STANDARD CONSTRUCTION SPECIFICATIONS FOR
EARTHWORK
DIVISION 20
INDEX

STANDARD CONSTRUCTION SPECIFICATIONS FOR EARTHWORK DIVISION 20

SECTION 20.01 GENERAL

For the purposes of this Division, the terms “unsuitable” and “unusable” are equivalent when used as a description of a type of material and may be used interchangeably.

Article 1.1 Scope of Work

The Work covered by this Division consists of providing all plant, labor, equipment, supplies, material, transportation, handling, and storage, and performing all operations pertaining to the: 1) construction of subbase for parking lots, streets, alleys, curbs, gutters, sidewalks and bike trails, 2) construction for all trench excavation, backfill, bedding, and foundation material for utility installation; and 3) excavation and backfill for building structures and retaining walls.

Article 1.2 Definitions

A. **Backfill**

Material placed in an excavated area.

B. **Bedding**

Ground or support in which pipe is laid.

C. **Borrow**

Material used as fill and/or backfill which is obtained from a source other than required excavation.

D. **Compaction**

Tamping by hand or machine to achieve required density in soils.

E. **Disposal Site**

Any area where waste, unsuitable, unusable or surplus material from construction is placed. Contractor provided disposal sites are delineated in Division 10, Section 10.04, Article 4.9 – Disposal Sites.

F. **Excavation**

Area or material removed to provide a suitable base for improvement.

G. **Fill**

Fill is considered the material placed above the original or natural ground line.

H. **Leveling Course**

Leveling course is compacted material placed above the subbase and below the finishing surface of the improvement.

I. **Non-Frost-Susceptible Material**

Non-organic soil containing less than three percent (3%) by weight of grains smaller than .02 mm obtained from minus three inches (-3") material.

J. **Service Connection**

Any connection from a main line utility or storm drain to a property line for the purpose of providing service to an individual property

K. **Subbase**

The subbase is compacted material placed above the subgrade and below the leveling course.

L. **Subgrade or Bottom Excavation**

The subgrade is material below the bottom of excavation and upon which the subbase material is placed.

M. **Trench**

Any excavation for a utility or drainage system.

N. **Unsuitable or Unusable Material**

Unsuitable or unusable material may consist of any material which is, in the opinion of the Engineer, inadequate for use in the proposed construction.

Article 1.3 Applicable Standards

The latest revision of the following standards of the American Society for Testing and Materials (ASTM) and the American Association of State Highway Transportation Officials (AASHTO) are hereby made a part of these specifications:

ASTM C-29	Test for Unit Weight of Aggregate
ASTM C-117	Test for Materials Finer than No. 200 Sieve in Aggregates by Washing

ASTM C-131	Test for Resistance to Abrasion of Small Size Coarse Aggregate by Use of the Los Angeles Machine
ASTM C-136	Test for Sieve or Screen Analysis of Fine and Coarse Aggregates
ASTM D-422	Test for Particle Size Analysis of Soil
ASTM D-424	Test for Plastic Limit and Plasticity Index of Soils
AASHTO M-147	Materials for Aggregate and Soil-Aggregate Subbase, Base, and Surface Courses
AASHTO T-180-D	Test for Moisture-Density Relations of Soils
AASHTO T-205	Test for Field Determination of Density of Soil In-Place
AASHTO T-238	Test for Density of Soil In-Place by Nuclear Method.

Article 1.4 Equipment

All equipment, tools, and machines used in the performance of the Work covered by these Specifications shall be subject to the approval of the Engineer and shall comply with all applicable safety requirements. All equipment used on the project shall be adequately maintained and shall be the proper equipment for the Work being accomplished so as to produce the result required by the Contract Documents.

Article 1.5 Compaction Standards

The required density of fill and backfill shall meet the requirements as outlined in Section 20.21 - Classified Fill and Backfill. In areas outside of road rights-of-way, the density shall be as required by the Contract Documents or as directed by the Engineer.

Where compaction density is specified, the maximum density shall be determined in accordance with the current requirements of AASHTO Standard Method T-180-D.

The Diameter of the test mold in AASHTO T-180 Method D limits the size of particles which may be included in the test to that passing the three-quarter inch (3/4”) sieve. In those instances where the particles are retained on the three-quarter inch (3/4”) sieve, a correction must be applied to the standard laboratory density prior to calculating the percent compaction. To expedite field result the plus three-quarter inch (3/4”) material may be sieved wet and the weight computed as a percent of the total weight of the material from the hole. The corrected laboratory density shall be computed in each instance by the formula:

$$\text{Corrected Lab Density} = \frac{62.4}{\frac{A}{C} + \frac{62.4(B)}{r\,D}}$$

Where: A = Percent by weight of original material retained on the 3/4-inch sieve, expressed as a decimal.

B = Percent by weight of original material passing the 3/4-inch sieve, expressed as a decimal.

C = Specific gravity of +3/4-inch material (apparent specific gravity) as determined by AASHTO T-85.

D = Uncorrected laboratory density (minimum 3/4-inch material).

r = Coefficient with value depending A, as follows:

for A = 0.18 or less, r = 1.00
A = 0.19 or more, r = 1.036 - 0.2A

Backfill under traffic and building structures and trench backfill in the public rights-of-way from six inches (6") over the top of the pipe to the surface shall be compacted to ninety-five percent (95%) of maximum density, unless otherwise noted and approved by the Engineer.

The backfill material shall be placed in horizontal lifts not exceeding twelve inches (12") in thickness and compacted. Any excavations improperly filled shall be reopened to the depth required for proper compaction, then refilled and compacted at the Contractor's expense. The use of water in excess of the quantity required to obtain specified density (optimum moisture content) to settle or compact the backfill will not be permitted.

Article 1.6 Subsurface Investigation

Information pertaining to subsurface exploration, borings, test pit locations, and other preliminary investigation may appear in the Bidding Documents or be available at selected locations for review by the Bidder. This information was acquired for design purposes only and is not considered adequate for construction.

The soils classifications and geotechnical designations recorded are informational only and represent only those subsurface conditions on the particular date, at the specific location, as indicated on each soils log and on the plans. The ground water levels indicated on the test hole logs and shown on the Drawings were recorded at the time the test holes were performed. These water levels may vary seasonally and are shown for design and informational purposes only. Contractor shall assume responsibility for any conclusions that may be drawn from such information and the conclusions shall not be considered just cause for a claim for additional compensation or contract time extension.

Contractor should obtain and analyze such additional information as the Contractor may feel necessary and shall be responsible for any conclusions drawn from that information.

The Owner does not warrant the correctness of the soils investigation or of any interpretation, deduction, or conclusion given in the report relative to subsurface conditions. The Bidder shall make his own deductions and conclusions as to the nature of the materials to be excavated, the difficulties of making and maintaining the required excavations, the difficulties which may arise from subsurface conditions, and of doing any other Work affected by the subsurface conditions, and shall accept full responsibility therefore.

Article 1.7 Weather Limitations

Unless otherwise authorized by the Engineer, fill and backfill material, base course, and leveling course shall not be placed when the atmospheric temperature is below thirty-five degrees Fahrenheit (35°F). When the temperature falls below thirty-five degrees Fahrenheit (35°F), it shall be the responsibility of the Contractor to protect all areas of completed Work against any detrimental effects. Any areas of Work not completed in accordance with the Contract Documents that are damaged by weather shall be reconditioned, reshaped, and recompacted by the Contractor in conformance with the requirements of the Contract Document without additional cost to the Owner.

Article 1.8 Underground Utilities

The Contractor shall continuously support underground utilities during backfill placement and compaction. During backfill placement and compaction, the Contractor shall place geotextile fabric with a minimum twelve inch (12”) separation from underground utilities, unless directed otherwise by the Engineer.

Article 1.9 Contaminated Material

Unless otherwise noted in the Contract Documents, the Owner is not aware of any contaminated material within the project limits. If such material is encountered, Contractor shall notify the Engineer immediately for direction. Unless the contamination was caused by Contractor’s operation, discovery of contaminated material will be treated as a changed condition per Division 10, Section 10.05, Article 5.18 – Changed Conditions.

SECTION 20.02 STORM WATER POLLUTION PREVENTION PLAN

This Section is not used.

SECTION 20.03 EXPLORATORY TEST PITS

Article 3.1 General

Work under this Section consists of furnishing an excavator, operator, and all related supplies in order to dig and fill exploratory test pits as directed by the Engineer prior to the commencement of construction activities.

Article 3.2 Materials

Contractor shall furnish an excavator capable of excavating to a minimum depth of twelve feet (12').

Article 3.3 Construction

Contractor shall excavate as directed by the Engineer. After inspection of the test pit is complete, Contractor shall backfill test pits with native material and compact them so that the ground is returned to its original condition. If directed by the Engineer, Contractor shall segregate the cast piles to avoid contamination.

Article 3.4 Measurement

Work performed under this Section is measured by the cost per hour for all personnel, equipment, and supplies necessary for completion of said Work. Down time or delays caused by equipment failure is included in the measurement and no additional payment will be made.

Article 3.5 Basis of Payment

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment is made under the following item:

ITEM	UNIT
Exploratory Excavation	Hour

SECTION 20.04 CLEARING AND GRUBBING

Article 4.1 General

The Work under this Section consists of removing all vegetation, brush, trees, logs, tree stumps, roots, and root mat to a Contractor-provided disposal site, and the preservation from damage of all items designated to remain. Limits of clearing and grubbing shall be in conformance with right-of-way easements, and stipulations, and as shown on the Drawings, staked by the Contractor, and approved by the Engineer.

Article 4.2 Construction

The Contractor shall do all clearing and grubbing necessary in the construction of roadways, bike trails, and utilities. Prior to clearing and grubbing, the Contractor shall stake the clearing limits. Trees, brush, roots, and root mat removed in the clearing, and grubbing operations shall be hauled to a disposal site provided by the Contractor as delineated in Division 10, Section 10.04, Article 4.9 – Disposal Sites.

Any areas designated to remain shall be protected per Division 75, Section 75.02, Article 2.3 – Construction.

Article 4.3 Measurement

The measurement of clearing and grubbing shall be by the acre or portion thereof as shown on the Drawings and staked by the Contractor and approved by the Engineer, or lump sum.

Article 4.4 Basis of Payment

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made under the following unit:

ITEM	UNIT
Clearing and Grubbing	Acre
Clearing and Grubbing	Lump Sum

SECTION 20.05 CLEARING

Article 5.1 General

The Work under this Section consists of clearing the areas shown on the Drawings, staked by the Contractor, and approved by the Engineer of all logs, trees, brush, and other vegetation, and removal to a Contractor-provided disposal site, and the preservation from damage of all items designated to remain.

Article 5.2 Construction

The Contractor shall perform all clearing necessary within the areas shown on the Drawings and staked by the Contractor. All stumps shall be cut off a maximum of two inches (2") above the ground.

Areas designated to remain shall be protected in accordance with Division 75, Section 75.02, Article 2.3 – Construction.

Tree pruning shall be done by an International Society of Arboriculture (ISA) Certified Arborist in accordance with ANSI A300.

All material removed in the clearing operation shall be hauled to a disposal site provided by the Contractor as delineated in Division 10, Section 10.04, Article 4.9 – Disposal Sites. With prior approval of the Engineer, chipping may be an acceptable alternate to clearing and hauling away of spoils.

A. Clearing for Multi Use Paths

Overhanging limbs shall be pruned to provide a six foot (6’) clear corridor on both sides of the centerline with a nine foot (9’) clearance above finished trail. Where filter fabric is specified, the stumps shall removed completely or ground to a minimum of 6” below the soil surface and backfilled with the appropriate material.

B. Clearing for Sidewalks/Curb Ramps

Contractor shall prune overhanging limbs and other vegetation to provide full clearance of the sidewalk to a minimum height of ten feet (10’) above and a minimum width of two feet (2’) from the outside edges of the sidewalk, unless otherwise specified on the Drawings or directed by the Engineer.

Article 5.3 Measurement

The measurement of clearing shall be measured by the acre or portions thereof, as shown on the Drawings and staked by the Contractor, or lump sum. Clearing for bike trails, sidewalks, and curb ramps shall be measured by linear feet along the centerline of the improvement.

Article 5.4 Basis of Payment

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made under the following units:

ITEM	UNIT
Clearing	Acre
Clearing	Lump Sum
Clearing for Bike Trail/Sidewalk/Curb Ramp	Linear Foot

SECTION 20.06 REMOVAL OF TREES

Article 6.1 General

The Work under this Section consists of the performance of all operations pertaining to the removal and disposal of trees nine and one-half inches (9 1/2") or greater in diameter measured at Diameter Breast Height (DBH) taken at four and one half feet (4.5') above the lowest soil line. This item will not be a pay item if Clearing or Clearing and Grubbing is included in the Bid Schedule.

Article 6.2 Construction

Contractor shall dispose of trees, including stumps, of the size described above which interfere with construction under this Contract at a Contractor provided disposal site as delineated in Division 10, Section 10.04, Article 4.9 – Disposal Sites.

Removal and disposal of all trees, including stumps, less than nine and one-half inches (9 1/2") DBH will be considered an incidental part of the excavation unless either the pay items Clearing and/or Clearing and Grubbing are included in the Bid Schedule.

Article 6.3 Measurement

Measurement for tree removal shall be per tree removed in the size range described.

Article 6.4 Basis of Payment

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made under the following units:

ITEM	UNIT
Tree Removal	Each

SECTION 20.07 REMOVAL OF SIDEWALK AND CONCRETE APRON

Article 7.1 General

The Work under this Section consists of performing all operations pertaining to the removal and disposal of sidewalks and concrete aprons designated for removal, including wire mesh or steel reinforcement within the concrete sidewalk and apron, in accordance with the limits shown on the Drawings or as directed by the Engineer.

Article 7.2 Construction

Sidewalks or concrete aprons to be removed shall be saw cut or broken at a joint. Broken joints shall be finished, as required by the Engineer, to eliminate jagged edges. The Contractor shall dispose of this material at a Contractor-provided disposal site as delineated in Division 10, Section 10.04, Article 4.9 – Disposal Sites.

Article 7.3 Measurement

Sidewalk and concrete apron designated for removal will be measured in square yards regardless of thickness.

Article 7.4 Basis of Payment

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made under the following unit:

ITEM	UNIT
Remove Sidewalk	Square Yard
Remove Concrete Apron	Square Yard

SECTION 20.08 REMOVAL OF CURB AND GUTTER

Article 8.1 General

The Work under this Section consists of performing all operations pertaining to the removal and disposal of existing curb and gutter designated for removal, including any wire mesh or steel reinforcement within the curb and gutter, in accordance with the limits shown on the Drawings or as directed by the Engineer.

Article 8.2 Construction

Curb and gutter to be removed shall be saw cut or broken at a joint. Broken joints shall be finished, as required by the Engineer, to eliminate jagged edges. The Contractor shall dispose of removed curb and gutter at a Contractor-provided disposal site as delineated in Division 10, Section 10.04, Article 4.9 – Disposal Sites.

Article 8.3 Measurement

Curb and gutter removal designated for removal will be measured in linear feet removed, measured along the face of the curb.

Article 8.4 Basis of Payment

Payment for this item shall be in accordance with Division 10, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made under the following unit:

ITEM	UNIT
Remove Curb and Gutter	Linear Foot

SECTION 20.09 REMOVAL OF PAVEMENT

Article 9.1 General

The Work under this Section consists of performance of all operations pertaining to the removal and disposal of existing pavement in accordance with the limits indicated on the Drawings and as directed by the Engineer.

The Contractor will remove existing pavement (parking areas, driveways, etc.) within the right-of-way to a line one foot (1') back of the proposed improvements during the initial clearing/excavation operations. Further removal will be as directed by the Engineer in order to provide a proper transition between new and existing pavement. The intent is to minimize unnecessary removal of pavement.

The Contractor shall remove all pavement designated for removal, including pavement placed within the gutter pan. Removal of the pavement within the gutter pan shall be considered incidental to the bid item "Remove Existing Pavement" and no separate payment shall be made.

Article 9.2 Construction

Pavement shall be removed by the Contractor in a manner that will produce a straight, uniform edge along the section removed. The method of producing the straight edge shall be by cutting the section with an air chisel, wheel, power-driven saw, or other methods approved by the Engineer.

Contractor shall keep pavement that is designated for removal free from objectionable material (concrete, steel, etc.) and shall properly dispose of pavement designated for removal. If the removed pavement material under this Section contains objectionable material, as identified by the Engineer, then Contractor shall dispose of this material in accordance with Division 10, Section 10.04, Article 4.9 - Disposal Sites.

Article 9.3 Measurement

Pavement removed will be measured by the square yard of pavement designated for removal, regardless of thickness, except that no measurement will be made of pavement less than one inch (1") thick.

Article 9.4 Basis of Payment

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made under the following unit:

ITEM	UNIT
Remove Pavement	Square Yard

SECTION 20.10 EXCAVATION FOR TRAFFIC WAYS

Article 10.1 General

The Work under this Section consists of furnishing all plant, labor, equipment, supplies, and material in performance of all operations pertaining to the excavation of unsuitable and/or surplus material for street, alleys, access roads, parking lots, sidewalks, curbs, gutter, and bike trails.

Additional excavation for roadways may be required when authorized in writing by the Engineer. Contractor shall not be entitled to additional compensation for performing excavation not previously authorized by the Engineer.

Article 10.2 Survey Stakes

The Contractor shall place control stakes on each side of, and beyond the limits of, the proposed excavation. Stakes will be set at grade breaks and on even grades at intervals not to exceed fifty feet (50'), with additional stakes on vertical curves. These shall be marked with the station, offset, and show the cut or fill to centerline or grid design grade.

Article 10.3 Miscellaneous

Public property lying within the right-of-way, such as signs and markers, that interferes with construction shall be removed and reset at the time and place as directed by the Engineer. Any damage by the Contractor shall be repaired or the item replaced in kind at the Contractor's expense.

Contractor shall remove culverts designated for salvage. Contractor shall deliver salvaged culverts to the location specified in the Contract Documents or as directed by the Engineer.

A disposal site for non-salvageable materials shall be provided by the Contractor per Division 10, Section 10.04, Article 4.9 – Disposal Sites

All existing valve boxes, cleanouts, manholes, etc. shall be located and exposed by the Contractor and carefully protected during the course of the Work. The Contractor, in conjunction with the Engineer, shall check all utilities prior to the start of the construction and record their condition. All manholes, catch basins, cleanouts, etc. will be checked for damage resulting from the Contractor's operation prior to final acceptance by the Owner. The Contractor is responsible for restoring all existing utilities to pre-existing conditions, and shall coordinate with the affected utility in having any necessary repairs completed.

All existing utilities requiring adjustment to grade shall be adjusted by the Contractor in accordance with the applicable Standard Details. Payment for such adjustment shall be as specified under the applicable Section of these Specifications.

Article 10.4 Unusable and Usable Excavation

Unusable excavation shall consist of all excavation which is excess or not suitable for classified fill or backfill as determined by the Engineer. When grubbing of the surface organic or root mat is not required elsewhere on the Drawings or Specifications, unusable excavation shall include the surface mat.

Usable excavation shall consist of material from excavation that is designated by the Engineer as suitable for fill or backfill.

If usable soil conditions are encountered at elevations different from those indicated on the Drawings, the Engineer may direct, in writing, that the excavation be altered to elevations either above or below those specified.

Any unauthorized excavation beyond the specified lines, grades, and cross sections shall be filled with classified fill or backfill and compacted without additional cost to the Owner. The Contractor shall control the banks of all excavated areas as necessary to prevent movement of soil in areas supporting existing foundations, slabs, poles or other structures.

Where unusable soils are encountered in the subgrade within the specified depth below finish grade as indicated on the Drawings, the Contractor shall excavate to a depth such that usable soils are uncovered or the depth below finished grade as directed by the Engineer. The excavations shall be uniformly shaped so that classified backfill material can be properly placed and compacted. The area shall be feathered to adjoining areas where usable material is found. Excavated area shall not be backfilled until cross sectional elevations and measurements of the area excavated have been taken.

The Contractor shall be responsible for keeping all embankments and excavation well shaped and drained. The subgrade shall be maintained, compacted in cut sections if required, and kept free of leaves, sticks, or other debris.

The Contractor shall perform whatever work necessary to prevent flow and accumulation of surface water or ground water in excavations. Unless otherwise provided in the Special Provisions, all Work associated with pumping or dewatering shall be considered incidental to the Contract and no separate payment shall be made.

Article 10.5 Utilization or Disposal of Excavated Material

Excavated material conforming to the specifications for classified fill and backfill shall be used where practical for fill and backfill as directed by the Engineer. When this material is used, it shall be considered usable excavation. Usable excavation shall be compacted in accordance with Section 20.01, Article 1.5 - Compaction Standards. When not used on the Project site, the material shall be hauled away and treated as unusable excavation. Unusable excavation shall be hauled to a Contractor-furnished disposal site as delineated in Division 10, Section 10.4, Article 4.9 – Disposal Sites. Unless otherwise specified in the Special Provisions, the Contractor will not be required to transport usable excavation

from one schedule of a Contract for use in another schedule of the same Contract unless they are continuous or adjacent.

Article 10.6 Excavation

The Contractor shall utilize whatever methods and equipment necessary to excavate to the limits designated by the Drawings and Specifications and authorized by the Engineer, except that no equipment or method may be utilized that because of its action deteriorates the subgrade making additional excavation necessary beyond the limits originally authorized.

Article 10.7 Measurement

The measurement of excavation will not include water or other liquids but will include topsoil, mud, muck, or other similar semi-solid material which cannot be drained or pumped away.

Usable excavation will be measured per cubic yard by cross section or at the option of the Engineer per cubic yard by truck count. Computation of truck volumes will be by actual measurement to arrive at truck loading, adjusted by an appropriate swell factor as approved by the Engineer.

Unusable excavation will be measured per cubic yard by cross section or at the option of the Engineer per cubic yard by truck count. Computation of truck volumes will be by actual measurement to arrive at truck loading, adjusted by an appropriate swell factor as approved by the Engineer.

Cross-section measurement of usable or unusable excavation shall be based on in-place volumes as determined by the average end areas of cross sections.

For all scale measured quantities, the Contractor shall furnish a scale certified by the State of Alaska for weighing excavation at a location agreeable to the Engineer. Weight tickets will be serialized and witnessed at the time of weighing by a Contractor-furnished weighman. The Engineer may at any time verify load weights and weighing process. Tickets shall be presented for each load at time of delivery to the Engineer or his designated representative.

Article 10.8 Basis of Payment

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment for usable excavation includes the costs of subsequent placement and compaction of the excavated material and shall not be paid separately as Classified Fill or Backfill. Payment for unusable excavation includes removal from the project site and disposal.

Payment shall be made under the following units:

ITEM	UNIT
Usable Excavation	Cubic Yard
Unusable Excavation	Cubic Yard

SECTION 20.11 GRADING EXISTING SURFACES

Article 11.1 General

The Work under this Section consists of performing all operations necessary to shape the existing ground prior to placement of the fill or surfacing material.

Article 11.2 Construction

To the extent indicated on the Drawings, and as directed by the Engineer, the Contractor shall grade the existing ground. Material removed from the high areas shall be used to fill the depressions. Where the existing ground has a slope greater than one vertical to four horizontal, the surface of such ground shall be plowed, steeped or broken up in such a manner that graded material will blend with the existing surface.

On trails, the graded material shall be compacted to ninety percent (90%) of the maximum density; for roads, the required compaction shall be ninety-five percent (95%) of the maximum density. Graded material which is excessively wet shall be aerated by means of blade graders, harrows, or other suitable equipment until the moisture content is satisfactory.

When the bid item is "Grading Existing Surfaces," no separate payment will be made for "Usable Excavation."

Article 11.3 Measurement

Measurement for grading shall be per lineal foot along the centerline of the constructed trail or roadway.

Article 11.4 Basis of Payment

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made under the following unit:

ITEM	UNIT
Grading Existing Surfaces	Linear Foot

SECTION 20.12 DEWATERING

Article 12.1 General

The Work under this Section consists of performing all work and operations pertaining to the dewatering of Work areas, including diversion of surface and subsurface water flows, to provide a dry and stable environment for excavation, backfill, and trench Work.

Article 12.2 Materials

Contractor is responsible for preparing, obtaining approval of, and implementing the Dewatering Plan. The Contractor shall provide all equipment, materials, and personnel necessary to prepare and implement the Dewatering Plan and provide a dry and stable construction environment.

Article 12.3 Construction

Design, installation, and operation of dewatering systems shall comply with current safety and environmental regulations.

The Contractor shall submit his Dewatering Plan to the Engineer a minimum of seven (7) days prior to beginning dewatering activities. The Dewatering Plan shall contain copies of all Contractor obtained permits and approvals. When dewatering approval is required by ADEC, the Contractor shall submit a copy of the approved dewatering plan to the Engineer. Dewatering activities shall not commence until the Engineer has approved the Plan.

Acceptance of Contractor's Dewatering Plan by the Engineer shall not relieve the Contractor of responsibility for the exercise of reasonable precaution, sound engineering judgment, prudent construction practices, overloading or misuse of existing or new structures, the adequacy and safety of such Works, and potential damage or undermining of existing or completed Work. Acceptance of the Dewatering Plan by the Engineer does not relieve the Contractor of the responsibility for providing additional Dewatering Work if implementation of the accepted Dewatering Plan does not result in a dry and stable construction environment.

Water resulting from Contractor's dewatering effort may not be pumped or otherwise diverted into existing storm drains unless required permits, including, but not limited to, the Alaska Department of Environmental Conservation and Environmental Protection Agency, are obtained by Contractor. Under no circumstances will Contractor be allowed to divert water from the excavation onto roadways. Contractor shall provide disposal site for excess water and shall be responsible for securing all necessary permits and approvals. Contractor shall provide copies of permits and approvals to the Engineer.

The Contractor shall dispose of all water from trench dewatering in accordance with the State of Alaska regulations. Contractor shall treat all ground water to prevent debris and sediments from entering creeks, lakes, ponds, wetlands areas and drainage systems.

Article 12.4 Measurement

The method of measurement for Dewatering is lump sum for all Work necessary to provide a dry and stable construction environment, including Work not identified in the accepted Dewatering Plan.

Article 12.5 Basis of Payment

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made under the following unit:

ITEM	UNIT
Dewatering	Lump Sum

SECTION 20.13 TRENCH EXCAVATION AND BACKFILL

Article 13.1 General

The Work under this Section consists of providing all materials and performance of all operations pertaining to items of Work involved in excavation, bedding, backfill, and compaction of trenches. When unsuitable or surplus excavation material is removed from the job site, it will be paid for under Section 20.27 – Disposal of Unusable or Surplus Material. When material is imported, it will be paid for under the appropriate item.

Any shoring, sheeting, or bracing required shall be considered incidental to Work under this Section.

The Contractor is subject to the same utilities check requirements as described under Section 20.10, Article 10.3 - Miscellaneous.

Article 13.2 Trench Excavation and Backfill - Description

This Work shall consist of all excavation and backfill of trenches as specified for pipe installation and all other miscellaneous items as specified in this Section.

The Contractor shall minimize the width of the trench.

Trench limits shall be shown on the Drawings, and staked in the field. Trench width at or below the top of the pipe shall be of a width that will allow compaction equipment to be utilized at the sides of the pipe. Trenches shall be of the necessary width for proper laying of pipe, conduit, or cable and the banks shall be sloped so as to conform to the prevailing safety requirements.

Trench depth shall be excavated not less than six inches (6”) below the barrel of the pipe unless otherwise directed by the Engineer. Where maximum trench width is limited, as shown on the Drawings, the Contractor shall provide trench shoring or supports systems as necessary to ensure that the trench width does not exceed the established limits. The Contractor shall erect and maintain continuous trench barricades to prevent access around all excavations left open at the end of the workday. The Contractor shall provide and maintain adequate barricades to insure public safety at all times during the prosecution of the Work. All excavated material shall be stockpiled on geotextile fabric to limit damage to the existing vegetation.

If at any time the Engineer determines that the construction trench section is greater than the pay limits as shown on the Drawings and described herein, the Contractor may be required to implement appropriate construction techniques to reduce the trench section or absorb all costs associated with the greater trench section, including, but not limited to: replacement of pavement, curb and gutter, sidewalk, street amenities, landscaping, disposal of surplus material and furnishing classified backfill. The pay limits as shown on the Drawings and described herein are to limit pay quantities and incidental costs only and are not intended to limit or in any way alter the requirements of Occupational Safety and Health Administration (OSHA) or State of Alaska safety regulations. The Contractor

is required to conduct all trenching operations in accordance with current safety standards.

The Contractor shall be responsible for any and all costs resulting from over excavation, including the need for additional backfill beyond the maximum pay limits as shown on the Drawings or described herein. In addition, the Contractor shall be responsible for all costs and time required for the repair or replacement of streets, alleys, driveways, buildings, sidewalks, curb and gutter, drainage patterns, gravel pads, fences, lawns, property corner markers, survey monumentation, street name signs, traffic control signs, light poles, trees, utilities, shrubbery, gardens, retaining walls, utility markers, rockeries, landscaping, or other public or private improvements damaged by the Contractor which are located outside of the horizontal pay limits defined above. The cost of repairing damage or replacing such facilities within the horizontal pay limits shall be included as part of the unit price for the pay item under construction or shall otherwise be considered incidental to the Contract.

Resurfacing of trench excavation and backfill shall conform to the appropriate sections of this Division, Division 40 – Asphalt Surfacing, and the Standard Details, as appropriate.

Article 13.3 Construction

A. Trench Excavation

The Contractor shall perform all excavation of every description and whatever substance encountered including rock and permafrost. Excavation will be to the extent indicated on the Drawings, and as staked in the field. All excavated materials for backfill shall be placed in an orderly manner and placed at a distance from the trench section which conforms to all state and/or federal safety codes.

All excavated organic or other unsuitable backfill materials shall be placed in a similar manner, but shall be kept separate from all excavated sandy, silty, or gravelly material. In addition, excavated materials suitable for bedding, foundation material, Type II or Type III material, shall be stockpiled separate from each other.

Time is of the essence; therefore, the Contractor shall not begin excavation of the trench until all materials, equipment, and personnel are present to complete the Work in the most expedient manner. Not more than four hundred feet (400') of trench shall be open in advance of pipe or conduit installation unless authorized, in writing, by the Engineer. Unless otherwise indicated in the Drawings and Specifications, all excavation will be open cut.

Where rock or permafrost is encountered, it shall be removed as shown on the Drawings or as directed by the Engineer, and shall be replaced with approved material.

All unusable or surplus material excavated from within the trench section, as shown on the Drawings, shall be removed from the project site. Payment for this Work shall be in accordance under Section 20.27 – Disposal of Unusable or

Surplus Material. Unusable or surplus material excavated outside of the authorized trench section shall be disposed of at the Contractor's expense.

B. Trench Dewatering

Contractor shall protect adjacent utilities and property by trench dewatering and to successfully install the new utility lines. Dewatering shall be performed in accordance with Section 20.12 - Dewatering.

C. Bedding

All pipe shall be placed in bedding material as specified or as shown on the Drawings. Bedding materials for the type specified shall conform to the requirements of Section 20.16 – Furnish Bedding Material.

Bedding material shall be placed so that it does not free fall for a distance greater than two feet (2') above the top of the pipe. If the distance is greater than two feet (2'), the Engineer may require the Contractor to expose the exterior surface of the pipe being bedded. The Contractor shall provide the Engineer an opportunity to inspect the uncovered Work for damage. Upon completion of the inspection, the Contractor shall repair or replace damaged Work to the satisfaction of the Engineer. All costs associated with inspection, repair, replacement, and installation of the Work due to the bedding material free falling greater than two feet (2') shall be incidental to the Contract.

Where specified bedding material is available from trench excavation, the Contractor shall use care to separate it from unsuitable material. Class B or C bedding material shall be placed under and around the pipe in lifts not to exceed twelve inches (12"), and compacted to ninety-five percent (95%) of maximum density. In no case shall bedding material be placed above the spring line of the pipe in a single lift.

Where specified bedding materials are encountered in the trench bottom, the trench shall be accurately graded to provide uniform bearing and support for each section of the pipe for its entire length, except for the portion of the pipe sections where it is necessary to excavate for the bell holes and other type joints and for the proper sealing of the joints. Bell holes and depressions for joints shall be dug after the trench bottom has been graded and, in order that the pipe will rest on the prepared bottom for as nearly its full length as practical, bell holes and depressions shall be only of such length, depth, and width as required for properly making the particular type of joint. Where unsuitable material such as, but not limited to hard pan or rock is encountered, the trench shall be over-excavated so a minimum of six inch (6") depth of bedding material is required to bring the trench bottom up to the specified grade. This bedding material shall be compacted to a minimum of ninety-five percent (95%) of maximum density prior to the installation of the pipe. If the Engineer determines that excavated material is unsuitable for bedding, he may direct the Contractor to "Furnish Bedding Material."

D. Trench Backfill

Trench backfill is defined as the placement of material above the level of bedding material. Material for backfill shall be obtained from trench excavation if the material is suitable or conforms to the specifications for backfill. If the Engineer determines that excavated material is unsuitable for trench backfill, he may direct the Contractor to "Furnish Trench Backfill." Backfill shall be placed in lifts and compacted in such a manner that ninety-five percent (95%) of maximum density is obtained unless otherwise specified in the Contract Documents. No separate payment will be made for compaction to ninety-five percent (95%) of maximum density. Where mechanical compaction is required, compaction shall be accomplished in accordance with Section 20.01, Article 1.5 - Compaction Standards. Backfill shall not contain broken bituminous pavement or Portland Cement Concrete, and shall be placed in accordance with Section 20.21 - Classified Fill and Backfill.

E. Locator Tape

Contractor shall provide and install a detectable locator tape properly coded and labeled identifying the utility or utilities installed in the trench. The locator tape shall not be less than five (5) mil, foil backed, and six inch (6") wide vinyl tape. The Contractor shall install the locator tape above and parallel to the axis of the utility with no breaks in continuity. The Contractor shall install the locator tape three feet (3') below finish grade or two feet (2') deep in the street structural section. Installation of the locator tape is considered incidental to Trench Excavation and no separate payment shall be made.

F. Cleanup

This item consists of cleanup and finishing of all construction areas to their original condition or better. All Work shall be in accordance with Division 10, Section 10.05, Article 5.25 - Final Trimming of Work.

G. Insulation

Refer to Section 20.26 – Insulation and Standard Detail 20-9 for insulation installation requirements.

Article 13.4 Measurement

Measurement of trench excavation and backfill will be per linear foot of horizontal distance for the various depths as set forth in the Bid Schedule. On sanitary sewer and storm drain construction, measurement will be from center to center of manholes, from center of manhole to center of catch basins, from center of manhole to center of cleanout wye, from center of manhole to end of out-fall piping. On all other construction, measurement will be from station to station as shown on the Drawings. Trench depth shall be measured from original ground to the bottom of bedding along centerline of pipe.

If trench excavation is performed under the same Contract with a roadway project, the depth of trench shall be measured from the bottom of bedding to the subgrade as it exists after the excavation necessary under the roadway project is complete.

When rock or permafrost is encountered for the full depth of trench, it will be measured as stated above. When the rock or permafrost is encountered in the lower part of the trench only, measurement will be by the cubic yard of material excavated. The material overlying the rock or permafrost will also be paid by the cubic yard of material excavated.

Locator tape is incidental to this Bid Item.

Article 13.5 Basis of Payment

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described in this Section.

Disposal of unusable or surplus material will be paid under Section 20.27 – Disposal of Unusable or Surplus Material and no payment shall be made in this Section.

Payment shall be made under the following units:

ITEM	UNIT
Trench Excavation and Backfill (various depths)	Linear Foot
Trench Excavation and Backfill (various depths)	Cubic Yard
Rock Excavation and Backfill	Linear Foot
Rock Excavation and Backfill	Cubic Yard
Permafrost Excavation & Backfill	Linear Foot
Permafrost Excavation & Backfill	Cubic Yard
Trench Dewatering	Lump Sum
Insulation (R-Value)	Square Foot

SECTION 20.14 TRENCH EXCAVATION, BACKFILL AND COMPACTION FOR SERVICE CONNECTIONS

Article 14.1 General

The Work under this Section consists of performing all operations necessary for excavation, backfill, and compaction required for service connections and all other miscellaneous items as specified in this Section. Service connections include Sanitary Sewer Service Connections, Footing Drain Services, and Water Service Lines.

Article 14.2 Construction

A. Excavation

Excavation for service connections shall be unclassified and the Contractor shall excavate whatever substances that are encountered to the depth required for the connections. However, if rock or permafrost is encountered in the trench section different from what is shown on the Drawings, measurement and payment will be as delineated in Section 20.13, Articles 13.4 - Measurement and 13.5 - Basis of Payment.

Depth for service connections shall be as required by the utility. Variations in required depth will not be grounds for additional payment. It shall be the Contractor's responsibility to familiarize himself with the depth of the main line utilities and storm drain systems for the project. The Contractor shall excavate for service connections in such a manner that the excavation is ninety (90) degrees to the street line, whenever possible. The ditch shall be long enough to allow the service connection to be stubbed at the property line.

Trenches shall be of sufficient width at the bottom to allow for laying of the particular service (minimum two and one-half feet [2-1/2'] for single service). Excavation of all fill materials to virgin ground is required to provide safety for workmen utilizing the trench.

The Contractor shall be responsible for, and shall bear expenses incurred, in the event that a main line utility should be damaged during excavation or backfilling.

It shall be the responsibility of the Contractor during construction to keep all embankments and excavation well shaped and drained. The subgrade shall be maintained, compacted in cut sections if required, and kept free of leaves, sticks, and other debris.

The Contractor shall perform all Work necessary to prevent flow and accumulation of surface water or ground water in trenches. Unless otherwise provided in the Special Provisions, all Work associated with pumping or dewatering shall be considered a responsibility of the Contractor and shall be accomplished at no additional cost to the Owner.

The Contractor shall submit as a part of his proposal the method to be used in the dewatering of the trench section.

If any portion of asphalt or concrete surfacing is under-cut or damaged during trench excavation, Contractor shall saw cut, remove, and replace the affected area at no additional cost to the Owner.

B. Backfill

At such time as the Engineer may direct, but only after the service lines and appurtenances have been properly completed and inspected, the trenches and appurtenant structures shall be backfilled. The backfill material, free from clods or boulders, shall be placed by the Contractor in conformance with the codes and regulations of the City. Backfill shall be placed and compacted in conformance with Section 20.13 - Trench Excavation and Backfill.

The material shall be placed and spread uniformly in successive layers not exceeding twelve inches (12”) in loose thickness. The Engineer may approve lifts of greater thickness provided the equipment and method used will consistently achieve the specified density. The layers shall be carried up full width from the bottom of the fill to avoid the necessity of widening the edges after the center has been brought to grade. Each layer shall be compacted to a minimum of ninety-five percent (95%) of the maximum density at optimum moisture as determined by the method of testing noted in Section 20.01, Article 1.5 - Compaction Standards. Reasonable time shall be provided the Engineer to make field density determinations prior to placement of successive layers of material.

The maximum dimensions of any particle of the embankment material shall not be greater than two-thirds (2/3) of the compacted thickness of the layer in which it is placed. The top six inches (6”) of embankment material for streets shall be Type II-A classified fill and backfill. Oversize material shall be removed. Portions of any layer in which the embankment material becomes segregated shall be removed and replaced with satisfactory material or shall be added to and remixed to secure proper gradation as directed by the Engineer. No separate payment will be made for any material removed or regraded in areas where material becomes segregated.

The Engineer may permit lifts in excess of twelve inch (12") thickness when fill or backfill is placed over swampy or saturated ground, or where he is satisfied that the Contractor's method and equipment will consistently produce the specified density. No frozen material shall be used for backfill. Backfill shall not be placed in frozen trench.

C. Notification

The Contractor shall notify the Engineer forty-eight (48) hours before starting excavation (excluding Saturday, Sunday and holidays) on all service connection requests which involve twelve (12) or less connections. On connection requested

for subdivisions involving more than twelve (12) connections, one (1) week notification prior to excavating is required.

Article 14.3 Measurement

Trench excavation, backfill and compaction for service connections shall not be measured for payment.

Article 14.4 Basis of Payment

No separate payment shall be made for trench excavation, backfill and compaction for service connections. This Work is considered incidental to the service connection pay item.

SECTION 20.15 FURNISH TRENCH BACKFILL

Article 15.1 General

The work under this Section consists of performing all operations necessary to furnish trench backfill.

Article 15.2 Construction

The Engineer shall order in writing the amount and type of backfill material to be transported to the Project site. No payment will be made for backfill material under this item that has not been ordered in writing. Material hauled to the Project site shall meet the requirements for the type specified in Section 20.21 - Classified Fill and Backfill.

Article 15.3 Measurement

Trench backfill material furnished to the Project site shall be measured in tons (2000 lbs.) delivered to the Project site. Weights shall be obtained on a scale certified by the State of Alaska. All loads shall be accompanied with a serialized weight ticket witnessed at the time of weighing by a Contractor-furnished weighman. The Engineer may at any time verify load weights and the weighing process. Measurement of delivered material may include moisture up to a maximum of four percent (4.0%) of dry weight of material. When tests by the Engineer indicate that moisture contents in excess of four percent (4.0%) may be occurring consistently, the frequency of testing will be increased as necessary and the results averaged over a period of one week. When the average is greater than four percent (4.0%), the tonnage, as measured over the above period, shall be reduced by the difference. No credit will be due the Contractor when moisture content is less than four percent (4.0%). Testing will be done in accordance with standards provided in this Specification.

Article 15.4 Basis of Payment

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment, and shall be full payment for all Work described in this Section.

Payment shall be made under the following unit:

ITEM	UNIT
Furnish Trench Backfill (Type)	Ton

SECTION 20.16 FURNISH BEDDING MATERIAL

Article 16.1 General

The Work under this Section consists of performance of all operations pertaining to providing bedding material for underground utilities.

Article 16.2 Materials

The coarse aggregate material conforming to the requirements specified below shall have a percentage of wear not to exceed thirty (30) after five hundred (500) revolutions, as determined by the current requirements of ASTM C-131.

A. Class "B" Bedding

Materials furnished by the Contractor for use as "B" bedding classified fill and/or backfill shall be graded within the limitations delineated below:

Class “B” Bedding

U.S. Std. Sieve	Cumulative % Passing by Weight
1"	100
3/8"	60-100
#4	40-85
#10	25-70
#40	5-40
#200	0-6

In addition to the grading limits listed above, the fraction of material passing the #200 sieve shall not be greater than thirty-five percent (35%) of that fraction passing the #40 sieve. The bedding material shall not include mechanically fractured materials.

B. Class "C" Bedding

Materials furnished by the Contractor for use as "C" bedding classified fill and/or backfill shall be graded within the limitations delineated below:

Class “C” Bedding

U.S. Std. Sieve	Cumulative % Passing by Weight
2"	100
1/2"	40-100
#4	20-75
#10	12-60
#40	2-30
#200	0-6

In addition to the grading limits listed above, the fraction of material passing the #200 sieve shall not be greater than twenty percent (20%) of that fraction passing the #40 sieve. The bedding material shall not include mechanically fractured materials.

C. Class "D" Bedding

Materials furnished by the Contractor for use as "D" bedding classified fill and/or backfill shall be graded within the limitations delineated below:

Class “D” Bedding

U.S. Std. Sieve	Cumulative % Passing by Weight
1"	100
3/4"	90-100
1/2"	50-70
3/8”	20-50
#4	0-10
#200	0-1

The bedding material shall not include mechanically fractured materials.

D. Class "E" Bedding

Materials furnished by the Contractor for use as "E" bedding classified fill and/or backfill shall be graded within the limitations delineated below:

Class "E" Bedding

U.S. Std. Sieve	Cumulative % Passing by Weight
1/2"	100
#4	20-75
#10	12-60
#40	2-30
#200	0-6

Article 16.3 Construction

Placement of bedding shall conform to the requirements of Section 20.13, Article 13.3 - Construction.

The Contractor shall employ such means and methods to keep the bedding material contained and segregated from potential contaminants until it is placed per the Contract Documents. Bedding material lost, contaminated with other material, or otherwise found to be unusable shall not be used for bedding material and the Contractor shall not be paid for that material.

Article 16.4 Measurement

Measurement of bedding shall be per ton or per linear foot of bedding material placed in the trench.

Article 16.5 Basis of Payment

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made under the following units:

ITEM	UNIT
Bedding Material (Class)	Ton
Bedding Material (Class)	Linear Foot

SECTION 20.17 FURNISH FILTER MATERIAL

Article 17.1 General

This Work under this Section consists of performance of all operations pertaining to providing filter material.

Article 17.2 Materials

Filter material shall be gravel or sand consisting of crushed or naturally-occurring granular material. It shall be free of clay particles and conforming to the gradation requirements below.

The coarse aggregate material conforming to the requirements specified below shall have a percentage of wear not to exceed thirty (30) after five hundred (500) revolutions, as determined by the current requirements of ASTM C-131.

Requirements for Grading of Filter Material
Gradation (% Passing)

Sieve	2”	1-1/2”	1”	3/4"	1/2"	3/8”	#4	#16	#50	#100	#200
Type A						100	95-100	45-80	10-30	0-10	0-3
Type B						100		0-5			
Type C	100	95-100		0-20		0-5					
Type D			100	90-100	50-70	20-50	0-10				0-1

Foundry sand and other material which may be cementitous or not suitable for water percolation shall not be used.

Article 17.3 Construction

Filter material is defined as the material which is placed below, above, and on each side of a perforated pipe to form a subdrain. Filter material may also be used directly in the trenches without a perforated pipe to form a French drain. Refer to Standard Detail 55-3 for construction of a subdrain.

Article 17.4 Measurement

Measurement of filer material shall be per ton or per linear foot of material placed in the trench.

Article 17.5 Basis of Payment

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment for placing filter material for French drains is included in Section 20.13 - Trench Excavation and Backfill.

Payment for furnishing and placing filter material for subdrains is included in payment for Division 55, Section 55.03 - Subdrains.

Payment for this item includes furnishing the required type of filter material.

Payment shall be made under the following unit:

ITEM	UNIT
Filter Material (Type)	Ton
Filter Material (Type)	Linear Foot

SECTION 20.18 DRAIN/FILTER ROCK

Article 18.1 General

The Work under this Section consists of performing all operations pertaining to furnishing and placing a layer of drain/filter rock as shown on the plans or as directed by the Engineer.

Article 18.2 Materials

Materials furnished by the Contractor for drain/filter rock shall be graded within the limitations delineated below:

Drain/Filter Rock

U.S. Std. Sieve	Cumulative % Passing by Weight	
	Drain Rock	Filter Rock
8”	100	-
6”	50-80	100
4”	25-50	50-80
3”	0-25	-
2”	0-10	
1”	-	0-10
#200	0-1	0-1

Article 18.3 Construction

The drain/filter rock shall be handled, dumped, or spread into place so as to secure a stone mass of the dimensions shown on the Drawings.

Article 18.4 Measurement

Drain/filter rock shall be measured in tons complete and accepted in place.

Article 18.5 Basis of Payment

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made under the following unit:

ITEM	UNIT
Drain Rock	Ton
Filter Rock	Ton

SECTION 20.19 FURNISH FOUNDATION BACKFILL

Article 19.1 General

The Work under this Section consists of performing all operations necessary for excavation, backfilling, compacting foundation materials and trenches.

Article 19.2 Materials

Foundation material for backfill shall consist of Type II, II-A, III, V, or VI classified backfill as specified in the Contract Documents or by the Engineer.

Article 19.3 Construction

If the trench material at the bottom of bedding does not furnish a suitable foundation, the Contractor shall remove the unsuitable material to whatever depth the Engineer determines and replace with foundation material from borrow. Foundation material shall be placed the full width of trench, in lifts not to exceed twelve inches (12") in thickness and compacted to a minimum of ninety-five percent (95%) of maximum density.

In the event of unauthorized over-excavation, the Contractor shall backfill with foundation material to the proper grade and compact to a minimum of ninety-five percent (95%) of maximum density for the full length of the over-excavated trench, all at no additional expense to the Owner.

Article 19.4 Measurement

Where the Contractor is ordered to remove unsuitable material below grade and replace it with foundation material, the material shall be paid for on a cubic yard or ton basis.

Article 19.5 Basis of Payment

Payment for the Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made under the following units:

ITEM	UNIT
Foundation Backfill (Type)	Cubic Yard
Foundation Backfill (Type)	Ton

SECTION 20.20 UNCLASSIFIED FILL AND BACKFILL

Article 20.1 General

The Work under this Section consists of furnishing all plant, labor, equipment, supplies, and material in performance of all operations pertaining to the excavation, stockpiling on site, and placement of Unclassified Fill and Backfill.

Article 20.2 Material

Unclassified Fill and Backfill shall be defined as excavated non-organic material that is determined by the Engineer to be unsuitable for Classified Fill and Backfill and suitable for deposition in non-structural fill zones.

Article 20.3 Construction

Excavated material not conforming to the specifications of Section 20.21 - Classified Fill and Backfill shall be used as Unclassified Fill and Backfill adjacent to the fill-slopes to provide additional slope stability to the fill-slopes. Excess Unclassified Fill and Backfill not used shall be disposed of at a Contractor-furnished disposal site as delineated in Division 10, Section 10.04, Article 4.9 – Disposal Sites.

Article 20.4 Measurement

The measurement of excavation will not include water or other liquids, but will include topsoil, mud, muck, or other similar semi-solid material which cannot be drained or pumped away.

Unclassified Fill and Backfill will be measured per cubic yard by cross section.

Cross section measurement of Unclassified Fill and Backfill shall be based on in-place volumes as determined by the average end areas of cross sections.

Article 20.5 Basis of Payment

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made under the following unit:

ITEM	UNIT
Unclassified Fill and Backfill	Cubic Yard

SECTION 20.21 CLASSIFIED FILL AND BACKFILL

Article 21.1 General

The Work under this Section consists of performing all operations necessary to furnish, place, and compact classified fill and backfill.

Article 21.2 Material

Classified fill and backfill shall contain no lumps, frozen material, organic matter, or other deleterious matter, and shall be durable and sound. It shall have a plasticity index not greater than six (6) as determined by ASTM D-424 and shall conform to one of the following types as required by the Drawings and Specifications. The coarse aggregate material conforming to the requirements specified below shall have a percentage of wear not to exceed thirty (30) after five hundred (500) revolutions, as determined by the current requirements of ASTM C-131.

The portion of the material retained on a #4 sieve shall be known as coarse aggregate. Both coarse and fine aggregates shall conform to the quality requirements of AASHTO M-147.A. Type II

Materials furnished by the Contractor for use as Type II classified fill and/or backfill shall be graded within the limitations delineated below:

Type II

U.S. Std. Sieve	Cumulative % Passing by Weight
8"	100
3"	70-100
1-1/2"	55-100
3/4"	45-85
#4	20-60
#10	12-50
#40	4-30
#200	2-6

* In addition to the grading limits listed above, the fraction of material passing the #200 sieve shall not be greater than fifteen percent (15%) of that fraction passing the #4 sieve.

B. Type II-A

Materials furnished by the Contractor for use as Type II-A classified fill and/or backfill shall be graded within the limitations delineated below:

Type II-A

U.S. Std. Sieve	Cumulative % Passing by Weight
3"	100
3/4"	50-100
#4	25-60
#10	15-50
#40	4-30
#200	2-6

* In addition to the grading limits listed above, the fraction of material passing the #200 sieve shall not be greater than twenty percent (20%) of that fraction passing the #4 sieve.

C. Type III

Materials furnished by the Contractor for use as Type III classified fill and/or backfill shall be approved sand or gravel with a maximum of ten percent (10%) passing the #200 sieve.

D. Type IV

Materials furnished by the Contractor for use as Type IV classified fill and/or backfill shall be an approved material consisting of sand or gravel with a maximum of twenty-five percent (25%) passing the #200 sieve.

E. Type V

Materials furnished by the Contractor for use as Type V classified fill and/or backfill shall be graded within the limitations delineated below:

Type V

U.S. Std. Sieve	Cumulative % Passing by Weight
3”	100
1 1/2"	60-90
3/4"	40-80
#4	25-55
#10	15-45
#40	4-30
#200	2-6

* In addition to the grading limits listed above, at least thirty percent (30%) of the coarse aggregate particles shall have one or more mechanically fractured face.

F. Type VI

Materials furnished by the Contractor for use as Type VI classified fill and/or backfill shall be graded within the limitations delineated below:

Type VI

U.S. Std. Sieve	Cumulative % Passing by Weight
2”	100
1 1/2"	65-95
3/4"	50-80
1/2"	30-60
#4	20-50
#10	10-30
#40	5-25
#200	2-6

* In addition to the grading limits listed above, at least forty percent (40%) of the coarse aggregate particles shall have one or more mechanically fractured face.

Article 21.3 Construction

The subgrade shall be cleared of all debris and organic material. All depressions or holes below the general area surface level, whether caused by removal of debris or

unacceptable material, or otherwise, shall be backfilled with approved material and compacted to specified density and to a level, uniform surface before the placement of other layers. Embankment shall not be placed on frozen ground, nor on ground having a slope greater than one vertical to four horizontal (slope 1:4).

The specified material shall be constructed at the locations and to the lines and grades indicated on the Drawings. The material shall be placed and spread uniformly in successive layers not exceeding twelve inches (12”) in loose thickness. The Engineer may approve lifts of greater thickness provided the equipment and method used will consistently achieve the specified density. The layers shall be carried up full width from the bottom of the fill to avoid the necessity of widening the edges after the center has been brought to grade. Each layer shall be compacted to not less than ninety-five percent (95%) of the maximum density at optimum moisture as determined by the method of testing noted in Section 20.01, Article 1.5 – Compaction Standards. Reasonable time shall be provided the Engineer to make field density determinations prior to placement of successive layers of material.

Blading, rolling, and tamping shall continue until the surface is smooth, free from waves and irregularities, and conforms to elevations shown on the Drawings. If at any time the material is excessively wet, it shall be aerated by means of blade graders, harrows, or other suitable equipment until the moisture content is satisfactory. The surface shall then be compacted and finished as specified above.

Contractor shall submit a processing and blending plan to the Engineer for review and approval prior to utilization of classified fill or backfill from more than one source. The plan must be accompanied by materials analysis reports for each material source and fully describe how the material will be placed and blended to ensure that timely and accurate in-place density testing can be achieved.

The maximum dimensions of any particle of the embankment material shall not be greater than two-thirds (2/3) of the compacted thickness of the layer in which it is placed unless specified elsewhere. The top six inches (6”) of embankment material for roads, streets, parking lots, and bike trails, shall be Type II-A classified fill and backfill. Oversize material shall be removed. Portions of any layer in which the embankment material becomes segregated shall be removed and replaced with satisfactory material or shall be added to and remixed to secure proper gradation as directed by the Engineer. No separate payment will be made for any material removed or regraded in areas where material becomes segregated.

The Engineer may permit lifts in excess of twelve inch (12") thickness when classified fill or backfill is placed over swampy or saturated ground, or where he is satisfied that the Contractor's method and equipment will consistently produce the specified density.

Embankments for bike trail sections will be brought to grade in one (1) single lift for embankments less than eighteen inches (18”) to finish grade. Trail embankments over eighteen inches (18”) shall be brought to grade in lifts as directed by the Engineer.

Article 21.4 Measurement

Classified fill or backfill material, obtained from borrow pits, will be measured in tons (2000 lbs.) of material delivered and placed in accordance with these Specifications. The measurement may include moisture up to a maximum of four percent (4.0%) of dry weight of the material. When tests by the Engineer indicate that moisture contents in excess of four percent (4.0%) may be occurring consistently, the frequency of testing will be increased as necessary and the results averaged over a period of one week. When this average is greater than four percent (4.0%), the tonnage as measured over the above period, shall be reduced by the difference. No credit will be due the Contractor when moisture content is less than four percent (4.0%). Testing shall be done in accordance with Section 20.01, Article 1.3 – Applicable Standards.

Imported classified fill and backfill will be weighed on a scale certified by the State of Alaska. Weight tickets will be serialized and witnessed at the time of weighing by a Contractor-furnished weighman. The Engineer may at any time verify load weights and the weighing process.

Where excavation of unsuitable material beyond the lines and grades shown on the Drawings is ordered in writing, the measurement of classified backfill will include the material required for replacement. No measurement will be made for quantities placed beyond the lines and grade authorized or for quantities placed outside the limits of required excavation.

The Contractor and the Engineer shall verify daily the quantity of material delivered to the Project site. Weight tickets not presented at time of delivery will require special verification by the Contractor before payment can be made.

Article 21.5 Basis of Payment

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment for the placement and compaction of usable excavation shall not be paid under this Section.

Payment shall be made under the following units:

ITEM	UNIT
Classified Fill and Backfill (Type)	Ton

SECTION 20.22 LEVELING COURSE

Article 22.1 General

The Work under this Section consists of performing all operations necessary to complete construction of the leveling course on the prepared subbase.

Article 22.2 Material

The leveling course shall consist of crushed gravel, rock, sand, or other approved material. The aggregate shall be free from lumps, balls of clay, or other objectionable matter, and shall be durable and sound. The portion of the material retained on a No. 4 sieve shall be known as coarse aggregate. Both coarse and fine aggregates shall conform to the quality requirements of AASHTO M-147.

Upon written approval by the Engineer, recycled asphalt concrete pavement (RAP) may be substituted for leveling course, on an inch for inch basis. All RAP shall conform to Division 40, Section 40.08 – Recycled Asphalt Pavement. RAP which has been derived from environmentally contaminated aggregates shall not be accepted.

A. Coarse Aggregate

The coarse aggregate material conforming to the requirements specified above shall have a percentage of wear not to exceed thirty-five (35) after five hundred (500) revolutions, as determined by the current requirements of ASTM C-131. It shall consist of angular fragments reasonably uniform in density and quality, and reasonably free from thin and elongated pieces, dirt, and other objectionable material. At least fifty percent (50%) of the coarse aggregate particles shall have two or more mechanically fractured faces.

B. Fine Aggregate

The fine aggregate shall consist of material free of organic or other objectionable matter. The fine aggregate, either naturally combined with the coarse aggregate or separately obtained and mixed therewith, shall be of such character that the composite material will conform to the gradation and other requirements specified.

C. Gradation

The composite mixture of coarse aggregate and fine aggregate, processed as hereinafter specified, shall conform to the following gradation limits as required by the Drawings:

Leveling Course

U.S. Std. Sieve	Cumulative % Passing by Weight
1"	100
3/4"	70-100
3/8"	50-80
#4	35-65
#8	20-50
#50	8-28
#200	*2-6

*In addition to the grading limits stipulated above, fractions passing the #200 sieve shall not be greater than seventy-five percent (75%) of the fractions passing the #50 sieve.

Article 22.3 Construction

The leveling course shall be placed to the lines, grades, and thicknesses shown on the Drawings and shall consist of the materials hereinbefore specified. The leveling course shall provide a smooth stabilized surface on which to place the pavement.

A. Preparation of Subbase

Subbase preparation shall consist of dressing, shaping, wetting, and compacting of the subbase to a minimum density of ninety-five percent (95%) in accordance with Section 20.01, Article 1.5 - Compaction Standards. Surfaces shall be cleaned of all foreign substances and debris. Any ruts or soft yielding spots that may appear in the subbase surface shall be corrected by loosening, removing and adding approved material, reshaping, and recompacting the affected areas to the line, grade, and to the specified density requirements.

B. Surveying

Subbase and leveling course control stakes shall be wooden bluetops set to finish subbase. The subbase bluetops will be the reference used by the Contractor to set top of leveling course. Subbase bluetops shall be set at breaks in grade and on even grade at intervals not to exceed fifty feet (50’), with additional stakes at vertical curves. Side control will be from the lip or gutter, or in the case of strip paving, additional bluetops shall be provided.

C. Placing

The approved leveling course material shall be deposited and spread in a uniform layer to the required contour and grades and to such loose depth that when compacted to the density required will achieve the specified thickness. The material shall be spread uniformly on the prepared subbase from moving vehicles or spreading boxes, then leveled to the required contour and graded with blade graders. Portions of the layer which become segregated in spreading shall be remixed to the required gradation.

D. Compacting

The leveling course shall be compacted to a minimum of ninety-five percent (95%) of maximum density. In all places not accessible to the rolling equipment, the mixture shall be compacted with tamping equipment. Blading, rolling and tamping shall continue until the surface is smooth and free from waves and inequalities. If at any time the mixture is excessively moistened by rain, it shall be aerated by means of blade graders, harrows or other approved equipment until the moisture content is such that the surface can be recompacted and finished as above. The finished leveling course shall be maintained by the Contractor in the above condition until the pavement is applied.

E. Smoothness Test

The surface of the leveling course, when finished, shall not show any deviation in excess of three-eighths inch (3/8") when tested with a ten foot (10') straightedge applied parallel with, and at right angles to, the centerline of the area to be paved. Any deviation in excess of this amount shall be corrected by loosening, adding, or removing material and reshaping and compacting to satisfy the above requirement.

Contractor shall obtain written approval from the Engineer for the final leveling course grade prior to pavement placement.

Article 22.4 Measurement

The leveling course shall be measured in tons of materials delivered and placed in accordance with these Specifications . The measurement may include moisture up to a maximum of four percent (4.0%) of dry weight of the material. When tests by the Engineer indicate that moisture contents in excess of four percent (4.0%) may be occurring consistently, the frequency of testing will be increased as necessary and the results averaged over a period of one week. When this average is greater than four percent (4.0%), the tonnage as measured over the above period, shall be reduced by the difference. No credit will be due the Contractor when moisture content is less than four percent (4.0%). Testing shall be done in accordance with Section 20.01, Article 1.3 – Applicable Standards.

Article 22.5 Basis of Payment

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made under the following unit:

ITEM	UNIT
Leveling Course	Ton

SECTION 20.23 COBBLES

Article 23.1 General

The Work under this Section consists of performing all operations pertaining to furnishing and placing a layer of cobbles as shown on the Drawings or as directed by the Engineer.

Article 23.2 Materials

Materials furnished by the Contractor for cobbles shall be graded within the limitations delineated below:

Cobbles

U.S. Std. Sieve	Cumulative % Passing by Weight
12”	100
8”	50-80
6”	25-50
3”	0-25
2”	0-10
#200	0-1

Article 23.3 Construction

The cobbles shall be handled, dumped, or spread into place so as to secure a stone mass of the dimensions shown on the Drawings.

Article 23.4 Measurement

Cobbles shall be measured in tons complete and accepted in place.

Article 23.5 Basis of Payment

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made under the following unit:

ITEM	UNIT
Cobbles	Ton

SECTION 20.24 RIPRAP

Article 24.1 General

This work shall consist of furnishing and placing a protective covering of stone as shown on the Drawings or as directed by the Engineer.

Article 24.2 Materials

Stone for this work shall be hard angular quarry stones and have a percentage of wear of not more than fifty (50) at five hundred (500) revolutions as determined by ASTM C-535. The least dimension of any piece of stone shall be not less than one-fourth (1/4) its greatest dimension. Stones shall meet the following gradation requirement for the class specified:

A. Class I

No more than ten percent (10%) of the stones by total weight shall weigh more than fifty (50) pounds per piece and no more than fifty percent (50%) by total weight of the stones shall weigh less than twenty-five (25) pounds per piece.

B. Class II

No more than ten percent (10%) of the stones by total weight shall weigh more than four hundred (400) pounds per piece and no more than fifteen percent (15%) by weight of the stones shall weigh less than twenty-five (25) pounds per piece. The stones shall be evenly graded and a minimum of fifty percent (50%) by weight of the stones shall weight two hundred (200) pounds or more per piece.

C. Class III

No more than ten percent (10%) of the stones by total weight shall weigh more than one thousand four hundred (1,400) pounds per piece and no more than fifteen percent (15%) of the stones shall weigh less than twenty-five (25) pounds per piece. The stones shall be evenly graded and a minimum of fifty (50%) by weight of the stones shall weigh seven hundred (700) pounds or more per piece.

Article 24.3 Construction

A footing trench shall be excavated along the toe of the slope when shown on the plans. The stones shall be handled or dumped into place so as to secure a stone mass of the thickness, height and length shown on the plans, or as staked with a minimum of voids.

Undesirable voids shall be filled in with small stones or spalls. The rock shall be manipulated sufficiently by means of a bulldozer, rock tongs, or other suitable equipment to secure a reasonably regular surface and mass stability.

Riprap protection shall be placed to its full course thickness at one operation and in such manner as to avoid displacing the underlying material. Placing of riprap protection in layers or by dumping into chutes or by similar methods likely to cause segregation will not be permitted.

All material going into riprap protection shall be so placed and distributed that there will be no large accumulation or area composed largely of either the larger or smaller sizes of stone.

Unless otherwise authorized by the Engineer, the riprap protection shall be placed in conjunction with the construction of the embankment with only sufficient lag in construction of the riprap protection as may be necessary to prevent mixture of embankment and riprap material.

The Contractor shall provide a level compact area of sufficient size to dump and sort typical loads of riprap at approved location(s). He shall further dump loads specified in this area and assist the Engineer as needed to sort and measure the stones in the load for the purpose of determining if the riprap is within specifications. Mechanical equipment as needed to assist in this sorting shall be provided by the Contractor at no additional cost to the Owner.

Article 24.4 Method of Measurement

Riprap shall be measured in cubic yards measured by neat line measure, or tons, completed and accepted in place. Excavation and backfill required for placement of riprap is considered incidental to the bid item.

Article 24.5 Basis of Payment

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described in this Section.

When more than one class of riprap is specified for any pay item, letter suffixes shall be included within the parentheses of the item numbers in order to differentiate between the different classes.

Payment will be made under the following item:

ITEM	UNIT
Riprap (Class)	Cubic Yard
Riprap (Class)	Ton

SECTION 20.25 GEOTEXTILE FABRIC

Article 25.1 Description

The Work under this Section shall consist of furnishing and installing Geotextile Fabric for embankment separation, subgrade reinforcement of roadways, subsurface drainage, or riprap lining in a manner and at locations as shown in the Drawings or as directed by the Engineer.

Article 25.2 Materials

Geotextile fabrics furnished as required in the Drawings shall meet conform to the following specifications, based on AASHTO M288-06. Additional requirements follow depending on the application of the geotextile fabric.

			Geotextile Class [a,b]			
			Class 1		Class 2	
Property	Test Methods	Units	Woven Elongation < 50% [c]	Non-Woven Elongation ≥ 50% [c]	Woven Elongation < 50% [c]	Non-Woven Elongation ≥ 50% [c]
Grab Strength	ASTM D 4632	Lbs (#)	315	200	250	160
Sewn Seam Strength	ASTM D 4632	Lbs (#)	285	182	225	140
Tear Strength	ASTM D 4533	Lbs (#)	115	80	90	56
Puncture Strength	ASTM D 6241	Lbs (#)	620	435	495	310

[a] The severity of installation conditions for the application generally dictates the required geotextile class. Class 1 is specified for more severe or harsh installation conditions where there is greater potential for geotextile damage. Class 2 is specified for less severe conditions.

[b] All numeric values represent MARV in the weaker principal direction.

[c] As measured in accordance with ASTM D 4632.

A. Type A Geotextile (Separation)

Type A Geotextile is used for separation. The Type A Geotextile shall be a woven or nonwoven pervious fabric constructed from long chain polymeric filaments such as polypropylene, polyethylene, polyester, polyvinylidene chloride or polyamide formed into a stable network such that the filaments or yarns retain their relative

position to each other. The geotextile shall be inert to commonly encountered chemicals and shall be free from defects.

Non-woven geotextile may be formed by the needle-punched, spun-bonded or melt-bonded process.

Woven geotextile shall be a pervious sheet of yarn woven into a uniform pattern with distinct and measurable openings. Edges of the cloth shall be salvaged to prevent the outer yarn from pulling away from the cloth.

Acceptance of geotextile material is to be determined according to ASTM D-4873.

Geotextile manufacturer shall provide a letter certifying that its geotextile product meets the specified requirements.

Type A Geotextile supplied shall be Class 2, unless otherwise specified in the Contract Documents and shall meet the physical and mechanical properties listed below:

Property	Test Methods	Units	Requirements
Permittivity	ASTM D 4491	Sec^{-1}	0.02 [a]
Apparent Opening Size	ASTM D 4751	mm	0.60 max avg roll value
Ultraviolet stability (retained strength)	ASTM D 4355	%	50% after 500 h of exposure

[a] Default value. Permittivity of the geotextile should be greater than that of the soil. The Engineer may also require the permeability of the geotextile to be greater than that of the soil.

B. Type B Geotextile (Reinforcement)

Type B Geotextile is used for reinforcement. Type B Geotextile shall consist of a regular grid structure formed by biaxially drawing a continuous sheet of select polypropylene material; it shall have aperture geometry and rib and junction cross sections sufficient to permit significant mechanical interlock with the material being reinforced.

Type B Geotextile shall have high flexural rigidity and high tensile strength at ribs and junctions of the grid structure.

Type B Geotextile shall maintain its reinforcement and interlock capabilities under repeated dynamic loads while in service and shall also be resistant to ultraviolet

degradation, to damage under normal practices, and to all forms of biological or chemical degradation normally encountered in the material being reinforced.

Type B Geotextile supplied shall be Class 1 unless otherwise specified in the Contract Documents and shall meet the physical and mechanical properties listed below:

Property	Test Methods	Units	Requirements
Permittivity	ASTM D 4491	Sec^{-1}	0.05 [a]
Apparent Opening Size	ASTM D 4751	mm	0.43 max avg roll value
Ultraviolet stability (retained strength)	ASTM D 4355	%	50% after 500 h of exposure

[a] Default value. Permittivity of the geotextile should be greater than that of the soil. The Engineer may also require the permeability of the geotextile to be greater than that of the soil.

C. Type C Geotextile (Drainage/Riprap Lining)

Type C Geotextile is used for drainage or riprap lining. The geotextile shall be constructed from long chain polymeric filament or yarns such as polypropylene, polyethylene, polyester, nylon, polyvinylidene chloride or polyamide formed into a stable network such that the filaments or yarns retain their relative position to each other. The geotextile shall be inert to commonly encountered chemicals and shall be free from defects.

Non-woven geotextile may be formed by the needle punched, spun-bonded or melt-bonded process.

Woven geotextile shall be a pervious sheet of yarn woven into a uniform pattern with distinct and measurable openings. Edges of the cloth shall be salvaged to prevent the outer yarn from pulling away from the cloth.

Geotextiles made from yarns of a flat, tape-like character are not allowed.

Type C Geotextile supplied shall be Class 2, unless otherwise specified in the Contract Documents and shall meet the physical and mechanical properties listed below:

			Requirements		
			Percent *in Situ* Soil Passing #25 Sieve [a] (0.075mm)		
Property	Test Methods	Units	< 15	15 to 50	> 50
Permittivity	ASTM D 4491	Sec^{-1}	0.5	0.2	0.1
Apparent Opening Size	ASTM D 4751	mm	0.43	.25	.22
			max. avg roll value		
Ultraviolet stability (retained strength)	ASTM D 4355	%	50% after 500 h of exposure		

[a] Based on grain size analysis of in situ soil in accordance with AASHTO T88.

Acceptance of geotextile material shall be determined according to ASTM D-4759.

D. Submittal Requirements

The Contractor shall submit the following information to the Engineer for review and acceptance:

1. Full-scale laboratory testing and in-ground testing of pavement structures reinforced with the proposed geotextile product which illustrates significant structural contribution of the geotextile product to the pavement structure.
2. Certified test results stating that the geotextile product meets the material and physical properties in all respects.
3. Guidelines to pavement design using proposed geotextile product.
4. A list of not less than ten (10) comparable projects, in terms of size and application, in the United States, with references and phone numbers, where the results of the proposed geotextile product's use can be verified after a minimum of three years continuous service life.
5. Geotextile product samples and certified material property data sheets.
6. Recommended installation instructions.
7. Geotextile manufacturer shall provide a letter certifying that its geotextile product meets the specified requirements.

Article 25.3 Construction

A. Surface Preparation

Prepare surface by removal of stumps, boulders, and sharp objects in accordance with Section 20.05 - Clearing. Contractor shall fill holes and large ruts with material shown on the Drawings or as approved by the Engineer.

Clearing shall be considered incidental to this item. Material used to fill ruts and holes shall be paid for at the unit price for the type of material used, as shown on the Drawings or as approved by the Engineer.

In Areas to Be Surcharged: All trees and brush having a trunk base diameter greater than one-half inch (1/2") shall be cut to within two inches (2") of original ground surface. Grass shall be flattened with no more than two passes of a tracked vehicle.

B. Geotextile Placement

Unroll geotextile directly onto the prepared surface. Exposure of geotextile to the elements after removal of protective covering shall not exceed five days.

Unroll geotextile for embankment reinforcement parallel to the embankment centerline.

Geotextile shall be placed in daily work sections so the lap adjustment can be made should movement of the geotextile occur during placement of fill.

C. Joining

1. Type A Geotextile

Fabric shall be joined with adjacent pieces of fabric by sewing or overlapping.

If fabric is sewn, the fabric shall have all seams sewn by butterfly or J-seams and shall develop a minimum of eighty-five percent (85%) of the specified strength. Seams shall be sewn with a double-thread chain-lock stitch. High strength polyester, polypropylene or Kevlar thread shall be used. The seam shall be one and one-half inch plus or minus one-quarter inch (1-1/2" $\pm$1/4") from the outside edge of the geotextile.

2. Type B Geotextile

Sections shall be overlapped a minimum of three feet (3'), or as shown on the Drawings, to prevent shifting of geotextile during installation and filling.

Lap joints shall be tied with plastic ties specifically manufactured for this purpose at five foot (5') intervals.

3. Type C Geotextile

Fabric shall be joined with adjacent pieces of fabric by sewing or overlapping.

If fabric is sewn, the fabric shall have all seams sewn by butterfly or J-seams and shall develop a minimum of eighty-five percent (85%) of the specified strength. Seams shall be sewn with a double-thread chain-lock stitch. High strength polyester, polypropylene or Kevlar thread shall be used. The seam shall be one and one-half inch plus or minus one-quarter inch (1-1/2" ±1/4") from the outside edge of the geotextile. If the fabric is overlapped, the sections shall be overlapped a minimum of three feet (3') or as shown on the Drawings.

D. Material Placing and Spreading

Fill material placement shall not occur until the Engineer accepts surface preparation and geotextile laps.

Contractor shall maintain minimum laps and fabric continuity without fabric loops or kinks during material placement and spreading.

Follow the manufacturer's recommendations for material placing and spreading of the geotextile. During placing and spreading, the Contractor shall maintain a minimum depth of one foot (1') of cover material at all times between the fabric and the wheels or tracks of the construction equipment. At no time shall equipment operate on the unprotected geotextile. Construction equipment shall not make sudden stops, starts, or turns on the over material. Use a smooth drum roller to achieve the specified density.

Spread the material in the direction of the fabric overlap.

On weak subgrades, spread the cover material simultaneously with dumping to minimize the potential of a localized subgrade failure.

E. Geotextile Repair

Should it be determined during or after embankment construction that specified geotextile lap widths have not been achieved, or that the Contractor otherwise damaged the installed geotextile, the Contractor shall correct the geotextile installation at no additional cost to the City.

The Contractor shall expose the geotextile and add additional geotextile extending in all directions to achieve specified laps and anchorage. After correcting the geotextile, the embankment shall be reconstructed in accordance with the Contract Documents.

Article 25.4 Method of Measurement

Geotextile shall be measured in square yards of ground surface covered by fabric as shown on the Drawings or as approved by the Engineer. Overlapping and stitching of fabric will be considered incidental to this pay item and no additional payment will be made.

Material used to fill ruts and holes shall be paid for at the unit price of the appropriate bid item for the type material used, as shown on the Drawings or as approved by the Engineer.

Article 25.5 Basis of Payment

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made under the following unit:

ITEM	UNIT
Geotextile (Type)	Square Yard

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SECTION 20.26 INSULATION

Article 26.1 General

The Work under this Section consists of performing all operations including labor and material pertaining to the placement of insulation. Contractor shall provide polystyrene insulation board(s), extruded or expanded, in conformance with the Drawings and these Specifications

The Work under this Section also includes shaping and compacting a level area under the horizontal insulation boards and placing the insulation as indicated on the Drawings.

Article 26.2 Materials

The insulation board shall have a minimum full board size of two foot by eight foot (2' x 8'), have the specified R-Value or better, and shall conform to the requirements of AASHTO M230. R-Value of insulation shall be based on manufacturer's warranted R-Value. The insulation board shall be rigid, homogeneous, and conform to the following:

Property	Test Method	Value
Compressive Strength psi, minimum at yield or 5 percent strain	ASTM D-1621	60.0
Water Absorption, maximum percent by volume	ASTM C-272	0.3%
Thermal Resistance, minimum R-Value at 75ºF, ºF-Ft^2-Hr/BTU	ASTM C-177	As Specified

Article 26.3 Construction

Contractor shall install the insulation board with staggered joints. Layering of insulation to obtain the specified R-Value is allowed as long as joints are overlapped at least one foot (1'). Contractor shall blade, shape, and compact the area prior to placing the insulation board in accordance with this Division. Contractor shall shape the subgrade to the lines and grades shown on the Drawings and provide a smooth surface on which to place the insulation board. Prior to placing the insulation board on the prepared subgrade, the Contractor shall furnish straightedges to the Inspector for checking surface uniformity. Surface irregularities shall not exceed one inch (1") within eight feet (8'), or three-eighths inch (3/8") in two feet (2'). Contractor shall uniformly compact the subgrade. Contractor shall hand-rake smooth and recompact the ridges left by the compaction equipment. Contractor shall accurately set the horizontal insulation boards to the line and grade established and in such a manner as to hold the board firmly in place by mechanically connecting it to the subgrade.

Contractor shall replace or repair insulation panels broken, crushed, or cracked, as determined by the Engineer, at no additional cost to the Owner.

Contractor shall cover the insulation board with approved three inch (3”-) minus Classified Fill and Backfill material, placed in a twelve inch (12”) lift, spread, and compacted for the full width of the insulation layer prior to placing subsequent lifts. Contractor shall place, spread, and compact in such a manner as not to damage the insulation board. Engineer will approve spreading and compacting equipment prior to its use.

Article 26.4 Measurement

The insulation board is measured per square foot regardless of thickness, complete and accepted in place.

Additional Work required for preparing the subgrade to the smoothness required is incidental to the bid item(s) in this Section and no separate payment is made.

Article 26.5 Basis of Payment

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment will be made under the following unit:

ITEM	UNIT
Insulation Board (R-Value)	Square Foot

SECTION 20.27 DISPOSAL OF UNUSABLE OR SURPLUS MATERIAL

Article 27.1 General

The Work under this Section consists of performing all operations pertaining to the disposal of unusable or surplus material encountered in the trench excavation. This material may include peat, roots, large rocks, unstabilized soil, cesspools, privy pits, or any other material, which in the opinion of the Engineer is objectionable for use as fill or backfill.

Article 27.2 Construction

The Contractor shall use care in separating unusable material from usable material. When unusable material shall be disposed of, the Engineer will order the same in writing, stating the limitations of the Work. Should the trench be, in the opinion of the Engineer, wider than is necessary for the safety of the workmen, a deduction may be made for the excess width. Payment will not be made for disposal of unusable material unless the material is moved in excess of one hundred feet (100') from the excavation.

All unusable material shall be hauled to a disposal site provided by the Contractor as delineated in Division 10, Section 10.04, Article 4.9 – Disposal Sites.

Article 27.3 Cesspools, Privy Pits and Septic Tanks

If cesspools and privies are encountered in right-of-way areas and have to be removed to allow construction, the following procedures for removal are to be used.

In the case of a privy encountered, the Contractor shall remove the privy from the right-of-way area and set it over onto the private property where the privy belongs.

In the case of septic tanks, cesspools and privy pits, the liquid sewage and sludge from the cesspool or privy pit shall be pumped into a watertight container and disposed of at a designated manhole. Care shall be exercised in transporting cesspool and privy pit liquids and sludge so that spillage does not occur during transportation and disposal.

The Contractor shall then remove the remaining sludge, cesspool and privy pit logs or cribbing, and any saturated gravel remaining in the trench area, and shall dispose of this material at the Municipal Landfills. Disposal of this material will be coordinated with the Engineer, in order that the materials disposed of can be covered with fill material by others at the landfill site immediately after it is dumped. Care shall be exercised in transporting this material so that spillage does not occur during transportation and disposal.

Article 27.4 Measurement

The method of measurement for this item will be per cubic yard measured by truck count or by cross section measurement before and after removal of unusable materials. Unless otherwise noted in the Bid Schedule, measurement will be by truck count.

Article 27.5 Basis of Payment

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment, and shall include full payment for all work described in this Section.

Payment shall be made under the following unit:

ITEM	UNIT
Disposal of Unusable or Surplus Material	Cubic Yard

SECTION 20.28 RECONSTRUCT DRIVEWAY

Article 28.1 Description

The Work under this Section consists of performing all operations and furnishing all materials pertaining to removing, disposing of, re-grading and replacing existing driveway approaches, including removal and disposal of existing pavement, excavation, surfacing, classified fill and backfill, leveling course, and working adjacent to existing landscaping amenities, as indicated on the Drawings.

Driveway reconstruction consists of installing a section of driveway that provides a smooth transition from the existing driveway to the street improvements. The transition length is measured from the back of curb or back of sidewalk and shall be as shown on the Drawings or as directed by the Engineer.

Contractor shall not disturb existing driveways that have imbedded heating systems.

Article 28.2 Materials

All materials used in the reconstruction of driveways shall conform to the requirements for Portland cement concrete Class A-3 conforming with Division 30 – Portland Cement Concrete and asphalt concrete pavement conforming with Division 40 – Asphalt Surfacing for asphalt paved driveways. Subbase material shall conform to the requirements of this Division.

Article 28.3 Construction

All construction practices, tests and other controls shall conform to Division 20 – Earthwork, Division 30 – Portland Cement Concrete, and Division 40 – Asphalt Surfacing.

The Contractor shall neatly and cleanly saw cut and remove existing driveway surfacing. Contractor shall saw cut a minimum of two inches (2”) deep for asphalt surfaces and three inches (3”) deep for concrete surfaces. If any portion of the remaining asphalt or concrete surfacing is under-cut or damaged during construction operations, Contractor shall saw cut, remove, and replace the affected area at no additional cost to the Owner.

The Contractor shall reconstruct existing driveways with asphalt or concrete surfacing to match existing driveway surface. Contractor shall place two inches (2”) of asphalt surfacing over six inches (6”) of leveling course and concrete surfacing at a thickness of six inches (6”). Concrete driveways shall have a minimum six by six inch (6” x 6”) woven wire mesh reinforcement installed. Contractor shall provide all areas of reconstructed driveway with a minimum eighteen inches (18”) of Type II-A Classified Fill and Backfill subbase, and, when required on the Drawings, geotextile fabric.

Contractor shall perform asphalt paving by utilizing a mechanical spreader and compact by a mechanical roller weighing not less than ten (10) tons, except that where the area of the asphalt replacement patch is less than three hundred (300) square feet, a mechanical spreader need not be employed.

Contractor shall tamp small inaccessible areas to produce a compression and surface texture equivalent to that produced by the specified rolling. Hand tampers shall have a maximum tamping face of fifty (50) square inches and minimum weight of twenty-five (25) pounds.

Contractor shall maintain access and parking accommodations for each resident during driveway work. Contractor shall notify and coordinate with the affected resident(s) prior to necessary driveway closures.

Article 28.4 Measurement

Driveway reconstruction is measured per square yard of replaced driveway surface complete and in place for the specified type of surface. No separate measurement is to be made for asphalt, classified backfill, excavation, geotextile fabric, of leveling course as these items are incidental to the Work item. No measurement is made for temporary relocation of driveways or required driveway maintenance during construction as these items are incidental to the Work item.

Article 28.5 Basis of Payment

Payment for this item shall be in accordance with Division 10, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made under the following unit:

ITEM	UNIT
Reconstruct Driveway, Asphalt (Class)	Square Yard
Reconstruct Driveway, Concrete (Class)	Square Yard

SECTION 20.29 PIPE CASING

Article 29.1 General

The Work under this Section consists of performing all operations necessary for furnishing and placing a casing by trenchless method under structures, roadways, railroad tracks, or runways.

Article 29.2 Materials

Materials shall be as required by the Contract Documents.

Article 29.3 Construction

Method of installing a pipe casing shall be optional to the Contractor, except that prior to commencing jacking or augering operations, the Contractor shall furnish a work plan to the Engineer and show that his planned method of installation has worked satisfactorily in other areas under similar conditions. The excavation at both ends of the casing shall be considered incidental to this bid item and no separate payment shall be made.

A vertical and horizontal tolerance shall be as shown on the Drawings, provided that the Contractor will be responsible, and use such fittings as are required to adjust alignment and grade to accomplish the connections.

The pipe within the casing (barrier pipe) shall be arrested from movement by sand filling or wood slats and banding according to Standard Detail 20-18.

Article 29.4 Measurement

Measurement shall be from end to end of pipe casing acceptably installed and completed. No measurement will be made for trench excavation and backfill where casing is installed. No compensation will be made for casing installations abandoned or aborted due to deviations in excess of allowable tolerances.

Article 29.5 Basis of Payment

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment and shall include full payment for all Work described in this Section, including arrestment of pipe.

Payment shall be made under the following unit:

ITEM	UNIT
Furnish and Install Casing	Linear Foot

SECTION 20.30 SHORING, SHEETING AND BRACING/SHORING AND SHEETING LEFT IN THE TRENCH AND PORTABLE

Article 30.1 General

The Work under this Section consists of all operations pertaining to furnishing and installing sheeting, shoring, and bracing to support the trench section to prevent any movement that might damage adjacent facilities or injure workmen or the public, and the use of portable steel shielding.

Article 30.2 Materials

The Contractor shall obtain approval from the Engineer for all sheeting, bracing and shoring materials and/or equipment to be used on the project. Materials used shall be in accordance with Section 1926.651, Subparagraph 1 of the Federal Register, Volume 37, No. 243, OSHA Regulations.

Article 30.3 Construction

All construction requirements for design, installation, and use of sheeting, shoring, bracing, and shielding shall be in accordance with current safety regulations. All sheeting, shoring, bracing, and shielding shall be designed by a Professional Engineer commissioned by the Contractor. All shop drawings and design data shall be submitted to the Engineer for approval.

When shoring and sheeting is left in the trench, sheeting must be lower than the bottom of the pipe and cut off one foot (1') below ground surface. No transverse bracing will be permitted to remain.

Any Contractor provided portable trench shielding shall comply with relevant OSHA regulations. The Contractor shall provide the Engineer certification of such compliance from the portable shield manufacturer or supplier.

Article 30.4 Measurement

No measurement will be made for Work in this Section.

Article 30.5 Basis of Payment

No separate payment shall be made for shoring, sheeting, bracing, or portable shields. Any single technique or combination of techniques used for shoring, sheeting, and bracing shall be considered incidental to the Contract.