

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. Site preparation.
 2. Excavation.
 3. Filling and backfilling.
 4. Grading.
 5. Soil Disposal.
 6. Clean Up.
 7. Contaminated Soils

1.2 DEFINITIONS:

- A. Unsuitable Materials (Physical Characteristics):
1. Fills: Topsoil; frozen materials; construction materials and materials subject to decomposition; clods of clay and stones larger than 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, D 1556 or D 1557, AASHTO T 99 or T 180.
 2. Existing 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. Trench Earthwork: Trenchwork required for utility lines.
- C. Site Earthwork: Earthwork operations required in area outside of a line located 5 feet outside of principal building perimeter and within new construction area with exceptions noted above.
- D. 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.

- E. Backfill: Soil materials or controlled low strength material used to fill an excavation.
- F. Unauthorized excavation: Removal of materials beyond indicated sub-grade elevations or indicated lines and dimensions without written authorization by the COTR. No payment will be made for unauthorized excavation or remedial work required to correct unauthorized excavation.
- G. Authorized additional excavation: Removal of additional material authorized by the COTR based on the determination by the Owner'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.
- H. Subgrade: The undisturbed earth or the compacted soil layer immediately below granular sub-base, drainage fill, or topsoil materials.
- I. Structure: Buildings, foundations, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.
- J. Borrow: Satisfactory soil imported from off-site for use as fill or backfill.
- K. Drainage course: Layer supporting slab-on-grade used to minimize capillary flow of pore water.
- L. 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.
- M. 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.
- N. Utilities include on-site underground pipes, conduits, ducts, and cables as well as underground services within buildings.
- O. 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.
- P. Contaminated soils (Organic and In-Organic Chemical Characteristics): Soil that contains contaminants as defined and determined by the testing agency and classified below.

1. Non-Hazardous Excavated Material:

- a. Material that may include or contain mixtures of the following: soil (including natural undisturbed material), debris, concrete and concrete products (including steel or fiberglass reinforcing rods that are embedded in the concrete), asphalt pavement, brick, glass, rock, and incidental ash. This material may also include Construction and Demolition (C&D) debris defined in Title 6 New York Codes, Rules and Regulations Part 360-7.1(b)(i) and will exceed 6 NYCRR Part 375 Unrestricted Use ("Track 1") Soil Cleanup Objectives and NYSDEC TAGM 4046 Recommended Soil Cleanup Objectives.
- b. All material classified as fill excavated from the site is assumed to meet the definition of non-hazardous excavated material.

2. Petroleum-Contaminated Material:

- a. This material (soil, concrete, sediment, fill, debris, etc.) shall meet the NYSDEC STARS Memo #1 definition of petroleum-contaminated material from known source areas. Petroleum-contaminated material shall be evidenced by the following observations and be from a known source area: producing higher than background responses on a portable vapor meter such as a photo ionization detector, petroleum like odor, visual impacts (e.g., staining or discoloration), proximity to existing or historic petroleum storage tanks or systems, known releases, and exceed the guidance values provided in the NYSDEC STARS Memo #1 and TAGM 4046 Recommended Soil Cleanup Objectives.
- b. The determination as to whether the excavated material is petroleum-contaminated or is not petroleum-contaminated material will be made by laboratory testing of representative material samples. The Contractor shall provide the laboratory qualitative and quantitative information, and the laboratory shall make the final determination as to whether or not the material is petroleum-contaminated and the appropriate disposal.

1.3 RELATED WORK:

- A. Materials testing and inspection during construction: Section 01 45 29, TESTING LABORATORY SERVICES.
- B. Protection of existing utilities, fire protection services, existing equipment, roads, and pavements: Section 01 00 00, GENERAL REQUIREMENTS.

- C. Subsurface Investigation: Section 01 00 00, GENERAL REQUIREMENTS, Article, PHYSICAL DATA.
- D. Erosion Control: Section 01 57 19, TEMPORARY ENVIRONMENTAL CONTROLS.
- E. Site preparation: Section 31 23 19, DEWATERING, and Section 02 41 00, DEMOLITION.
- F. Foundation system requirements: Section 31 63 16, AUGER CAST GROUT PILES.
- G. 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.

1.5 SUBMITTALS:

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Furnish to COTR:
 - 1. Contactor shall furnish resumes with all personnel involved in the project including Project Manager, Superintendent, and on-site COTR. Project Manager and Superintendent should have at least 3 years of experience on projects of similar size.
 - 2. Soil samples.
 - a. Classification in accordance with ASTM D2487 for each on-site or borrow soil material proposed for fill, backfill, engineered fill, or structural fill.
 - b. Laboratory compaction curve in accordance with ASTM D 698 or D 1557, AASHTO T 99 or T 180 for each on site or borrow soil material proposed for fill, backfill, engineered fill, or structural fill.
 - c. Test reports for compliance with ASTM D 2940 requirements for sub-base material.
 - d. Pre-excavation photographs and videotape in the vicinity of the existing structures to document existing site features, including surfaces finishes, cracks, or other structural blemishes that might be misconstrued as damage caused by earthwork operations.
 - e. The Contractor shall submit a scale plan daily that defines the location, limits, and depths of the area excavated.

C. The Contractor shall provide an Excavation Management Disposal Plan in accordance with Section 3.2.B.2

1.6 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 5.5 lb Rammer and a 12 inch Drop

T180-01(2004).....Moisture-Density Relations of Soils using a 10 lb Rammer and a 18 inch Drop

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

D448-03a.....Standard Classification for Sizes of Aggregate for Road and Bridge Construction

D698-00ae1.....Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort 12,400 ft. lbf/ft³

D1556-00.....Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method

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

D2167-94 (2001).....Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method

D2487-06.....Standard Classification of Soil for Engineering Purposes (Unified Soil Classification System)

D2922-05.....Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)

D2940-03.....Standard Specifications for Graded Aggregate Material for Bases or Sub-bases for Highways or Airports

D. Society of Automotive Engineers (SAE):

J732-92.....Specification Definitions - Loaders

J1179-02.....Hydraulic Excavator and Backhoe Digging Forces

E. New York State Department of Environmental Conservation (NYSDEC Technical and Administrative Guidance Memorandum TAGM:

STARS Memo #1.....Petroleum-Contaminated Soil Guidance Policy

SW-89-2002.....Construction and Demolition Debris

HWR-94-4046.....Determination of Soil Cleanup Objectives and
Cleanup Levels

Draft DER-10.. Technical Guidance for Site Investigation and Remediation

Division of Environmental Remediation Memorandum, signed April 10, 2001
Re: Response to Comments Relative to 12/20/00 Soil Cleanup Memo

Division of Environmental Remediation Memorandum, signed July 10, 2001
Re: Soil Cleanup Consolidation - Further Clarifications

F. New York Standards - New York Codes, Rules and Regulations, Part 6

(6 NYCRR):

Part 360, Solid Waste Management Facilities

Part 364, Waste Transporter Permits

Part 370, Hazardous Waste Management System - General

Part 371, Identification and Listing of Hazardous Wastes

Part 372, Hazardous Waste Manifest System and Related Standards for
Generators, Transporters and Facilities

Part 373, Hazardous Waste Management Facilities

Part 375, Environmental Remedial Programs

PART 2 - PRODUCTS

2.1 MATERIALS:

A. General: Provide borrow soil material when sufficient satisfactory soil materials are not available from excavations.

B. Fills: Material in compliance with ASTM D2487 Soil Classification Groups GW, GP, GM, SW, SP, SM, SC, and ML, or any combination of these groups; free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter. Material approved from on site or off site sources having a minimum dry density of 110 pcf, a maximum Plasticity Index of 15, and a maximum Liquid Limit of 40.

C. Engineered Fill: Naturally or artificially graded mixture of compliance with ASTM D2487 Soil Classification Groups GW, GP, GM, SW, SP, SM, SC, and ML, or any combination of these groups, or as approved by the COTR or material with at least 90 percent passing a 1 1/2-inch sieve and not more than 12 percent passing a No. 200 sieve, per ASTM D2940;.

- D. Bedding: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D2940; except with 100 percent passing a 1 inch sieve and not more than 8 percent passing a No. 200 sieve.
- E. Drainage Fill: Washed, narrowly graded mixture of crushed stone, or crushed or uncrushed gravel; ASTM D448; coarse-aggregate grading Size 57; with 100 percent passing a 1 1/2-inch sieve and 0 to 5 percent passing a No. 8 sieve.
- F. Granular Fill:
 - 1. Under concrete slab, crushed stone or gravel graded from 1 inch to No. 4, per ASTM D 2940.
 - 2. Bedding for sanitary and storm sewer pipe, crushed stone or gravel graded from 1/2 inch to 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 as per the COTR's approval.
- B. Grubbing: Remove stumps and roots 3 inch and larger diameter. Undisturbed sound stumps, roots up to 3 inch diameter, and non-perishable solid objects a minimum of 3 feet below subgrade or finished embankment may be left.
- C. Trees and Shrubs: Trees and shrubs, not shown for removal, may be removed from areas within 15 feet of new construction and 7.5 feet of utility lines when removal is approved in advance by the COTR. Remove materials from Medical Center. Trees and shrubs, shown to be transplanted, shall be dug with a ball of earth and burlapped in accordance with latest issue of, "American Standard for Nursery Stock" of the American Association of Nurserymen, Inc. Transplant trees and shrubs to a permanent or temporary position within two hours after digging. Maintain trees and shrubs held in temporary locations by watering as necessary and feeding semiannually with liquid fertilizer with a minimum analysis of 5 percent nitrogen, 10 percent phosphorus, and 5 percent potash. Maintain plants moved to permanent positions as specified for plants in temporary locations until conclusion of contract. 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.

- 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 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. Lines and Grades: Registered Professional Land Surveyor or Registered Civil Engineer, specified in Section 01 00 00, GENERAL REQUIREMENTS, shall establish lines and grades.
1. Grades shall conform to elevations indicated on plans within the tolerances herein specified, especially at flood gate locations. Generally grades shall be established to provide a smooth surface, free from irregular surface changes. Grading shall comply with compaction requirements and grade cross sections, lines, and elevations indicated. Where spot grades are indicated the grade shall be established based on interpolation of the elevations between the spot grades while maintaining appropriate transition at structures and paving and uninterrupted drainage flow into inlets.
 2. Locations of existing and proposed elevations indicated on plans are from a site survey that measured spot elevations and subsequently generated existing contours and spot elevations. Proposed spot elevations and contour lines have been developed utilizing the existing conditions survey and developed contour lines and may be approximate. Contractor is responsible to notify the COTR of any differences between existing elevations shown on plans and those encountered on site by Surveyor/Engineer described above. Notify the COTR of any differences between existing or constructed grades, as compared to those shown on the plans.
 3. Subsequent to establishment of lines and grades, Contractor will be responsible for any additional cut and/or fill required to ensure that site is graded to conform to elevations indicated on plans.

3.2 DISPOSAL - GENERAL:

- A. 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.
- B. Excavated Material Disposal Plan:
1. Site soils consist of fill material in which a field detection of petroleum odor was noted. Contractor shall have a contingency plan for handling Petroleum Contaminated Soil as well as Non-Hazardous Excavated Material as set forth in this specification.
 2. An Excavated Material Disposal Plan (EMDP) for non-hazardous excavated material and petroleum-contaminated material shall be prepared by the Contractor and approved by the COTR a minimum of two weeks prior to the start of excavation. Prior to submittal of the EMDP the contractor shall provide pre-sampling soil analysis of any suspect soils in order to obtain the necessary analytical data to support the EMDP. The EMDP shall be prepared by a Certified Hazardous Materials Manager approved by the Institute of Hazardous Materials Management in Rockville, Maryland, or Qualified Environmental Professional, approved by the Institute of Professional Environmental Practice, Pittsburgh, Pennsylvania, or similar board-certified professions. In the Excavated Material Disposal Plan, the Contractor shall, at a minimum:
 - a. Provide a to-scale figure indicating the quantities of excavated materials and the proposed locations where discrete soil samples shall be collected and which discrete soil samples shall make up each composite sample.
 - b. Define the sampling rates (e.g. 1 composite sample / 500 cubic yards) along with the estimated quantity of material to be disposed.
 - c. Define the sampling methods (e.g. backhoe, Geoprobe®, drill rig, etc.) to be used.
 - d. Define the parameters and methods for analyzing all the collected soil samples.
 - e. Define how the sample chain-of-custody will be maintained and recorded.
 - f. Define how the QA/QC of the EMDP will be maintained.
 - g. Provide a listing of the off-site disposal facilities meeting the requirements for the specific material to be disposed and a copy of each facility's permit (NYSDEC or equivalent out of

- state), and a complete listing of the facility's disposal requirements for the specific material.
- h. Health and Safety Plan for handling the material to be excavated.
 - i. Provide a list of haulers meeting the requirements of Part 364 as referenced in Par 3.2.F above.
- C. Disposal of non-contaminated unsuitable and excess excavated material:
- 1. Site soils characterized as Fill may require site characterization prior to off site disposal.
 - 2. Disposal: Remove non-contaminated surplus soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Medical Center property. Transport surplus satisfactory soil to designated storage areas as directed by the COTR.
 - 3. Place excess excavated materials suitable for fill and/or backfill on site where directed by the COTR.
 - 4. Remove from site and dispose of any excess excavated materials after all fill and backfill operations have been completed.
- D. Disposal of contaminated unsuitable excavated material: Site soils observed to have petroleum odors will require site characterization prior to disposal. materials may be encountered that meet the classification of non-hazardous excavated material or petroleum contaminated material. the contractor shall prepare for encountering these materials according to the excavation material disposal plan to preclude construction delays.

3.3 EXCAVATION:

- A. Shoring, Sheet piling and Bracing: Shore, brace, or slope, its angle of repose or to an angle considered acceptable by the COTR, 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 COTR.

3. Extend shoring and bracing to a minimum of 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, and provide a concrete fill support under the disturbed foundations, as directed by the COTR, at no additional cost to the Government. Do not remove shoring until permanent work in excavation has been inspected and approved by The COTR.
- B. Excavation Drainage: Operate pumping equipment, and/or provide other materials, means and equipment as required to keep excavation free of water and sub-grade dry, firm, and undisturbed until approval of permanent work has been received from the COTR. Approval by the COTR 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 COTR.
- 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. Trench Earthwork:
1. Sanitary and storm sewer trenches:

- a. Trench width below a point 6 inches above top of pipe shall be 24 inches maximum for pipe up to and including 12 inches diameter, and four-thirds diameter of pipe plus 8 inches for pipe larger than 12 inches. Width of trench above that level shall be as necessary for sheeting and bracing and proper performance of the work.
 - b. Bed bottom quadrant of pipe on undisturbed soil or granular fill.
 - 1) Undisturbed: Bell holes shall be no larger than necessary for jointing. Backfill up to a point 12 inches above top of pipe shall be clean earth placed and tamped by hand.
 - 2) Granular Fill: Depth of fill shall be a minimum of 3 inches plus one sixth of pipe diameter below pipe to 12 inches above top of pipe. Place and tamp fill material by hand.
 - c. Place and compact as specified remainder of backfill using acceptable excavated materials. Do not use unsuitable materials.
 - d. Use granular fill for bedding where rock or rocky materials are excavated.
- 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 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 The COTR 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 COTR, 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 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 1 inch.
 - 2) Walks: Plus or minus 1 inch.
 - 3) Pavements: Plus or minus 1/2 inch.
- d. Grading inside building lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10 foot straightedge.

3.4 UNDERPINNING:

- A. Design of the underpinning system is the responsibility of the Contractor and is subject to review and approval by the COTR. Underpinning of existing building foundations, as indicated on structural drawings, or where excavation undermines existing foundations, shall be accomplished in the following manner:
1. Make general excavation for new construction, where new foundations are to be below existing foundations, to elevation of new foundations (or sized stone sub-base), maintaining a 45 degree sloped berm.
 2. For underpinning pits, underpin existing wall foundations by excavating 4 feet wide pits to depth shown on drawings skipping 3 sections at any one time so as to maintain support for wall at all times.
 3. Underpin intervening sections one at a time; no adjacent sections shall be underpinned until concrete in adjacent sections shall have reached 2500 psi strength and have been dry packed with non-shrink grout to obtain positive bearing. Sheet and brace underpinning pits if soil will not stand on a vertical cut during this operation, or as required for safety of workmen. Repack any voids behind sheeting to prevent sloughing which could cause settlement of existing foundations. Contractor performing this portion of work shall have been prequalified by the COTR as having previously performed successfully this type of work or will

demonstrate his capability for successfully performing this work. It shall be sole responsibility of the Contractor to guard against objectionable movement or settlement and to preserve integrity of existing structures.

4. The tip elevation of the underpinning pits shall be a minimum of 3 feet below the adjacent excavation elevation.
5. Subgrades at the tip of the underpinning pit shall be clean, dry, and free of debris and shall be observed by the COTR prior to concrete placement.
6. Concrete shall not be free fall greater than 10 feet into the pit.

3.5 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. Do not backfill until foundation walls have been completed above grade and adequately braced, waterproofing or damp proofing applied, foundation drainage, and pipes coming in contact with backfill have been installed and work inspected and approved by The COTR.
- B. Placing: Place materials in horizontal layers not exceeding 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 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 tamping rollers, sheepsfoot rollers, pneumatic tired rollers, steel wheeled rollers, vibrator compactors, or other approved equipment (hand or mechanized) well suited to soil being compacted. Do not operate mechanized vibratory compaction equipment within 10 feet of new or existing building walls without prior approval of The COTR. 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 the following percentages of maximum dry density, according to ASTM D698 or ASTM D1557 as specified below:
 1. Fills, Embankments, and Backfill

- a. Under proposed structures, building slabs, steps, and paved areas, scarify and recompact top 12 inches of existing subgrade and each layer of backfill or fill material in accordance ASTM D698, D1557, D 1556, D 2167, D 2922, 95 percent.
 - b. Curbs, curbs and gutters, ASTM D698, D1557, D 1556, D 2167, D 2922 95 percent.
 - c. Under Sidewalks, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill material in accordance with ASTM D698, D1557, D 1556, D 2167, D 2922 95 percent.
 - d. Landscaped areas, top 400 mm (16 inches), ASTM D698, D1557, D 1556, D 2167, D 2922 85 percent.
 - e. Landscaped areas, below 16 inches of finished grade, ASTM D698, D1557, D 1556, D 2167, D 2922, 90 percent.
2. Natural Ground (Cut or Existing)
- a. Under building slabs, steps and paved areas, top 6 inches, ASTM D698, D1557, D 1556, D 2167, D 2922 95 percent.
 - b. Curbs, curbs and gutters, top 150 mm (6 inches), ASTM D698, D1557 D 1556, D 2167, D 2922 95 percent.
 - c. Under sidewalks, top 6 inches, ASTM D698, D1557, D 1556, D 2167, D 2922 95 percent.

3.6 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. Place crushed stone or gravel fill under concrete slabs on grade, tamped, and leveled. Thickness of fill shall be 6 inches unless otherwise shown.
- D. 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.

E. Grading for Paved Areas: Provide final grades for both subgrade and base course to +/- 0.25 inches of indicated grades.

3.7 CLEAN UP:

A. 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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