

SECTION 312000 - EARTH MOVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Geotechnical Report: Become familiar with the geotechnical report created for this project as well as all other available geotechnical reports related to this site.

1.2 SPECIFICATIONS

- A. FAA Advisory Circular 150/5370-10C "STANDARDS FOR SPECIFYING CONSTRUCTION OF AIRPORTS".
- B. FAA Advisory Circular 150/5320-6D "AIRPORT PAVEMENT DESIGN AND EVALUATION".
- C. All other FAA Specifications.
- D. Geotechnical Report.

1.3 SUMMARY

- A. Section Includes:
 - 1. Preparing subgrades for slab-on-grade pavement.
 - 2. Drainage course for concrete slabs-on-grade.
 - 3. Engineered Fill for concrete pavements.
- B. Related Sections:
 - 1. Division 31 Section 311000 "Site Clearing" for site stripping, grubbing, stripping, and stockpiling topsoil, and removal of above- and below-grade improvements and utilities.
 - 2. Division 31 Section 312319 "Dewatering" for lowering and disposing of ground water during construction.

1.4 DEFINITIONS

- A. Backfill: Soil material used to fill an excavation.
 - 1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
 - 2. Final Backfill: Backfill placed over initial backfill to fill a trench.
- B. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.
- C. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

- D. Drainage Course: Aggregate layer supporting the slab-on-grade that also minimizes upward capillary flow of pore water.
- E. Engineered Fill: Soil materials either processed on or off site to meet certain specifications for being used as a fill material above subgrade layer and usually below an aggregate base and or pavement layer. Sometimes referred to as Subbase Course.
- F. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.
 - 1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Engineer. Authorized additional excavation and replacement material will be paid for according to Contract provisions for unit prices, and or changes in the Work.
 - 2. Bulk Excavation: Excavation more than 10 feet (3 m) in width and more than 30 feet (9 m) in length.
 - 3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Engineer. Unauthorized excavation, as well as remedial work directed by Engineer, shall be without additional compensation.
- G. Fill: Soil materials used to raise existing grades.
- H. Rock: Rock material in beds, ledges, unstratified masses, conglomerate deposits, and boulders of rock material 3/4 cu. yd. (0.57 cu. m) or more in volume that exceed a standard penetration resistance of 100 blows/2 inches (97 blows/50 mm) when tested by a geotechnical testing agency, according to ASTM D 1586.
- I. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.
- J. Subgrade: Uppermost surface of an excavation on top of which a combination of Engineered Fill, Aggregate Base, and or new pavement will be placed.
- K. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.5 SUBMITTALS

- A. Qualification Data: For qualified testing agency.
- B. Material Test Reports: For each on-site and borrow soil material proposed for fill and backfill as follows:
 - 1. Classification according to ASTM D 2487.
 - 2. Laboratory compaction curve according to ASTM D 1557.
- C. Pre-excavation Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by earth moving operations. Submit before earth moving begins.

1.6 QUALITY ASSURANCE

- A. Geotechnical Testing Agency Qualifications: Qualified according to ASTM E 329 and ASTM D 3740 for testing indicated.

1.7 PROJECT CONDITIONS

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and all airport related activities including aircraft moving from runways to the taxiways, apron, hangar buildings and terminal building.
 - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from the San Bernardino International Airport Authority and authorities having jurisdiction.
 - 2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.
 - 3. Contact San Bernardino Airport Authority immediately if some previously unapproved construction activity will result in the complete or partial obstruction of one or more taxiways.
 - 4. Construction is subject to being stopped at any time by the San Bernardino International Airport Authority if access to the runway, taxiways and or apron area is compromised.
- B. Utility Locator Service: Notify utility locator service for area where Project is located before beginning earth moving operations.
- C. Do not commence earth moving operations until temporary erosion- and sedimentation-control measures are in place.
- D. Existing Utilities: Do not interrupt utilities serving facilities occupied by the Airport or others unless permitted in writing by the San Bernardino International Airport Authority, and then only after arranging to provide temporary utility services according to requirements indicated.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

- A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.
- B. Satisfactory Soils: Soil Classification Groups GW, GP, GM, SW, SP, and SM according to ASTM D 2487; free of rock or gravel larger than 3 inches (75 mm) in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.
 - 1. Liquid Limit: Less than or equal to 15%
 - 2. Plasticity Index: Less than or equal to 30%
- C. Unsatisfactory Soils: Soils not meeting the requirements of Engineered Fill. More generally, unsatisfactory soils are also classified as follows:
 - 1. Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D 2487.

2. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.
- D. Engineered Fill: Comply with Standard Specifications for Public Works Construction (Greenbook) criteria for structure backfill. Import material shall consist of clean, non-expansive, granular material which conforms with the latest edition of "Greenbook" Standard Specifications for Public Works Construction for structure backfill. "Non-expansive" is defined as soil having an EI of 50 or less in accordance with UBC Standard 18-2 (ICBO, 1997). Soil shall also be tested for corrosive properties prior to importing. Imported materials shall satisfy the Caltrans (2003) criteria for non-corrosive soils (i.e., soils having a chloride concentration of 500 parts per million [ppm] or less, a soluble sulfate context of approximately 0.20 percent (2,000 ppm) or less, and a pH value of 5.5 or higher).
 - E. Sand: ASTM C 33; fine aggregate.
 - F. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.
 - G. Asphalt Grindings: Asphalt grindings from this or any other site may not be used as any type of fill material.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect structures, utilities, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth moving operations.
- B. Protect and maintain erosion and sedimentation controls during earth moving operations.
- C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.
- D. Pavement Subgrade Preparation: All subgrade that will lie under new pavement shall be firm and not yielding. Refer to section 321313 "CONCRETE PAVING" for information regarding proof rolling.
- E. Protect subgrade from drying caused by weather, traffic, or other uses.

3.2 DEWATERING

- A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.
- B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.
 1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.

3.3 EXCAVATION, GENERAL

- A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.
 - 1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.

3.4 EXCAVATION FOR PAVEMENTS

- A. Excavate surfaces under pavements to indicated lines, cross sections, elevations, and subgrades. Extend excavations for placing and removing concrete formwork, for installing services and other construction, and for inspections.

3.5 SUBGRADE INSPECTION

- A. Notify Engineer when excavations have reached required subgrade.
- B. If Engineer determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.
- C. Proof-roll subgrade pavements with any pneumatic-tired vehicle weighing not less than 15 tons (13.6 tonnes) to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
 - 1. Completely proof-roll subgrade in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph (5 km/h).
 - 2. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Engineer, and replace with compacted backfill or fill as directed.
- D. Authorized additional excavation and replacement material will be paid for according to Contract provisions for unit prices and or changes in the Work.
- E. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Engineer, without additional compensation.

3.6 STORAGE OF SOIL MATERIALS

- A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 - 1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees. Any excess soil material not used for this project shall be removed off-site legally prior to completion of the project.

3.7 BACKFILL

- A. Place and compact backfill in excavations promptly, but not before completing the following:
 - 1. Construction below finish grade including, where applicable, subdrainage, dampproofing, waterproofing, and perimeter insulation.
 - 2. Surveying locations of underground utilities for Record Documents.
 - 3. Testing and inspecting underground utilities.
 - 4. Removing concrete formwork.
 - 5. Removing trash and debris.
 - 6. Removing temporary shoring and bracing, and sheeting.
 - 7. Installing permanent or temporary horizontal bracing on horizontally supported walls.
- B. Place backfill on subgrades free of mud, frost, snow, or ice.
- C. Place and compact initial backfill of satisfactory soil, free of particles larger than 1 inch (25 mm) in any dimension, to a height of 12 inches (300 mm) over the pipe or conduit.
 - 1. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.
- D. Place and compact final backfill of satisfactory soil to final subgrade elevation.

3.8 SOIL FILL

- A. Place and compact fill material in layers to required elevations as follows:
 - 1. Under pavements, use engineered fill.
- B. Place soil fill on subgrades free of mud, frost, snow, or ice.

3.9 SOIL MOISTURE CONTROL

- A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.
 - 1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
 - 2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.10 COMPACTION OF SOIL BACKFILLS AND FILLS

- A. General: Refer to Geotechnical Report, AC 150/5320-6C, and AC 150/5370-10C for extensive compaction requirements for subgrades, Engineered Fill, and Aggregate Base under aircraft pavement.
- B. Place backfill and fill soil materials in layers not more than 8 inches (200 mm) in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches (100 mm) in loose depth for material compacted by hand-operated tampers.

- C. Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.
- D. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 1557:
 - 1. Subgrade Below Portland Cement Concrete Pavement Sections: Subgrade soil below concrete sections and below aggregate base shall be compacted to 100% of required maximum dry density per ASTM D1557 in the upper 6" of the subgrade section, the underlying section up to 18" shall be compacted to 95% of the required maximum dry density per ASTM D1557. Refer to geotechnical report and project Drawings for information on compacted subgrade section.
 - 2. Cement Treated Subgrade: Cement treated subgrade shall be compacted to 100% of the required maximum dry density per ASTM D1557 for the full depth of cement treatment.

3.11 GRADING

- A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
 - 1. Provide a smooth transition between adjacent existing grades and new grades.
 - 2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.
 - 3. Grade all areas to within plus or minus ½ inch.

3.12 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:
 - 1. Determine prior to placement of fill that site has been prepared in compliance with requirements.
 - 2. Determine that fill material and maximum lift thickness comply with requirements.
 - 3. Determine, at the required frequency, that in-place density of compacted fill complies with requirements.
 - 4. Continually inspect the site for areas exhibiting unacceptable levels of pumping and yielding. To be done by way of watching regular construction machinery driving on exposed surfaces. Contractor to accommodate inspector if detailed proof-rolling is necessary.
- B. Testing Agency: Owner will engage a qualified geotechnical engineering testing agency to perform tests and inspections.
- C. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.
- D. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

3.13 PROTECTION

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.
- B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
 - 1. Scarify or remove and replace soil material to depth as directed by Engineer; reshape and recompact.
- C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
 - 1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.14 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

3.15 EROSION CONTROL

- A. Erosion and sediment control measures shall be effective for construction during the rainy season (October 15 through April 15) and when the five day rain probability forecast exceeds forty percent.
- B. All mud or sediment that is tracked outside of project area shall be removed the same day.
- C. All erosion control measures shall be maintained until disturbed areas are stabilized by paving.
- D. Maintain silt fence around the work area and around the relocated dirt stockpile. The silt fence around the dirt stockpile shall be left in place after the completion of all other work.
- E. Inspect and repair all erosion control facilities at the end of each working day during the rainy season, or during other periods of wet weather.
- F. Fueling and maintenance of vehicles shall be done off site.
- G. Protect the adjacent wetlands area adjacent to the site free from sediments, stormwater runoff and contaminants. Keep all equipment and personnel clear of this area.
- H. Remove all erosion control devices at the completion of the project.

END OF SECTION 312000