing, sampling and inspection.
 - 3. The Geotechnical Engineer is responsible for approving materials, installation and procedures.
 - 4. The Contractor is responsible for providing these services.
 - 5. The Contractor is responsible for all coordination and scheduling with the Geotechnical Engineer.
- B. Topsoil:
 - 1. All topsoil shall be tested and approved by the Soil Scientist.
 - 2. Refer to 1.3 Submittals for more information.
- C. Any work in public right-of-way or other areas subject to the jurisdiction of anybody shall be performed either to the requirements of that jurisdiction or to the requirements of this Specification, whichever is more stringent.

1.3 SUBMITTALS

- A. All submittals shall be reviewed and approved by Architect/Engineer and Geotechnical Engineer.
- B. Product Data and Test Reports:
 - 1. Field and laboratory tests and inspections.

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2. Drainage file: Include material specifications and sieve analysis. Include signed material certificate from manufacturer/supplier.
3. Chemical modification: Include material specifications and signed material certificate from manufacturer/supplier.
4. Geo-synthetic materials: Include material specifications and signed material certificate from manufacturer/supplier.

C. Topsoil:

1. Furnish topsoil analysis performed by a soil scientist.

Approved Vendors:

- a. A&L Greatlakes Laboratories at 3505 Conestoga Dr. Fort Wayne, IN 46808.
- b. Lawn & Garden Soil Analysis at 682 North Pleasant Street, University of Massachusetts, Amherst, MA 01003.

2. Analysis shall state the following: (Refer to Part 2 for minimum requirements)

- a. Percentage of organic matter.
- b. Gradation of sand, silt and clay, Include USDA textural classification.
- c. Cation exchange capacity.
- d. Deleterious material.
- e. ph.
- f. Mineral and plant nutrient content (phosphorus, potassium, magnesium, calcium).
- g. Any requirements or recommendations necessary to make it suitable.
- h. Annual nutrient requirements and recommendations for evergreens shrubs, trees, and flowers. Soil test results without recommendations will be rejected.

3. This analysis is required for both on site and off-site topsoil.

4. Samples of the topsoil shall be taken under the following conditions:

- a. Within four (4) weeks prior to placing topsoil, take three representative samples of proposed topsoil.
- b. Within one week after placing topsoil, take three representative samples of in-place topsoil.
- c. All samples shall be taken at the witness of the Owner, in areas approved by the Owner. Contractor to coordinate with Owner as required.

5. Provide copies of all topsoil analysis and recommendations to Owner and Architect/Engineer.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General:

1. All soil materials shall be approved by the Geotechnical Engineer.
2. All soil materials shall be suitable for each application.
3. Suitable soils are defined as soils which provide proper strength, compaction and drainage requirements and which are approved by the Geotechnical Engineer.

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4. Fill material which is unsuitable due to excess moisture will not be classified as unsuitable if it can be dried to optimum moisture specified herein by manipulation, aeration or blending with other materials satisfactorily as approved by the Geotechnical Engineer.

B. Fill Materials:

1. Note: The following describes fill materials and their application for use. The materials shall be used for the listed applications, unless designated otherwise on the Drawings. If the Contractor has any questions or concerns regarding the materials or intended application, contact the Architect/Engineer for directions. Compaction requirements are the percentage of maximum dry density per ASTM D698 Standard Proctor Test, unless noted otherwise in the Geotechnical Report.
2. General fill:
 - a. Suitable on-site or off-site fill material free of debris, roots, organic and frozen materials, and stones having a maximum dimension of 2".
 - b. Minimum compaction: 95%.
 - c. Application: General filling and backfilling of excavations and trenches outside of the building.
3. Granular fill:
 - a. Clean, natural or manufactured sand per requirements of INDOTSS Type "B" borrow, 4.75mm (No. 4) gradation. Pea gravel is not acceptable.
 - b. Minimum compaction: 95%.
 - c. Application: Backfilling of excavations and trenches which are under or within 5' of pavement, and underneath exterior concrete pavement, walks, curbs and slabs on grade.
4. Drainage Fill:
 - a. General: Clean, washed fill sand with 100% passing the 4.75mm (No.4) sieve and no more than 5% passing the 0.075 mm (No. 200) sieve. Pea gravel or #53 stone are not acceptable.
 - b. Minimum compaction: 95%.
 - c. Application: Free draining material required for applications such as the outside of basement walls, the back side (earth side) of retaining walls and building slabs on grade.
5. Aggregate fill: Unless otherwise indicated, shall meet the following:
 - a. Naturally or artificially graded mixture of natural or crushed gravel, crushed stone and natural or crushed sand.
 - b. ASTM D2940, with 100 percent passing a 1 ½ inch sieve and not more than 8 percent passing a No. 200 sieve.
 - c. Application: base course under concrete and other items per plans.

C. Topsoil:

1. Topsoil shall be fertile, friable, natural surface soil obtained from well-drained areas and possessing characteristics of representative soils in the project vicinity that produce heavy growths of crops, grass or other vegetation.
2. Topsoil shall consist of friable loam, reasonably free of subsoil, clay lumps, brush, roots, weeds or other objectionable vegetation, stones or similar objects larger than 1-1/2" in any dimension, litter or other materials unsuitable or harmful to plant growth.
3. Supplement on-site topsoil with off-site topsoil as necessary.
4. Unless otherwise indicated, minimum compacted thickness in lawn areas is 4".

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5. The mechanical analysis of topsoil shall be as follows:
 - a. 1" mesh sieve size; 99%-100% passing.
 - b. 1/4" mesh sieve size: 97%-99% passing.
 - c. No. 100 mesh sieve size: 40%-60% passing.
 - d. No. 200 mesh sieve size: 20%-40% passing.
 6. The following minimum requirements shall also be met:
 - a. Organic matter: 3-5%.
 - b. pH: 6.5 to 7.3.
 - c. Sand, silt, clay content: per USDA loam textural classification.
 - d. Minerals and nutrients: Per Geotechnical Engineer or Soil Scientist recommendations and amendments suitable for use in local area.
- D. Soil Separator Fabric:
1. Nonwoven, needle-punched geotextile fabric manufactured from polyolefins or polyesters per ASTM M288, suitable for subsurface drainage and other specified applications.
 2. Application: subsurface drains and as specified in Contract Documents.
 3. Specifications (values based on Mirafi 140N):
 - a. Apparent opening size: 70 (U.S. Standard Sieve Size); ASTM D-4751-99A.
 - b. Flow rate: 135 gpm/sf; ASTM D-4491-99A.
 - c. Puncture strength: 65 lbs; ASTM D-4833-00.
 - d. Mullen Burst: 225 lb/sq. in.
 - e. Grab tensile/elongation: 155 lbs/50%.
 - f. UV Resistance: 70% at 500 hours.
- E. Geo-synthetic Reinforcement:
1. General: H-Series HX165 Geogrid as manufactured by Tensar International Corp., Atlanta Georgia.
 2. Application: Soil stabilization as required and as recommended by the Geotechnical Engineer.
- F. Chemical Modification:
1. General: INDOTSS 215.
 2. Materials: Hydrated lime per INDOTSS 913.04(b) and Type I Portland cement per INDOTSS 901-01(b).
 3. Quantity: 4.0 +/- 0.5% by dry unit mass of the soils.
 4. Application: If Geotechnical report indicates that chemical modification may be needed for soil stabilization, then the Contractor shall include provisions for chemical modification in their bid.
- G. Other Materials:
1. All other materials not specifically described but not required for proper completion of the Work of this Section, shall be selected by the Contractor subject to the approval of the Architect/Engineer and Geotechnical Engineer.

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PART 3 - EXECUTION

3.1 REQUIREMENTS

A. General:

1. Weather: Do not perform earthwork activities during inclement weather.
2. Dust: Use all necessary and appropriate means, such as water sprinkling, as required to prevent dust from being a nuisance to the Owner, public and concurrent performance of other work on the site.
3. Conflicts: Should the preceding job conditions or other items specified herein because of actual or possible conflicts, notify the Architect/Engineer immediately and do not proceed until such conflict has been resolved.
4. Refer to Division 31 Section "Termite Control" for termite protection requirements.

B. Preparation: Verify that the following has been completed prior to beginning earthwork:

1. Protective fencing has been installed for trees and vegetation to remain.
2. Site clearing (clearing and grubbing).
3. Selective site demolition.
4. Erosion and sediment control measures are in place.

C. Protection:

1. For items indicated to remain, provide protection to prevent damage from construction activities. Any damage or destruction to items intended to remain intact shall be repaired or replaced to the satisfaction of the Owner at the Contractor's expense.
2. Topsoil: Protect placed topsoil from heavy machinery traffic. Remove and replace topsoil that is compacted by heavy machinery traffic.
3. Subgrade: Ditches and drains along the subgrade shall be maintained to always drain effectively. Repair subgrade of any ruts that may occur by reshaping and recompact as required.
4. Utilities: Determine locations of existing utilities and the extent to which they may affect earthwork operations. Where service and utility lines are to remain, provide protection to prevent damage or disruption of services.
5. Damaged utilities shall be repaired immediately at the Contractor's expense.
6. Open excavation:
 - a. The Contractor is responsible for ensuring all open excavations are properly barricaded and always protected. This includes work such as mass excavation and trenching and includes other potentially dangerous conditions such as retention ponds.
 - b. Provide and install all necessary and appropriate means such as, but not limited to, signage, fencing, traffic barricades, and lighting to warn, discourage, and prevent danger to adjacent workers and the public.
 - c. Unless otherwise indicated, install a minimum 6' 10-gauge chain link fence around all open excavations, retention ponds, and other areas of potential danger, and maintain them while such conditions exist. Increase measures as required by site conditions.

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3.2 LAYOUT

- A. Surveyor: Secure the services of a licensed land surveyor, acceptable to the Architect/Engineer and Owner, to layout locations of building, parking areas, drive, walks, curbs, finish elevations and other work, including mechanical and electrical items that are to be installed on the project site.
- B. References: Establish and maintain lines, corners, elevations and general reference points. Verify dimensions indicated on Drawings. If conflicts exist, immediately notify the Architect/Engineer before continuing work.

3.3 EXCESS WATER CONTROL

- A. Excess moisture: If excess moisture is present in soil, do not resume operations until moisture content and density are reported to be satisfactory by the Geotechnical Engineer.
- B. Flooding: Provide berms or channels to prevent flooding of subgrade. Promptly remove all water collecting in depressions.
- C. Softened subgrade: Where soil has been softened or eroded by flooding or placement during inclement weather, remove all damaged areas and recompact as specified for fill and compaction.
- D. Dewatering:
 - 1. Provide and maintain ample means and devices with which to promptly remove and dispose of all water from every source always entering the excavations or other parts of the work during construction.
 - 2. Dewater by means which will ensure dry excavations and the preservation of the final lines and grades at bottom of excavations, such as sump pumps, trenching, etc.
 - 3. Do not use extreme measures or durations to cause adverse effects to Project Site or adjoining properties.

3.4 CHEMICAL MODIFICATION

- A. General:
 - 1. Scarify and/or disc area to a depth of 12" prior to distributing modifiers.
 - 2. Utilize screw type, cyclone, or pressure manifold type distributors to apply modifier.
 - 3. Do not apply when wind conditions create potential hazards or transference of material to adjacent areas.
 - 4. Mix modifiers with rotary speed mixers or disc harrow and continue until a homogenous layer of the required thickness is obtained.
 - 5. Compaction:
 - a. Lime modified soils shall be compacted within 3 days.
 - b. Cement modified soils shall be compacted within 30 minutes.
 - 6. Observation and testing: Quantities of materials, placing, mixing, and compacting shall be, as recommended, observed and tested by the Geotechnical Engineer.

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3.5 STOCKPILING

A. General:

1. See drawings for designated stockpiling areas. If Drawings do not designate specific areas, or areas shown are insufficient, contact Architect/Engineer for direction.
2. Stockpile earth materials in manners that will prevent intermixing of different materials and intrusion of trash, debris and organic materials.
3. Slope stockpiled materials to provide adequate surface drainage.
4. Install and maintain erosion control measures. Refer to drawings and Division 31 Section "Erosion Control". At a minimum, silt fences shall be installed around all stockpiled areas. Seed areas which are to remain stockpiled for extended periods of time.
5. Storage or stockpiling of materials on the subgrade is prohibited.

3.6 EXCAVATION

A. General:

1. Excavation shall conform to OSHA and all other applicable safety regulations.
2. Excavation shall conform to the dimensions and elevations indicated on the Drawings, except as specified herein.
3. Excavation shall extend sufficient distance from walls and footings to allow for placing and removal of forms, installation of services and inspection.
4. Remove unsuitable material below indicated depths and replace it with suitable, compacted material or lean concrete, at the Architect/Engineer discretion.
5. Topsoil stripping: Strip topsoil to its depth from areas to be covered by building, by walks and by other work and where existing surface areas required grading to establish new elevations.
6. Subgrade: Unless otherwise indicated, excavate to following subgrades:
 - a. Slab-on-grade: Sub-grade at bottom of drainage fill or at bottom of existing topsoil, whichever is lower.
 - b. Drives and paving: Sub-grade at bottom of aggregate base.
 - c. Footing: Sub-grade at indicated bottom of footing.
 - d. Lawn area: Sub-grade 4" below indicated surface elevation.

3.7 TRENCHING

A. General:

1. All trenching shall conform to OSHA and all other applicable safety standards.
2. Verification:
 - a. Contractor shall verify all existing grades, inverts, utilities, obstacles and topographical conditions prior to any trenching, excavation or underground installations.
 - b. In the event existing conditions are such as to prevent installations in accordance with the Contract Documents, immediately notify the Architect/Engineer and await decision before continuing work.
 - c. Architect/Engineer decision will be final and binding upon the Contractor, and installations shall be in accordance with same.
3. Saw cut existing pavements to proper width for trenching.

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4. Legally dispose materials unsuitable for trench backfilling off-site.
- B. Width:
1. Trenches for piping shall be not less than 12" wide or more than 16" wider than the outside diameter of the pipe to be laid therein, and shall be excavated true-to-line, so that a clear space not less than 6" or more than 8" in width is provided on each side of the pipe.
 2. For sewers, the maximum width of the trench specified shall apply to the width at and below the level at the top of the pipe. The width of the trench above that level may be made as wide as necessary for sheeting and bracing, and proper installation of the Work.
 3. Trenches shall be open vertical construction.
- C. Depth:
1. Trench as required to provide the elevations shown on the drawings.
 2. Where elevations are not shown on the drawings, trench to sufficient depth to give a minimum of 36" of fill above the top of the pipes measured from the adjacent finish grade.
 3. Where trench excavation is inadvertently carried below proper elevation, backfill with approved material and then compact to provide a firm and unyielding subgrade and/or foundation at no additional cost to the Owner.
- D. Trench Bracing:
1. Properly support all trenches in strict accordance with all pertinent rules and regulations.
 2. Brace, sheet, and support trench walls in such a manner that they will be safe and that the ground alongside the excavation will not slide or settle, and that all existing improvements of every kind, whether on public or private property, will be fully protected from damage.
 3. In the event of damage to such improvements, immediately make all repairs and replacements necessary at no additional cost to the Owner.
 4. Arrange all bracing, sheeting, and shoring so as to not place stress on any portion of the completed Work until the general construction thereof has proceeded far enough to provide sufficient strength.
 5. All shoring and sheeting required to perform and protect the excavation and as required for the safety of employees and abutting structures shall be performed. All workmen performing work in 48" or deeper trench or excavation shall be protected by use of a welded sheet steel "safety box."
 6. Removal: Exercise care in the drawing and removal of sheeting, shoring, bracing, and timbering to prevent collapse or caving of the excavation faces being supported.
- E. Bedding:
1. Where pipes or conduits are to be installed, excavate below the proposed alignment of the pipe and backfill with clean sand to provide uniform support unless otherwise noted on the drawings.
 2. Unless shown otherwise on Drawings, minimum bedding to be 4" below pipe.
 3. Storm sewer pipes are to be bedded with stone.
 4. Refer to drawings and details for further information and requirements.
- F. Grading and Handling of Trenched Material:
1. During excavation, material shall be stacked in an orderly manner a sufficient distance back from edges of trenches to avoid overloading and prevent slides or cave-ins.
 2. Control the temporary stockpiling of trenched material in a manner to prevent water from running into the excavations.

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3. Do not obstruct the surface drainage but provide means whereby stormwater is diverted into existing gutters, surface drains or other temporary drains.
4. Any water accumulated in the trenches shall be removed by pumping or by other approved methods.

3.8 FILLING, BACKFILLING AND COMPACTING

- A. Prior to filling, backfilling and compacting, proof-roll and remediate subgrade per Part 3 Quality Assurance.
- B. Unless otherwise indicated, maximum lift thickness is 8" of un-compacted material.
- C. Moisture:
 1. Thoroughly mix each layer to assure uniformity of material.
 2. Supplement mixing with wetting or drying as required to obtain the moisture content required for the indicated percentages of compaction.
 3. All fill shall be placed so that the moisture content is within +/- 2% of the optimum moisture content according to ASTM D698.
 4. Do not use frozen materials in the fill or allow the fill to be placed upon frozen materials.
- D. Compaction:
 1. Compaction shall be accomplished by approved means and shall meet the following densities for various parts of the Work. See Part 2 for density requirements of individual soil materials.
 2. Compaction by flooding is not acceptable.
 3. In cut areas where pavement is planned, scarify the upper 12" of subgrade prior to compaction.
- E. Equipment:
 1. Tracked equipment shall not be used as compaction equipment.
 2. The static weight of compaction equipment utilized for the compaction of backfill materials near walls as defined in No.3 below shall not exceed 2,000 lbs. for non-vibratory equipment and 1,000 lbs. for vibratory equipment.
 3. All heavy equipment, including compaction equipment heavier than noted herein, shall not be allowed closer to walls than 3 feet plus the vertical distance from backfill surface to the bottom of the wall.

3.9 GRADING

- A. General:
 1. After filling and backfilling operations are complete, neatly and evenly grade areas to be seeded or sodded.
 2. Scarify subgrade to a depth of 6" and place minimum 4" topsoil (6" maximum).
 3. Grade to obtain the elevations indicated within a tolerance of plus or minus 0.1 foot.
 4. Slope finished subgrade surface to provide drainage away from building walls.
- B. Treatment After Completion of Grading:

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1. After grading is completed and inspected, permit no further excavation, filling, or grading except with the review of and the inspection by the Owner.
2. Use all necessary means to prevent the erosion of freshly graded areas during construction and until such time as permanent drainage and erosion control measures have been installed.

3.10 QUALITY ASSURANCE

A. Coordination:

1. A representative from the Geotechnical Engineer shall be present to always observe and perform tests earthwork is in progress.
2. Contractor shall provide minimum 72 hour notice to Geotechnical Engineer before each operation requiring testing or inspection.

B. Testing:

1. To verify the adequacy of compaction, the Geotechnical Engineer shall perform field density tests.
2. A grid pattern shall be established with a maximum area of 1,000 square feet.
3. For each grid, provide a minimum of one test per each lift of compacted material.

C. Proof rolling:

1. Proof rolling shall be supervised by the Geotechnical Engineer.
2. Since standard test procedures are not available for proof rolling, the necessary scope and method of testing shall be determined by the Geotechnical Engineer, subject to review by the Architect/Engineer.
3. In areas covered by buildings and other site improvements, and other areas deemed necessary by the Geotechnical Engineer or Architect/Engineer, prepare and test subgrade as follows:
 - a. Using a loaded tri-axle dump truck or other approved method, the Contractor shall proof-roll the exposed subgrade under the observation of the Geotechnical Engineer.
 - b. Based on this observation, plus supplemental testing as required, the Geotechnical Engineer shall determine when and where soft, loose or other undesirable materials are to be removed and replaced.

D. Approval and Remediation:

1. When testing and proof rolling indicate proper compaction has been obtained, and after approval from Geotechnical Engineer has been given, continue fill and backfill work until the indicated elevation is achieved.
2. If required density has not obtained, the Contractor shall remove the defective material and repeat operations until the required density is obtained, and approval is given by the Geotechnical Engineer.
3. Cost of material removal, replacement, compaction and re-testing shall be the responsibility of the Contractor.

3.11 SURPLUS SOIL MATERIALS

- A. Unless otherwise indicated or directed by Owner, remove excess soil materials and legally dispose of off-site.

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3.12 JOB COMPLETION

A. Upon completion of the Work of this Section:

1. Remove all trash and debris from earthwork operations.
2. Remove surplus equipment and tools.
3. Leave the site in a neat and orderly condition.
4. Restore all adjacent areas disrupted by earthwork activities to their original condition.

END OF SECTION 31 20 00