SECTION 31 23 00

EXPANDED POLYSTYRENE GEOFOAM

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\*\* NOTE TO SPECIFIER \*\* Shelter Enterprises, Inc.; expanded polystyrene building products.
This section is based on the products of Shelter Enterprises, Inc., which is located at:
8 Saratoga St.
Cohoes, NY 12047
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Web: <http://www.shelter-ent.com>
 [ [Click Here](https://www.arcat.com/arcatcos/cos38/arc38839.html) ] for additional information.
Ever since Shelter Enterprises Inc. developed the original Shelterwrap over thirty-five years ago, millions of homeowners and businesses across America have cut their energy consumption and lowered their energy bills. As a recognized innovator in the building products industry, Shelter Enterprises, Inc. continually strives to develop new products for this century and beyond for residential, commercial, and civil markets. We look forward to being challenged to meet or exceed your needs and the needs of your clients and projects.

1. GENERAL
	1. SECTION INCLUDES
		1. Expanded Polystyrene (EPS) Geofoam.
		2. Expanded Polystyrene (EPS) ShelterFoam.
		3. Graphite Enhanced Polystyrene (GPS) SelterFoam
	2. RELATED SECTIONS

\*\* NOTE TO SPECIFIER \*\* Delete any sections below not relevant to this project; add others as required.

* + 1. Section 02 30 00 - Subsurface Investigation.
		2. Section 02 20 00 - Assessment.
		3. Section 31 20 00 - Earth Moving.
		4. Section 31 32 13.13 - Asphalt Soil Stabilization.
		5. Section 33 00 00 - Utilities.
		6. Section 33 40 00 - Stormwater Utilities.
		7. Section 32 10 00 - Bases, Ballasts, and Paving.
		8. Section 32 39 33 - Artificial Rock Fabrications.
		9. Section 32 90 00 - Planting.
	1. REFERENCES

\*\* NOTE TO SPECIFIER \*\* Delete references from the list below that are not actually required by the text of the edited section.

* + 1. ASTM International (ASTM):
			1. ASTM D6817 - Standard Specification for Rigid Cellular Polystyrene Geofoam.
	1. SUBMITTALS
		1. Submit under provisions of Section 01 30 00 - Administrative Requirements.
		2. Product Data: Submit manufacturer's product data and technical bulletins including materials, profiles, physical properties, and accessories for each product to be used, including:
			1. Shipment information.
			2. Manufacturing materials and additives.
			3. Preparation instructions and recommendations.
			4. Storage and handling requirements and recommendations.
			5. Installation methods.
		3. Shop Drawings: Include the following:
			1. Project specific layout plan, profiles and components.
		4. Test Reports: Submit summary of tests that products comply with specified performance requirements.
		5. Certificates: Submit independent third party product certificates signed by manufacturer to demonstrate materials comply with specified performance requirements and ASTM D6817.

\*\* NOTE TO SPECIFIER \*\* Delete below if sustainable design documentation or LEED is not required.

* + 1. Sustainable Design Submittals:
			1. Recycled Content: Submit documentation of pre-consumer and post-consumer recycled content including manufacturing process recovery of recycled materials.
			2. Regional Materials: Submit documentation of manufacturing plant location relative to project location if less than 500 miles (800 km).
		2. Qualification Data: Submit manufacturer and installer qualifications.
		3. Warranty.
	1. QUALITY ASSURANCE
		1. Manufacturer Qualifications: Minimum 5 years experience manufacturing similar products.
		2. Installer Qualifications: Minimum 2 years experience installing similar products of the scope and complexity required for this project.
		3. Pre-Installation Meeting: Convene at the project site a minimum of two weeks prior to starting work of this section to verify project requirements, substrate conditions, installation instructions and manufacturer's warranty requirements.
	2. DELIVERY, STORAGE, AND HANDLING
		1. Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.
		2. Deliver products in manufacturer's unopened packaging bearing the brand name and manufacturer's identification until ready for installation.
		3. Store and handle materials in accordance with the manufacturers instructions to avoid damage.
	3. PROJECT CONDITIONS
		1. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

\*\* NOTE TO SPECIFIER \*\* Delete below if warranty is not required.

* 1. WARRANTY
		1. Warranty: Manufacturer's standard warranty that products will maintain performance values in ASTM D6817.
			1. Warranty Period: Ten years.
1. PRODUCTS
	1. MANUFACTURERS
		1. Acceptable Manufacturer: Shelter Enterprises, Inc., which is located at: 8 Saratoga St.; Cohoes, NY 12047; Toll Free Tel: 800-836-0719; Tel: 518-237-4100; Fax: 518-237-0125; Email: [request info (jhalek@shelter-ent.com)](https://admin.arcat.com/users.pl?action=UserEmail&company=Shelter+Enterprises,+Inc.&coid=38839&rep=&fax=518-237-0125&message=RE:%20Spec%20Question%20(02315she):%20%20&mf=); Web: <http://www.shelter-ent.com>

\*\* NOTE TO SPECIFIER \*\* Delete one of the following two paragraphs; coordinate with requirements of Division 1 section on product options and substitutions.

* + 1. Substitutions: Not permitted.
		2. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.

\*\* NOTE TO SPECIFIER \*\* Delete if not required.

* 1. EPS GEOFOAM

\*\* NOTE TO SPECIFIER \*\* Geofoam is expanded polystyrene (EPS) manufactured into large lightweight, easily handled, pre-cut, customizeable structural blocks that are unaffected by weather, and with insulating and noise reduction characteristics. The primary function of geofoam is to provide a lightweight void filler below highways, bridge approaches, embankments, plaza decks, or parking lots. EPS Geofoam minimizes settlement on underground utilities and can be used in broader applications, for example lightweight fill, floor elevation changes, green roof fill, landscaping and planters, embankments, uniform slope stabilization, compressible inclusions, and tapered drainage systems. Geofoam is manufactured with insect repelling borates, available in numerous configurations to handle hydrostatic, soil, or seismic pressures, and gases such as radon.

* + 1. EPS Geofoam: Provide EPS geofoam, structural geotechnical engineering fill blocks, as manufactured by Shelter Enterprises Inc. in locations and configurations as shown on the drawings, and to meet the following properties:

\*\* NOTE TO SPECIFIER \*\* Select EPS geofoam type based on project requirements, the relationship between foam density and compressive resistance at 1% strain is critical. Delete types not required.

* + - 1. EPS 15, 1.0#, Type I in accordance with ASTM D6817:
				1. Minimum Density: 0.90 pounds per cubic foot (14.4 kilograms per cubic meter).
				2. Compressive Resistance:

At 1% Deformation: Minimum 3.6 psi, 520 psf (25 kPa).

At 5% Deformation: Minimum 8 psi, 1150 psf (55 kPa).

At 10% Deformation: Minimum 10.2 psi, 1470 psf (70 kPa).

* + - * 1. Elastic Modulus: 360 psi (2500 kPa).
				2. Flexural Strength: 25.0 psi (172 kPa).
				3. Water Absorption, Maximum Total Immersion: 4 percent.
				4. Oxygen Index: 24.0 percent.
				5. Buoyancy Force: 61.5 pounds per cubic foot (980 kilograms per cubic meter).
			1. EPS 19, 1.25#, Type VIII in accordance with ASTM D6817:
				1. Minimum Density: 1.15 pounds per cubic foot (18.4 kilograms per cubic meter).
				2. Compressive Resistance:

At 1% Deformation: Minimum 5.8 psi, 835 psf (40 kPa).

At 5% Deformation: Minimum 13.1 psi, 1890 psf (90 kPa).

At 10% Deformation: Minimum 16.0 psi, 2300 psf (110 kPa).

* + - * 1. Elastic Modulus: 580 psi (4000 kPa).
				2. Flexural Strength: 30.0 psi (207 kPa).
				3. Water Absorption, Maximum Total Immersion: 3 percent.
				4. Oxygen Index: 24.0 percent.
				5. Buoyancy Force: 61.3 pounds per cubic foot (980 kilograms per cubic meter).
			1. EPS 22, 1.5#, Type II in accordance with ASTM D6817:
				1. Minimum Density: 1.35 pounds per cubic foot (21.6 kilograms per cubic meter).
				2. Compressive Resistance:

At 1% Deformation: Minimum 7.3 psi, 1050 psf (50 kPa).

At 5% Deformation: Minimum 16.7 psi, 2400 psf (115 kPa).

At 10% Deformation: Minimum 19.6 psi, 2820 psf (135 kPa).

* + - * 1. Elastic Modulus: 730 psi (5000 kPa).
				2. Flexural Strength: 35.0 psi (240 kPa).
				3. Water Absorption, Maximum Total Immersion: 3 percent.
				4. Oxygen Index: 24.0 percent.
				5. Buoyancy Force: 61.1 pounds per cubic foot (980 kilograms per cubic meter).
			1. EPS 29, 2.0#, Type IX in accordance with ASTM D6817
				1. Minimum Density: 1.80 pounds per cubic foot (28.8 kilograms per cubic meter).
				2. Compressive Resistance:

At 1% Deformation: Minimum 10.9 psi, 1570 psf (75 kPa).

At 5% Deformation: Minimum 24.7 psi, 3560 psf (170 kPa).

At 10% Deformation: Minimum 29.0 psi, 4180 psf (200 kPa).

* + - * 1. Elastic Modulus: 1090 psi (7500 kPa).
				2. Flexural Strength: 50.0 psi (345 kPa).
				3. Water Absorption, Maximum Total Immersion: 2 percent.
				4. Oxygen Index: 24.0 percent.
				5. Buoyancy Force: 60.6 pounds per cubic foot (970 kilograms per cubic meter).
			1. EPS 39, 2.5#, Type XIV in accordance with ASTM D6817:
				1. Minimum Density: 2.40 pounds per cubic foot (38.4 kilograms per cubic meter).
				2. Compressive Resistance:

At 1% Deformation: Minimum 15.0 psi, 2160 psf (103 kPa).

At 5% Deformation: Minimum 35.0 psi, 5040 psf (241 kPa).

At 10% Deformation: Minimum 40.0 psi, 5760 psf (276 kPa).

* + - * 1. Elastic Modulus: 1500 psi (10300 kPa).
				2. Flexural Strength: 60.0 psi (414 kPa).
				3. Water Absorption, Maximum Total Immersion: 2 percent.
				4. Oxygen Index: 24.0 percent.
				5. Buoyancy Force: 60.0 pounds per cubic foot (960 kilograms per cubic meter).
			1. EPS 46 3.0#, Type XV in accordance with ASTM D6817:
				1. Minimum Density: 2.85 pounds per cubic foot (45.7 kilograms per cubic meter).
				2. Compressive Resistance:

At 1% Deformation: Minimum 18.6 psi, 2680 psf (128 kPa).

At 5% Deformation: Minimum 43.5 psi, 6260 psf (300 kPa).

At 10% Deformation: Minimum 60.0 psi, 7200 psf (345 kPa).

* + - * 1. Elastic Modulus: 1860 psi (12800 kPa).
				2. Flexural Strength: 75.0 psi (517 kPa).
				3. Water Absorption, Maximum Total Immersion: 2 percent.
				4. Oxygen Index: 24.0 percent.
				5. Buoyancy Force: 59.5 pounds per cubic foot (950 kilograms per cubic meter).
		1. Connector Plates: Provide manufacturers BLOK-LOK Connector Plates to restrain geofoam from lateral movement.
			1. Materials: Galvanized steel with two-sided multi-barbed design capable of piercing geofoam.
			2. Holding Strength: 60 pounds (27.2 kg).

\*\* NOTE TO SPECIFIER \*\* It is the responsibility of the civil engineer or installer to determine the load requirements for the project.

* + - 1. Quantity: As shown on the drawings, minimum 8 plates per block.

\*\* NOTE TO SPECIFIER \*\* Delete article if not required.

* 1. EPS SHELTER FOAM

\*\* NOTE TO SPECIFIER \*\* Construction Applications: ShelterFoam is used in assorted building applications, including plaza decks, landscape planters, utility and conduit insulation / protection, embankments, building sheathing, roadway bases and bridge abutment lightweight backfill, median barriers, and under slab / perimeter insulation, along with numerous other geofoam applications.

* + 1. ShelterFoam 100: High-performance high-density insulation consisting of a superior closed-cell, lightweight and resilient expanded polystyrene (EPS). Long-term stable R-Value, excellent dimensional stability, compressive strength and water resistant properties.
			1. Meets or exceeds requirements of ASTM D6817.
			2. Environmentally Friendly. Contains no formaldehyde or ozone-depleting HCFCs.
			3. Contains recycled material, and is 100 percent recyclable if ever removed or replaced.
			4. Stable R-Value over its entire service life. No thermal drift.
			5. Water-Resistant. Does not readily absorb moisture from the environment.
			6. Standards Compliance: Recognized by the International Code Council Evaluation Service (ICC-ES).
			7. Mold and mildew resistant.
			8. Physical Properties:
				1. Density; nominal pcf per ASTM C303: 5.00
				2. Conductance per Inch: per ASTM C518 or ASTM C177

At 25 degrees F ( degrees C): 0.196 BTU/hr sq ft F

At 40 degrees F ( degrees C): 0.198 BTU/hr sq ft F

At 75 degrees F ( degrees C): 0.217 BTU/hr sq ft F

* + - * 1. R-Value Resistance: per ASTM C518 or ASTM C177
				2. Hr sq ft F)/BTU

At 25 degrees F ( degrees C): 05.10

At 40 degrees F ( degrees C): 5.05

At 75 degrees F ( degrees C): 5.00

* + - * 1. Compressive Strength at 10 percent deformation per ASTM D1621: 100 psi.
				2. Flexural Strength per ASTM C203: 140 psi minimum.
				3. Dimensional Stability: per ASTM D2126: 2.0 maximum.
				4. Water Vapor Permeance per ASTM E96: 2.5 maximum
				5. Water Absorption per ASTM C272: 0.0 percent by volume maximum.
				6. Water Absorption per ASTM C272: 2.0 percent weight.
				7. Capillarity: None
				8. Per ASTM E84

Flame Spread: 25.0.

Smoke Developed: 150 to 300.

* + - 1. Sizes:

\*\* NOTE TO SPECIFIER \*\* ShelterFoam EPS is readily available in custom sizes with little or no lead time impact. Tapered panels are also available.

* + - * 1. Sheets: 2 x 8 ft (310 x mm)
				2. Sheets: 3x 8 ft ( x mm)
				3. Sheets: 4 x 8 ft (1219 x mm)

\*\* NOTE TO SPECIFIER \*\* Delete sheet thickness options not required, Thicknesses range from to 54 inches in job specific quantities.

* + - * 1. Sheet Thickness: As detailed on the drawings.
				2. Sheet thickness: \_\_\_\_ inches (\_\_\_\_ mm).

\*\* NOTE TO SPECIFIER \*\* Delete article if not required.

* 1. GRAPHITE ENHANCED POLYSTYRENE FOAM

\*\* NOTE TO SPECIFIER \*\* ShelterFoam GPS is commonly used within a variety of industrial, commercial, and residential projects including exterior insulation finish systems (EIFS), traditional and one-coat stucco systems, continuous insulation sheathing, tilt up walls, sheathing systems, under slab and perimeter/foundation applications, cavity walls, interior walls, cold storage walls and floors, commercial roofing, garage and entry doors, insulated vinyl siding, radiant flooring, structural insulated panels (SIPS), along with attics and crawl spaces to name a few. ShelterFoam GPS achieves a higher R-value in a thinner profile, making it ideal for space-constrained applications. This product has even become the leading form of insulation in Europe over the past few decades.

* + 1. ShelterFoam GPS: High-performance, closed cell, lightweight, mold and mildew resistant expanded polystyrene material used as rigid thermal insulation
			1. Standards Compliance:
				1. Meets or exceeds the highest standards of ASTM C578 and ASTM D6817 for expanded polystyrene,
				2. Recognized by the ICC-ES and UL.
				3. Approved for use in certain NFPA 285 wall assembles.
			2. Color: Silver-Gray color, due to the high purity graphite that is contained within the polymer intercellular substance of the foam board.
			3. Graphite Particles: Reflect and absorb radiant energy increasing insulation R-value.
			4. No thermal drift. Physical properties remain stable over entire service life.
			5. Mold and Mildew Resistant: Does not support mold or mildew growth
			6. Water Resistant and Closed Cell Foam: Breathable. Does not retain moisture and maintains physical properties even under extreme environmental conditions
			7. Reflects radiant heat energy, reduces thermal conductivity, and
			8. R-Values: Increase during colder temperatures as much as 25 percent due to the combination of GPS Matrix along with cell gas and radiation.

\*\* NOTE TO SPECIFIER \*\* Delete the physical properties paragraphs for types not required.

* + - 1. Physical Properties: Type IX
				1. Nominal Density (description /classification name) per ASTM C303: 2.00 lb/cu ft (32.0 kg/cu m).
				2. R-VALUE per 1.0625 inch Thermal Resistance: per ASTM C518 or C177

At 25 degrees F (minus 3.9 degrees C): 5.5.

At 40 degrees F (4.4 degrees C): 5.3.

At 75 degrees F (23.9 degrees C): 5.1.

Comprehensive Resistance at 10 percent Deformation per ASTM D1621:

Minimum: 15.0 psi per ASTM C578

Actual: 20.0 psi

* + - * 1. Flexural Strength per ASTM C203: 35.0 psi minimum
				2. Water Vapor Permeability: per ASTM E96: 2.5 maximum permeability per inch.
				3. Water Absorption by total immersion per ASTM C272: 1.1 percent by volume, maximum.
				4. Dimensional Stability per ASTM D2126: 2.0 percent maximum change.
				5. Oxygen Index per ASTM D2863: 24.0 percent volume.
				6. Per ASTM E84:

Flame Spread Index: Class A; 5 or less.

Smoke Development Index: 25 or less.

* + - 1. Physical Properties: Type II
				1. Nominal Density (description /classification name) per ASTM C303: 1.50 lb/ cu ft (24.0 kg/cu m).
				2. R-VALUE per 1.0625 inch Thermal Resistance: per ASTM C518 or C177

At 25 degrees F (minus 3.9 degrees C): 5.5.

At 40 degrees F (4.4 degrees C): 5.3.

At 75 degrees F (23.9 degrees C): 5.1.

Comprehensive Resistance at 10 percent Deformation per ASTM D1621:

Minimum: 15.0 psi per ASTM C578

Actual: 20.0 psi

* + - * 1. Flexural Strength per ASTM C203: 35.0 psi minimum
				2. Water Vapor Permeability: per ASTM E96: 3.1 maximum permeability per inch.
				3. Water Absorption by total immersion per ASTM C272: 1.1 percent by volume, maximum.
				4. Dimensional Stability per ASTM D2126: 2.0 percent maximum change.
				5. Oxygen Index per ASTM D2863: 24.0 percent volume.
				6. Per ASTM E84:

Flame Spread Index: Class A; 5 or less.

Smoke Development Index: 25 or less.

* + - 1. Physical Properties: Type IX
				1. Nominal Density (description /classification name) per ASTM C303: 1.00 lb/ cu ft (16.0 kg/cu m).
				2. R-VALUE per 1.0625 inch Thermal Resistance: per ASTM C518 or C177

At 25 degrees F (minus 3.9 degrees C): 5.1.

At 40 degrees F (4.4 degrees C): 5.3.

At 75 degrees F (23.9 degrees C): 5.1.

Comprehensive Resistance at 10 percent Deformation per ASTM D1621:

Minimum: 10.0 psi per ASTM C578

Actual: 13.0 psi

* + - * 1. Flexural Strength per ASTM C203: 25.0 psi minimum
				2. Water Vapor Permeability: per ASTM E96: 4.0 maximum permeability per inch.
				3. Water Absorption by total immersion per ASTM C272: 1.1 percent by volume, maximum.
				4. Dimensional Stability per ASTM D2126: 2.0 percent maximum change.
				5. Oxygen Index per ASTM D2863: 24.0 percent volume.
				6. Per ASTM E84:

Flame Spread Index: Class A; 5 or less.

Smoke Development Index: 25 or less.

* + - 1. Sizes:

\*\* NOTE TO SPECIFIER \*\* ShelterFoam GPS is lightweight and easy to cut into custom shapes and sizes for any application. Tapered panels are also available.

* + - * 1. Sheets: 2 x 4 ft (310 x 1219 mm).
				2. Sheets: 2 x 8 ft (310 x mm)
				3. Sheets: 4 x 8 ft (1219 x mm)

\*\* NOTE TO SPECIFIER \*\* Delete sheet thickness options not required, Thicknesses range from 1/2 to 48 inches in job specific quantities.

* + - * 1. Sheet Thickness: As detailed on the drawings.
				2. Sheet thickness: \_\_\_\_ inches (\_\_\_\_ mm).
1. EXECUTION
	1. EXAMINATION
		1. Examine and measure installation areas and subgrade conditions are prepared to receive geofoam to confirm site conditions are within the manufacturers limits.
		2. Do not begin installation until substrates have been properly prepared.
		3. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
	2. PREPARATION
		1. Excavate and prepare subgrade in accordance with the manufacturers instructions and project documents.
		2. Verify engineered depths, product thicknesses, and other conditions which would affect installation.
		3. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
	3. INSTALLATION
		1. Install in accordance with the manufacturer's current published instructions, and details and drawings issued for the project.
			1. Conflicts between the manufacturer instructions and project documents shall be resolved in writing prior to construction.
	4. PROTECTION
		1. Protect installed products and surface finishes from damage during construction
		2. Remove and legally dispose of construction debris from project site.

END OF SECTION