

**SECTION 31 20 00 – EARTH MOVING****PART 1 - GENERAL****1.01 SUMMARY**

- A. This Section includes the following:
  - 1. Preparing subgrades for bases.
  - 2. Excavating and backfilling.
  - 3. Subbase course for concrete bases.
- B. Related Sections include the following:
  - 1. Division 03 Section "Cast-in-Place Concrete" for concrete bases.

**1.02 DEFINITIONS**

- A. Backfill: Soil materials used to fill an excavation.
- B. Base Course: Course placed between the subgrade and cement concrete base.
- C. Borrow: Satisfactory soil and gravel imported from off-site for use as fill or backfill.
- D. Excavation: Removal of material encountered above subgrade elevations.
- E. Fill: Soil materials used to raise existing grades.
- F. 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.
- G. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase.
- H. Utilities include on-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

**1.03 SUBMITTALS**

- A. Sieve Analyses: For the following:
  - 1. Subbase course.

**1.04 DEFINITIONS**

- A. ODOT: Oregon Department of Transportation.
- B. ODOT "Standard Specifications for Construction," latest edition, hereby known as the Standard Specifications.

**1.05 QUALITY ASSURANCE**

- A. Codes and Standards: All work falling under the jurisdiction of the City and County shall comply with applicable codes, standards and ordinances. Work shall comply with all municipal, State, and Federal regulations regarding safety.
- B. Base and Subbase Compaction: Degree of soil compaction shall be determined and controlled in accordance with ASTM D-1557. If necessary, soil shall be moistened or allowed to dry to correct moisture content before compaction.
- C. Soil Testing Service: Engage a soil testing service for testing soil materials proposed for use in the work and for quality control testing during excavation and fill operations.
- D. Certification of Aggregate: Prior to the placing of the aggregate base course material, the Contractor shall produce test results from a certified testing laboratory indicating the suitability of the material. Samples for the test shall be taken in the presence of the COR. Final acceptance of the material will, however, be from samples taken on the finished grade in the compacted state.
- E. Geotechnical Testing Agency Qualifications: An independent testing agency qualified according to ASTM E-329 to conduct soil materials and rock-definition testing, as documented according to ASTM D-3740 and ASTM E-548.

**1.06 PROJECT CONDITIONS**

- A. Should any conditions not mentioned on the Drawings be found to exist, the contractor shall notify the Contracting Officers' Representative (COR) as soon as possible.
- B. Environmental Requirements:
  - 1. Do not place, spread, or roll fill materials during unfavorable weather conditions. When work is interrupted by adverse weather conditions, do not resume fill operations until moisture content and density of fill are satisfactory.
- C. Existing Utilities:
  - 1. Locate and identify, with visible markings, existing underground utilities in the areas of Work. Call Northwest Utility Notification Center (800) 424-5555. If utilities are to remain in place, provide adequate means of protection during excavation operations.
  - 2. Do not interrupt existing utility services occupied and used by the Owner or others except when permitted in writing by the COR and then only after acceptable temporary utility services have been provided.
  - 3. Should uncharted piping or other utilities be encountered during excavation, consult utility owner immediately for directions. Cooperate with the Owner and public and private utility companies in keeping their respective services and facilities in operation. Repair damaged utilities to the satisfaction of the utility owner. The Contractor shall pay for cost of repairing damage to charted utilities at no additional cost to the Owner..
  - 4. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies to shut off services if lines are active.

- D. Protection, General: Barricade open excavations and post warning lights and other devices as required by applicable codes and laws. Operate warning lights as recommended by authorities having jurisdiction. Protect structures, utilities, sidewalks, pavements, existing vegetation, and other facilities immediately adjacent to excavations from damages caused by settlement, lateral movement, undermining, washout, and other hazardous displacements.
- E. Protection of Subgrade: Do not allow equipment to pump or rut subgrade, stripped areas, footing excavations or other areas prepared for project. Protect subgrades, fills, and excavation areas from surface waters flowing into work areas.
- F. Existing Tree and Plant Protection: Protect trees and plants from damage.

## **PART 2 - PRODUCTS**

### **2.01 SOIL MATERIALS**

- A. General: Aggregate material shall conform in all respects to the requirements set forth in the latest edition of the Standard Specifications.
- B. Satisfactory Soils: ASTM D 2487 soil classification groups GW, GP, GM, SW, SP, and SM, or a combination of these group symbols; free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.
- C. Unsatisfactory Soils: ASTM D 2487 soil classification groups GC, SC, ML, MH, CL, CH, OL, OH, and PT, or a combination of these group symbols.
  - 1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.
- D. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.
- E. Subbase Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 100 percent passing a 1-inch sieve and not more than 10 percent passing a No. 200 sieve.
- F. Engineered (Structural) Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch sieve and not more than 10 percent passing a No. 200 sieve.

## **PART 3 - EXECUTION**

### **3.01 DISPOSITION OF UTILITIES**

- A. Active utilities shown on Drawings shall be adequately protected from damage and removed or relocated only as indicated or specified. Where active utilities are encountered, but are not shown on Drawings, notify the COR immediately. Work shall be adequately protected, supported, or relocated as directed by the Owner's Representative.

1. Any damage to utility lines that occur as a result of operations of this Work, whether or not such utility lines are indicated, shall be repaired to satisfaction of the COR. Owner shall pay cost of repairing previously uncharted utilities unless previously identified and acknowledged by Contractor. In this case, the Contractor shall pay. Cost of repairing those utilities shown on Drawings or found during utility locate (or shown in field by Owner or Utility Provider) shall be paid by the Contractor at no additional cost to the Owner.
- B. Demolish and completely remove from site existing underground utilities indicated to be removed on the Drawings. Remove inactive and abandoned utilities encountered in excavating and grading operations. Coordinate with utility companies to shut off services if lines are active. In absence of specific requirements, plug or cap such utility lines as required by local regulations.

### **3.02 PREPARATION**

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.
- B. Remove vegetation, topsoil, debris, obstructions, and deleterious materials from ground surface as required.
- C. Provide and maintain erosion and sedimentation controls.
- D. Protect subgrades and foundation soils against freezing temperatures or frost. Provide protective insulating materials as necessary.
- E. Collect and remove from site all rubble, debris, and rubbish.
- F. Strip all organic matter from top 12 inches in areas to be paved.

### **3.03 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.
  2. Install a dewatering system to keep subgrades dry and convey ground water away from excavations. Maintain until dewatering is no longer required.

### **3.04 EXCAVATION, GENERAL**

- A. Excavation consists of removal and disposal of material encountered when establishing required grade elevations. Unclassified excavation shall comprise and include the satisfactory removal and disposal of all materials encountered, at no additional cost to the Government.

- B. Erosion Control: Provide erosion control measures according to Erosion Control Plan in contract documents, and as required by governing authorities.
- C. Excavation:
  - 1. Conform to elevations and dimensions shown within a tolerance of plus or minus 0.10 foot.
  - 2. Cut surface to comply with sections, details and grades as shown on the Drawings.

### **3.05 EXCAVATION FOR WALKS AND PAVEMENTS**

- A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

### **3.06 SUBGRADE INSPECTION**

- A. Notify Owner's Representative when excavations have reached required subgrade.
- B. If Owner's Representative determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.
  - 1. Excavate soft spots, unsatisfactory soils, as determined by Owner's Representative, and replace with compacted backfill or fill as directed.
- C. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Owner's Representative, at no additional cost to the Government.

### **3.07 BACKFILL**

- A. Use approved excavated or imported material for backfill.
- B. Place and compact backfill in excavations promptly, but not before completing the following:
  - 1. Acceptance by the COR of construction below finish grade.
  - 2. Construction below finish grade including, where applicable, subdrainage, dampproofing, waterproofing, and perimeter insulation.
  - 3. Surveying locations of underground utilities for Record Documents.
  - 4. Testing and inspecting underground utilities.
  - 5. Removing concrete formwork.
  - 6. Removing trash and debris.
  - 7. Removing temporary shoring and bracing, and sheeting.
  - 8. Installing permanent or temporary horizontal bracing on horizontally supported walls.
- C. Place backfill on subgrades free of mud, frost, snow, or ice.
- D. Place backfill below subgrade under pavements and slabs.

**3.08 SOIL FILL**

- A. Ground Surface Preparation: Remove vegetation, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface prior to placement of fills.
- B. Scarify subgrades to a depth of 6 inches and recompact.
- C. Place and compact fill material in layers to required elevations as follows:
  - 1. Under walks and pavements, use satisfactory soil material.
- D. Place soil fill on subgrades free of mud, frost, snow, or ice.

**3.09 MOISTURE CONTROL**

- A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill layer before compaction to within 2 percent of optimum moisture content.
  - 1. Watering shall be by means of hose and nozzle or by other means, any and all of which shall insure uniform and controlled application.
  - 2. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.
  - 3. 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 density.

**3.10 COMPACTION OF SOIL BACKFILLS AND FILLS**

- A. Place backfill and fill soil materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.
- B. Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.
- C. Compact soil materials to not less than the following percentages of maximum dry density according to ASTM D 698 for cohesive soils and ASTM D 1557 for granular soils:
  - 1. Under walkways, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 92 <Insert percentage> percent.

**3.11 GRADING**

- A. General: Uniformly grade areas to a smooth surface, free from irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated on the Drawings.
  - 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.
- B. Site Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:

1. Pavements: Plus or minus 1/2 inch.

### **3.12 SUBBASE AND BASE COURSES**

- A. Under concrete bases, place subbase course on prepared subgrade and as follows:
  1. Place base course material over subbase.
  2. Compact subbase course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry density according to ASTM D 1557.
  3. Shape subbase to required elevations and cross-slope grades.
  4. When thicknesses of compacted subbase or base course are 6 inches or less, place each course in a single layer.
  5. COR shall approve the subbase course prior to placement of concrete base.
  6. The subbase course shall not be compacted when the underlying course is soft or yielding or when the compacting operations cause undulation in the subgrade. When the compacting develops segregated areas or irregularities that exceed 1/2 inch when tested with a 10 foot straightedge, the irregular surface shall be loosened, refilled with the same kind of materials as that used in constructing the course, and compacted again as required.

### **3.13 FIELD QUALITY CONTROL**

- A. Testing Agency: Engage a qualified independent geotechnical engineering testing agency to perform field quality-control testing.
- B. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earthwork only after test results for previously completed work comply with requirements.
- C. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable. Tests will be performed at the following locations and frequencies:
  1. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 2000 sq. ft. or less of paved area or building slab, but in no case fewer than 3 tests.
- 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 to depth required; recompact and retest until specified compaction is obtained at no additional cost to the Government.
- E. Surface Test: After the subbase course has been completely compacted and graded, the surface shall be tested for smoothness and accuracy of grade and crown. Any portion lacking the required smoothness or failing in accuracy of grade or crown shall be scarified, reshaped, recompact, and otherwise manipulated as the COR may direct until the required smoothness and accuracy are obtained. The finished surface shall not vary more than 0.05 foot from true grade or more than 1/2 inch from a 10 foot straightedge when applied to the surface parallel with, and at right angles to the centerline.

**3.14 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, vandalism, or weather conditions.
  - 1. Scarify or remove and replace soil material to depth as directed by COR; reshape and recompact.

**3.15 DISPOSAL OF SURPLUS AND WASTE MATERIALS**

- A. Disposal: Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Government's property.

END OF SECTION