

DIVISION 3

SECTION 02315 - EXCAVATION AND EMBANKMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. This work shall consist of excavation, embankment fill, disposal of excess material, shaping, and compaction of all material encountered within the limits of work, including excavation and backfill for structures. The excavation shall include, but is not limited to, the native soils which must be excavated for the project work. All work shall be completed in accordance with these Specifications and the lines and grades on the Drawings.

1.02 DEFINITIONS

- A. Unclassified Excavation shall consist of the excavation of all materials on site to final grades, excluding the bid items included in section 02220. Excavation of unsuitable material will only be paid for if it is found to be unsuitable in its original state.
- B. Muck Excavation shall consist of the removal and disposal of mixtures of soils and organic matter not suitable for foundation material and replacement with approved material. Material damaged due to rain or weather will not be paid for as Muck excavation and is entirely the responsibility of the CONTRACTOR.
- C. Rock Excavation shall consist of igneous, metamorphic and sedimentary rock which cannot be excavated without the use of rippers, and all boulders or other detached stones each having a volume of 1/2 cubic yard or more, as determined by physical or visual measurement. It shall also include replacement with approved material as required.
- D. Embankment (Complete in Place): shall consist of placing all excavated material, except material being hauled and disposed, as embankment and compacted to final grades as specified in the Contract Documents and on the Drawings.

1.03 DESCRIPTION

- A. This work shall consist of excavation, disposal, placement, and compaction of all material encountered within the limits of the work, and not being completed under some other item, necessary for the construction of the project in accordance with the Specifications and the lines, grades, and typical cross-sections shown on the Drawings. All excavation will be classified, “unclassified excavation”, or “muck excavation” or “rock excavation”, as hereafter described. All embankment will be classified “embankment material” as hereafter described.

1.04 RELATED SECTIONS

- A. Section 02240 – Water Control and Dewatering

1.05 QUALITY ASSURANCE

- A. Final topography and/or cross-sections will be surveyed of areas that are to finished grade and compared to the design section for accuracy. Final grade shall match design grades within the tolerances discussed in PART 3 EXECUTION.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Embankment material may consist of approved material acquired from excavations or material hauled from outside the project limits. Suitable material identified on-site shall be used first for embankments and backfill. Excess excavated native soils which are not used as embankment or backfill shall become the property of the CONTRACTOR and shall be disposed of off-site by the CONTRACTOR, in a location acceptable to the ENGINEER.
- B. Muck excavation encountered in all areas other than within the lakes shall also include the replacement of excavated muck with uniformly graded rock, riprap, on-site or imported soils, or other material whichever is most suitable for the specific situation encountered. The ENGINEER will determine which type of aggregate or other material which shall be used after observing the specific site conditions.

PART 3 EXECUTION

3.01 GENERAL EXCAVATION/EMBANKMENT

- A. General: The excavation and embankment for the project work shall be finished to reasonably smooth and uniform surfaces. Variation from the subgrade plane shall not be more than .08 feet in soil or more than .08 feet above or .50 below in rock. Materials shall not be wasted without permission of the ENGINEER. Excavation operations shall be conducted so that material outside of the limits of slopes will not be disturbed.
- B. When the CONTRACTOR's excavating operations encounter remains of pre-historic people's dwelling sites or artifacts of historical or archaeological significance, the operations, shall be temporarily discontinued. The ENGINEER will contact archaeological authorities to determine the disposition thereof. When directed, the CONTRACTOR shall excavate the site in such a manner as to preserve the artifacts encountered and shall remove them for delivery to the custody of the proper state authorities. Such excavation will be considered and paid for as extra work.

C. Excavation:

- 1. Unclassified: All excess suitable material excavated from the project site and not used for embankment shall be removed from the project site and become the property of the CONTRACTOR. Where material encountered within the limit of the work is considered unsuitable for embankment (fills) on any portion of this project work, such material shall be excavated as directed by the ENGINEER and replaced with suitable fill material. All unsuitable excavated material from excavation consisting of any type of debris (surface or buried), excavated rock, bedrock or rocks larger than 6 inches in diameter and boulders shall be hauled from the project site and disposed of. Debris is defined as "anything that is not earth which exists at the job site".
- 2. Muck: Where excavation to the finished grade section results in a subgrade or slopes of unsuitable soil, the ENGINEER may require the CONTRACTOR to remove the unsuitable materials and backfill to the finished graded section with approved material. Disposal of the material shall be at the CONTRACTOR's expense.

Good surface drainage shall be provided around all permanent cuts to direct surface runoff away from the cut face.

Rock: Unless otherwise specified, rock shall be excavated to a minimum depth of 0.5 feet below subgrade within the limits of the channel area, and the excavation shall be backfilled with material shown on the Drawings or as designated by the ENGINEER. Disposal of material and replacement with suitable approved material shall be at the CONTRACTOR's expense.

- D. Embankment Construction: Embankment construction shall consist of constructing all fill areas, including preparation of the areas upon which they are to be placed, and the placing and compacting of embankment material in holes, pits and other depressions within the project area. Only approved materials shall be used in the construction of embankments and backfills.

Approved materials shall consist of clean on-site cohesive soils or approved imported soils. On-site cohesive soils are suitable for use as compacted fill provided the following recommendations are met:

Excavation and Embankment will only be paid when a significant change in grade is required, as determined by the ENGINEER. Minor cuts and fills will be considered incidental to the work, and will not be paid for separately under this section.

Percent Finer by Weight

<u>Gradation</u>	<u>(ASTM C136)</u>
½-Inch	100
3/8-Inch	70 – 100
No. 4 Sieve	50 – 100
No. 200 Sieve	60 (min)

Percent Finer by Weight

<u>Gradation</u>	<u>(ASTM C136)</u>
• Liquid Limit	35 (max)
• Plasticity Index	20 (max)
• In-Situ Coefficient of Permeability	1x10 ⁻⁶ cm/sec

On-site cohesive soils or imported soils should be placed and compacted in horizontal lifts, using equipment and procedures that will produce recommended moisture contents and densities throughout the lift and embankment height. On-site or imported cohesive soils should be compacted within a moisture content range of 2% below, to 2% above optimum moisture content and compacted to 95% of the Maximum Standard Proctor Density (ASTM D698).

When embankment is to be placed and compacted on hillsides, or when new embankment is to be compacted against existing embankments, or when embankment is built 1/2 width at a time, the slopes that are steeper than 4:1 when measured longitudinally or at right angles to the adjacent ground shall be continuously benched over those areas where it is required as the work is brought up in layers. Benching shall be well keyed and where practical a minimum of 8 feet. Each horizontal cut shall begin at the intersection of the original ground and the vertical sides of the previous cuts. Material thus cut out shall be recompacted along with the new embankment material at the CONTRACTOR’s expense.

The ground surface underlying all fills shall be carefully prepared by removing all organic matter, scarification to a depth of 8 inches and recompacting to 95% of the Maximum Standard Proctor Density (ASTM D698) at optimum moisture content + or - 2% prior to fill placement.

Embankment material shall be placed in horizontal layers not exceeding 8 inches (loose measurement) and shall be compacted to 95% of the Maximum Standard Proctor Density (ASTM D698) at optimum moisture content + or - 2%. Effective spreading equipment shall be used on each lift to obtain uniform thickness prior to compacting. As the compaction of each layer progresses, continuous leveling and manipulating will be required to assure uniform density.

For embankments which serve as berms, the downstream portion shall be “keyed” into the subsurface soils a minimum of 3 feet to enhance the stability of the slope.

Materials which are removed from excavations beneath the water table may be over the optimum moisture content and will require that they be dried out prior to reusing them.

Cross hauling or other action as appropriate will be ordered when necessary to insure that the best available material is placed in critical areas of embankments, including the top 2 feet of all embankments. No additional payment will be made for cross hauling ordered by the ENGINEER.

Frozen materials shall not be used in construction of embankments.

During the construction of the channels, the channel bottom shall be maintained in such condition that it will be well drained at all times.

Excavation or Embankment (Fill), and Structural Backfill work either completed or in a stage of completion that is either eroded or washed away or becomes unstable due to either rains, snow, snow melt, channel flows or lack of proper water control shall be either removed and replaced, recompact or reshaped as directed by the ENGINEER and in accordance with the Drawings and Specifications at the CONTRACTOR's sole expense. Removed unsuitable materials shall be hauled away and disposed of at the CONTRACTOR's expense. Placing of replacement materials for removed unsuitable materials shall be purchased, placed and compacted at the CONTRACTOR's expense.

- E. Proof rolling with a heavy rubber tired roller will be required, if designated on the Drawings or when ordered by the ENGINEER. Proof rolling shall be done after specified compaction has been obtained. Areas found to be weak and those areas which failed shall be ripped, scarified, wetted if necessary, and recompact to the requirements for density and moisture at the CONTRACTOR's expense.

Proof rolling shall be done with equipment and in a manner acceptable to the ENGINEER. Proof rolling as shown on the Drawings or as ordered by the ENGINEER shall not be measured and paid for separately, but shall be included in the unit prices bid for the work.

END OF SECTION