

SECTION 02222

EXCAVATION, FILL, BACKFILL, AND GRADING

PART 1 – GENERAL

1.01 SUMMARY

- A. Work Included: Excavating, filling, backfilling, and grading for this work includes, but is not necessarily limited to:
 - 1. Excavating for footings, foundations, roads, and utilities.
 - 2. Placing and compacting all fill and backfill.
 - 3. Placement of granular mat vapor barrier and granular cushion below interior slabs on grade.
 - 4. Placement of crushed stone mat below tank slabs and manhole/vault slabs, basement floors, or other structures where required.
 - 5. Rough and finish grading prior to paving, seeding, etc.
- B. Related Sections and Divisions: Applicable provisions of Division 1 shall govern work in this section.
- C. Allowances:
 - 1. CONTRACTOR shall INCLUDE in the Bid the cost of replacing 600 cubic yards of unsuitable foundation material for structures and roads as defined in this section. The unit price shall include the cost of dewatering and slope stabilization and other incidental items associated with this work. Payment to CONTRACTOR for unsuitable foundation material for structures and roads will be adjusted, add or deduct, based upon the actual unsuitable material excavated (more or less than 200 cubic yards) and the Supplemental Unit Price for replacing unsuitable foundation material. Volume shall be as measured in the ground. Extra payment will not be made for specified undercutting and filling or gravel bedding material required for placing concrete above water level as required under the concrete specifications. The Bid shall include any removal and replacement of excavated material so indicated on the drawings or specified herein.
 - 2. CONTRACTOR shall INCLUDE in the Bid the cost of replacing 50 cubic yards of unsuitable foundation material for utility trenches as defined in this section. The unit price shall include the cost of dewatering and slope stabilization and other incidental items associated with this work. Payment to CONTRACTOR for unsuitable foundation material for utility trenches will be adjusted, add or deduct, based upon the actual unsuitable material excavated (more or less than 50 cubic yards) and the Supplemental Unit Price for replacing unsuitable foundation material. Volume shall be as measured in the ground. Extra payment will not be made for specified undercutting, filling, or bedding. The Bid shall include any removal and replacement of excavated material so indicated on the drawings or specified herein.
 - 3. CONTRACTOR shall INCLUDE in the Bid an allowance of \$7,500 for the cost of field density tests. This allowance shall be adjusted by change order (up or down), based on the actual cost of tests to CONTRACTOR. Cost of additional field density tests required because of suspected or actual nonconformance of the specifications shall be borne by CONTRACTOR and shall not be included in the allowance.

D. Payment:

1. General excavation shall include all excavation specified, undercutting, fill, backfill and grading, and rock excavation, except unsuitable foundation material, as hereinafter described.
2. All general excavation shall be included in the Lump Sum Bid. Changes which require additions to or deductions from the excavation will be adjusted on the basis of the unit price for changes contained in the Contract.

1.02 REFERENCES

- A. ASTM D1557 - Test Methods for Moisture Density Relations of Soils and Soil - Aggregate Mixtures using 10-pound Rammer and 18-inch drop.
- B. Standard Specifications: Unless otherwise indicated, Standard Specifications within this section shall refer to the State of Wisconsin Department of Transportation, Standard Specifications for Highway and Structure Construction, current edition, including all issued supplemental specifications.

1.03 SUBMITTALS

- A. CONTRACTOR shall submit samples of materials proposed for use as fill to soils testing laboratory for analysis of their suitability and for recommendations on moisture content during compaction, compaction methods, or other appropriate information.
- B. CONTRACTOR shall submit sufficient samples of each different type or classification of soil to obtain representative values.

1.04 JOB CONDITIONS

- A. The elevations shown for existing work and ground are reasonably correct, but are not guaranteed to be absolutely accurate. No extras will be allowed because of variations between drawings and actual grades.
- B. Soil borings were made and the logs are included in the Appendix to these Specifications. The information contained on the borings is not guaranteed to be indicative of conditions to be encountered during construction. It is CONTRACTOR's responsibility to make his own investigations. The complete soil report is available for review at the office of ENGINEER, Madison, Wisconsin and at OWNER'S office.

PART 2 – PRODUCTS

2.01 COMPACTED FILL

- A. All fill and backfill material designated to be compacted fill shall be a clean granular material meeting the following gradation requirements:

<u>Sieve Size or Number</u>	<u>% Passing by Weight</u>
4"	100
2"	80-100
#4	60-100
#200	0-10

- B. Native material may be used as compacted fill if it meets the above specification. CONTRACTOR shall determine whether native material meets the above specification. CONTRACTOR shall provide all needed fill material whether from on-site or off-site at no additional cost to OWNER.

2.02 CRUSHED STONE MAT

- A. Crushed stone mat below foundation slabs and footings shall be 3/4-inch clear crushed stone and shall meet all requirements of ASTM C33 size No. 67.

2.03 GRANULAR CUSHION

- A. Granular cushion beneath floor slabs-on-grade shall meet requirements of Section 304 of Standard Specifications for Crushed Aggregate, Wisconsin DOT Gradation No. 3.

2.04 EMBANKMENT FILL

- A. Embankment fill shall contain no stumps, brush, rubbish or other perishable material. The top 12 inches of the earth embankment shall be earthy material free from large stones.

2.05 CONCRETE FILL

- A. Concrete fill shall be Class X concrete as defined in Section 03300 Cast-In-Place Concrete.

2.06 CLAY FILL

- A. Clay fill shall contain at least 25% clay minerals (material finer than 0.002 mm).

PART 3 – EXECUTION

3.01 GENERAL

- A. Prior to all excavating, CONTRACTOR shall become thoroughly familiar with the site and site conditions.

3.02 PROTECTION

- A. CONTRACTOR shall provide all necessary sheeting and shoring including all labor, material, equipment and tools required or as necessary to maintain the excavation in a condition to provide safe working conditions, to permit the safe and efficient installation of all items of Contract work, and to protect adjacent property. CONTRACTOR shall be held liable for any damage which may result to property from excavation or construction operations. Sheet piling and timbers in excavations shall be withdrawn in a manner so as to prevent subsequent settlement of structures.
- B. Nothing in this specification shall be deemed to allow the use of protective systems less effective than those required by the Occupational Safety and Health Administration (OSHA) and other applicable code requirements.

3.03 UTILITIES

- A. Before starting excavations, CONTRACTOR shall locate existing underground utilities in all areas of the work.
- B. If utilities are to remain in place, CONTRACTOR shall provide adequate means of protection during earthwork operations.
- C. Should uncharted or incorrectly charted piping or other utilities be encountered during excavation, consult utility owner immediately for directions.
- D. Cooperate with OWNER and utility companies in keeping respective services and facilities in operation and repair any damaged utilities to satisfaction of utility owner.
- E. CONTRACTOR shall not interrupt existing utilities serving facilities occupied and used by OWNER or others, except when permitted in writing by OWNER.
- F. CONTRACTOR shall demolish and completely remove from the site existing underground utilities indicated to be removed after utility has been capped and sealed.
- G. CONTRACTOR shall accurately locate and record abandoned and active utility lines rerouted or extended on project record drawings.

3.04 FINISH ELEVATIONS AND LINES

- A. CONTRACTOR is responsible for setting and establishing finish elevations and lines.

3.05 EXCAVATION

- A. After the site has been cleared and stripped, the site shall be cut and filled to the indicated subgrade as shown or specified.
- B. All excavated material which does not meet the specification for compacted fill or embankment fill, or meets the specification, but is not required for backfill or fill shall be classified as excess material and shall be placed on site in locations and layout as approved by OWNER and at CONTRACTOR's expense.
- C. All material other than suitable bearing soil or bedrock, as determined by the Project Soils Engineer, shall be removed from under concrete to be poured on ground.
- D. Excavation for all footings, foundation walls, pits, etc. shall be large enough to provide adequate clearance for the proper execution for the work within them.
- E. Excavations scheduled to extend below groundwater shall not be started until the area has been dewatered. See Section 02140 - Dewatering.
- F. No footings or slabs shall bear on the top two feet of existing soil. Where planned subgrade is within two feet of existing grade, remove soils to two feet below existing grade and backfill with compacted fill up to subgrade elevation.

- G. When excavations reach subgrade elevations as shown on the drawings, or as specified herein, the Project Soils Engineer will observe the bottom material. Where, in the opinion of the Project Soils Engineer, unsuitable foundation material is found at the level of the subgrade, original material below the excavation necessary for construction according to grades shown or specified, shall be removed and replaced with material and placing methods as specified under compacted fill and backfill.
- H. Excavations that are undercut beneath the foundation shall extend beyond the perimeter of the foundation one foot plus a distance at least equal to the depth of undercut below footing grade.
- I. CONTRACTOR shall backfill and compact all overexcavated areas.

3.06 PREPARATION OF SUBGRADE

- A. After the site has been cleared, stripped, and excavated to subgrade, thoroughly compact subgrade to the requirements specified for compacted fill below. Scarify and moisture condition the subgrade as recommended by the Project Soils Engineer.
- B. Remove all ruts, hummocks, and other uneven surfaces by surface grading prior to placement of fill.
- C. All slab on grade and road subgrades shall be proofrolled with a heavy rubber-tired construction vehicle (such as a fully loaded, tandem-axle dump truck) in the presence of the Project Soils Engineer.

3.07 COMPACTED FILL AND BACKFILL

- A. All fill and backfill, except as otherwise specified, shall be compacted fill placed to within four inches of the bottom of the topsoil, or to the bottom of the structure, or other improvement.
- B. Unless otherwise noted, structures with a top slab shall not be backfilled until the slab is in place and has reached its specified 28-day strength.
- C. In fill areas above existing grade around structures, compacted fill shall be placed within a minimum of ten feet from the structure.
- D. No fill shall be placed under water or over unsuitable subgrade conditions.
- E. All fill and backfill except embankment fill and clay fill shall be compacted as follows:
 - 1. Class 1 Compaction - This class of compaction shall apply to all fill areas under buildings, structures, piping, bituminous roadway and parking areas, curb and gutter, and backfill within ten feet of structure walls. All compacted material shall be placed in uniform layers not exceeding eight inches in loose thickness prior to compaction. Each layer shall be uniformly compacted to a dry density at least 95% of the maximum dry density as determined by a laboratory compaction test at the optimum moisture content (ASTM Test Designation D1557). Compaction shall be obtained by compaction equipment appropriate for the conditions.
 - 2. Class 2 Compaction - This class of compaction shall be used in excavated areas beyond ten feet of structures without any piping, or adjacent foundations. Material for backfill shall be granular material as specified above. The material shall be deposited,

spread and leveled in layers generally not exceeding 12 inches in thickness before compaction. Each layer of the fill shall be compacted to at least 90% of the maximum dry density (testing same as Class 1). Compaction shall be obtained by compaction equipment appropriate for the conditions.

- F. No frozen material shall be placed nor shall any material be placed on frozen ground.
- G. Four inches of clay fill shall be placed and compacted to at least a firm consistency in areas to be seeded or sodded prior to placement of topsoil.

3.08 EMBANKMENT FILL

- A. Embankment fill may be placed in fill areas to be seeded or sodded if no piping exists in the fill, and the areas are at least 10 feet from any structure.
- B. Embankment fill shall be deposited, spread, and leveled in layers generally not exceeding 12 inches in thickness before compaction. Each layer shall be compacted to the degree that no further appreciable consolidation is evidenced under the action of the compaction equipment. The required compaction shall be obtained for each layer before any material for a succeeding layer is placed thereon. Compaction shall be obtained using the hauling and leveling equipment and in addition tamping rollers, pneumatic-tired rollers, vibratory rollers, or other types of equipment required to produce the desired results.

3.09 CONCRETE FILL

- A. In areas where there is inadequate room for compaction equipment and in other areas as shown or specified, Class X concrete shall be used as fill material.

3.10 GRADING

- A. CONTRACTOR shall perform all rough and finish grading required to attain the elevations shown on the drawings.
- B. Grading Tolerances:
 - 1. Rough Grade: Buildings, parking areas, and sidewalks - ± 0.1 feet.
 - 2. Finish Grade: Granular cushion or crushed stone mat under concrete slabs - ± 0.03 feet.
 - 3. Lawn areas away from buildings, parking areas, and sidewalks - ± 0.25 feet.

3.11 PLACING GRANULAR CUSHION AND VAPOR BARRIER

- A. When subgrade is prepared for slab on grade areas, CONTRACTOR shall place the vapor barrier.
- B. A six-inch layer of granular cushion shall then be placed, compacted, and finish graded.

3.12 PLACING CRUSHED STONE AND GEOTEXTILE FABRIC

- A. The same day that the subgrade is exposed, place geotextile fabric on subgrade and place 12 inches of crushed stone mat below tank slabs, manholes, vault slabs, and basement floors. Compact in place.

3.13 COMPACTION TESTING

- A. Compaction tests shall be done by the Project Soils Engineer. Location and frequency of the tests shall be as recommended by the Project Soils Engineer and paid for by CONTRACTOR per field density testing allowance.

END OF SECTION