

SECTION 2200

EARTHWORK

PART 1 - GENERAL

1.1 Description

A. Description of Work

The work to be performed in accordance with this section includes excavation, fill, borrow, spoil and compaction for roadways, structures, channels and embankments. The work shall include the furnishing of all labor, tools, equipment, materials and the performing of all operations required to provide a complete item in accordance with the project plans and these specifications.

B. Related Work Specified Elsewhere

Clearing and Grubbing..... Section 2100
Removal of Existing Improvements Section 2110
Trench Excavation and Backfill..... Section 2300
Subgrade Preparation..... Section 2600

1.2 Quality Assurance

A. Reference Test Standards and Specifications

ASTM D698, Test Methods for Moisture Density of Soils and Soil-Aggregate Mixtures Using 5.5 lb. Rammer and 12-inch Drop.

ASTM D1556, Density of Soil in Place by the Sand-Cone Method.

ASTM D6938-08a, Density of Soil and Soil-Aggregate in Place by Nuclear Methods.

ASTM D6938-08a, Moisture Content of Soil and Soil-Aggregate in Place by Nuclear Methods.

Rock Correction Procedure for Maximum Density Determination, ARIZ 227.

B. Frequency of Testing

- 1.** Maximum Dry Density and Optimum Moisture Content, ASTM D698.
 - a.** One test for each different class or type of material shall be provided by the **CONTRACTOR** prior to any earthwork operations.
 - b.** **CONTRACTOR** shall provide additional test when previous test is suspect, due to subtle changes in the material, as determined by the **OWNER**.
- 2.** Density of Soil In-Place by the Sand Cone or by Nuclear Methods, ASTM D1556 or D6938-08a.
 - a.** **OWNER** will perform a minimum of one test per lift per 5,000 square yards per each type of material.
 - b.** **OWNER** will perform additional tests as required to ensure proper compaction.

C. Testing Tolerances

1. Relative Percent Compaction

Not less than as specified on plans or in these specifications.

2. In-Place Moisture Content

As required to achieve minimum relative compaction.

3. Soft or Yielding Surfaces

Regardless of the percent compaction obtained by test, areas which are soft and yield under the load of construction equipment are to be removed and replaced at no additional cost.

1.3 Submittals

A. Materials Test Reports

Report on maximum dry density and optimum moisture content of soils proposed for use in the work prior to beginning of construction.

B. Disposal Area

Provide the location of the disposal area(s) and provide written approval for the use of the area(s) for disposing of excess soils from the operation. Work performed at the disposal areas shall meet all local codes and ordinances.

PART 2 - MATERIALS

2.1 Soil and Soil Aggregate Materials

A. Unsuitable materials not to be incorporated in the work.

1. Organic matter such as peat, mulch, organic silt or sod.
2. Soils containing expansive clays.
3. Material containing excessive moisture.
4. Poorly graded coarse material.
5. Material with particle sizes in excess of 12 inches.
6. Material which will not achieve density and/or bearing requirements.
7. Asphalt concrete or Portland cement concrete that does not conform to 3.5 Engineered Fill under Section 2200, Earthwork.

2.2 Earthwork Balance

No attempt has been made to estimate cut and fill earthwork quantities. The **CONTRACTOR** is solely responsible for the estimation of the earthwork quantities required to construct the project as indicated on the plans and described herein.

PART 3 - EXECUTION

3.1 Preliminary Investigation of the Work

Verify that all preliminary work including clearing, grubbing and staking has been performed in accordance with these specifications prior to earthwork operations.

3.2 Blasting

No blasting will be permitted unless approved by the **OWNER**. All permits shall be obtained by the **CONTRACTOR** at his own expense.

3.3 Spoil Disposal Area

Disposal of surplus excavated material shall be in an approved spoil area, outside of the project right-of-way. Make all arrangements necessary for disposal of material at an off-site location. The disposal of surplus materials in the designated area shall meet all local codes and ordinances.

3.4 Excavation

A. Unsuitable Material

Overexcavate existing unsuitable material below the lower limit of excavation to a depth that will provide adequate bearing, as determined by the **OWNER**. Remove unsuitable material from the site and dispose of the material at approved spoil area. Replace the overexcavated material with suitable material in accordance with Subsection 3.5 Engineered Fill.

B. Slides and Slipouts

Excavate and grade material outside the finished work which is unstable, or which has slipped out, to the slope and elevation determined by the **OWNER**. Dispose of excess material at approved spoil disposal area.

C. Slopes

Finish excavation slopes to the lines and grades shown on the plans. Remove all debris and loose materials. Round all grade breaks and slope transitions. Finish elevations on slopes shall not deviate from the plan elevation by more than ".25 feet. Variations from the plan grade and cross section shall be compensating so that the average

grade and cross section are obtained.

D. Foundation Excavation

1. Cast in Place Concrete on Rock

Remove sufficient depth of rock surface to expose sound rock. Cut rock to approximate horizontal and vertical steps to provide minimum dimensions. Grout seams and faults in rock surfaces as directed by the **OWNER**.

2. Cast in Place Concrete on In-Situ Soil

Excavate to the lines shown such that the surface on which the concrete is to rest is undisturbed native material with no loose materials or debris. Replace overexcavation with concrete as specified for the structure.

E. Roadway Excavation

Remove the existing pavement and excavate the existing base course and subgrade materials to the new subgrade elevation. Excavate to the cross section as shown on the plan. Prepare the existing soil at the new subgrade elevation in accordance with Section 2600, Subgrade Preparation.

F. Shoring and Sheeting

Provide such bracing, sheeting or shoring necessary to perform and protect the excavation as required for safety. Shore, sheet and brace excavations as set forth in the rules, orders and regulations of the United States Department of Labor Occupational Health and Safety Administration (OSHA). Provide detailed plan and calculations as prepared by a registered professional engineer for excavations 20 feet in depth or greater or when shoring, sheeting or bracing deviates from OSHA standards. Place and remove shoring, sheeting and bracing so as not to damage adjacent improvements, utilities or utility being placed. Costs for shoring, sheeting and bracing to be incidental to the other items.

3.5 Engineered Fill

A. Subgrade Preparation

Prior to fill placement, plow or scarify the surface to a minimum depth of 6 inches. Moisture condition and compact surface to 95 percent of the maximum density in accordance with Section 2600, Subgrade Preparation.

B. Moisture Conditioning

Condition the soil by aerating or wetting to obtain the moisture content required to achieve the relative percent compaction. Mix the soil such that the moisture content is uniform throughout the lift.

C. Fill Placement

1. Lift Thickness

The uncompacted lift thickness shall not exceed eight (8) inches. When material contains more than 25 percent of rock larger than six (6) inches, the uncompacted lift thickness shall not exceed the maximum particle size dimension.

2. Rock Fill

Rock, broken portland cement concrete and crushed asphalt concrete is permitted in fill areas when conforming to the following:

- a.** Place earth or other fine material around the interstices of the pieces to form a dense fill layer. Nesting is not permitted.
- b.** Do not place pieces larger than 4 inches closer than 12 inches from any structure.
- c.** Do not place pieces larger than 2-1/2 inches closer than 12 inches from the finish subgrade.
- d.** Existing asphalt concrete conforming to these requirements for rock fill may be used as fill material only in areas to receive pavement.

3. Benching

When fill is to be placed and compacted on slopes steeper than 5:1 or where new fill is to be compacted against existing fill or where embankment is built 1/2 width at a time, the slopes of original and old or new fills shall be benched as the fill is placed. A new bench shall be started wherever the vertical cut of the next lower bench intersects the existing ground. Material thus cut out shall be recompacted along with the new embankment material by the **CONTRACTOR** at no additional cost. The vertical bench cut shall not exceed three (3) feet.

D. Compaction

1. Compaction Methods

Water consolidation will not be permitted.

2. Percent Relative Compaction

Compact fill and backfill as indicated on the plan. When not indicated on the plan, compact as specified herein.

a. 95% of maximum dry density

- 1.** Areas to receive fill
- 2.** Areas to receive structures, including pavement, upper two feet of fill
- 3.** Structural backfill

b. 90% of maximum dry density

- 1.** All other areas

PART 4 - MEASUREMENT AND PAYMENT

4.1 Measurement

A. No measurement will be made for the item, Earthwork.

B. Overexcavation

Overexcavation shall be measured by the cubic yard. The quantity

will be computed by the average end area method. The end area is that bound by the original ground line established by field cross sections and the final theoretical pay line established by cross sections shown on the plans subject to verification by the **OWNER**. After completion of all operations and prior to the placing of base or subbase material, the final embankment shall be verified by the **OWNER** by means of field cross sections taken randomly at intervals not exceeding 500 linear feet.

Final field cross sections shall be employed if the following changes have been made:

1. Plan width of embankments or excavations are changed by more than plus or minus 1.0 foot; or
2. Plan elevations of embankments or excavations are changed by more than plus or minus 0.5 foot.

4.2 Payment

A. Earthwork

Payment for earthwork will be made at the contract lump sum price. The lump sum payment shall be full compensation for excavation of existing materials to the new subgrade elevation, subgrade preparation, fill placement, waste, borrow, hauling, and testing required to complete the item. The item shall be full compensation for all materials; for all preparation, hauling, and placing of these materials; and for all labor, equipment, tools, and incidentals necessary to complete the item.

B. Overexcavation

Payment for overexcavation will be made at the contract cubic yard price. The payment shall be full compensation for excavating the existing material to the depth and section required, hauling and wasting the overexcavated material and backfilling with suitable material. This item shall be full compensation for all work including furnishing all materials; for all preparation, hauling, and placing of these materials; and for all labor, equipment, tools, and incidentals necessary to complete the item.

The quantity of this item listed in the bid schedule represents no actual estimate, is nominal only, and may be greatly increased or decreased or reduced to zero. The increase or reduction of this quantity as compared with that set forth in the bid schedule shall not constitute a basis for claim by the **CONTRACTOR** for extra payment or damages.

See Section 00310 Bid Schedule for Bid Items.