

SECTION 02200 - ENGINEERED FILL

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SECTION 02200 - ENGINEERED FILL

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Site preparation
- B. Placing and compacting fill material
- C. Excavation
- D. Slope repair
- E. Buttress fill
- F. Treatment after completion of grading

1.02 RELATED REQUIREMENTS

- A. Section 02100, "Clearing, Grubbing, and Site Preparation"
- B. Section 02210, "Site Grading"
- C. Section 02410, "Subsurface Drains"

1.03 REFERENCE STANDARDS

- A. State Specifications

1.04 QUALITY ASSURANCE

- A. All work under this section will be subject to the inspection and approval of both the Engineer and an approved geotechnical engineer registered in California. Compaction testing either shall be performed by the geotechnical engineer or by a City approved independent testing laboratory under the supervision of a California registered geotechnical engineer.
- B. The geotechnical engineer shall make enough visits to the site to insure ongoing familiarity with the progress and quality of the work. The geotechnical engineer shall make a sufficient number of field observations and tests to allow the forming of an opinion regarding the adequacy of the site preparation, the acceptability of the native or import fill material, and the extent to which the degree of compaction meets the specification requirements and the project needs.

- C. Any fill where the site preparation, type of material, or compaction is not approved by the geotechnical engineer shall be removed and/or recompacted until the requirements are satisfied and approved by said geotechnical engineer. As required, fill material shall be tested for pollutants and certified for suitability by the geotechnical engineer.
- D. On City-funded Projects, services of the geotechnical engineer and/or testing laboratory shall be retained by, and paid for by the City. On all other projects, the geotechnical engineer and/or testing laboratory shall be retained by, and paid for by the developer. For City-funded Projects, testing will be paid for by the City; however, testing or retesting caused by unsatisfactory contract operations shall be paid for by the Contractor.
- E. The geotechnical engineer shall provide quality assurance reports as required and accepted by the Engineer.

1.05 MEASUREMENT AND PAYMENT

- A. Engineered fill shall be paid for by the Lump Sum or on a unit cost based on the finished volume measured from the grade before and after, tonnage by weight slips, as shown on the Bid Schedule, which price includes full compensation for clearing and stripping the site material, if necessary; excavating, loading, hauling, depositing, spreading, and compacting the material in place within the area specified.
- B. The above price and payment shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals, and for doing all the work involved in obtaining and placing imported fill, complete in place, as shown on the plans and as specified and approved by the Engineer.

1.06 DEFINITION OF TERMS

- A. ASTM Specifications: The latest volume of ASTM Standards (Part 19) of the American Society for Testing and Materials, latest revision.
- B. Buttress Fill: Buttress fill is an engineered support structure with parameters based upon a slope stability analysis. The key width and depth, the buttress height and mass are designed by a geotechnical engineer to support a slope that has a potential for failure. Subdrains are necessary and the filter material shall be designed by the geotechnical engineer.
- C. Degree of Compaction: The ratio, expressed as a percentage, of the dry density of the fill material as compacted in the field relative to the maximum dry density for the same material as determined by Test Method Number California 231-E or ASTM D 1557.
- D. Engineered Fill: Engineered fill is a fill upon which the geotechnical engineer have made sufficient tests and observations to enable them to issue a statement that, in

their opinion, the fill has been placed and compacted in accordance with the specification requirements and to the satisfaction of the Engineer.

- E. Fill: Fill is all soil or soil/rock materials placed to raise the grade of the site to finish grade.
- F. Import Material: Material hauled in from off-site areas.
- G. Maximum Laboratory Density: The maximum density of a given fill material that can be produced in the laboratory by the Standard Procedure ASTM D 1557, "Moisture-Density Relations of Soils Using 1 10-Pound (4.5 kg) Rammer and an 18-Inch (457 mm) Drop" (AASHTO Test T-180, "Moisture-Density Relations of Soils Using a 10-Pound Rammer and an 18-Inch Drop").
- H. On-Site Material: Material obtained from the required excavations on the site.
- I. Optimum Moisture Content: The moisture content at which the maximum laboratory density is achieved using the standard compaction procedure ASTM Test Designation D 1557 (AASHTO Test T-180).
- J. Select Material: Soil material meeting the requirements set forth in these specifications.
- K. Soils Report: A report prepared specifically for the project by a geotechnical engineer. The Soils Report shall be made a part of these specifications by reference.

1.07 SITE CONDITIONS

- A. The Contractor shall be familiar with the soil conditions on the site, whether covered in the Soils Report or not, and shall thoroughly understand all recommendations associated with the grading. The Contractor shall obtain all necessary permits, including DOSH permits.

PART 2 - PRODUCTS

2.01 GENERAL

- A. All fill material shall be in conformance with applicable requirements of Section 19, "Earthwork," of the State Specifications. Imported material shall conform to the requirements for harmful contaminants test for pollutants.

2.02 GENERAL ENGINEERED FILL

- A. All fill material must be approved by the geotechnical engineer. The material for fill shall be a soils or soil/rock mixture that is free from organic matter or other deleterious substances. The fill material shall not contain rocks or lumps over six inches (6") in greatest dimension, and not more than fifteen percent (15%) by dry weight shall be larger than two and one-half inches (2-1/2") in greatest dimension.

2.03 SELECT FILL MATERIAL BENEATH FLOOR SLABS

- A. In addition to the requirements above, select material, when called for on the plans and for use under floor slabs, must conform to the following minimum requirements:

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- B. In addition to the requirements of "A", above, select material for use in buttress fills shall be non-plastic and shall have an "R" value of at least thirty (30). For non-traffic areas, the select material for buttress fills shall be approved by the geotechnical engineer.

2.04 GEOTECHNICAL REPORT

- A. The geotechnical report for the project shall be made part of these specifications.

PART 3 - EXECUTION

3.01 GENERAL

- A. Work done under this Section shall meet the applicable requirements of Section 19, "Earthwork," of the State Specifications. The Contractor shall cut, fill, import, or export materials as required to meet the lines and grades for subgrade or grade as shown on the plans.

3.02 SITE PREPARATION

- A. After stripping, the areas to be filled shall be over-excavated to the minimum depth called for on the plans or that is required by the geotechnical engineer. The over-excavated soil that is clean and free from organic material can be used later as engineered fill. In general, the depth of over-excavation required in low areas of the site shall be two feet (2').
- B. After stripping the surface vegetation and over-excavating to the required depths, the exposed surface shall be scarified to a minimum depth of six inches (6"), watered or aerated as necessary to bring the soil to a moisture content that will permit proper compaction, and compacted to the requirement of engineered fill as specified. Prior to placing fill, the Contractor shall obtain the geotechnical engineer's approval of the site preparation in the area to be filled.

- C. All fills within thirty feet (30') of a fill slope, or where fills are placed on natural slopes inclined five (5) horizontal to one (1) vertical or steeper, shall be founded on natural undisturbed soil below the natural surface. An excavation shall be made at the toe of the fill slope to form a key having a width equal to the width of the equipment (as a minimum). The key shall be excavated a minimum depth of four feet (4') and into the underlying undisturbed rock or natural undisturbed soil, if approved by the geotechnical engineer. Excavations shall be made into the natural undisturbed soil to form level benches upon which to place the fill, as recommended in the geotechnical report.
- D. Prior to placing the fill, subdrains, if required, shall be installed at the locations indicated in the geotechnical report and as directed by the geotechnical engineer. Subdrains shall be constructed as specified in Section 02410, "Subsurface Drains," of these specifications, and the extent of the subdrains shall be as directed by the geotechnical engineer.

3.03 PLACING AND COMPACTING FILL MATERIAL

- A. All fill material shall be compacted as specified or by other methods, if approved by the geotechnical engineer, to produce a minimum degree of compaction of ninety percent (90%). Fill material shall be spread in uniform lifts not exceeding eight inches (8") in thickness. Before compaction begins, the fill shall be brought to a water content that will permit proper compaction by either aerating the material if it is too wet, or spraying the material with water if it is too dry. Each lift shall be thoroughly mixed before compaction to ensure a uniform distribution of water content.
 - 1. Lift thickness requirements may be modified by the geotechnical engineer to suit equipment and materials or other conditions when required to assure satisfactory compaction.
 - 2. Moisture-condition fill material by aerating or watering and thoroughly mix material to obtain moisture content permitting proper compaction.
 - 3. Place and compact each layer of fill to indicated density before placing additional fill material. Repeat filling until proposed grade, profile, or contour is attained.
 - 4. Suspend fill operations when satisfactory results cannot be obtained because of environmental or other unsatisfactory site conditions. Do not place fill material on muddy or frozen subgrade surface.
 - 5. Maintain surface conditions which permit adequate drainage of rainwater and prevent ponding of surface water in pockets. When fill placement is interrupted by rain, remove wet surface materials or permit to dry before placing additional fill material.
- B. Place backfill material in uniform layers not greater than eight inches (8") loose thickness over entire backfill area.

1. Use hand tampers or vibrating compactors at foundation walls, retaining walls, and similar locations. Do not use large rolling equipment adjacent to foundation walls and retaining walls.
 2. Do not backfill against foundation walls or retaining walls until walls for bearing surfaces have reached design strength or are properly braced, and backfilling operations approved. Provide clean backfill materials or granular materials as required. Compact in maximum eight-inch (8") layers.
- C. Fill all areas of settlement to proper grade before subsequent construction operations are performed.
- D. Compaction
1. Provide compaction control and request testing and inspection of all fill and backfill.
 2. Unless specifically approved by the Engineer, water settling, puddling, and jetting of fill and backfill materials, as a compaction method is not acceptable.
 3. Maintain moisture content of materials during compaction operations within required moisture range to obtain indicated compaction density.
 4. Provide adequate equipment to achieve consistent and uniform compaction of fill and backfill materials.

3.04 EXCAVATION

- A. All excavation shall be carefully made true to the grades and elevations shown on the plans. The excavated surfaces shall be properly graded to provide positive drainage during construction and to prevent ponding of water.

3.05 SLOPE REPAIR

- A. Where slide areas are to be repaired, the entire slide mass shall be excavated to a depth below the slide plane and to a depth where undisturbed rock is encountered. The depth of the excavation shall be approved by the geotechnical engineer. After the slide mass has been completely removed to the approved depth, the exposed material shall be keyed and benched as specified and the subdrains shall be installed as directed by the geotechnical engineer and as specified in the subdrain specifications. When this is done, the excavations shall be backfilled with engineered fill compacted in accordance with this specification.

3.06 BUTTRESS FILLS

- B. Where buttress fills are to be constructed, a key shall be excavated below the toe of the planned slope to the design depth as shown on the plans or where strong, undisturbed soil is encountered. The final depth of the excavations shall be approved by the geotechnical engineer. The key shall extend back horizontally for the minimum specified distance or until strong rock is encountered. Where strong rocks form level surfaces upon which to place the fill, the exposed surfaces shall be scarified and recompactd as described.
- C. Subdrains shall be installed as directed by the geotechnical engineer and as specified in the specifications for subsurface drains. When this is done, the excavation shall be backfilled with engineered fill compacted in accordance with these specifications. Typical buttress fill shall be constructed as shown on the detail plans and at location shown on the site plan presented by the geotechnical engineer.

3.07 TREATMENT AFTER COMPLETION OF GRADING

- A. After grading is completed and the geotechnical engineer has finished observation of the work, no further excavation or filling shall be performed.
- B. It shall be the responsibility of the Contractor to prevent erosion of freshly graded areas during construction and until permanent drainage and erosion control measures have been installed.

End of Section