SECTION 31 2323.43 – GEOFOAM

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Rigid molded expanded polystyrene (EPS) block fill and accessory materials.

1.02 RELATED REQUIREMENTS

A. Section 01 5713 – Temporary Erosion and Sediment Control: Slope protection and erosion control.
B. Section 03 3000 – Cast-in-Place Concrete.
C. Section 31 2200 – Grading: Removal and handling of soil to be re-used.
D. Section 31 2200 – Grading: Site grading.
E. Section 31 2316 – Excavation: Removal and handling of soil to be re-used.
F. Section 31 2323 – Fill: Filling, backfilling, and compacting soil material.
G. Section 31 3700 – Riprap.
H. Section 32 1413 – Precast Concrete Unit Paving: Leveling bed placement under pavers.
I. Section 33 4100 – Subdrainage: Filter aggregate for foundation drainage systems.

1.03 REFERENCE STANDARDS

B. American Wood Protection Association (AWPA); www.awpa.com
   1. AWPA E7 – Standard Field Test for Evaluation of Wood Preservatives to be used in Ground Contact (UC4A, UC4B, and UC4C); Stake Test; 2015.
C. International Code Council (ICC) Evaluation Service (ES); www.icc-es.org
D. National Cooperative Highway Research Program (NCHRP); www.trb.org/NCHRP/NCHRP.aspx

1.04 SUBMITTALS

A. See Section 01 3000 – Administrative Requirements, for submittal procedures.
B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.
C. Shop Drawings: Provide drawings with a profile and section view of proposed project, including individual layers of geofoam blocks in multiple-layer projects, indicating size, type, location, connector plate location and orientation of geofoam blocks.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

E. Test and Evaluation Reports:
   1. ICC-ES or UL report for building code compliance.
   2. UL Evaluation Report indicating compliance with ASTM D6817/D6817M.
   3. [Evaluation report for use in “very heavy termite infestation” areas.]

F. Manufacturer's Installation Instructions: Include information on special environmental conditions required for installation and installation techniques.

G. Provide certificate indicating compliance with standard specifications ASTM D6817/D6817M for each type of geofoam.

H. Provide evidence of authorities having jurisdiction (AHJ) approved termiticide; [TalonGUARD EPS] as required for project.

I. Manufacturer’s Qualification Statement.

J. Installer’s Qualification Statement.

K. Warranty Documentation: Submit manufacturer warranty and ensure forms have been completed in Owner’s name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Manufacturers Qualifications: Company specializing in manufacturing products specified in this section, with not less than [ten] years documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least [three] years of documented experience.

C. Manufacturers Pre-Certification: Deliver geofoam only upon completion of following pre-certification requirements:
   1. Provide evidence of third party certification of geofoam in accordance with ASTM D6817/D6817M.
   3. Signed certification statement submitted from manufacturer acknowledging project specifications, and that supplied geofoam blocks will comply with specified requirements.
   4. Geofoam Block Certification: Provide geofoam blocks traceable to following compliance requirements:
      a. Mark geofoam block to include manufacturer’s date of molding, individual block identifier and “Type” in compliance with ASTM D6817/D6817M.
      b. Mark each geofoam block in compliance with UL requirements.
      c. Provide sampling of geofoam blocks upon initial project delivery in accordance with ASTM D7557/D7557M and test for compliance with Compressive Resistance minimum value at 1 percent deformation in accordance with ASTM D6817/D6817M requirements.
      d. Repeat initial type testing of geofoam for every 650 cubic yards delivered to project site.
      e. Test results to be maintained by manufacturer.

D. Termiticide-treated geofoam in compliance with ICC-ES AC239 criteria, and additional requirements are as follows:
   2. Mark geofoam termiticide-treated blocks as required by authorities having jurisdiction (AHJ).

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original, unopened, undamaged containers with identification labels intact.
B. Store materials protected from exposure to harmful environmental conditions as recommended by manufacturer.
   1. Avoid prolonged exposure to sunlight; cover with opaque tarp or keep inside original packaging.
   2. Avoid exposure of insulation to temperatures exceeding 165 degrees F (74 degrees C).
   3. Avoid exposure of insulation to heated asphalt or coal tar.

C. Handling: Rigid geofoam insulation may be cut, drilled, sawn, rasped or otherwise handled similar to other construction materials, such as wood.
   1. Field test compatibility with waterproofing mastics or other materials prior to use; examples of non-compatible compounds include products containing ketones, gasoline or diesel solvents.

1.07 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Manufacturer shall warrant rigid geofoam insulation for life of original installation for the following:
   1. Thermal insulation value will not vary more than ten (10) percent from the published R-value.
   2. Insulation will meet the physical performance requirements within ten (10) percent of the minimum requirements for Types as indicated in compliance with ASTM D6817/D6817M.
   3. Geofoam insulation will retain a termite resistance of seven (7) or greater in compliance with AWPA E7.

C. Warranty Period: 20 years from Date of Substantial Completion.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Atlas EPS, a Division of Atlas Roofing Corporation; Elevation® Geofoam and Gripper Plates.
   1. Address: 8240 Byron Center SW, Byron Center, MI 49315
   2. Phone: (800) 917-9138; Fax: (616) 878-9942.

2.02 MATERIALS

A. Geofoam Blocks: Provide Geofoam of type indicated in compliance with ASTM D6817/D6817M physical properties.
   1. Type EPS 12:
      a. Density: 0.70 lbs/cu ft (11.2 kg/cu m), minimum; ASTM D1622.
      b. Compressive Resistance: 2.2 psi (15 kPa), minimum, at 1 percent deformation; ASTM D1621.
      c. Flexural Strength: 10 psi (69 kPa), minimum; ASTM C203.
   2. Type EPS 15:
      a. Density: 0.90 lbs/cu ft (14.4 kg/cu m), minimum; ASTM D1622.
      b. Compressive Resistance: 3.6 psi (25 kPa), minimum, at 1 percent deformation; ASTM D1621.
      c. Flexural Strength: 25 psi (172 kPa), minimum; ASTM C203.
   3. Type EPS 19:
      a. Density: 1.15 lbs/cu ft (18.4 kg/cu m), minimum; ASTM D1622.
      b. Compressive Resistance: 5.8 psi (40 kPa), minimum, at 1 percent deformation; ASTM D1621.
      c. Flexural Strength: 30 psi (207 kPa), minimum; ASTM C203.
   4. Type EPS 22:
      a. Density: 1.35 lbs/cu ft (21.6 kg/cu m), minimum; ASTM D1622.
      b. Compressive Resistance: 7.3 psi (50 kPa), minimum, at 1 percent deformation; ASTM D1621.
      c. Flexural Strength: 35 psi (240 kPa), minimum; ASTM C203.
   5. Type EPS 29:
      a. Density: 1.80 lbs/cu ft (28.8 kg/cu m), minimum; ASTM D1622.
      b. Compressive Resistance: 10.9 psi (75 kPa), minimum, at 1 percent deformation; ASTM D1621.
      c. Flexural Strength: 50 psi (345 kPa), minimum; ASTM C203.
   6. Type EPS 39:
      a. Density: 2.40 lbs/cu ft (38.4 kg/cu m), minimum; ASTM D1622.
      b. Compressive Resistance: 15.0 psi (103 kPa), minimum, at 1 percent deformation; ASTM D1621.
      c. Flexural Strength: 60 psi (414 kPa), minimum; ASTM C203.
   7. Type EPS 46:
a. Density: 2.85 lbs/cu ft (45.7 kg/cu m), minimum; ASTM D1622.
b. Compressive Resistance: 18.6 psi (128 kPa), minimum, at 1 percent deformation; ASTM D1621.
c. Flexural Strength: 75 psi (517 kPa), minimum; ASTM C203.

B. Geofoam does not contain Formaldehyde, CFCs, HCFCs or other volatile components.

C. Surface Burning: Class A, with Flame Spread Index (FSI) of 20, and Smoke Developed Index (SDI) of 400, in compliance with ASTM E84.

D. Geofoam blocks are shop-trimmed as necessary so surfaces are smooth and flat, and are within tolerances of plus/minus 0.5 percent of respective height, width and length dimensions; additional field and/or shop cutting or trimming may be required and shall be done with a saw or hot wire cutter.

E. Correct damage to geofoam as follows:
   1. Slight Damage: Less than 0.12 cubic feet (0.0034 cu m) with no linear dimension greater than 1 foot (0.31 m), may be left in place.
   2. Moderate Damage: Less than 0.35 cubic feet (0.01 cu m) with no linear dimension greater than 3.3 feet (1.0 m), shall be filled with sand.
   3. Geofoam blocks with excessive damage, such as exceeding the “Moderate Damage” category, shall be replaced with blocks that comply with damage criteria requirements.
   4. Geofoam blocks not in compliance with damage criteria may be cut to eliminate the excessive damage and the remaining undamaged portion of the block may be used within the fill, provided the undamaged portion of the block meets other requirements.

2.03 PERFORMANCE REQUIREMENTS

A. Manufacture geofoam using 100 percent virgin feedstock for blocks having no recycle content.

F. Standard size EPS geofoam blocks, are up to 40 inches (1.02 m) in height, 48 inches (1.22 m) in width, and 96 inches (2.44 m) in length; use of half blocks, smaller end pieces and thinner sheets may be used as needed to offset joints and complete project geometry.

1. Block Sizes: [32 inch by 48 inch by 96 inch (0.81 m by 1.22 m by 2.44 m)] or [40 inch by 48 inch by 96 inch (1.02 m by 1.22 m by 2.44 m)].

G. Regardless of dimensions, product and accessories require compliance with minimum specified values.

H. Cure geofoam at least 72 hours at ambient temperature prior to use to allow blowing agent and condensate dissipation; accelerated curing under heated area conditions is also permitted.

I. Shop-trim geofoam blocks to ensure face trueness and tight dimensional fit with adjacent blocks.

J. In areas where termite damage is of high concern over long periods, use geofoam enhanced TalonGUARD EPS approved and field-tested for construction applications, and complies with ICC-ES AC239.

2.04 DESIGN CRITERIA

A. Select geofoam for compressive resistance performance at 1 percent deformation as required to resist live and dead load forces anticipated throughout the life of the structure in compliance with ASTM D6817/D6817M.

B. Geofoam is a thermal insulation that isolates the adjoining material from normal ground temperatures; consider freeze conditions and providing sufficient earth mass over geofoam to avoid black ice conditions or other undesirable surface freeze events of supported structures.

C. Due to density of geofoam being roughly one percent of surrounding dirt, consider hydrostatic forces and providing sufficient ballast over geofoam blocks to prevent uplift during life of installation.

D. For construction of highway embankments, refer to guidelines of NCHRP Document 65 and Report 529 for additional information.

2.05 ACCESSORIES
PART 3 – EXECUTION

3.01 PREPARATION

A. Clear debris and dewater site as needed.

B. Grade according to elevations shown on plans; the finish grade shall be smooth and free from holes or protruding objects.

C. Cover graded area to receive geofoam blocks with sand or other drainage layer as indicated on drawings.

3.02 INSTALLATION

A. Install geofoam blocks to lines and grades as indicated on drawings and approved by project engineer.
   1. Install surface layer of geofoam blocks with tolerance of no more than a 1/2 inch (12.7 mm) in interval of 10 feet (3.05 m).
   2. Gaps greater than 2 inches (51 mm) are not permitted on vertical joints.
   3. Cut and fit geofoam tightly around projections and penetrations.

B. Offset each subsequent layer of blocks 90 degrees in placement direction from previous layer, or stagger otherwise, as approved by project engineer for increased system stability.

C. Properly secure second layer and above with connector plates, using quantity and pattern recommended by manufacturer to prevent geofoam blocks from shifting while being backfilled.

D. Provide rebar supports (Dobies) to support steel rebar during concrete placement over top surface of geofoam as required for load distribution.

E. Provide necessary space to accommodate utilities using pipe, structures and conduit system and flowable fill placed within geofoam.

END OF SECTION