

SECTION 31 00 00 - EARTHWORK

08/23

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS
(AASHTO)

AASHTO T 180 (2025) Standard Method of Test for
Moisture-Density Relations of Soils Using a 4.54-kg (10-
lb) Rammer and a 457-mm (18-in.) Drop

ASTM INTERNATIONAL (ASTM)

ASTM C33/C33M (2024a) Standard Specification for
Concrete Aggregates

ASTM C117

ASTM C136/C136M

ASTM D698

ASTM D1140

ASTM
D1556/D1556M

ASTM D1557

ASTM D2321	(2023) Standard Test Method for Materials Finer than 75-um (No. 200) Sieve in Mineral Aggregates by Washing
ASTM D2487	(2019) Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates (2012; R 2021) Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/cu. ft. (600 kN-m/cu. m.)) (2017) Standard Test Methods for Determining the Amount of Material Finer than 75-µm (No. 200) Sieve in Soils by Washing (2015; E 2016) Standard Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method (2012; E 2015) Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft ³) (2700 kN-m/m ³) (2020) Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications (2017; R 2025) Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D4253	(2016; E 2019) Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table
ASTM D4254	(2016) Standard Test Methods for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density
ASTM D4318	(2017; E 2018) Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
ASTM D4829	(2021) Standard Test Method for Expansion Index of Soils
U.S. ARMY CORPS OF ENGINEERS (USACE)	
EM 385-1-1	(2024) Safety -- Safety and Occupational Health (SOH) Requirements
U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)	

EPA SW-846.3-3

(1999, Third Edition, Update III-A) Test
Methods for Evaluating Solid Waste:
Physical/Chemical Methods

1.2 DEFINITIONS

1.2.1 Structural Fill

Soil material placed to support buildings, walls, pads, and other similar facilities.

1.2.2 Embankment Fill

Soil material placed to construct embankment.

1.2.3 Porous Fill

Free-draining material placed for subsurface drainage, as a capillary break, or another specific purpose.

1.2.4 Topsoil

Surface layer of primarily organic soil capable of supporting vegetation growth.

1.2.5 Utility Bedding Material

Fill placed to directly support pipes, conduits, cables, and appurtenant structures. Bedding may also be used to provide a cushion between utilities and bedrock, obstacles, obstructions and other unyielding materials.

1.2.6 Flowable Fill

Fill placed in a plastic or liquid form that flows to near its final placement location with limited assistance and subsequently cures or solidifies to provide a stable or impermeable barrier.

1.2.7 Satisfactory Materials

Satisfactory materials for fill, backfill, and/or any in-situ soils to remain in place comprise any materials classified by ASTM D2487 as GM, GC, CL with a liquid limit less than 45 and a plasticity index less than 23.

Maximum particle size to be no greater than 3 inches in any dimension.

Any material designated as acceptable in the Geotechnical Report dated February 3, 2026 by Terracon shall also be considered Satisfactory Materials.

1.2.8 Unsatisfactory Materials

Materials which do not comply with the requirements for satisfactory materials are unsatisfactory.

Unsatisfactory materials also include man-made fills; trash; refuse; backfills from previous construction; roots and other organic matter or frozen material. Notify the Contracting Officer when encountering any contaminated materials.

1.2.9 Cohesionless Materials

Cohesionless materials include materials classified in ASTM D2487 as GW, GP, SW, and SP. Materials classified as GM and SM will be identified as cohesionless only when the fines are nonplastic. Perform testing, required for classifying materials, in accordance with ASTM D4318, ASTM C117, ASTM C136/C136M and ASTM D1140.

1.2.10 Cohesive Materials

Cohesive materials include materials classified as GC, SC, ML, CL, MH, and CH. Materials classified as GM and SM will be identified as cohesive only when the fines are plastic. Perform testing, required for classifying materials, in accordance with ASTM D4318, ASTM C117, ASTM C136/C136M and ASTM D1140.

1.2.11 Hard/Unyielding Materials

Hard/Unyielding materials comprise weathered rock, dense consolidated deposits, or conglomerate materials which are not included in the definition of "rock" with stones greater than 12 inch in any dimension or as defined by the pipe manufacturer, whichever is smaller. These materials usually require the use of heavy excavation equipment, ripper teeth, or jack hammers for removal.

1.2.12 Unstable Material

Unstable materials are too weak to adequately support the utility pipe, conduit, equipment, or appurtenant structure. Satisfactory material may become unstable due to ineffective drainage, dewatering, becoming frozen, excessive loading.

1.2.13 Expansive Soils

Expansive soils are defined as soils that have an expansion index greater than 20 when tested in accordance with ASTM D4829.

1.2.14 Rock

Solid homogeneous interlocking crystalline material with firmly cemented, laminated, or foliated masses or conglomerate deposits, neither of which can be removed without systematic drilling and blasting, drilling and the use of expansion jacks or feather wedges, or the use of backhoe-mounted pneumatic hole punchers or rock breakers; also large boulders, buried masonry, or concrete other than pavement exceeding 1 cubic yard in volume. Removal of hard material will not be considered rock excavation because of intermittent drilling and blasting that is performed merely to increase production.

1.2.15 Capillary Water Barrier

A layer of clean, poorly graded crushed rock, stone, or natural sand or gravel having a high porosity which is placed beneath a building slab with or without a vapor barrier to cut off the capillary flow of pore water to the area immediately below a slab.

1.2.16 Degree of Compaction (Proctor)

Degree of compaction required, except as noted in the second sentence, is expressed as a percentage of the maximum dry density obtained by the test procedure presented in ASTM D698 abbreviated as a percent of laboratory maximum dry density. Since ASTM D1557 applies only to soils that have 30 percent or less by weight of their particles retained on the 3/4 inch sieve, express the degree of compaction for material having more than 30 percent by weight of their particles retained on the 3/4 inch sieve as a percentage of the maximum dry density in accordance with AASHTO T 180-21 paragraph 1.5, Note 1.

1.2.17 Degree of Compaction (Relative Density)

Degree of compaction required for soils with less than 5 percent passing the No. 200 sieve, is expressed as a relative percentage of the maximum index density/dry unit weight and minimum index density/dry unit weight, obtained by the test procedures in accordance with ASTM D4253 and ASTM D4254, respectively, abbreviated as a percent of laboratory relative density.

1.2.18 Borrow

Soil brought to the project site from an external location for the purposes of project construction.

1.2.19 Subgrade

Earth materials directly below foundations and directly below granular base materials in building slab and pavement areas including shoulders.

1.3 SUBSURFACE DATA

Subsurface soil boring logs are shown in project plans . These data represent available subsurface information; however, variations may exist between boring locations.

1.4 SUBMITTALS

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Excavation and Trenching Plan; G

Preconstruction Meeting; G

SD-03 Product Data

Geotextiles

SD-06 Test Reports

Material Test Report; G

Borrow Site Testing; G

1.5 QUALITY CONTROL

1.5.1 Geotechnical Engineer

Provide a Professional Geotechnical Engineer to provide inspection of excavations and soil/groundwater conditions throughout construction. The Geotechnical Engineer is responsible for performing pre-construction and periodic site visits throughout construction to assess site conditions. The Geotechnical Engineer is responsible for preparing and updating the Excavation and Trenching Plan as construction progresses to reflect changing conditions and submit an updated plan if necessary.

1.5.2 Qualified Technician

Provide a Qualified Technician to inspect, monitor, sample, and performing field testing. The technician qualifications need to be one of the following: a current National Institute for Certification in Engineering Technologies (NICET) Level II minimum certification in Construction Materials Testing Soils; a Geologist-in-Training with minimum one-year experience; an Engineer-in-Training with minimum one-year experience; a Registered Geologist; or a Professional Engineer.

1.5.3 Lab Validation

Perform testing by a Corps validated commercial testing laboratory or Contractor established testing laboratory meeting the requirements of Section 01 45 00 (or similar number) entitled QUALITY CONTROL and approved by the Contracting Officer. Submit testing laboratory validation for the testing to be performed. Do not permit work requiring testing until testing facilities have been inspected, Corps validated and approved by the Contracting Officer.

1.5.4 Preconstruction Meeting

Conduct a preconstruction meeting at the jobsite at least five business days prior to the start of earthwork operations on the project. The preconstruction meeting is to be arranged by the Contractor and is to follow the written agenda submitted prior to the meeting. The purpose of this meeting is to review the requirements of this specification and the associated plans. The following individuals must be in attendance at this meeting: Contractor's Project Manager and Project Superintendent, earthwork subcontractor's Project Manager and Site Foreman, Contractor's Geotechnical Engineer and Testing Agency, Government Geotechnical Engineer and Civil Engineer, and Government Construction Manager and Engineering Technician.

The minutes of this meeting are to be recorded by the Contractor and published via email within 48 hours to all attendees. The minutes must be re-published within 48 hours via email pending any subsequent comments from the attendees.

PART 2 PRODUCTS

2.1 SOIL MATERIALS

2.1.1 Structural Fill

Materials as described in the Geotechnical Report by Terracon dated February 3, 2026 in accordance with ASTM D2487. Select material type appropriate for the intended purpose.

2.1.2 Embankment Fill

Materials as described in the Geotechnical Report by Terracon dated February 3, 2026 in accordance with ASTM D2487. Select material type appropriate for the intended purpose.

2.1.3 Porous Fill

Materials containing less than 5 percent passing the No. 200 sieve.
Provide the gradation as appropriate for the intended purpose.

2.1.4 Topsoil

Material suitable for topsoil obtained from excavations is defined as: Natural, friable soil representative of productive, well-drained soils in the area, free of subsoil, stumps, rocks larger than one inch diameter, brush, weeds, toxic substances, and other material detrimental to plant growth.

2.1.5 Capillary Water Barrier

Conform to ASTM C33/C33M for fine aggregate grading with a maximum of 3 percent by weight passing ASTM D1140, No. 200 sieve, or 1-1/2 inch and no more than 2 percent by weight passing the No. 4 size sieve.

2.1.6 Utility Bedding Material

Except as specified otherwise in the individual piping section, provide bedding for buried piping in accordance with ASTM D2321. Install bedding for plastic piping to spring line of pipe. Utility bedding material to comply with the City of Jacksonville Water and Wastewater Standard Specifications and Details.

2.2 BURIED WARNING AND IDENTIFICATION MARKERS

Provide metallic core or metallic-faced, acid- and alkali-resistant, polyethylene plastic warning tape manufactured specifically for warning and identification of buried utility lines. Provide tape on rolls, 3 inches minimum width, color coded as specified below for the intended utility with warning and identification imprinted in bold black letters continuously over the entire tape length. Warning and identification to read, "CAUTION, BURIED (intended service) LINE BELOW" or similar wording. Provide permanent color and printing, unaffected by moisture or soil.

Warning Tape Color Codes	
Red	Electric
Yellow	Gas, Oil; Dangerous Materials

Orange	Telephone and Other Communications
Blue	Water Systems
Green	Sewer Systems
White	Steam Systems
Gray	Compressed Air

2.2.1 Warning Tape for Metallic Piping

Provide acid and alkali-resistant polyethylene plastic tape conforming to the width, color, and printing requirements specified above, with a minimum thickness of 0.003 inch and a minimum strength of 1500 psi lengthwise, and 1250 psi crosswise, with a maximum 350 percent elongation.

2.2.2 Detectable Warning Tape for Non-Metallic Piping

Provide polyethylene plastic tape conforming to the width, color, and printing requirements specified above, with a minimum thickness of 0.004 inch, and a minimum strength of 1500 psi lengthwise and 1250 psi crosswise. Manufacture tape with integral wires, foil backing, or other means of enabling detection by a metal detector when tape is buried up to 3 feet deep. Encase metallic element of the tape in a protective jacket or provide with other means of corrosion protection.

2.2.3 Detection Wire for Non-Metallic Piping

Insulate a single strand, solid copper detection wire with a minimum of 12 AWG.

2.3 MATERIAL FOR RIP-RAP

Provide filter fabric and rock conforming to DOT for construction indicated.

2.3.1 Bedding Material

Provide bedding material consisting of sand, gravel, or crushed rock, well graded, with a maximum particle size of 2 inches. Compose material of tough, durable particles. Allow fines passing the No. 200 standard sieve with a plasticity index less than 6 .

2.3.2 Grout

Provide durable grout composed of cement, water, an air-entraining admixture, and sand mixed in proportions of one-part Portland cement to two parts of sand, sufficient water to produce a workable mixture, and an amount of admixture which will entrain sufficient air, as determined by the Contracting Officer. Mix grout in a concrete mixer. Allow a sufficient mixing time to produce a mixture having a consistency permitting gravity flow into the interstices of the riprap with limited spading and brooming.

2.3.3 Rock

Provide rock fragments which ensure permanence in the structure and the environment in which it is to be used. Use rock fragments free from cracks, seams, and other defects that would increase the risk of deterioration from natural causes. Provide fragments sized such that no individual fragment exceeds a weight of 150 pounds and that no more than 10 percent of the mixture, by weight, consists of fragments weighing 2 pounds or less each. Provide rock with a minimum specific gravity of 2.50 . Do not permit the inclusion of more than trace 1 percent quantities of dirt, sand, clay and rock fines.

2.4 BORROW

Provide borrow materials from sources located outside of Government property meeting the requirements of paragraph STRUCTURAL FILL .

2.5 GEOTEXTILE

Provide a pervious sheet of polyester, nylon, glass or polypropylene ultraviolet resistant filaments woven, spun bonded, fused, or otherwise manufactured into a non-raveling fabric with uniform thickness and strength.

PART 3 EXECUTION

3.1 PROTECTION

Perform all work specified in accordance with applicable requirements of the Corps of Engineers publication EM 385-1-1 Safety and Health Requirements Manual.

Use equipment of type and size appropriate for the site conditions (soil character and moisture content). Maintenance of exposed subgrades and fills is the responsibility of the Contractor. The Contractor is required to prevent damage by ineffective drainage, dewatering, and heavy loads and equipment by implementing precautionary measures. Repair or replace any defects or damage.

3.1.1 Underground Utilities

Location of the existing utilities indicated is approximate. Physically verify the location and elevation of the existing utilities indicated prior to starting construction. The Contractor is responsible for protecting utilities from damage during construction.

3.1.2 Drainage and Dewatering

Provide for the collection and disposal of surface and subsurface water encountered during construction.

3.1.2.1 Drainage

Provide for the collection and disposal of surface and subsurface water encountered during construction. Construct storm drainage features (ponds/basins) at the earliest stages of site development, and throughout construction grade the construction area to provide positive surface water runoff away from the construction activity and provide temporary ditches, swales, and other drainage features and equipment as required to keep soils from becoming unstable, prevent erosion, or undermining of foundations. Remove unstable material from working platforms for equipment operation and soil support for subsequent construction features and provide new material as specified

herein. It is the responsibility of the Contractor to assess the site conditions to employ necessary measures to permit construction to proceed.

3.1.3 Protection of Graded Surfaces

Protect newly backfilled, graded, and topsoiled areas from traffic, erosion, and settlements that may occur. Repair or reestablish damaged grades, elevations, or slopes.

3.2 BORROW

Select borrow material to meet the requirements and conditions of the fill or embankment for which it is to be used. Obtain borrow material from approved private sources. Submit a Borrow Plan that includes materials to be excavated, stockpile locations, proposed slopes, drainage, and closure. Unless otherwise provided in the contract, the Contractor is responsible for obtaining 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 from the owners. Unless specifically provided, do not obtain borrow within the limits of the project site without prior written approval.

3.2.1 Contractor Furnished Borrow Area(s)

Obtain approved borrow materials from approved offsite sources. If a borrow source is selected that is not a commercial entity from which soil material is directly purchased, submit a Borrow Plan that includes the borrow source location, geotechnical test results showing the fill material meets the Contract requirements, environmental test results in accordance with paragraph ENVIRONMENTAL REQUIREMENTS FOR OFF-SITE SOIL, and any Federal, State, and local permits required for excavation and reclamation of the borrow area.

3.2.2 Environmental Requirements for Off-Site Soil

Test offsite soils brought in for use as backfill for Total Petroleum Hydrocarbons (TPH), Benzene, Toluene, Ethyl Benzene, and Xylene (BTEX) and full Toxicity Characteristic Leaching Procedure (TCLP) including ignitability, corrosivity and reactivity. Backfill may not contain concentrations above 10 parts per million (ppm) of total petroleum hydrocarbons (TPH) and 10 ppm of the sum of Benzene, Toluene, Ethyl Benzene, and Xylene (BTEX) and pass the TCLP test. Determine TPH concentrations by using applicable State TPH Testing Requirements. Determine BTEX concentrations by using EPA SW-846.3-3 Method 5030/8020/8260B. Perform TCLP in accordance with EPA SW-846.3-3 Method 1311. Perform hazardous waste characteristic tests for ignitability, corrosivity, and reactivity in accordance with accepted standard methods. Perform PCB testing in accordance with accepted standard methods for sampling and analysis of bulk solid samples. Provide borrow site testing for petroleum hydrocarbons and BTEX from a grab sample of material from the area most likely to be contaminated at the borrow site (as indicated by visual or olfactory evidence), with at least one test from each borrow site. Provide borrow site testing for hazardous waste characteristics (TPH, BTEX and TCLP) from a composite sample of material, collected in accordance with standard soil sampling techniques. Do not bring borrow material to project site until Borrow Plan containing environmental test results has been received and approved by the Contracting Officer.

3.3 SURFACE PREPARATION

3.3.1 Clearing and Grubbing

Clear and grub as specified in Section 31 11 00 CLEARING AND GRUBBING.

Remove trees, stumps, logs, shrubs, brush and vegetation and other items that would interfere with construction operations. Remove stumps entirely. Grub out matted roots and roots over 3 inches in diameter to at least 18 inches below existing surface.

3.3.2 Stripping

Strip site where indicated on the plans. Strip existing surface materials to a depth of 6 inches below the existing ground surface in areas designated as Clear and Grub on the plans. Strip existing surficial soils to a depth of 6 inches in all other areas. Strip in all areas within the planned limits of disturbance. All stripped materials not suitable for reuse as topsoil will be wasted in specified disposal area. Screen all stripped soils to remove roots and organic materials prior disposal.

3.3.3 Proof Rolling

Perform proof rolling on exposed subgrade that is unfrozen and free of surface water (wet conditions resulting from rainfall).

proof roll the existing subgrade of all building, pavement and embankment locations with six passes of a loaded tandem axle dump truck . Operate the truck in a systematic manner to ensure the number of passes over all areas, and at speeds between 2.5 to 3.5 miles per hour. Subgrade materials that exhibit excessive deflection and/or rutting during proof rolling need to be scarified, aerated, and re-compacted to specified density at plus or minus 2 percent of optimum moisture content prior to being considered for remedial action by the Contracting Officer. When proof rolling under buildings, the building subgrade is considered to extend 5 feet beyond the building lines, and make one-half of the passes with the roller in a direction perpendicular to the other passes.

3.3.4 Stockpiling Operations

Place and grade stockpiles of satisfactory and unsatisfactory and wasted materials as specified. Keep stockpiles in a neat and well drained condition, giving due consideration to drainage at all times. Clear, grub, and seal by rubber-tired equipment, the ground surface at stockpile locations; separately stockpile excavated satisfactory and unsatisfactory materials. Protect stockpiles of satisfactory materials from contamination which may destroy the quality and fitness of the stockpiled material. Do not create stockpiles that could obstruct the flow of any stream, endanger a partly finished structure, impair the efficiency or appearance of any structure, or be detrimental to the completed work in any way. If the Contractor fails to protect the stockpiles, and any material becomes unsatisfactory, remove and replace such material with satisfactory material from approved sources.

3.4 EXCAVATION

Excavate to contours, elevation, and dimensions indicated. Excavate soil disturbed or weakened by Contractor's operations, and soils softened or made unstable for subsequent construction due to exposure to weather. Use material removed from excavations meeting the specified requirements in the construction of fills, embankments, subgrades, shoulders, bedding (as backfill), and for similar purposes to minimize surplus material and to minimize additional material brought on site. Do not

excavate below indicated depths except to remove unstable material as determined by the Geotechnical Engineer and confirmed by the Contracting Officer. Remove and replace excavations below the grades shown with appropriate materials as directed by the Contracting Officer.

If at any time during excavation, including excavation from borrow areas, the Contractor encounters material that may be classified as rock or as hard/unyielding material, uncover such material, and notify the Contracting Officer. Do not proceed with the excavation of this material until the Contracting Officer has classified the materials as common excavation or rock excavation. Failure on the part of the Contractor to uncover such material, notify the Contracting Officer, and allow sufficient time for classification and delineation of the undisturbed surface of such material will cause the forfeiture of the Contractor's right of claim to any classification or volume of material to be paid for other than that allowed by the Contracting Officer for the areas of work in which such deposits occur.

3.4.1 Ditches, Gutters, and Channel Changes

Finish excavation of ditches, gutters, and channel changes by cutting accurately to the cross sections, grades, and elevations shown. Do not excavate below grades shown. Backfill excessive excavation as directed by the Contracting Officer, with satisfactory, compacted, material or with suitable stone or cobble to grades shown. Dispose excavated material as shown or as directed. Do not allow material to be deposited within 4 feet from edge of a ditch. Maintain excavations free from detrimental quantities of leaves, brush, sticks, trash, and other debris until final acceptance of the work.

3.4.2 Trench Excavation Requirements

Excavate the trench as recommended by the manufacturer of the pipe to be installed. Slope trench walls below the top of the pipe, or make vertical, and of such width as recommended by the manufacturer. Provide vertical trench walls where no manufacturer installation instructions are available. Do not exceed the trench width of 24 inches below the top pipe plus pipe outside diameter (O.D.) for pipes of less than 24 inches inside diameter, and do not exceed 36 inches plus pipe outside diameter for pipe sizes larger than 24 inches inside diameter. Where recommended trench widths are exceeded, provide redesign, stronger pipe, or special installation procedures. The Contractor is responsible for the cost of redesign, stronger pipe, or special installation procedures without any additional cost to the Government.

3.4.2.1 Bottom Preparation

Grade the bottoms of trenches accurately to provide uniform bearing and support for the bottom quadrant of each section of the pipe. Excavate bell holes to the necessary size at each joint or coupling to eliminate point bearing. Remove stones of 3 inch or greater in any dimension, or as recommended by the pipe manufacturer, whichever is smaller, to avoid point bearing.

3.4.2.2 Removal of Unyielding Material

Where unyielding material is encountered in the bottom of the trench, notify the Contracting Officer. Following approval, remove such material 6 inch below the required grade and replaced with suitable materials as provided in paragraph FILLING AND COMPACTION.

3.4.2.3 Removal of Unstable Material

Where unstable material is encountered in the bottom of the trench, remove such material to the depth directed and replace it to the proper grade with suitable material as provided in paragraph FILLING AND COMPACTION. When removal of unstable material is required due to the Contractor's fault or neglect in performing the work, the Contractor is responsible for excavating the resulting material and replacing it without additional cost to the Government.

3.4.2.4 Excavation for Appurtenances

Provide excavation for manholes, catch-basins, inlets, or similar structures of sufficient size to permit the placement and removal of forms for the full length and width of structure footings and foundations as shown.

3.4.2.5 Gas Distribution

Excavate trenches to a depth that will provide a minimum 18 inches of cover in rock excavation and a minimum 24 inches of cover in other excavation.

3.4.3 Underground Utilities

Perform work adjacent to utilities in accordance with procedures outlined by utility owner.. Report damage to utility lines or subsurface construction immediately to the Contracting Officer.

3.4.4 Structural Excavation

Comply with the recommendations found the Geotechnical Report for the site completed by Terracon dated February 3, 2026.

Make excavations to the lines, grades, and elevations shown, or as directed. Provide trenches and foundation pits of sufficient size to permit the placement and removal of forms for the full length and width of structure footings and foundations as shown. Clean rock or other hard foundation material of loose debris and cut to a firm, level, stepped, or serrated surface. Remove loose disintegrated rock and thin strata.

Concrete placement is not allowed until footing subgrades have been inspected and approved by the Contracting Officer.

3.5 SUBGRADE PREPARATION

3.5.1 General Requirements

Shape subgrade to line, grade, and cross section as indicated. Remove unsatisfactory and unstable material in surfaces to receive fill or in excavated areas, as determined by proof rolling, and replaced with structural fill . Do not place material on surfaces that are muddy, frozen, contain frost, or otherwise containing unstable material. Scarify the surface to a depth of 4 inches prior to placing fill. Step or bench sloped surfaces steeper than 1 vertical to 4 horizontal prior to scarifying. Place 4 inches of loose fill and blend with scarified material. When subgrade is part fill and part excavation or natural ground, scarify to a depth of 8 inches.

3.5.2 Subgrade for Pavements

Compact top 12 inches of subgrade for pavements to at least 95 percent of ASTM D698 . After final rolling, the surface of the subgrade for buildings and pavements must not show deviations greater than 0.05 foot when tested with a 12-foot straightedge applied both parallel and at right angles to the centerline of the area.

3.5.3 Subgrade for Shoulders

Compact the upper 6 inches of subgrade for shoulders to at least 95 percent of ASTM D698 for the full depth of the shoulder.

3.5.4 Subgrade Filter Fabric

Place filter fabric as indicated directly on prepared subgrade free of vegetation, stumps, rocks larger than 2 inch diameter and other debris which may puncture or otherwise damage the fabric. Repair damaged fabric by placing an additional layer of fabric to cover the damaged area a minimum of 3 feet overlap in all directions. Overlap fabric at joints a minimum of 3 feet. Obtain approval of filter fabric installation before placing fill or backfill. Place fill or backfill on fabric in the direction of overlaps and compact as specified herein. Follow manufacturer's recommended installation procedures.

3.6 FILLING AND COMPACTION

Prepare ground surface on which backfill is to be placed and provide compaction requirements for backfill materials in conformance with the applicable portions of paragraphs for SUBGRADE PREPARATION. Do not place material on surfaces that are muddy, frozen, or contain frost. Finish compaction by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, or other approved equipment well suited to the soil being compacted. Moisten material as necessary to plus or minus 2 percent of optimum moisture. Fill and backfill to contours, elevations, and dimensions indicated. Compact and test each lift before placing overlaying lift.

3.6.1 Trench Backfill

Backfill trenches to the grade shown. Do not backfill the trench until all specified tests are performed.

3.6.1.1 Replacement of Unyielding Material

Replace unyielding material removed from the bottom of the trench with satisfactory material or initial backfill material.

3.6.1.2 Replacement of Unstable Material

Replace unstable material removed from the bottom of the trench or excavation with satisfactory material placed in layers not exceeding 6 inches loose thickness.

3.6.1.3 Bedding and Initial Backfill

Provide bedding of the type and thickness shown. Place initial backfill material and compact it with approved tampers to a height of at least one foot above the utility pipe or conduit. Bring up the backfill evenly on both sides of the pipe for the full length of the pipe. Take care to ensure thorough compaction of the fill under the haunches of the pipe. Except where shown or when specified

otherwise in the individual piping section, provide bedding for buried piping in accordance with PART 2 paragraph UTILITY BEDDING MATERIAL. Compact backfill to top of pipe to 95 percent of ASTM D698 maximum dry density . Provide plastic piping with bedding to spring line of pipe.

3.6.1.4 Final Backfill

Do not begin backfill until construction below finish grade has been approved, underground utilities systems have been inspected, tested and approved, forms removed, and the excavation cleaned of trash and debris. Bring backfill to indicated finish grade. Where pipe is coated or wrapped for protection against corrosion, the backfill material up to an elevation 2 feet above sewer lines and one foot above other utility lines need to be free from stones larger than one inch in any dimension. Heavy equipment for spreading and compacting backfill are not to be operated closer to foundation or retaining walls than a distance equal to the height of backfill above the top of footing; compact remaining area in layers not more than 4 inches in compacted thickness with power-driven hand tampers suitable for the material being compacted. Place backfill carefully around pipes or tanks to avoid damage to coatings, wrappings, or tanks. Do not place backfill against foundation walls prior to 7 days after completion of the walls. As far as practicable, bring backfill up evenly on each side of the wall and sloped to drain away from the wall.

Fill the remainder of the trench, except for special materials for buildings and pavements with satisfactory material. Place backfill material and compact as follows:

3.6.1.4.1 Buildings and Pavements

Place backfill up to the required elevation as specified. Do not permit water flooding or jetting methods of compaction. Compact as specified for Structural Fill.

3.6.1.4.2 Turfed or Seeded Areas and Miscellaneous Areas

Deposit backfill in layers of a maximum of 12 inches loose thickness, and compact it to 85 percent maximum dry density for cohesive soils and 90 percent maximum dry density for cohesionless soils. Do not permit compaction by water flooding or jetting. Apply this requirement to all other areas not specifically designated above.

3.6.1.5 Heat Distribution System

Free initial backfill material of stones larger than 1/4 inch in any dimension.

3.6.1.6 Electrical Distribution System

Provide a minimum cover of 24 inches from the finished grade to direct burial cable and conduit or duct line, unless otherwise indicated.

3.6.1.7 Displacement of Features

After other required tests have been performed and the trench backfill compacted to the finished grade surface, inspect the pipe to determine whether unexpected or damaging displacement has occurred. Conduct walk-through inspection of pipe sizes larger than 48 inches. Inspect pipes smaller than 48 inches using remote methods using closed circuit television, sonar, or hybrid that can provide a 360-degree inspection of the pipe. Prepare and submit a pipe inspection report consisting of digital

video or photos. If, in the judgment of the Contracting Officer, the interior of the pipe shows poor alignment or any other defects that would cause improper functioning of the system, replace or repair the defects as directed at no additional cost to the Government.

3.6.1.8 Buried Tape And Detection Wire

3.6.1.8.1 Buried Warning and Identification Tape

Provide buried utility lines with utility identification tape. Bury tape 12 inches below finished grade; under pavements and slabs, bury tape 6 inches below top of subgrade.

3.6.1.8.2 Buried Detection Wire

Bury detection wire directly above non-metallic piping at a distance not to exceed 12 inches above the top of pipe. Extend the wire continuously and unbroken, from manhole to manhole. Terminate the ends of the wire inside the manholes at each end of the pipe, with a minimum of 3 feet of wire, coiled, remaining accessible in each manhole. Furnish insulated wire over its entire length. Install wires at manholes between the top of the corbel and the frame, and extend up through the chimney seal between the frame and the chimney seal. For force mains, terminate the wire in the valve pit at the pump station end of the pipe.

3.6.2 Structural Fill Placement

Place fill and backfill beneath and adjacent to structures in successive horizontal layers of loose material not more than 8 inches in depth, or in loose layers not more than 4 inches in depth when using hand-operated compaction equipment. Do not place over wet or frozen materials. Compact to at least 90 percent of laboratory maximum dry density for cohesive materials or 95 percent of laboratory maximum dry density for cohesionless materials, except as otherwise specified. Perform compaction in such a manner as to prevent wedging action or eccentric loading upon or other damage to the structure. Moisture condition fill and backfill material to within range of plus 2 or minus 2 percent of optimum moisture content at the time of compaction.

3.6.3 Backfill for Appurtenances

After the manhole, catchbasin, inlet, or similar structure has been constructed and the concrete has been allowed to cure for 7 days, place backfill in such a manner that the structure is not be damaged by the shock of falling earth. Deposit the backfill material, compact it as specified for final backfill, and bring up the backfill evenly on all sides of the structure to prevent eccentric loading and excessive stress.

3.6.4 Porous Fill Placement

Provide under floor and area-way slabs on a compacted subgrade. Place in a single lift and compact with a minimum of two passes of a hand-operated plate-type vibratory compactor.

3.6.5 Flowable Fill

Place fill in a manner to completely fill voids in the location indicated. Do not place when atmospheric temperatures are expected to be below 33 degrees F at any time during the 3 day period following placement.

3.6.6 Compaction

3.6.6.1 General Site

Compact underneath areas designated for vegetation and areas outside the 5 foot line of the paved area or structure to 90 percent of ASTM D698 .

3.6.6.2 Adjacent Areas

Compact areas within 5 feet of structures to 95 percent of ASTM D698 .

3.7 EMBANKMENTS

3.7.1 Earth Embankments

Construct earth embankments from satisfactory materials free of organic or frozen material and rocks with any dimension greater than 3 inches. Place the material in successive horizontal layers of loose material not more than 8 inches in depth. Spread each layer uniformly on a soil surface that has been moistened or aerated as necessary and scarified or otherwise broken up so that the fill will bond with the surface on which it is placed. After spreading, plow, disk, or otherwise break up each layer; moisten or aerate as necessary; thoroughly mix; and compact to at least 90 percent laboratory maximum dry density for cohesive materials or 95 percent laboratory maximum dry density for cohesionless materials. Backfill and fill material are to be within the range of minus 2 to plus 2 percent of optimum moisture .

Compaction requirements for the upper portion of earth embankments forming subgrade for pavements are identical with those requirements specified in paragraph SUBGRADE PREPARATION. Finish compaction by sheepfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment.

3.8 RIP-RAP CONSTRUCTION

Construct rip-rap on filter fabric in accordance with DOT Trim and dress indicated areas to conform to cross sections, lines and grades shown within a tolerance of 0.1 foot.

3.8.1 Stone Placement

Place rock for rip-rap on prepared bedding material to produce a well graded mass with the minimum practicable percentage of voids in conformance with lines and grades indicated. Distribute larger rock fragments, with dimensions extending the full depth of the rip-rap throughout the entire mass and eliminate "pockets" of small rock fragments. Rearrange individual pieces by mechanical equipment or by hand as necessary to obtain the distribution of fragment sizes specified above.

3.9 FINISHING/FINISH OPERATIONS

During construction, keep embankments and excavations shaped and drained. Maintain ditches and drains along subgrade to drain effectively at all times. Do not disturb the finished subgrade by traffic or other operation. Protect and maintain the finished subgrade in a satisfactory condition until ballast, subbase, base, or pavement is placed. Do not permit the storage or stockpiling of materials on finished subgrade. Do not lay subbase, base course, ballast, or pavement until the subgrade has been

checked and approved, and in no case place subbase, base, surfacing, pavement, or ballast on a muddy, spongy, frozen or otherwise unstable subgrade.

Finish the surface of excavations, embankments, and subgrades to a smooth and compact surface in accordance with the lines, grades, and cross sections or elevations shown. Provide the degree of finish for graded areas within 0.1 foot of the grades and elevations indicated except as indicated for subgrades specified in paragraph SUBGRADE PREPARATION. Finish gutters and ditches in a manner that will result in effective drainage. Finish the surface of areas to be turfed to a smoothness suitable for the application of turfing materials. Repair graded, topsoiled, or backfilled areas prior to acceptance of the work, and re-established grades to the required elevations and slopes.

3.9.1 Capillary Water Barrier

Place a capillary water barrier under concrete floor and area-way slabs grade directly on the subgrade and compact with a minimum of two passes of a hand-operated plate-type vibratory compactor.

3.9.2 Grading Around Structures

Construct areas within 5 feet outside of each building and structure line true-to-grade, shape to drain, and maintain free of trash and debris until final inspection has been completed and the work has been accepted.

3.9.3 Shoulder Construction

Construct shoulders of satisfactory material. Submit advanced notice on shoulder construction for rigid pavements. Construct shoulders immediately after adjacent paving is complete. In the case of rigid pavements, do not construct shoulders until permission of the Contracting Officer has been obtained. Compact the entire shoulder area to at least the percentage of maximum dry density as specified in paragraph SUBGRADE PREPARATION above, for specific ranges of depth below the surface of the shoulder. Finish compaction by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment. Finish shoulder construction in proper sequence in such a manner that adjacent ditches will be drained effectively and that no damage of any kind is done to the adjacent completed pavement. Align the completed shoulders true to grade and shaped to drain in conformity with the cross section shown.

3.9.4 Grading

Finish grades as indicated within one-tenth of one foot. Grade areas to drain water away from structures. Maintain areas free of trash and debris. For existing grades that will remain but which were disturbed by Contractor's operations, grade as directed.

3.10 DISPOSITION OF SURPLUS MATERIAL

Remove from Government property all surplus or other soil material not required or not suitable for filling or backfilling, along with brush, refuse, stumps, roots, and timber. Properly disposed of in accordance with all applicable laws and regulations.

3.11 [Enter Appropriate Subpart Title Here][Enter Appropriate Subpart Title Here][Enter Appropriate Subpart Title Here]TESTING

Perform testing as indicated in Table 1. Submit Material Test Reports within 7 days of tests being completed.

Material Type list materials to be tested as identified in paragraph DEFINITIONS	Location of Material	Test Method	Test Frequency
Fill Material	Entire Project	Density - ASTM D1556/D1556M	One test per 2000 square feet, or fraction thereof, of each lift of fill or backfill areas compacted by other than hand-operated machines. Double testing frequency for areas compacted by hand-operated machines. [If ASTM D6938 or ASTM D8167/D8167M is used, check in-place densities by ASTM D1556/D1556M as follows: One check test per lift for every [6] [10] tests.] [Where ASTM D8167/D8167M is used, provide water content verification in accordance with ASTM D2216 for each test.]

Fill Material	Entire Project	Moisture Content - ASTM D2216	Two tests per day for each type of fill and backfill. Sample taken immediately prior to compaction after moisture conditioning.
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Material Type list materials to be tested as identified in paragraph DEFINITIONS	Location of Material	Test Method	Test Frequency
Fill Material	Entire Project	Moisture Density Relationship - ASTM D698	One representative test per 500 cubic yards of fill and backfill, or when any change in material occurs which may affect the optimum moisture content or laboratory maximum dry density. Sample to be taken from stockpile or location of placement.

Fill Material	Entire Proejct	Relative Density - ASTM D4253 and ASTM D4254	One test per 2000 square feet, or fraction thereof, of each lift of fill or backfill areas compacted by other than hand-operated machines. Double testing frequency for areas compacted by hand-operated machines.
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Material Type list materials to be tested as identified in paragraph DEFINITIONS	Location of Material	Test Method	Test Frequency
Fill Material	Entire Project	Gradation - ASTM C136/C136M	One representative test per 500 cubic yards of fill and backfill, or when any change in material occurs which may affect the optimum moisture content or laboratory maximum dry density. Sample to be taken from stockpile or location of placement.

Fill Material	Entire Project	Atterberg Limits - ASTM D4318	One representative test per 500 cubic yards of fill and backfill, or when any change in material occurs which may affect the optimum moisture content or laboratory maximum dry density. Sample to be taken from stockpile or location of placement.
Material Type list materials to be tested as identified in paragraph DEFINITIONS	Location of Material	Test Method	Test Frequency
Fill Material	Entire Project	Organic Content Test - ASTM D2974, Method C	One representative test per 200 lineal feet of embankment.

-- End of Section --