Sidney-Waterville
WIN 029486.00
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SPECIAL PROVISION
SECTION 203
EXCAVATION AND EMBANKMENT
(Ultra-Lightweight Foamed Glass Aggregate)

203.01 Description

The following is added to Subsection 203.01 of the Standard Specifications:

The work shall consist of furnishing all labor, equipment and materials, including supplying the Ultra-Lightweight Foamed Glass Aggregate (ULFGA), and performing all operations required to install ULFGA fill to the limits shown on the Plans or as approved by the Resident (for the work of this section the term Resident will include the Geotechnical Engineer). All work performed under this Special Provision shall be coordinated with the Resident. The work shall include complete encapsulation of the ULFGA from surrounding materials using a geotextile and as outlined herein, including:

1. Separating pavement subbase materials (above) from the ULFGA.
2. Separating the soils present at embankment subgrade (below) from the ULFGA.
3. Separating the fill materials or underdrain material alongside the ULFGA section from the ULFGA

The Contractor shall furnish all labor, materials, equipment, tools, and appurtenances required to complete the Work specified in this Section, including:

1. Preparation of subgrade.
2. Storage and handling of ULFGA.
3. Protection of all existing utilities and structures.
4. Placement and compaction of ULFGA fill to the limits shown on the Plans.
5. Placement of geotextile as specified herein and to the limits shown on the Plans.
6. Protection of placed ULFGA from damage or disturbance.

203.02 Materials

The following is added to Subsection 203.02 of the Standard Specifications:

The Contractor shall supply and install ULFGA fills that conforms to the following requirements:

1. ULFGA shall be made from of a minimum of 95% recycled glass.
2. ULFGA shall meet the gradation specifications presented below upon delivery per ASTM C136/136M-19. Gradation tests shall conform to the requirements of AASHTO Method T27.

Sieve Designation	Percentage by Weight Passing Square Mesh Sieve
4-in.	100
2 ½-in.	85-100
3/8-in.	0-15

3. The as-manufactured ULFGA shall have a maximum dry bulk density of 15 pounds per cubic foot (pcf) per ASTM C29/29M-17a. The as-delivered ULFGA shall have a maximum compacted moist bulk density of 18 pcf per ASTM C29/29M-17a.
4. The manufacturing process shall produce a closed cell ULFGA material, which is non-leaching.
5. The ULFGA shall have a minimum peak friction angle of 40 degrees at 10% to 15% strain for normal stresses between 500 and 1,000 psf per ASTM D3080/D3080M-11.
6. The ULFGA shall have a compressive minimum strength at 20 percent strain of 15,000 psf per modified EN-1097 (no precompression of material).
7. The ULFGA (subjected to precompression at a 1.3:1 ratio) shall have minimum compressive strengths per EN 826 (modified) according to table below.

Deformation	Minimum Compressive Strength (psf)
1%	18,000
5%	20,000
10%	24,000

8. The ULFGA manufacturer must demonstrate experience of manufacturing a minimum of 100,000 cubic yards of ULFGA meeting the requirements of this Section.

Geotextile fabric shall be completely encapsulate the placed ULFGA and separate if from adjacent prepared subgrades below, topsoil/fill on embankment slopes, and granular fills on top.

The geotextile fabric shall be a non-woven, staple fiber, needle-punched, polypropylene geotextile. The geotextile shall consist of punched, non-woven geotextile with a minimum grab tensile strength of 160 lbs per ASTM D4632 and shall meet the requirements of Subsection 722.04 for Separation Geotextile.

203.21 Submittals

The following subsection is added to Standard Specification 203:

The Contractor shall submit an Installation Plan to the Resident for approval a minimum of 30 calendar days prior to the first scheduled delivery of ULFGA material to the site. The Installation Plan shall include but may not be limited to the following:

1. The name and address of the ULFGA supplier(s).
2. Manufacturer's specifications, catalog cut sheets, laboratory testing results, and other product data needed to demonstrate compliance with the requirements specified herein
3. Written certification from manufacturer's quality control testing laboratory indicating that the product meets or exceeds the gradation, strength, compacted unit weight, and internal friction angle requirements specified herein. The laboratory test results shall be completed within 60 calendar days of submitting the Installation Plan to the Resident. The Contractor shall submit additional laboratory testing results to the Resident for each 500 cy delivered to the site, prior to delivery of the UFLGA material to the site.
4. Two (2) bulk samples of ULFGA.
5. Proposed means of delivery to the site and stockpiling (if proposed).
6. Proposed equipment specifications and procedures for placing separation geotextile and placing and compacting ULFGA.
7. Proposed plan for protecting exposed ULFGA.
8. Description of methodology to provide a continuous ULFGA fill layer in accordance with the Plans considering phased bridge construction.
9. Description of the type, size, and ground pressure limitations of all equipment intended for compaction operations.

203.04 General

The following is added to Subsection 203.04 of the Standard Specifications:

ULFGA Product Delivery, Storage and Handling

1. Deliver, store, and handle materials in accordance with manufacturer's recommendations.
2. During all stages of manufacture, shipment, storage, and construction, the Contractor shall minimize the amount that the ULFGA material moves on site to prevent physical damage. Construction equipment other than for placement and compaction of ULFGA shall not operate on the exposed ULFGA surface until a minimum 12-in. thickness of aggregate subbase material (i.e., cover material) is placed over the ULFGA. The cover material shall be placed and compacted within 48 hours of placing and compacting the final lift(s) of ULFGA in an area. Until that time, operation of construction equipment directly on the ULFGA shall be limited to light-duty equipment with rubber tires.
3. During delivery, storage and handling, the Contractor shall not contaminate the ULFGA with earth material or any other debris or aggregate materials.
4. The Contractor shall protect the ULFGA before, during, and after construction as recommended by the material manufacturer.

ULFGA Installation

1. The Contractor shall provide a minimum of five (5) working days' notice to the Resident prior to the placement of any ULFGA fill.
2. The Contractor shall place the ULFGA fill to the plan and vertical limits shown on the Plans. Preparation of the subgrade shall include excavation with a smooth-edged bucket to minimize disturbance of the subgrade materials.
3. If deemed necessary by the Resident, the Contractor shall proof compact soil subgrades prior to placement of ULFGA fill to the satisfaction of the Resident at no additional cost to the Department.
4. Compaction shall be performed in the presence of the Resident who will observe performance of the selected equipment and compactive effort, and will modify requirements for the number of passes and lift thickness stated herein if needed for specific compaction equipment.
5. The areas to be filled using ULFGA shall not have standing water, ice, organic or otherwise unsuitable materials present prior to placement. If encountered, the Contractor shall excavate these materials and replace them with compacted fill meeting the requirements of Subsection 703.18 Common Borrow.
6. Adjacent panels of geotextile used for separation of ULFGA from surrounding materials shall be either sewn together or overlapped a minimum of 12 inches. The Contractor shall not place geotextile fabric until the subgrades have been inspected and approvedby the Resident.
7. Care shall be takenduring placement of topsoil/loam on embankment side slopes and aggregate fills above the ULFGA to prevent damage to ULFGA.
8. To limit possible degradation, the geotextile shall not be exposed to the elements for more than 14 days afterplacement.
9. The contractor shall prevent submergence of compacted ULFGA until the material is ballasted in its final position by overlying layers, as shown on the contract documents. Previously placed material which shifts due to buoyancy forces shall be removed and recompacted in lifts.
10. ULFGA may be dumped and spread in place. Construction equipment other than for placement and compaction shall not operate on the exposed ULFGA. If equipment is anticipated over exposed material, the Contractor shall bridge the exposed material using crane mats or similar materials.
11. In open areas, ULFGA fill shall be placed using tracked equipment (excavator and dozer) in uncompacted lifts not exceeding 18 inches in loose thickness.
12. Compaction in open areas shall be performed with a pneumatic rubber tired static roller with maximum ground pressures of 1,500 psf. Sufficient compaction has been achieved when, in the judgment of the Resident, the material ceases to densify further with additional passes of the roller. Excessive compaction shall be avoided to minimize crushing of the ULFGA particles.
13. In areas not accessible by larger equipment (e.g., adjacent to bridge abutments and wingwalls, near utilities, etc.), ULFGA fill shall be placed using smaller tracked equipment in uncompacted lifts not exceeding 12 inches in loose thickness.

Compaction in these areas shall be performed using a small vibratory plate compactor with a maximum operating weight of 250 lbs. Sufficient compaction has been achieved when, in the judgement of the Resident, the material ceases to densify further with additional passes of the plate compactor. Excessive compaction shall be avoided to minimize crushingof the ULFGA particles.

ULFGA Testing

1. The Contractor shall measure the compacted bulk density at the site per the requirements of ASTM C29/29M-17a and shall submit documentation of the results to the Resident. A minimum of one (1) test shall be performed for every 500 cubic yards of ULFGA delivered to the site. All bulk density testing shall be performed in the presence of the Resident.
2. The Resident shall visually observe compaction of each lift of ULFGA for sufficient compaction. The Contractor shall not place additional lifts of ULFGA until the previous lift has been inspected and approved by the Resident.
3. Compaction shall be performed in the presence of the Resident who will observe performance of the selected equipment and the compactive effort, and establish requirements for the number of passes, and lift thickness for each piece of specific compaction equipment that the Contractor intends to use.

203.18 Method of Measurement

The following is added to Subsection 203.18 of the Standard Specifications:

Lightweight Fill (ULFGA) will be measured by the Cubic Yard in place to limits shown on the Plans.

203.19 Basis of Payment

The following subsection is added to Section 203 of the Standard Specifications:

Lightweight Fill (ULFGA) will be paid for at the contract unit price per in place Cubic Yard, which shall be full compensation for all labor, materials, equipment, and incidentals required to supply, deliver, protect, place and compact the ULFGA and separation geotextile as described herein and shown on the Plans including the creation of an Installation Plan. Removal and replacement of ULFGA material that has been damaged by the Contractor, in the opinion of the Resident, shall be incidental to the work, as directed by the Resident. No additional compensation shall be provided for separation geotextile.

Payment will be made under:

Pay Item		Pay Unit
203.4338	Lightweight Fill – Ultra-Lightweight Foamed Glass Aggregate	Cubic Yard