

**SECTION 31 20 00
EARTH MOVING**

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK:

- A. This section specifies the requirements for furnishing all equipment, materials, labor, tools, and techniques for earthwork including, but not limited to, the following:
1. Excavation.
 2. Filling and backfilling.
 3. Grading.
 4. Soil Disposal.
 5. Clean Up.

1.2 DEFINITIONS:

- A. Unsuitable Materials:
1. Fills: Topsoil; frozen materials; construction materials and materials subject to decomposition; clods of clay and stones larger than 75 mm (3 inches); organic material, including silts, which are unstable; and inorganic materials, including silts, too wet to be stable and any material with a liquid limit and plasticity index exceeding 40 and 15 respectively. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction, as defined by ASTM D 698 or D 1557.
 2. Existing Subgrade (Except Footing Subgrade): Same materials as 1.2.A.1, that are not capable of direct support of slabs, pavement, and similar items with possible exception of improvement by compaction, proofrolling, or similar methods.
- B. Building Earthwork: Earthwork operations required in area enclosed by a line located 1500 mm (5 feet) outside of principal building perimeter. It also includes earthwork required for auxiliary structures and buildings.
- C. Trench Earthwork: Trenchwork required for utility lines.
- D. Site Earthwork: Earthwork operations required in area outside of a line located 1500 mm (5 feet) outside of principal building perimeter and within new construction area with exceptions noted above.
- E. Degree of compaction: Degree of compaction is expressed as a percentage of maximum density obtained by laboratory test procedure. This percentage of maximum density is obtained through use of data provided from results of field test procedures presented in ASTM D1556, ASTM D2167, and ASTM D2922.

- F. Fill: Satisfactory soil materials used to raise existing grades. In the Construction Documents, the term "fill" means fill or backfill as appropriate.
- G. Backfill: Soil materials or controlled low strength material used to fill an excavation.
- H. Unauthorized excavation: Removal of materials beyond indicated sub-grade elevations or indicated lines and dimensions without written authorization by the COR. No payment will be made for unauthorized excavation or remedial work required to correct unauthorized excavation.
- I. Authorized additional excavation: Removal of additional material authorized by the COR based on the determination by the Government's soils testing agency that unsuitable bearing materials are encountered at required sub-grade elevations. Removal of unsuitable material and its replacement as directed will be paid on basis of Conditions of the Contract relative to changes in work.
- J. Subgrade: The undisturbed earth or the compacted soil layer immediately below granular sub-base, drainage fill, or topsoil materials.
- K. Structure: Buildings, foundations, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.
- L. Borrow: Satisfactory soil imported from off-site for use as fill or backfill.
- M. Drainage course: Layer supporting slab-on-grade used to minimize capillary flow of pore water.
- N. Bedding course: Layer placed over the excavated sub-grade in a trench before laying pipe. Bedding course shall extend up to the springline of the pipe.
- O. Sub-base Course: Layer placed between the sub-grade and base course for asphalt paving or layer placed between the sub-grade and a concrete pavement or walk.
- P. Utilities include on-site underground pipes, conduits, ducts, and cables as well as underground services within buildings.
- Q. Debris: Debris includes all materials located within the designated work area not covered in the other definitions and shall include but not be limited to items like vehicles, equipment, appliances, building materials or remains thereof, tires, any solid or liquid chemicals or products stored or found in containers or spilled on the ground.
- R. Contaminated soils: Soil that contains contaminants as defined and determined by the COR or the Government's testing agency.

1.3 RELATED WORK:

- A. Protection of existing utilities, fire protection services, existing equipment, roads, and pavements: Section 01 00 00, GENERAL REQUIREMENTS.
- B. Subsurface Investigation: Section 01 00 00, GENERAL REQUIREMENTS, Article, PHYSICAL DATA.
- C. Paving sub-grade requirements: Section 32 12 16, ASPHALT PAVING.

1.4 CLASSIFICATION OF EXCAVATION:

- A. Unclassified Excavation: Removal and disposal of pavements and other man-made obstructions visible on surface; utilities, and other items including underground structures indicated to be demolished and removed; together with any type of materials regardless of character of material and obstructions encountered.
- B. Rock Excavation:
 - 1. Trenches and Pits: Removal and disposal of solid, homogenous, interlocking crystalline material with firmly cemented, laminated, or foliated masses or conglomerate deposits that cannot be excavated with a late-model, track-mounted hydraulic excavator; equipped with a 1050 mm (42 inch) wide, short-tip-radius rock bucket; rated at not less than 103 kW (138 hp) flywheel power with bucket-curling force of not less than 125 kN (28,090 lbf) and stick-crowd force of not less than 84.5 kN (19,000 lbf); measured according to SAE J-1179. Trenches in excess of 3000 mm (10 feet) wide and pits in excess of 9000 mm (30 feet) in either length or width are classified as open excavation.
 - 2. Open Excavation: Removal and disposal of solid, homogenous, interlocking crystalline material firmly cemented, laminated, or foliated masses or conglomerate deposits that cannot be dislodged and excavated with a late-model, track-mounted loader; rated at not less than 157 kW (210 hp) flywheel power and developing a minimum of 216 kN (48,510 lbf) breakout force; measured according to SAE J-732.
 - 3. Other types of materials classified as rock are unstratified masses, conglomerated deposits and boulders of rock material exceeding 0.76 m³ (1 cubic yard) for open excavation, or 0.57 m³ (3/4 cubic yard) for footing and trench excavation that cannot be removed by rock excavating equipment equivalent to the above in size and performance ratings, without systematic drilling, ram hammering, ripping, or blasting, when permitted.
 - 4. Definitions of rock and guidelines for equipment are presented for general information purposes only. The Contractor is expected to use the information presented in the Geotechnical Engineering Report to evaluate the extent and competency of the rock and to determine both quantity estimations and removal equipment and efforts.

1.5 MEASUREMENT AND PAYMENT FOR ROCK EXCAVATION:

- A. Measurement: Cross section and measure uncovered and separated materials, and compute quantities by Registered Professional Land Surveyor or Registered Civil Engineer, specified in Section 01 00 00, GENERAL REQUIREMENTS. Do not measure quantities beyond the following limits:
1. 600 mm (24 inches) from outside face of concrete work for which forms are required, except for footings.
 2. 300 mm (12 inches) from outside of perimeter of formed footings.
 3. 150 mm (6 inches) below bottom of pipe and not more than pipe diameter plus 600 mm (24 inches) in width for pipe trenches.
 4. From outside dimensions of concrete work for which no forms are required (trenches, conduits, and similar items not requiring forms).

1.6 SUBMITTALS:

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Rock Excavation Report:
1. Certification of rock quantities excavated.
 2. Excavation method.
 3. Labor.
 4. Equipment.
 5. Land Surveyor's or Civil Engineer's name and official registration stamp.
 6. Plot plan showing elevation.
- C. Furnish to COR:
1. Contactor shall furnish resumes with all personnel involved in the project including Project Manager, Superintendent, and on-site Engineer. Project Manager and Superintendent should have at least 3 years of experience on projects of similar size.

1.7 APPLICABLE PUBLICATIONS:

- A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in text by basic designation only.
- B. American Association of State Highway and Transportation Officials (AASHTO):
- T99-01(2004).....Moisture-Density Relations of Soils Using a 2.5 kg (5.5 lb) Rammer and a 305 mm (12 inch) Drop
- T180-01(2004).....Moisture-Density Relations of Soils using a 4.54 kg (10 lb) Rammer and a 457 mm (18 inch) Drop

C. American Society for Testing and Materials (ASTM):

D698-07ae1.....Standard Test Methods for Laboratory Compaction
Characteristics of Soil Using Standard Effort
(12,400 ft. lbf/ft³ (600 kN m/m³))

D1557-02e1.....Standard Test Methods for Laboratory Compaction
Characteristics of Soil Using Modified Effort
(56,000 ft-lbf/ft³ (2700 kN m/m³))

PART 2 - PRODUCTS

2.1 MATERIALS:

- A. General: Provide borrow soil material when sufficient satisfactory soil materials are not available from excavations.
- B. Material approved from on site or off site sources having a minimum dry density of 1760 kg/m³ (110 pcf), a maximum Plasticity Index of 6, and a maximum Liquid Limit of 30.
- C. Granular Fill:
 - 1. Under concrete slab, crushed stone or gravel graded from 25 mm (1 inch) to 4.75 mm (No. 4), per ASTM D 2940.
 - 2. Bedding for chilled water and domestic water, crushed stone or gravel graded from 13 mm (1/2 inch) to 4.75 mm (No 4), per ASTM D 2940.

PART 3 - EXECUTION

3.1 SITE PREPARATION:

- A. Clearing: Clear within limits of earthwork operations as shown. Work includes removal of trees, shrubs, fences, foundations, incidental structures, paving, debris, trash, and other obstructions. Remove materials from Medical Center.
- B. Trees and Shrubs: Trees and shrubs, not shown for removal, may be removed from areas within 4500 mm (15 feet) of new construction and 2250 mm (7.5 feet) of utility lines when removal is approved in advance by COR. Remove materials from Medical Center. Box, and otherwise protect from damage, existing trees and shrubs which are not shown to be removed in construction area. Immediately repair damage to existing trees and shrubs by trimming, cleaning and painting damaged areas, including roots, in accordance with standard industry horticultural practice for the geographic area and plant species. Do not store building materials closer to trees and shrubs, that are to remain, than farthest extension of their limbs.
- C. Stripping Topsoil: Strip topsoil from within limits of earthwork operations as specified. Topsoil shall be a fertile, friable, natural topsoil of loamy character and characteristic of locality. Topsoil shall be capable of growing healthy horticultural crops of grasses. Stockpile

topsoil and protect as directed by COR. Eliminate foreign materials, such as weeds, roots, stones, subsoil, frozen clods, and similar foreign materials larger than 0.014 m³ (1/2 cubic foot) in volume, from soil as it is stockpiled. Retain topsoil on station. Remove foreign materials larger than 50 mm (2 inches) in any dimension from topsoil used in final grading. Topsoil work, such as stripping, stockpiling, and similar topsoil work shall not, under any circumstances, be carried out when soil is wet so that the composition of the soil will be destroyed.

- D. Concrete Slabs and Paving: Score deeply or saw cut to insure a neat, straight cut, sections of existing concrete slabs and paving to be removed where excavation or trenching occurs. Extend pavement section to be removed a minimum of 300 mm (12 inches) on each side of widest part of trench excavation and insure final score lines are approximately parallel unless otherwise indicated. Remove material from Medical Center.
- E. Disposal: All materials removed from the property shall be disposed of at a legally approved site, for the specific materials, and all removals shall be in accordance with all applicable Federal, State and local regulations. No burning of materials is permitted onsite.

3.2 EXCAVATION:

- A. Shoring, Sheet piling and Bracing: Shore, brace, or slope, its angle of repose or to an angle considered acceptable by the COR, banks of excavations to protect workmen, banks, adjacent paving, structures, and utilities.
 - 1. Design of the temporary support of excavation system is the responsibility of the Contractor.
 - 2. Construction of the support of excavation system shall not interfere with the permanent structure and may begin only after a review by the COR.
 - 3. Extend shoring and bracing to a minimum of 1500 mm (5 feet) below the bottom of excavation. Shore excavations that are carried below elevations of adjacent existing foundations.
 - 4. If bearing material of any foundation is disturbed by excavating, improper shoring or removal of existing or temporary shoring, placing of backfill, and similar operations, the Contractor shall underpin the existing foundation, per Section 3.3, under disturbed foundations, as directed by COR, at no additional cost to the Government. Do not remove shoring until permanent work in excavation has been inspected and approved by COR.
- B. Excavation Drainage: Operate pumping equipment, and/or provide other materials, means and equipment as required to keep excavation free of

water and subgrade dry, firm, and undisturbed until approval of permanent work has been received from COR. Approval by the COR is also required before placement of the permanent work on all subgrades.

- C. Subgrade Protection: Protect subgrades from softening, undermining, washout, or damage by rain or water accumulation. Reroute surface water runoff from excavated areas and not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches. When subgrade for foundations has been disturbed by water, remove disturbed material to firm undisturbed material after water is brought under control. Replace disturbed subgrade in trenches with concrete or material approved by the COR.

D. Proofrolling:

1. After rough grade has been established in cut areas and prior to placement of fill in fill areas under building and pavements, proofroll exposed subgrade with a fully loaded dump truck to check for pockets of soft material.
2. Proofrolling shall consist of at least two complete passes with one pass being in a direction perpendicular to preceding one. Remove any areas that deflect, rut, or pump excessively during proofrolling, or that fail to consolidate after successive passes to suitable soils and replaced with compacted fill. Maintain subgrade until succeeding operation has been accomplished.

E. Building Earthwork:

1. Excavation shall be accomplished as required by drawings and specifications.
2. Excavate foundation excavations to solid undisturbed subgrade.
3. Remove loose or soft materials to a solid bottom.
4. Fill excess cut under footings or foundations with 25 MPa (3000 psi) concrete poured separately from the footings.
5. Do not tamp earth for backfilling in footing bottoms, except as specified.
6. Slope grades to direct water away from excavations and to prevent ponding.
7. Capillary water barrier (granular fill) under concrete floor and area-way slabs on grade shall be placed directly on the subgrade and shall be compacted with a minimum of two passes of a hand-operated plate-type vibratory compactor.
8. Ensure that footing subgrades have been inspected and approved by the Resident Engineer prior to concrete placement. Excavate to bottom of pile cap prior to placing or driving piles, unless authorized otherwise by the Resident Engineer. Backfill and compact over

excavations and changes in grade due to pile driving operations to 95 percent of ASTM D698 maximum density.

F. Trench Earthwork:

1. Utility trenches (except sanitary and storm sewer):

- a. Excavate to a width as necessary for sheeting and bracing and proper performance of the work.
- b. Grade bottom of trenches with bell holes scooped out to provide a uniform bearing.
- c. Support piping on undisturbed earth unless a mechanical support is shown.
- d. Length of open trench in advance of piping laying shall not be greater than is authorized by COR.

F. Site Earthwork: Earth excavation includes excavating pavements and obstructions visible on surface; underground structures, utilities, and other items indicated to be removed; together with soil, boulders, and other materials not classified as rock or unauthorized excavation. Excavation shall be accomplished as required by drawings and specifications. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 25 mm (1 inch). Extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, complying with OSHA requirements, and for inspections. Remove subgrade materials that are determined by COR as unsuitable, and replace with acceptable material. If there is a question as to whether material is unsuitable or not, the contractor shall obtain samples of the material, under the direction of the COR, and the materials shall be examined by an independent testing laboratory for soil classification to determine whether it is unsuitable or not. Testing of the soil shall be performed by the VA Testing Laboratory. When unsuitable material is encountered and removed, contract price and time will be adjusted in accordance with Articles, DIFFERING SITE CONDITIONS, CHANGES and CHANGES-SUPPLEMENT of the GENERAL CONDITIONS as applicable. Adjustments to be based on volume in cut section only.

1. Site Grading:

- a. Provide a smooth transition between adjacent existing grades and new grades.
- b. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

- c. Slope grades to direct water away from buildings and to prevent ponds from forming where not designed. Finish subgrades to required elevations within the following tolerances:
 - 1) Lawn or Unpaved Areas: Plus or minus 25 mm (1 inch).
 - 2) Walks: Plus or minus 25 mm (1 inch).
 - 3) Pavements: Plus or minus 13 mm (1 inch).
- d. Grading Inside Building Lines: Finish subgrade to a tolerance of 13 mm (1/2 inch) when tested with a 3000 mm (10 foot) straightedge.

3.3 FILLING AND BACKFILLING:

- A. General: Do not fill or backfill until all debris, water, unsatisfactory soil materials, obstructions, and deleterious materials have been removed from excavation. For fill and backfill, use excavated materials and borrow meeting the criteria specified herein, as applicable. Borrow will be supplied at no additional cost to the Government. Do not use unsuitable excavated materials.
- B. Placing: Place materials in horizontal layers not exceeding 200 mm (8 inches) in loose depth for material compacted by heavy compaction equipment, and not more than 100 mm (4 inches) in loose depth for material compacted by hand-operated tampers and then compacted. Place backfill and fill materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure. Place no material on surfaces that are muddy, frozen, or contain frost.
- C. Compaction: Compact with approved equipment (hand or mechanized) well suited to soil being compacted. Do not operate mechanized vibratory compaction equipment within 3000 mm (10 feet) of new or existing building walls without prior approval of COR. Moisten or aerate material as necessary to provide moisture content that will readily facilitate obtaining specified compaction with equipment used. Compact soil to not less than 95 percent of maximum density, according to ASTM D698.
- D. Borrow Material: Borrow material shall be selected to meet the requirements and conditions of the particular fill or embankment for which it is to be used. Borrow material shall be obtained from the borrow areas within the limits of the project site, selected by the Contractor from approved private sources. Unless otherwise provided in the contract, the Contractor shall obtain from the owners the right to procure material, pay royalties and other charges involved, and bear the expense of developing the sources, including rights-of-way for hauling. Borrow material from approved sources on Government-controlled land may

be obtained without payment of royalties. Unless specifically provided, no borrow shall be obtained within the limits of the project site without prior written approval. Necessary clearing, grubbing, and satisfactory drainage of borrow pits and the disposal of debris thereon shall be considered related operations to the borrow excavation.

- E. Opening and Drainage of Excavation and Borrow Pits: The Contractor shall notify the Resident Engineer sufficiently in advance of the opening of any excavation or borrow pit to permit elevations and measurements of the undisturbed ground surface to be taken. Except as otherwise permitted, borrow pits and other excavation areas shall be excavated providing adequate drainage. Overburden and other spoil material shall be transported to designated spoil areas or otherwise disposed of as directed. Borrow pits shall be neatly trimmed and drained after the excavation is completed. The Contractor shall ensure that excavation of any area, operation of borrow pits, or dumping of spoil material results in minimum detrimental effects on natural environmental conditions.

3.4 GRADING:

- A. General: Uniformly grade the areas within the limits of this section, including adjacent transition areas. Smooth the finished surface within specified tolerance. Provide uniform levels or slopes between points where elevations are indicated, or between such points and existing finished grades. Provide a smooth transition between abrupt changes in slope.
- B. Cut rough or sloping rock to level beds for foundations. In pipe spaces or other unfinished areas, fill low spots and level off with coarse sand or fine gravel.
- C. Slope backfill outside building away from building walls for a minimum distance of 1800 mm (6 feet).
- D. Finish grade earth floors in pipe basements as shown to a level, uniform slope and leave clean.
- E. Finished grade shall be at least 150 mm (6 inches) below bottom line of window or other building wall openings unless greater depth is shown.
- F. Place crushed stone or gravel fill under concrete slabs on grade, tamped, and leveled. Thickness of fill shall be 150 mm (6 inches) unless otherwise shown.
- G. Finish subgrade in a condition acceptable to Resident Engineer at least one day in advance of paving operations. Maintain finished subgrade in a smooth and compacted condition until succeeding operation has been accomplished. Scarify, compact, and grade subgrade prior to further

construction when approved compacted subgrade is disturbed by Contractor's subsequent operations or adverse weather.

- H. Grading for Paved Areas: Provide final grades for both subgrade and base course to +/- 6 mm (0.25 inches) of indicated grades.

3.5 DISPOSAL OF UNSUITABLE AND EXCESS EXCAVATED MATERIAL:

- A. Disposal: Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Medical Center property.
- B. Disposal: Transport surplus satisfactory soil to designated storage areas on Medical Center property. Stockpile or spread soil as directed by COR.
 - 1. Remove waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Medical Center property.
- C. Place excess excavated materials suitable for fill and/or backfill on site where directed.
- D. Remove from site and dispose of any excess excavated materials after all fill and backfill operations have been completed.
- E. Segregate all excavated contaminated soil designated by the COR from all other excavated soils, and stockpile on site on two 0.15 mm (6 mil) polyethylene sheets with a polyethylene cover. A designated area shall be selected for this purpose. Dispose of excavated contaminated material in accordance with State and Local requirements.

3.6 CLEAN UP:

Upon completion of earthwork operations, clean areas within contract limits, remove tools, and equipment. Provide site clear, clean, free of debris, and suitable for subsequent construction operations. Remove all debris, rubbish, and excess material from Medical Center Property .

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