

SECTION 312000 - EARTH MOVING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including Division 01 Specification Sections, apply to this Section.
- B. U.S. Fish and Wildlife Service (USFWS) Region 7 Guidelines for Preventing the Spread of Aquatic Invasive Species.
- C. Alaska Department of Environmental Conservation Division of Spill Prevention and Response. Managing Petroleum-Contaminated Soil, Water, or Free Product during Public Utility and Right-of-Way Construction and Maintenance Projects. Technical Memorandum. September 2018

1.02 SUMMARY

- A. Section Includes:
 - 1. Preparing subgrades for slabs-on-grade, walks, pavements, and grasses.
 - 2. Subbase course for pavements.
 - 3. Subbase course and base course for asphalt paving.
 - 4. Subsurface drainage backfill for walls and trenches.
 - 5. Excavating and backfilling trenches for utilities and pits for buried utility structures.
 - 6. Handling of contaminated soil in trenches.
- B. Related Sections:
 - 1. Division 01 Section "Temporary Facilities and Controls" for temporary controls, utilities, and support facilities; also for temporary site fencing if not in another Section.
 - 2. Division 22 Sections for installing underground utilities.
 - 3. Division 31 Section "Site Clearing" for site stripping, grubbing, stripping and stockpiling topsoil, and removal of above- and below-grade improvements and utilities.
 - 4. Division 32 Section "Turf and Grasses" for finish grading in turf and grass areas, including preparing and placing planting soil for turf areas.

1.03 DEFINITIONS

- A. Backfill: Soil material used to fill an excavation.
- B. Base Course: Aggregate layer placed between the subbase course and hot-mix asphalt paving.
- C. Bedding Course: Material in which utility pipelines or utility-related structures are set.
- D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.
- E. Breakup: Initiation of spring thaw as defined in APDES General Permit AKR100000 for Discharges from Large and Small Construction Activities (Construction General Permit).
- F. Clean Soil: Soil not located below groundwater seasonal fluctuation level and therefore believed to be free of PFAS contamination.

- G. Contaminated Soil: All soil below the upper limits of the seasonal groundwater table fluctuation are considered contaminated. Estimated upper limit is shown on project profile sheets.
- H. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.
 - 1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as recommended by Engineer of Record and approved by Developer. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
 - 2. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without recommendation by Engineer of Record and approval by Developer. Unauthorized excavation, as well as remedial work directed by Engineer of Record, shall be without additional compensation.
- I. Fill: Soil materials used to raise existing grades.
- J. Geomembrane: Synthetic liner rated for direct burial to impede subsurface liquid transport.
- K. Geotextile: Permeable synthetic fabric for soil separation or filtration. Non-Frost Susceptible Soils: Non-frost susceptible soils are inorganic soils containing less than 3 percent by weight of grains finer than 0.02 mm. The methods of test will be ASTM C 117, C 136, D 75, and D 422.
- L. PFAS: Per- and polyfluoroalkyl substances are a group of man-made chemicals that includes perfluorooctanoic acid (PFOA) and perfluorooctane sulfonate (PFOS).
- M. Pipe Zone: Interval of backfill around a buried pipe extending from the bottom of the pipe to a level of 1 foot over the top of the pipe.
- N. Spring Line: Horizontal line coincident with the centerline of a buried pipeline.
- O. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.
- P. Subbase Course: Aggregate layer placed between the subgrade and base course for hot-mix asphalt pavement, or aggregate layer placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.
- Q. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.
- R. Trench Excavation: Any excavation for a pipeline or appurtenance.
- S. Unauthorized Excavation: Removal of materials beyond indicated subgrade elevations or dimensions without recommendation by the Engineer of Record and approval by Developer. Unauthorized excavation, as well as remedial work recommended by the Engineer of Record and approved by Developer, shall be at the Contractor's expense.
- T. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.04 BUY AMERICAN REQUIREMENTS

- A. Provide certificates to show that all products meet the following requirements.
 - 1. American Iron and Steel (AIS)
 - 2. Build America, Buy America Act
- B. See Supplementary Conditions for details.

1.05 ACTION SUBMITTALS

- A. Product Data: For each type of the following manufactured products required:
 - 1. Warning tapes.

1.06 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified testing agency.
- B. Material Test Reports: For each on-site and borrow soil material proposed for fill and backfill as follows:
 - 1. Classification according to ASTM D 2487.
 - 2. Laboratory compaction curve according to ASTM D 1557.
- C. Preconstruction Submittals:
 - 1. Excavation and Trenching Plan: No less than 30 days prior to the anticipated start of excavation activities, submit for approval a detailed plan for all proposed structure excavation, trenching, bracing, and shoring activities. Excavation and trenching plan shall conform to:
 - a. Be prepared by a Professional Engineer registered in the State of Alaska.
 - b. Occupational Safety and Health Act's (OSHA) excavation standards outlined in 29 CFR Part 1926, Subpart P.
 - c. If stability of pavements, sidewalks, guardrails, and related structures is endangered by excavations then shoring or bracing designed by a qualified person shall be provided to ensure stability of structures and protect working personnel. Underpinning and undercutting shall not be allowed as part of the excavation and trenching plan.
 - d. At a minimum, the excavation and trenching plan shall include:
 - 1) Complete details and substantiating calculations, sealed by a Professional Engineer registered in the State of Alaska.
 - 2) Activity Hazard Analysis (AHA) that defines all proposed steps being performed within the excavation and trenching activities. The AHA shall identify work sequences, specific anticipated hazards, site conditions, equipment, materials, personnel, and the control measures to be implemented.
 - 3) Complete details of all protective systems proposed. Protective systems shall have the capacity to resist without failure all loads that are intended or could reasonably be expected to be applied or transmitted to the system.
 - 4) Methods and locations for egress into work area.
 - 5) Documentation that examination of the ground provides no indication of a potential cave-in.
 - 6) Rescue plan and procedure that contains provisions for self-rescue and assisted rescue of any working who is buried during a cave-in including rescue equipment.

- 7) Diagram or sketch of work area where work is to be performed, with adjacent and nearby structures and roadways shown.
 - 8) Projected maximum depth of excavation.
 - 9) Projected soil type classification and method of testing or justification to determine soil type.
 - 10) Planned method of shoring, sloping, and/or benching.
 - 11) Planned method for confined space entry, trench access and egress, and atmospheric monitoring process (if applicable).
 - 12) Proposed methods for preventing damage or impacts to adjacent pavements, sidewalks, guardrails, and other structures designated to remain within or adjacent to the construction work area.
 - 13) Plan for management of excavated soil/asphalt/concrete.
 - 14) Plan for traffic control.
 - 15) Digging permits (Excavation permits). All underground lines/utilities (communication lines, water, fuel, electric lines) shall be located and protected from damage or displacement.
 - 16) Utility companies and other responsible authorities shall be contacted to locate and mark the locations and, if they so desire, direct or assist with protecting the underground installations.
- e. Do not mobilize excavation and trenching equipment to the site without an approved excavation and trenching plan.
 - f. Submit all revisions to the approved excavation and trenching plan to the Engineer for approval. For all equipment not previously identified in the excavation and trenching plan, include in the submittal all of the information required above for the excavation and trenching plan. Explain to the Engineer, in writing, which portions of the approved excavation and trenching plan will be superseded by the revision and which portions remain unchanged. Allow at least 5 days for the Engineer's approval of excavation and trenching plan revisions.

1.07 QUALITY ASSURANCE

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

1.08 PROJECT CONDITIONS

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth moving operations.
 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from City and authorities having jurisdiction.
 2. Provide alternate routes around closed or obstructed traffic ways if required by City or authorities having jurisdiction.
- B. Utility Locator Service: Notify the Alaska Dig Line for area where Project is located a minimum of 24 hours before beginning earth moving operations.
- C. Do not commence earth moving operations until temporary erosion- and sedimentation-control measures, specified in Division 01 Section "Temporary Facilities and Controls" and Division 31 Section "Site Clearing," are in place.

PART 2 - PRODUCTS

2.01 SOIL MATERIALS

- A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.
- B. Satisfactory Soils: Soil Classification Groups GW, GP, GM, SW, SP, and SM according to ASTM D 2487, or a 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.
1. Plasticity Index: 6.
- C. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, OL, CH, MH, ML, OH, and PT according to ASTM D 2487, or a combination of these groups.
1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.
- D. Base Course (D-1 and E-1): Aggregate shall be crushed stone or crushed gravel, and shall consist of sound, tough, durable pebbles or rock fragments of uniform quality. All material shall be free from clay balls, vegetable matter or other deleterious matters. In addition, aggregate shall meet the following requirements:
- | | | |
|-------------------|----------------------------|---------|
| Percent of Wear | AASHTO T 96 | 50 max. |
| Degradation Value | ATM T 313 | 45 min. |
| Percent Fracture | WAQTC FOP for AASHTO TP 61 | 70 min. |
1. Gradations shall conform to the following requirements, as determined by WAQTC FOP for AASHTO T 27/T 11:

AGGREGATE FOR BASE

<u>Sieve Designation</u>	<u>D-1 Percent Passing by Weight Grading</u>	<u>E-1 Percent Passing by Weight Grading</u>
1-inch	100	100
3/4-inch	70 - 100	70 - 100
3/8-inch	50 - 80	50 - 85
No. 4	35 - 65	35 - 65
No. 8	20 - 50	20 - 50
No. 40	6 - 30	15 - 30
No. 200	0 - 6	8 - 15

- E. Subbase: Hard, durable particles or fragments of stone or gravel containing no muck, frozen material, roots, sod, or other deleterious matter. Liquid limit not greater than 25 as tested by ATM 204. Plasticity index not greater than 6 as tested by ATM 205.
- | | | |
|-------------------|-------------|---------|
| Percent of Wear | AASHTO T 96 | 50 max. |
| Degradation Value | ATM 313 | 40 min. |
1. Meet the following gradation as tested by ATM 304:

GRADING

<u>Sieve Designation</u>	<u>A</u>	<u>B</u>	<u>C</u>	<u>D</u>	<u>E</u>
4-inch	100	-	-	-	-
2-inch	85-100	100	-	-	-

Sieve Designation	GRADING				
	<u>A</u>	<u>B</u>	<u>C</u>	<u>D</u>	<u>E</u>
1-inch	-	-	100	-	-
3/4-inch	-	-	-	100	-
No. 4	15-60	15-60	40-75	45-80	-
No. 16	-	-	20-43	23-50	-
No. 200	Less than 10	Less than 6	4-10	4-12	0-6

- F. Selected Material, Type A: Aggregate containing no muck, frozen material, roots, sod or other deleterious matter and with a plasticity index not greater than 6 as tested by ASTM 204 and ATM 205. Meet the following gradation as tested by ATM 304:

Size	Percent Passing
No. 4	20-60
No. 200	Less than 6 (based on the 3-inch minus fraction)

- G. Bedding Course: Uniformly graded pea gravel meeting the gradation requirements in the table below if wet conditions are encountered:

Size	Percent Passing
3 inch	100
No. 4	20-60
No. 200	Less than 6 (based on the 3-inch minus fraction)

1. For dry conditions: Uniformly graded pea gravel as specified above or Pit Run gravel material meeting the requirements in the table below, containing no frozen, organic, muck, wood debris, or other deleterious material.

Size	Percent Passing
2-inch	100
No. 4	30 – 85
No. 60	35 max
No. 200	Less than 5

- H. Drainage Rock and Leach Rock: Washed, uniformly graded mixture of crushed stone, or crushed or uncrushed gravel, with 100 percent passing a 4-inch sieve and not more than 5 percent passing a 1-inch sieve. This material shall be free of silt and clay particles adhering to the rock.
- I. Common Fill: Subsoil materials used for fill and backfill shall be free of debris, roots, wood, scrap material, vegetation, refuse, soft unsound particles, and deleterious or objectionable materials and shall not contain unsuitable material and frozen material. Unless specified otherwise, the maximum particle diameter shall be one-half the lift thickness at the intended location.

2.02 ACCESSORIES

- A. Detectable Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide

- and 4 mils thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored as follows:
1. Blue: Water systems.
- B. Filter Fabric: Meet AASHTO M 288 for separation (Class 3). Fabric must be nonwoven and meet the following requirements: AMOCO 4547 or equal.
1. Grab Tensile Strength: Minimum 112 pounds as determined by ASTM D 4632.
 2. Puncture Strength: Minimum 40 pounds as determined by ASTM D 4833.
 3. Elongation: Minimum 50 percent as determined by ASTM D 4632.
- C. Geotextile: Geotextile shall meet AASHTO M 288 for separation (Class 2). Fabric must be nonwoven with an elongation greater than or equal to 50 percent.
1. Permittivity: Minimum of 0.05 per second as determined by ASTM D 4491.
 2. Apparent Opening Size: Equal to or between the No. 70 and No. 100 as determined by ASTM D 4751.
- D. Geogrid: Geogrid shall meet ASTM D6637. Mirafi BXG120, or equal.
- | | |
|--|---------------------------------|
| Mechanical Properties | Minimum Average Roll Value |
| 2% Strain Tensile Strength by ASTM D6637 | 410 lb/ft (MD) 620 lb/ft (CD) |
| 5% Strain Tensile Strength by ASTM D6637 | 810 lb/ft (MD) 1340 lb/ft (CD) |
| Ult. Strain Tensile Strength by ASTM D6637 | 1310 lb/ft (MD) 1970 lb/ft (CD) |
| Grid Aperture Size | 1.0 (MD) 1.3 (CMD) |
| Resistance to Installation Damage | 95% (SC), 93% (SW), 90% (GP) |
| Resistance to Long Term Degradation | 100% |
| Resistance to UV Degradation | 100% |
- E. Insulation: Extruded polystyrene board insulation, Type VII: ASTM C578, 60 psi minimum compressive strength.
1. Thermal resistance value (R-value) under heated structure:
 - a. Horizontal insulation: 1.7 hr-ft² °F/BTU
 - b. Vertical insulation: 6.7 hr-ft² °F/BTU
 - c. Corner insulation: 4.9 hr-ft² °F/BTU
 2. Thermal resistance value (R-value) under unheated structure:
 - a. Horizontal insulation: 10.9 hr-ft² °F/BTU
 3. The required R-values shown above should be divided by the R factor (R per inch) of the insulation board selected for construction to determine the thickness of insulation required in the vertical, central horizontal, and corner horizontal areas of the building to protect the foundation from frost action.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth-moving operations.
- B. Protect and maintain erosion and sedimentation controls during earth moving operations.
- C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

3.02 EXPLOSIVES

- A. Explosives: Do not use explosives.

3.03 EXCAVATION, GENERAL

- A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions.
 - 1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.

3.04 EXCAVATION FOR WALKS AND PAVEMENTS

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

3.05 EXCAVATION FOR UTILITY TRENCHES

- A. Excavate trenches to indicated gradients, lines, depths, and elevations.
- B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit unless otherwise indicated.
 - 1. Clearance: As indicated on Drawings.
- C. Trench Bottoms: Excavate trenches 6 inches deeper than bottom of pipe and conduit elevations to allow for bedding course. Hand-excavate deeper for bells of pipe.

3.06 SUBGRADE INSPECTION

- A. Notify Engineer of Record when excavations have reached required subgrade.
- B. If Engineer of Record determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.
 - 1. If peat or organic soils are encountered, these soils should be excavated and removed to a minimum depth of 3 feet from the pipe base.
- C. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
- D. Seasonally frozen soil within 2 feet of base of trench shall be allowed to thaw and base of trench shall be uniformly and systematically compacted to achieve required compaction in first lift of fill.
- E. If the soils are too wet to compact or pumping occurs, the Contractor has three options:
 - 1. Wait and allow silty soils to dry naturally.
 - 2. Till or otherwise accelerate the natural drying of the wet soils by mechanical means.
 - 3. Excavate an additional 1 foot of subgrade, install a geosynthetic separator, and float an initial 1-foot-thick lift of structural fill on top of the separator.
- F. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Engineer of Record, without additional compensation.

3.07 UNAUTHORIZED EXCAVATION

- A. Fill unauthorized excavations under other construction, pipe, or conduit as directed by Engineer of Record.

3.08 STORAGE OF SOIL MATERIALS

- A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 - 1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.
 - 2. Following requirements of Section 9 of Contaminated Materials Management Plan (CMMP).

3.09 BACKFILL

- A. Place and compact backfill in excavations promptly, but not before completing the following:
 - 1. Construction below finish grade including, where applicable, subdrainage, dampproofing, waterproofing, and perimeter insulation.
 - 2. Surveying locations of underground utilities for Record Documents.
 - 3. Testing and inspecting underground utilities.
 - 4. Removing trash and debris.
 - 5. Removing temporary shoring and bracing, and sheeting.
- B. Place backfill on subgrades free of mud, frost, snow, or ice.

3.10 UTILITY TRENCH BACKFILL

- A. Place backfill on subgrades free of mud, frost, snow, or ice.
- B. Coordinate backfilling with utilities testing.
- C. Clean material must be placed 18-inches above the pipe.
- D. Backfill voids with satisfactory soil while removing shoring and bracing.
- E. Place and compact final backfill of satisfactory soil to final subgrade elevation.
- F. Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

3.11 SOIL FILL

- A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.
- B. Place and compact fill material in layers to required elevations as follows:
 - 1. Under grass and planted areas, use satisfactory soil material.
 - 2. Under walks and pavements, use structural fill soil material.
- C. Place soil fill on subgrades free of mud, frost, snow, or ice.

3.12 SOIL MOISTURE CONTROL

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

3.13 COMPACTION OF SOIL BACKFILLS AND FILLS

- A. Place backfill and fill soil materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.
- B. Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.
- C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 1557:
 - 1. Under structures and pavements, scarify and recompact top 12 inches of existing subgrade and each layer of backfill or fill soil material at 95 percent.
 - 2. Under turf or unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 92 percent.

3.14 GRADING

- A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
 - 1. Provide a smooth transition between adjacent existing grades and new grades.
 - 2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.
- B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:
 - 1. Turf or Unpaved Areas: Plus or minus 0.10 foot.
 - 2. Walks: Plus or minus 0.05 foot.
 - 3. Pavements: Plus or minus 0.05 foot.

3.15 SUBBASE AND BASE COURSES UNDER PAVEMENTS AND WALKS

- A. Place subbase course and base course on subgrades free of mud, frost, snow, or ice.
- B. On prepared subgrade, place subbase course and base course under pavements and walks as follows:
 - 1. Place base course material over subbase course under hot-mix asphalt pavement.
 - 2. Shape subbase course and base course to required crown elevations and cross-slope grades.
 - 3. Place subbase course and base course 6 inches or less in compacted thickness in a single layer.

4. Place subbase course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
5. Compact subbase course and base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.

3.16 GEOTEXTILE

- A. Geotextile and Filter Fabric. Under this section, referred to commonly as “geotextile.”
 1. Storage: If stored outdoors for a prolonged period, geotextile must be elevated from the ground and covered under a tarpaulin or opaque plastic.
 - a. Contractor shall ensure rolls are adequately protected from:
 - 1) Moisture
 - 2) Ultraviolet radiation
 - 3) Chemicals such as strong acids or bases
 - 4) Temperatures in excess of 120°F
 - 5) Animal destruction
 - 6) Theft
 2. Construct the surface underlying the geotextile smooth and free of ruts, deleterious material such as sharp objects or large protruding rocks which could damage the geotextile. When placing above rip rap, flatten rip rap surface to minimize exposed particle edges and reduce the risk of tearing.
 3. Install geotextile in accordance with manufacturer’s recommendations.
 4. Hand place geotextile. No equipment shall be permitted to pull, stretch, or hold down geotextile. Place geotextile without folds or wrinkles, and avoid stretching and tearing the geotextile.
 5. Orient the geotextile with the machine (roll) direction parallel to the direction of water flow.
 6. If required, use key trenches where terminating geotextile into adjacent soil.
 7. For joining, overlap geotextile a minimum of 3 feet. Successive sheets must be overlapped upstream over downstream in a “shingle effect.”
 8. Fill. Place cover soil in accordance with this Section:
 - a. Use adequate ballast to prevent uplift by wind.
 - b. Do not leave the geotextile uncovered for more than 14 days.
 - c. Begin fill layer over geotextile at seams to maintain overlap.
 - d. Fill remaining areas with initial lift to protect geotextile.
 9. Repairs: In lieu of specific manufacturer guidelines, overlap any damaged geotextile by a minimum of 3 feet in all directions from the damage or defect. Replace geotextile that cannot be repaired.
- B. Field Quality Control: Notify Engineer for inspection of geotextile, and correct any deficiencies prior to placement of backfill.
- C. Backfill: Place fill around geomembrane to prevent stretching and tearing. Where geomembrane is positioned in the vertical plane, use temporary means to hold geotextile in position as fill is placed on either side of geotextile until completely buried.
- D. Geomembrane Repair: Clean the damaged area. Place a patch of the same type of geomembrane which extends a minimum of four inches beyond the edge of damage or defect. Thermally fuse patch to geomembrane. Replace geomembrane that cannot be repaired.
- E. Quality Control:

1. In-Factory Seaming:
 - a. 100% Visual Inspection by two persons. Inspect every third seam on both sides of the geomembrane. Factory seams shall be visually inspected for full seam continuity over their full length by providing tension perpendicular to seam. Any defective areas shall be removed and repaired.
 - b. Destructive Testing. Destructive tests shall be performed per ASTM D6392.
2. Field Testing. 100% Visual Inspection at each installed location. All damaged or defective areas shall be removed and repaired.
 - a. Marking: Indelibly mark all installed boots passing inspection with the date of inspection and initials of inspector at the twelve o'clock position on the boot.

3.17 GEOGRID

- A. Prepare the ground by removing stumps, boulders, etc. and fill in low spots. Unroll the geogrids directly over the ground to be stabilized. If more than one roll width is required, overlap rolls with at least 3 feet of overlap. End seams shall be staggered by a distance equal to the roll width.
- B. Place the aggregate onto previously installed geogrid.
- C. Traffic on top of the initial lift over the geogrid should travel in straight lines to prevent damage.

3.18 INSULATION

- A. Insulation shall be protected in accordance with Section 4.1.4 of the SEI/ASCE 32-01.
- B. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.
- C. Polystyrene insulation should not be exposed to petroleum-based products.
- D. Clean substrates of substances that are harmful to insulation, including removing projections capable of puncturing insulation.
- E. Vertical insulation placed externally on foundation walls or along edges of slab-on-grade floors should have an opaque and weather-resistant protective covering to mitigate degradation of thermal performance from ultraviolet radiation, physical damage, or other sources of deterioration.
- F. Horizontal insulation placed less than 12 inches below the ground surface, or any portion extending outward more than 24 inches from the foundation edge, should be protected against damage by concrete or asphalt pavement on the ground surface directly above the insulation by cementitious board or plywood rated for below-ground use, or by other approved materials placed directly on the top surface of the insulation.
- G. Install insulation with manufacturer's R-value label exposed after the insulation is installed.
- H. Extend insulation to envelop entire area to be insulated. Fit tightly around obstructions and fill voids with insulation.

3.19 FIELD QUALITY CONTROL

- A. Testing Agency: Contractor shall engage a qualified geotechnical engineering testing agency to perform tests and inspections.
- B. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.
- C. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2922, and Alaska Test Method T-11. Tests will be performed at the following locations and frequencies:
 - 1. Trench Backfill: At each compacted initial and final backfill layer, at least one test for every 150 feet or less of trench length, but no fewer than two tests.
 - 2. Road, Parking, and Developed Areas: At subgrade and at each compacted fill and backfill lift, perform at least one field in-place density test for every 2,000 square feet or less of area, but in no case fewer than three tests.
- D. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

3.20 PROTECTION

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

3.21 DISPOSAL OF SURPLUS AND WASTE MATERIALS

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

PART 4 - MEASUREMENT AND PAYMENT

4.01 MEASUREMENT

- A. Additional Excavation and Backfill: Shall be measured using the limits specified in the written authorization for the work issued on-site by the Engineer to compute the in-place cubic yardage. This is only to include additional work and material required in the case where poor soil is encountered.

- B. Gravel Road Resurfacing: Shall be measured based on the area reconstructed within in the limits of disturbance.
- C. Ditch Realignment: Shall be measured based on linear foot.

4.02 BASIS OF PAYMENT

- A. Payment for earthwork bid items shall include furnishing all necessary material, personnel, equipment, transportation, and supplies to perform the work as shown and specified.
- B. Payment for all other materials and work specified in this Section is subsidiary.

<u>Pay Item Number</u>	<u>Pay Item</u>	<u>Pay Unit</u>
312000-1	Additional Excavation & Backfill	Cubic Yard
312000-2	Gravel Road Resurfacing	Square Yard
312000-3	Ditch Realignment	Linear Foot

END OF SECTION