SECTION 227-0001 – MECHANICALLY STABILIZED EARTH RETAINING WALL, FGA

227-0001.01  DESCRIPTION. This work shall consist of designing, detailing, fabricating, furnishing, and erecting mechanically stabilized earth (MSE) retaining walls with foamed glass aggregate (FGA) backfill in accordance with these specifications, Section 227, and the lines, grades, details, and dimensions shown on the Plans, or as directed by the Engineer.

227-0001.02  MATERIALS. Materials shall meet the requirements of the following subsections:

Drainage Aggregate 704.16

Polyvinyl Chloride (PVC) Plastic Pipe 710.05

Bar Reinforcement 713.01

Mechanical Splices for Bar Reinforcement 713.02

Geotextile for Roadbed Separator 720.02

Mechanically Stabilized Earth (MSE) Wall Systems 760.06

Geomembrane Liner 760.07

Precast concrete shall meet the requirements of Section 540.

Reinforcing steel shall meet the requirements for Level II corrosion resistance unless otherwise specified on the Plans.

(a) Foamed Glass Aggregate. FGA shall be a lightweight (low-density), closed cell, non leaching aggregate consisting of post-consumer recycled glass with a minimum recycled content of 98%. FGA shall be produced utilizing a dry foaming process.

(1) Gradation. FGA shall meet the gradation requirements of Table 227-0001.02A, as determined in accordance with XXXXX.

TABLE 227-0001.02A – GRADATION OF FOAMED GLASS AGGREGATE

|  |  |
| --- | --- |
| Sieve Designation | Percentage by Mass (Weight) Passing Square Mesh Sieves |
| 4 inch (100.0 mm) | 100 |
| 2-1/2 inch (63.0 mm) | 85 – 100 |
| 3/8 inch (9.50 mm) | 0 – 15 |

(2) Friction Angle. The friction angle of the foamed glass aggregate backfill used in the reinforced zone for the internal stability of the wall shall be assumed to be 38°. Before construction begins, the foamed glass aggregate material shall be subject to approval by the Engineer. Compliance with the test requirements shall be the responsibility of the Contractor and material supplier. The wall supplier shall be furnished a copy of the test results for the backfill prior to construction.

(3) Density. The as-delivered FGA shall have a maximum dry bulk density of no more than 15 pounds per cubic foot. The loose bulk density of delivered FGA shall be determined in accordance with *ASTM C29, Method C*. If necessary, this value shall be adjusted by the moisture content of the FGA to determine the dryand loose bulk density. Moisture content shall be determined using *ASTM D2216*, *ASTM D4959*, or *ASTM D4643*.

The in-place compacted dry density shall not exceed 20 pounds per cubic foot when determined in accordance with the method by the Engineer.

227-0001.03  GENERAL REQUIREMENTS. Work under this section shall be performed in accordance with the requirements of Subsection 227.03 through Subsection 227.06, the Plans, and the requirements of this specification.

(a) Storage and Handling. Materials shall be delivered, stored, and handled in accordance with the manufacturer’s recommendations.

The amount of material movement shall be minimized during all stages of manufacture, shipment, storage, and construction to prevent physical damage. The amount of traffic on FGA shall be minimized until geotextile for roadbed separator and a thickness of 12 inches of subbase material have been placed over the FGA.

(b) Placement and Compaction. Geotextile and FGA shall be placed at the locations indicated on the Plans. The area to be filled shall not have any standing water (including ice) in it prior to placement of the FGA and storm water shall be diverted away from the installation area during placement of FGA.

FGA shall be placed in maximum uncompacted lift thicknesses of 24 inches and compaction shall be performed with a tracked excavator or bulldozer with a ground pressure of 625 to 1,025 pounds per square foot. The Contractor shall decrease this lift thickness, if necessary, to obtain equal lifts of FGA (for example, if there are 36 inches vertically between reinforcing, lifts shall be 18 inches think). Placement and compaction with wheeled equipment, such as rubber tired equipment or steel rollers, will not be permitted.

Compaction using tracked equipment shall be completed by placing the initial lift thickness and then raising the blade or bucket and tracking over the layer. The placement of the first and second lifts of FGA shall be used to establish a project-specific installation methodology that will be used to achieve 20% compaction of a given lift. The project-specific installation methodology shall reflect the lift thickness and identify the pieces of construction equipment and the corresponding number of passes required. Alternatively, compaction shall be complete after making the number of passes shown in Table 227-0001.03A.

TABLE 227-0001.03A – COMPACTION REQUIREMENTS

|  |  |
| --- | --- |
| Equipment Ground Pressure (lbs/ft2) | Number of Passes Required |
| 625 – 824 | 4 |
| 825 – 1025 | 3 |

Excessive compaction shall be avoided to minimize crushing of the aggregate. Construction equipment, other than that used for placement and compaction, shall not operate over the FGA until 12 inches of cover material have been placed.

(c) Compaction Around Structures. For areas not accessible to tracked equipment (e.g. around structures and utilities), FGA shall be placed in maximum uncompacted lifts of 12 inches and compacted with a plate compactor weighing 110 to 220 pounds. Compaction shall be complete after verifying that 20% compaction of the original lift thickness has been achieved.

Geotextile shall be placed as a separator between the FGA and the surrounding soils, including between the subgrade and the initial lift of FGA, the sides of the FGA fill area, and above the final lift as a separator between the FGA and the capping layer as shown on the Plans. Care shall be taken during placement of the capping layer to prevent damage to the geotextile. Adjacent panels of geotextile may be sewn together or overlapped a minimum of 12 inches. The geotextile shall not be left exposed for more than 14 days.

(d) Quality Assurance Testing. The Contractor shall provide safe access for the Agency or its representative to conduct quality assurance testing during FGA placement and compaction operations. Testing may include verification of lift thickness before and after compaction and density and moisture content determination using non-nuclear gage methods on each lift of FGA.

227-0001.04  SUBMITTALS. Submittals shall be in accordance with Section 227 and the following. Submittals for foamed glass aggregate shall include:

(a) Quality Control Data. At least 14 calendar days prior to material delivery to the project site, the Contractor shall provide the Engineer with a written certification or manufacturer’s quality control data which verifies that the products meet or exceed the values specified herein.

(b) Product Volume Availability. At least 14 calendar days prior to material delivery to the project site, the Contractor shall provide the Engineer with documentation that the manufacturer has a minimum of 12,000 cubic yards of product meeting the requirements of this specification on hand and available for the Contractor’s use (installation or stockpiling) at the project site.

(c) Product Sample. The Contractor shall provide a sample of the products described herein at the request of the Engineer.

(d) Proposed Installation Equipment. At least 14 calendar days prior to FGA installation, the Contractor shall provide the Engineer with cut sheets for the equipment the Contractor will be using for FGA placement and compaction.

227-0001.05  METHOD OF MEASUREMENT. The quantity of Retaining Wall, Mechanically Stabilized Earth, FGA to be measured for payment will be on a lump sum basis in the complete and accepted work.

227-0001.06  BASIS OF PAYMENT. The accepted quantity of Retaining Wall, Mechanically Stabilized Earth, FGA will be paid for at the Contract lump sum price. Payment will be full compensation for designing, detailing, fabricating, furnishing, transporting, erecting, and baseline monitoring the mechanically stabilized earth retaining wall system; for preparing all required submittals; for supervision by the manufacturer’s representative; for materials required, including but not limited to, foamed glass aggregate, PVC pipe, drainage aggregate, filter fabric, adhesive, underdrain pipe, concrete facing panels, reinforcing steel, concrete coping, soil reinforcements, attachment devices, fasteners, bearing blocks, shims, joint materials, geomembrane, and geotextiles; for preparing the wall foundation, proof rolling foundation soils, and constructing the concrete leveling pad; all required excavation; and for furnishing all labor, materials, tools, equipment, and incidentals necessary to complete the work.

Payment will be made under:

Pay Item Pay Unit

227.0100001  Retaining Wall, Mechanically Stabilized Earth, FGA Lump Sum