

DIVISION 31 EARTHWORK

Elevation™

Geofoam Applications

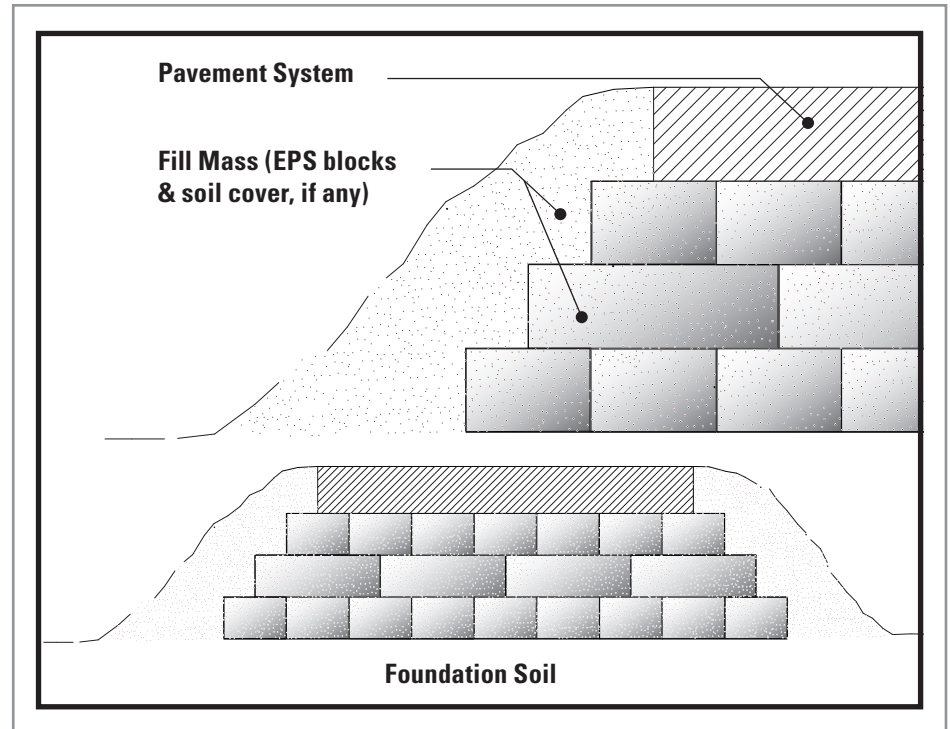
PART 1 – GENERAL

1.01 Scope

- A. Material, accessories and quality assurance practices for block molded expanded polystyrene (EPS) rigid cellular Elevation™ geofoam in road applications, embankments and bridge approaches on soft ground.
- B. Typical installation techniques are illustrated in this document, but the scope of this document does not include design nor qualification of installation contractors.

1.02 References

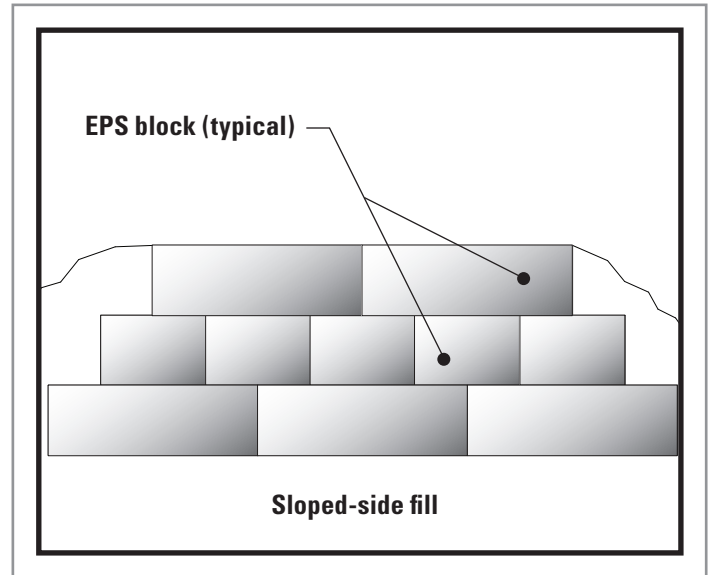
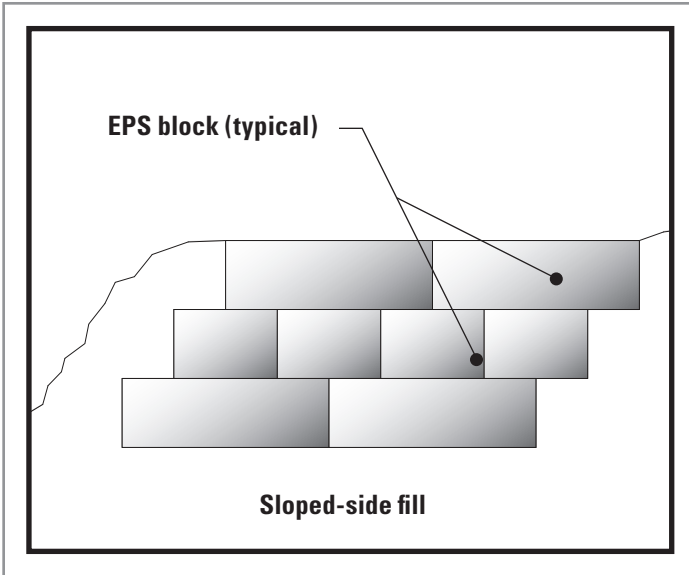
- A. American Society for Testing and Materials (ASTM):
 1. ASTM D6817 Standard Specification for Rigid Cellular Polystyrene Geofoam.
 2. ASTM D7180 Standard Guide for Use of Expanded Polystyrene (EPS) in Geotechnical Projects.
 3. ASTM D7557 Standard Practice for Sampling of Expanded Polystyrene Geofoam Specimens.
 4. ASTM C578 Standard Specification for Rigid Cellular Polystyrene Thermal Insulation.
 5. ASTM C203 Breaking Load and Flexural Properties of Block-Type Thermal Insulation.
 6. ASTM C303 Test Method for Dimensions and Density of Preformed Block and Board-Type Thermal Insulation.
 7. ASTM C2863 Test Method for Measuring the Minimum Oxygen Concentration to Support Candle-Like Combustion of Plastics (Oxygen Index).
 8. ASTM D1621 Test Method for Compressive Properties of Rigid Cellular Plastics.
 9. ASTM D1622 Apparent Density of Rigid Cellular Plastics.
 10. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials.
- B. National Cooperative Highway Research Program:
 1. NCHRP Document 65 Geofoam Applications in the Design and



- Construction of Highway Embankments.
- 2. NCHRP Report 529 Guideline and Recommended Standard for Geofoam Applications in Highway Embankments.
- C. National Standards of Canada:
 1. CAN/ULC S701 Standard for Thermal Insulation, Polystyrene, Boards and Pipe Coverings.

1.03 Design Requirements

- A. Performance Requirements:
 1. Unless specifically approved, the Elevation™ geofoam shall be manufactured using 100% virgin feedstock for blocks having no recycle content.
 2. Atlas EPS standard size blocks shall be used, generally 16 inches to 40 inches in height, 48 inches width, and 96 inches length. The use of ½ blocks, smaller end pieces and thinner sheets may be used as needed to offset joints and complete project geometry.
 3. Regardless of dimensions or recycle content, product and accessories will be required to meet or exceed the
- 4. Elevation™ geofoam shall be cured a minimum of 72 hours at ambient temperature prior to use to allow blowing agent and condensate dissipation. Alternately, accelerated curing under heated area conditions shall be approved.
- 5. All Elevation™ geofoam blocks shall be shop-trimmed (molded edges removed) to assure face trueness and tight dimensional fit with adjacent blocks.
- 6. Elevation™ geofoam shall be specified using the material *type* designations listed in ASTM D6817 "Standard Specification for Rigid Cellular Polystyrene Geofoam".
- 7. In areas where termite damage is of high concern over long periods, at the discretion of the engineer per project, the Elevation™ geofoam shall be enhanced TalonGUARD EPS approved and field-tested for construction applications.



B. Design Considerations:

1. Elevation™ geofoam shall be selected for elastic compressive performance as required to resist live and dead load forces anticipated during in situ use throughout the life of the structure. Refer to ASTM D6817 1% Deformation Compressive Strength minimum values for elastic limit stress of each type.
2. Elevation™ geofoam is a thermal insulation which will isolate the adjoining material from normal ground temperatures. As such, freeze conditions and sufficient earth mass over Elevation™ geofoam must be considered to avoid black ice conditions or other undesirable surface freeze events of the supported structures.
3. Because the density of Elevation™ geofoam is roughly 1% of that of the surrounding dirt, hydrostatic forces must be considered and sufficient ballast provided over the blocks to prevent uplift during the life of the structure.

1.04 Quality Assurance

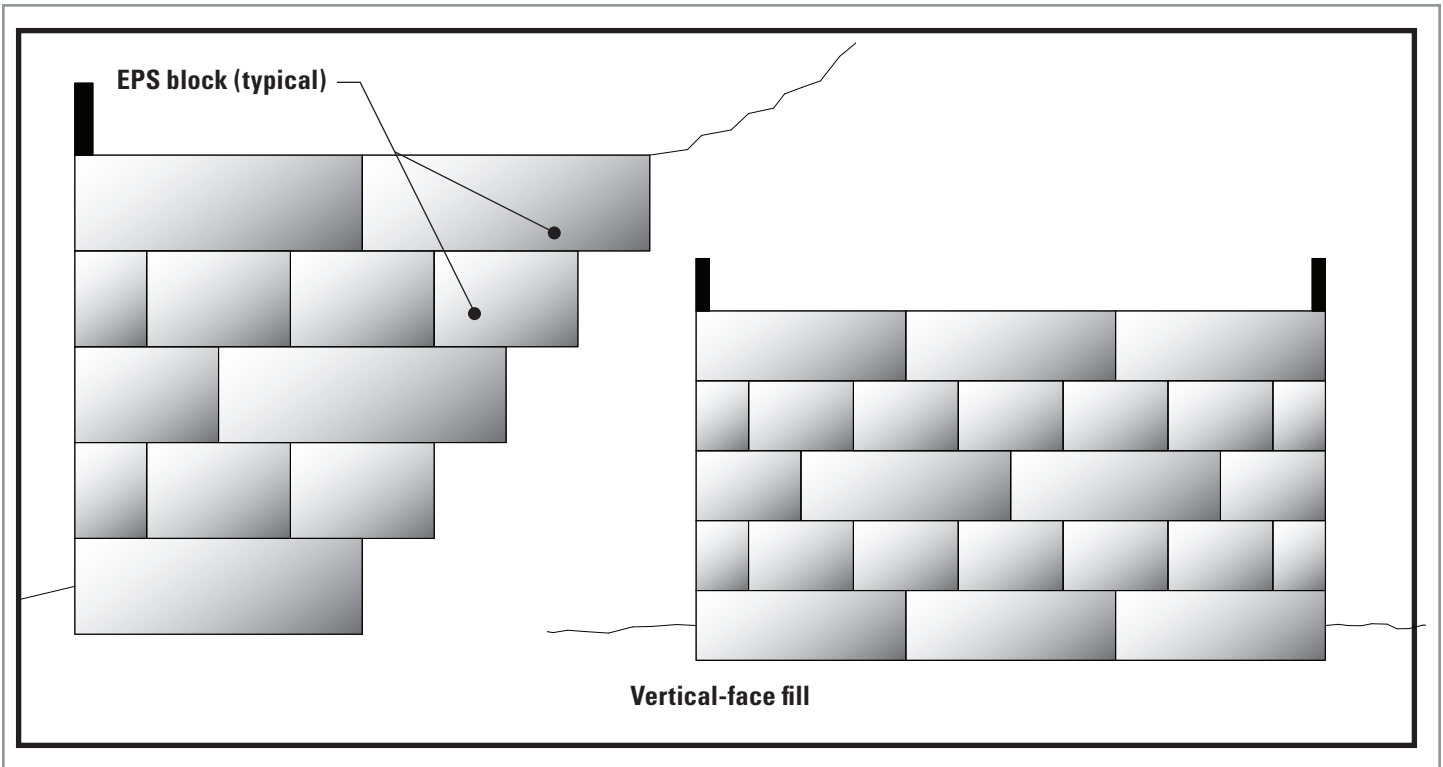
A. Atlas EPS Pre-Certification – No

Elevation™ geofoam shall be shipped prior to completion of pre-certification:

1. Atlas EPS shall provide evidence of 3rd party certification against ASTM D6817, including each of the following:
 - a) Current certification by Underwriters Laboratories specific to ASTM D6817 (QORW.R16529).
 - b) UL Follow-Up Services Procedures to assure compliance to ASTM D6817.

- c) Test reports from UL verifying compliance of project types to ASTM D6817 compressive resistance requirements.
 - d) Signed certification statement submitted from Atlas EPS acknowledging the specifications for the project have been read and understood, and that all Elevation™ geofoam blocks supplied to the project will meet the requirements in the specification.
- B. Elevation™ geofoam block certification—**each delivery of Elevation™ geofoam blocks shall be traceable to compliance testing as follows:
1. A collective “lot” of Elevation™ geofoam blocks shall be defined as those of the same ASTM D6817 type manufactured (molded) consecutively on the same calendar day.
 2. Each Elevation™ geofoam block shall be marked to include “Atlas EPS”, molded date, individual block identifier and ASTM D6817 type.
 3. Additionally, for each load requiring a 3rd party certification:
 - a) Each Elevation™ geofoam block shall be additionally stamped per UL requirements.
 - b) Each lot of Elevation™ geofoam blocks on the initial project delivery load per ASTM D6817 type shall be sampled according to ASTM D7557 and tested for compliance to Compressive Resistance minimum value at 1% deformation per ASTM

- c) Initial type testing in (b) above shall be repeated for every 650 cubic yards of each ASTM D6817 type delivered to the project.
 - d) All test results will be kept on file at Atlas EPS for review by Underwriters Laboratories.
- C. Additional Requirements—**applicable only when termiticide-treated Elevation™ geofoam is specified by the engineer:
1. Atlas EPS shall provide proof of EPA-registered, termiticide-treated TalonGUARD EPS approved with building code regulations.
 2. The Elevation™ geofoam blocks shall additionally be marked as required per the building code authority.
- D. Elevation™ geofoam test blocks:**
1. Portions of sampled blocks that are used for testing are not acceptable for construction. Portions of blocks that are otherwise acceptable can be used as desired by the contractor provided they comply with any other requirements of this specification.
 2. Any shipment of Elevation™ blocks, for which the representative samples fail to meet the parameters outlined in this specification, are considered defective and shall be replaced by the contractor with non-defective Elevation™ blocks at no additional cost or time to the project owner.



1.05 Warranty

- A. Physical Properties Warranty: Physical properties shall be warranted to ASTM D6817.
 1. Warranty Period: 20 years beginning with date of substantial project completion.
- B. Termite Preservative Warranty [where applicable]: Performance against termite infestation resulting in significant degradation shall be provided.
 1. Warranty Period: 20 years beginning with date of substantial project completion.

1.06 Delivery, Storage & Handling

- A. Delivery: Materials shall be delivered labeled "Atlas EPS"; date of manufacture, lot #, material type and any marking required to assist in installing according to shop drawings.
- B. Storage and Protection: Store materials protected from exposure to harmful environmental conditions.
 1. Avoid prolonged exposure to sunlight, cover with opaque tarp if stored outside for more than 30 days.
 2. Elevation™ geofoam should not be exposed to open flame or any other

- 3. Projects that include petroleum concerns shall include a specification for a puncture-free, low-vapor transmission rated product to protect Elevation™ geofoam from petroleum products.
- 4. Due to the lightweight nature of Elevation™ geofoam, it is the contractor's responsibility to provide temporary ballast or protection during storage and block placement.
- C. Handling: Elevation™ geofoam may be cut, drilled, sawn, sanded, rasped, or otherwise handled similar to other construction materials, such as wood. Care should be used in handling to prevent damage to blocks. No heavy construction equipment or vehicles shall be allowed directly on Elevation™ geofoam. Protective sheathing or planks should be placed on the blocks to allow light rubber-tired equipment use.

1.07 Submittals

- Prior to installation of the Elevation™ geofoam blocks, contractor shall provide engineer:
- A. Product Data: Submit Elevation™ geofoam data and installation instructions.
 - B. Shop Drawings: Provide drawings with a profile and section view of the proposed

project, including individual layers of Elevation™ geofoam blocks in multiple-layer projects. The drawing shall include size, type, location, connector plate location and orientation of all blocks.

- C. Quality Assurance Submittals: Submit the following:
 1. Evidence of Atlas EPS current UL ASTM D6817 certification, audit procedures and test reports verifying compliance of each type.
 2. Atlas EPS-signed certification letter to supply specification compliant material.
 3. Copy of Atlas EPS test report for capturing compressive property performance.
 4. Evidence of building authority-approved termiticide TalonGUARD EPS [when required as part of the specifications].
- D. Warranties
 1. Copy of Elevation™ Physical Property Warranty.
 2. Copy of Elevation™ TalonGUARD Termite Resistance Warranty [when required as part of project specifications].

PART 2 – PRODUCTS

2.01 Manufacturers

- A. Atlas EPS, a division of Atlas Roofing Corporation—Elevation™ geofoam, Geoclips.
- Corporate office: 8240 Byron Center SW, Byron Center, MI 49315; Telephone: (800) 917-9138; Fax: (616) 878-9942; www.atlaseps.com www.falcongeofoam.com, multiple locations.

2.02 Materials

- A. Elevation™ geofoam blocks:
- Elevation™ geofoam ASTM D6817 types and physical properties:

Type	Compressive Resistance @ 1% Deformation (min)	Flexural Strength (min)	Oxygen Index (min)	Block Density (min)
EPS 15	3.6 psi	25.0 psi	24.0	0.90 pcf
EPS 19	5.8 psi	30.0 psi	24.0	1.15 pcf
EPS 22	7.3 psi	40.0 psi	24.0	1.35 pcf
EPS 29	10.9 psi	50.0 psi	24.0	1.80 pcf
EPS 39	15.0 psi	60.0 psi	24.0	2.40 pcf
EPS 46	18.6 psi	75.5 psi	24.0	2.85 pcf

- Elevation™ geofoam shall not contain Formaldehyde, CFCs, HCFCs or other volatile components.
- All blocks shall be shop-trimmed as necessary so all surfaces are smooth and flat, are within tolerances of +/- 0.5% 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.
- Damage to Elevation™ geofoam shall be corrected as follows:
 - Slight damage (<0.12 cubic feet with no linear dimension > 1 ft) may be left in place as-is.
 - Moderate damage (<0.35 cubic feet with no linear dimension >3.3 ft)

shall be filled with sand.

- Elevation™ geofoam blocks with excessive damage (i.e., exceeding the “moderate” category) shall be replaced with blocks which meet the damage criteria.
- Elevation™ blocks not meeting the 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 all other requirements.

2.03 Accessories

- A. Elevation™ geofoam Connector Plates (Geoclips):
- Elevation™ geoclips shall be galvanized steel multi-barbed connectors. Each connector shall have a lateral holding strength of 60 lbs minimum when tested with ASTM D6817 type EPS22 Elevation™ geofoam. Install connector plates as directed on shop drawings.

PART 3 – EXECUTION

3.01 Preparation

- A. Clear debris and dewater site as needed. Grade according to elevations shown on plans; the finish grade shall be smooth and free from holes or protruding objects. Cover graded area to receive Elevation™ geofoam blocks with sand or other drainage layer.

3.02 Installation

A. General:

- Install Elevation™ geofoam blocks to the lines and grades shown in the plans and as directed by the engineer. The surface of a layer of blocks to receive additional Elevation™ geofoam shall be constructed with a variation in surface tolerance of no more than .5-inch any 10-foot interval. No gaps greater than 2 inches will be allowed on vertical joints. Cut and fit tightly around projections and penetrations.
- Each subsequent layer of blocks shall be offset 90 degrees from the direction of placement of the previous layer or otherwise staggered for increased stability of the system.
- Secure layers 2 and above with connector plates, using quantity and pattern recommended by manufacturer on shop drawings to prevent blocks from shifting during the backfill stage.
- For projects requiring a load distribution slab over the top surface of Elevation™ geofoam, it is permissible to use rebar supports (dobies) to support the reinforcing steel during concrete placement.
- In areas where utilities are placed in Elevation™ geofoam, provide space to accommodate pipe, structures and conduit system and flowable fill.



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