



Expanded Polystyrene (EPS) EPS Geofoam Application & Technical Data



**Geofoam
International**

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section one

PRODUCT

OVERVIEW

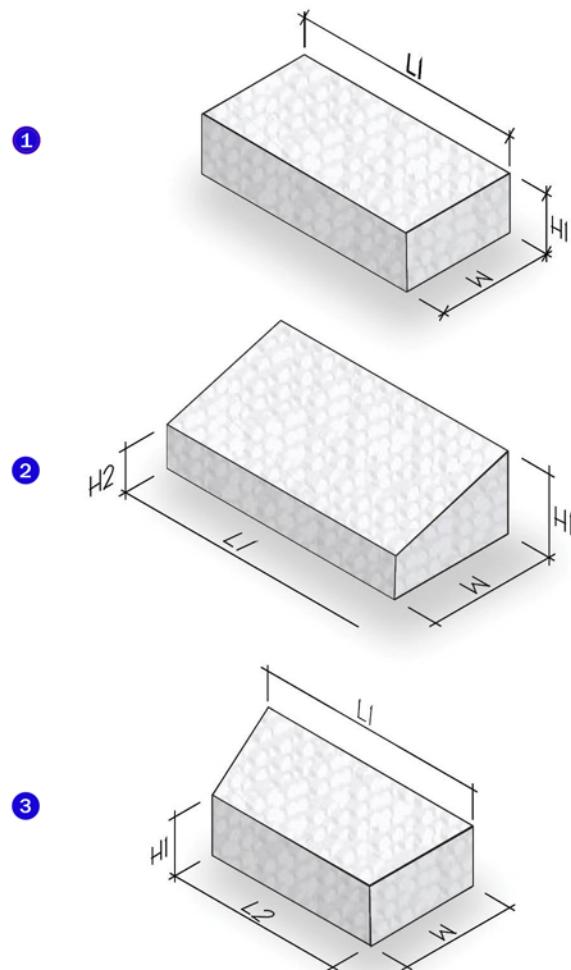


WHY GEOFOAM INTERNATIONAL?

Our team provides a reliable, easy to install product backed by solid ASTM certification. EPS Geofoam by Geoform International LLC is made and engineered with consistent physical properties no matter where your project is located across the World. It provides the highest level of control Over the construction element. Our EPS Geofoam can be UL certified and backed by ICC and other governing bodies of construction for its physical properties including compressive resistance.

Trusted professionals to get the job done. Our in house team of project managers, coordinators, business developers and EPS Geofoam specialists will design and verify compliance with specification documents to ensure that you are getting the right product for the job. All EPS Geofoam blocks are tested to ensure they are uniform and comply with the required specifications.

Performance you can rely on, anywhere in the World. "Additionally" Geoform International LLC has the experience of more than 100 manufacturing facilities located throughout North America. So, no matter where your project is located, our team of professionals will be able to provide you with a quality product at a competitive price. All EPS Geofoam is backed by a warranty from the manufacturer and is available in a range of densities and strengths.



- 1** Typical Rectangular EPS Geofoam Block
- 2** Typical Tapered EPS Geofoam Block
- 3** Trapezoidal EPS Geofoam Block

EPS Geofoam by Geoform International LLC provides the most reliable, highest level of stability for transportation or structural projects utilizing Geofoam. It is a clean, cost effective, lightweight material that can be used for many different applications.

- Typical PREFoam System Installation begins with the EPS Foam blocks being delivered via flatbed or box trailer (unless specified otherwise) the EPS Foam blocks are marked according to size and typical placement based on the provided shop drawings. EPS blocks are cut on site to fit the shop drawings and profile of the desired rise and run of the stadium platforms.
- Compressive resistance @ 1% deformation ranges from 2.2 psi to 18.6 pis.
- EPS Geofoam blocks can be molded to virtually any size and provided at different densities depending on the requirement by the project.
- EPS Geofoam is 100 times lighter than traditional fill materials like soil.
- Maintenance following installation is not required.
- The closed cell structure of the foam inhibits moisture absorption and the risk of mold or mildew growth
- Blocks can be pre-cut or field trimmed to be stacked easily in the field by the installing contractor.
- EPS Geofoam can be provided with an EPA-approved termite and bug resistant material which meets the strictest certifications in the market.
- Material can be delivered in a just in time method so no storage is involved.



EPS GEOFOAM PROPERTIES

Essentially, there are two different measurements for Expanded Polystyrene Density. It is imperative that one determines the relationship between the specific molding equipment being used, the achieved product density and its compressive resistance at 1% strain required. In most Geofoam specifications, the compressive resistance at 1% strain will be the overriding consideration. Performance requirements for EPS Geofoam applications must be evaluated individually as they relate to each project specification.

EPS Geofoam is one of the most versatile construction products on the market today. In short, Geofoam is an expanded polystyrene building material that is approximately 1% the weight of soil and less than 10% the weight of other lightweight fill alternatives. As an example, one cubic foot of EPS 15 weighs exactly one pound. As a lightweight fill alternative, EPS Geofoam reduces the loads imposed on adjacent and underlying structures and soils. EPS Geofoam is manufactured in various unit weights and typically range from 0.7 lbs. to 2.85 lbs. per cubic foot. EPS Geofoam is available in a wide variety of compressive resistances so the project designer/engineer can choose the appropriate density of EPS to support the design loading while minimizing cost.

The Technical Data section of this site will provide you with ASTM information which details the density,

compressive resistance, flexural strength and other important considerations for the use of the product. EPS Geofoam is known as a construction friendly material that does not require any large special equipment and the blocks can generally be hand carried by laborers. EPS Geofoam can be delivered to the site standard 4'-0" x 8'-0" blocks and easily cut it the field with a supplied hot-wire cutter or a common hand saw.

EPS geofoam is available in a range of compressive resistances. A project designer can choose the specific type of EPS required to support the design loading while minimizing cost. Several different types of EPS geofoam can be specified on a single project to maximize savings. For example, higher strength EPS geofoam can be used in high applied stress areas while lower strength blocks are used in areas where the applied stresses are lower.

EPS Geofoam design loads are recommended to not exceed the compressive resistance at 1% capacity. This limit controls the amount of long-term deflection, or creep, resulting from permanent sustained loads. Note: Adequate soil cover, or a load distribution slab, may be needed to distribute heavy concentrated loads.

ASTM D6817 PHYSICAL PROPERTY REQUIREMENTS OF EPS GEOFOAM

Type	EPS 12	EPS 15	EPS 19	EPS 22	EPS 29	EPS 39	EPS 46
Density, min., kg/m ³ (lb/ft ³)	11.2 (0.70)	14.4 (0.90)	18.4 (1.15)	21.6 (1.35)	28.8 (1.80)	38.4 (2.40)	45.7 (2.85)
Compressive Resistance, min., kPa (psi) at 1 %	15 (2.2)	25 (3.6)	40 (5.8)	50 (7.3)	75 (10.9)	103 (15.0)	128 (18.6)
Compressive Resistance, min., kPa (psi) at 5 %	35 (5.1)	55 (8.0)	90 (13.1)	115 (16.7)	170 (24.7)	241 (35.0)	300 (43.5)
Compressive Resistance, min., kPa (psi) at 10 % ^A	40 (5.8)	70 (10.2)	110 (16.0)	135 (19.6)	200 (29.0)	276 (40.0)	345 (50.0)
Flexural Strength, min., kPa (psi)	69 (10.0)	172 (25.0)	207 (30.0)	240 (35.0)	345 (50.0)	414 (60.0)	517 (75.0)
Oxygen index, min., volume %	24.0	24.0	24.0	24.0	24.0	24.0	24.0

The typical design load limit for EPS Geofoam is the compressive resistance at 1%. Please see ASTM D6817 for more information.

EPS GEOFOAM PROPERTIES

EPS Geofoam is a cellular plastic material that is extremely lightweight ($1\text{lb}/\text{ft}^3$), extremely strong, and has a very low density (1% of traditional earth materials.)

It is a manufactured block material meeting the engineered product specification standards of

ASTM D6817/ ASTM C-578 Standard densities range from $11\text{ kg}/\text{m}^3$ ($0.7\text{ lb}/\text{ft}^3$) to $32\text{ kg}/\text{m}^3$ ($1.8\text{ lb}/\text{ft}^3$).

This density range for the different EPS allows for the specification of a material with suitable mechanical properties as required by the project.

ASTM C-578 PHYSICAL PROPERTY REQUIREMENTS OF EPS GEOFOAM						
Property		Type XI	Type I	Type VIII	Type II	Type IX
Normal Denisty	lb/ ft^3 (kg/m^3)	0.75 (12)	1.00 (16)	1.25 (20)	1.50 (24)	2.00 (32)
Density ¹ , min.	lb/ ft^3 (kg/m^3)	0.70 (12)	0.90 (15)	1.15 (18)	1.35 (22)	1.80 (29)
Design Thermal Resistance per 1.0 in. thickness	75°F	$^{\circ}\text{F} \cdot \text{ft}^2 \cdot \text{h}/\text{Btu}$ ($^{\circ}\text{K} \cdot \text{m}^2/\text{W}$)	3.22 (0.57)	3.85 (0.68)	3.92 (0.69)	4.17 (0.73)
	40°F	$^{\circ}\text{F} \cdot \text{ft}^2 \cdot \text{h}/\text{Btu}$ ($^{\circ}\text{K} \cdot \text{m}^2/\text{W}$)	3.43 (0.60)	4.17 (0.73)	4.25 (0.75)	4.55 (0.80)
Thermal Resistance ¹ , min per 1.0 in. thickness	75°F	$^{\circ}\text{F} \cdot \text{ft}^2 \cdot \text{h}/\text{Btu}$ ($^{\circ}\text{K} \cdot \text{m}^2/\text{W}$)	3.10 (0.55)	3.60 (0.63)	3.80 (0.67)	4.00 (0.70)
	40°F	$^{\circ}\text{F} \cdot \text{ft}^2 \cdot \text{h}/\text{Btu}$ ($^{\circ}\text{K} \cdot \text{m}^2/\text{W}$)	3.30 (0.58)	4.00 (0.70)	4.20 (0.74)	4.40 (0.77)
Compressive strength ¹ @10% def., min.	psi (kPa)	5.0 (35)	10.0 (69)	13.0 (90)	15.0 (104)	25.0 (173)
Flexural strength ¹ min.	psi (kPa)	10.0 (69)	25.0 (173)	30.0 (208)	40.0 (276)	50.0 (345)
Water Vapor Permeance ¹ of 1.0 in. thickness, max., perm		5.0	5.0	3.5	3.5	2.0
Water Absorption ¹ by total immersion, max., volume %		4.0	4.0	3.0	3.0	2.0
Oxygen Index ¹ min., volume %		24.0	24.0	24.0	24.0	24.0
Flame Spread ²		20	20	20	20	20
Smoke Developed ²		150-300	150-300	150-300	150-300	150-300

¹ See ASTM C-578 Standard Specification for complete information



section two

GEOFOAM APPLICATIONS



GEOFOAM APPLICATIONS

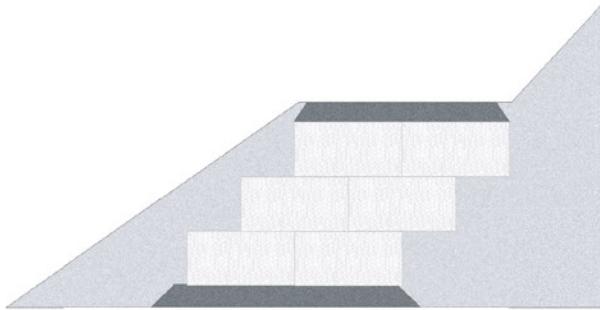
STADIUM PLATFORMS



EPS Geofoam blocks are an ideal structural solution for tiered seating platform construction. Weighing only one pound per cubic foot, EPS Geofoam is extremely lightweight and a perfect material for an upper floor or retail center application. Blocks are easily carried through the pedestrian doors of facilities under construction and installed late in the sequence as the material takes very little labor and time to install. Because of the geometry of the blocks, the weight is distributed evenly across the surface and no point load is achieved.



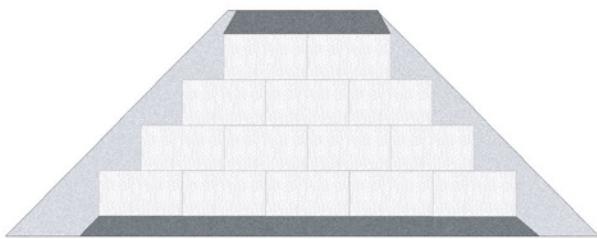
SIDE HILLS



The use of EPS Geofoam on a side hill project is common practice and has been used for years. The reduction of weight and pressure against the side of the hill is used to prevent landslides, and stabilize the hill side. The lack of increased weight on the side of the hill allows for a safer, more stable road construction project. As a rule of thumb, Geofoam is up to 1000 times lighter than other traditional fills with similar compressive strengths.

GEOFOAM APPLICATIONS

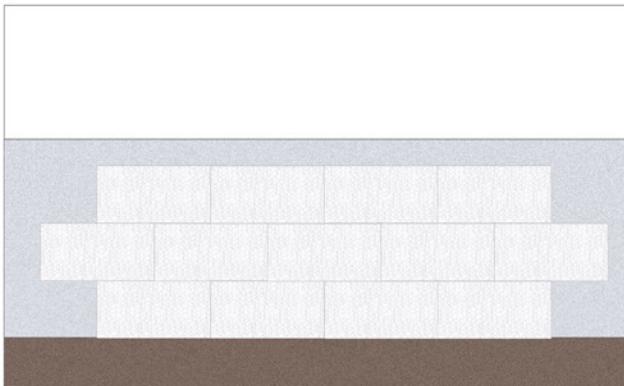
ROAD CONSTRUCTION



EPS Geofoam is often used in the construction of roads and has been across the world since the 1970's. The use of a lightweight fill material like EPS has enabled roads to be built faster, lighter, and with greater stability than they would have with other similar fill materials. Blocks are stacked up to a desired elevation and then typically covered in a geomembrane before being topped with asphalt or concrete. The use of geofoam saves time, money, and effectively allows contractors and architects in the field to adjust their project as they see fit based on field conditions. It is a very forgiving and easy to use material.



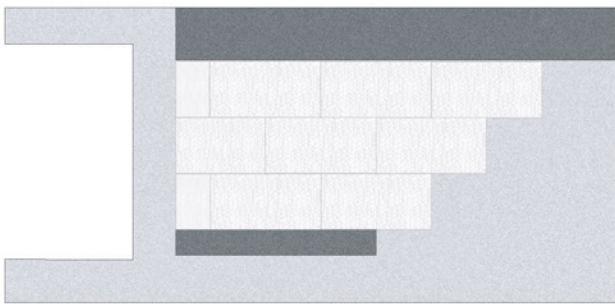
BUILDING FOUNDATIONS



EPS Geofoam can be used as a compensating foundation to reduce the load on underlying compressible soils and minimize building settlement along with potential bearing capacity problems. Existing soil is excavated to reduce the net applied load to the soil by the new structure. If the amount of soil excavated equals the full weight or stress applied by the new structure, the foundation is called "floating" or "fully compensating."

GEOFOAM APPLICATIONS

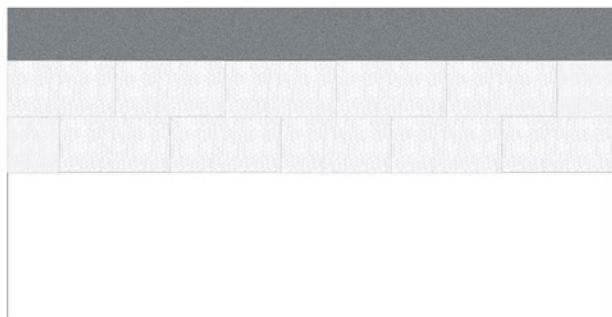
BRIDGE ABUTMENTS



EPS Geofoam can be used to support bridges when designed to the proper specification. The material adds little additional load to the underlying ground and therefore is a perfect material for the construction of a bridge structure. In cases of a rehabilitation of a bridge which is no longer structurally stable to hold the loads of current traffic loads, EPS Geofoam infill can help support the span and transfer the traffic load safely to the foundation or underlying soil.



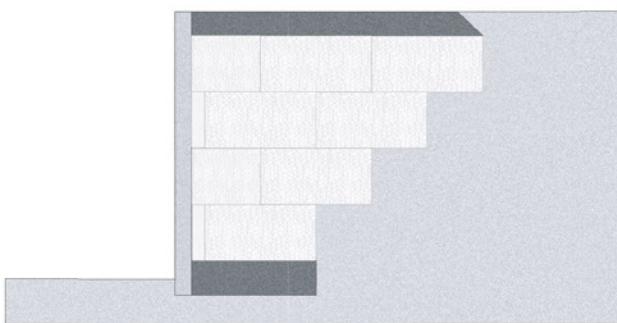
LANDSCAPING OR “LIVING ROOFS”



EPS Geofoam can be used to create topography without adding significant load to the underlying structures and services. Things like roof gardens are extremely popular today and the underlying material to create a living roof like this is often an EPS Geofoam product below soil. Things like Golf courses, ramp structures, and even parks are created using EPS Geofoam as a lightweight fill material to achieve the desired elevations and shapes of the land. In addition to flexibility, EPS Geofoam provides additional insulation to any roofing structure it is used on as well.

GEOFOAM APPLICATIONS

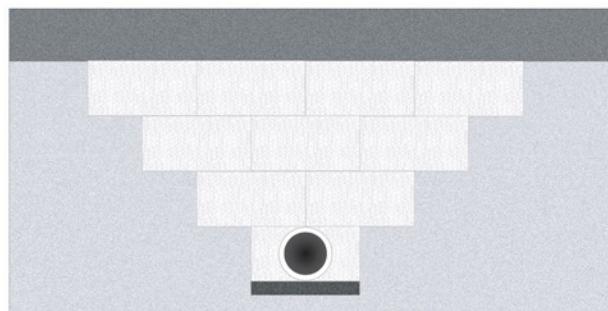
RETAINING WALLS



Using a EPS Geofoam product in a retaining structure will provide less lateral pressure and prevent any settlement. It is also good for improving waterproofing as the EPS Geofoam is a closed cell material and will not rot, leach into the ground, or decompose over time. The light weight aspects of the material reduce lateral force on a retaining wall or abutment. Most teams will install a draining system below the geofoam to prevent any hydrostatic pressure or buoyancy.



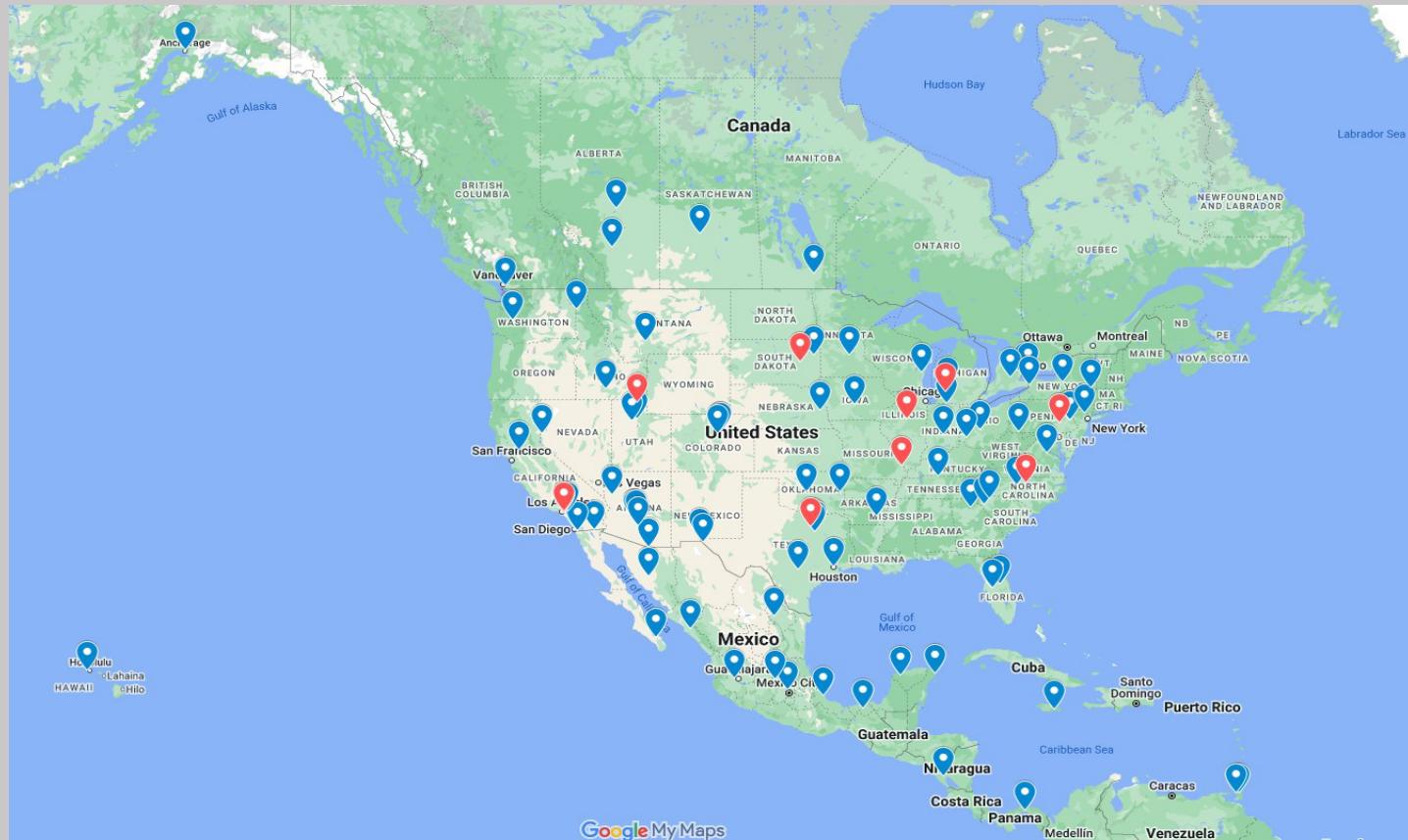
WEIGHT REDUCTION FOR UTILITIES



A great use for EPS Geofoam is the covering and protecting of underground utilities. The EPS distributes weight evenly around the piping or utility lines and reduces the amount of pressure and force on the ground. It reduces the vertical stress on pipes and other sensitive utilities. This reduction in weight on top of the utility lines will prevent potential issues like collapses.



MANUFACTURING PARTNERS



ENVIRONMENTALLY RESPONSIBLE

Today the question is HOW should architects and builders best apply "sustainable design principals" into the design and construction process. Until recently, compacted dirt fill; structural steel; precast concrete and others have been the only forms of high strength fill material.

Today there is a relatively new and innovative approach to construction. It is more efficient and economical than the traditional methods, and it is an environmentally responsible, "Green" solution that uses recyclable material as the "building blocks" for modern day infrastructure.

Architects, have taken on the challenge of determining how to build and furnish building's interiors with materials that are:

- 100% Recyclable
- Manufactured using post- consumer & post-industrial materials
- ENERGY STAR qualified
- Contributes toward LEEDS credit requirements
- Free of dyes, formaldehyde and HCFCs

This section addresses one aspect of modern day LEED related or environmentally responsible construction. EPS Geofoam is one of the most environmentally responsible materials to use for construction. EPS Geofoam blocks can be precut to field fit at the jobsite by the local contractor with little to no field modifications required. EPS Geofoam meets and exceeds many of the criteria necessary for LEED certification. It is typical to stack the blocks like "Legos" and adhered together using a non-solvent based adhesive. Geofoam International has established relationships with EPS manufacturers all over the country and typically blocks are manufactured within a 500 mile radius of the project location, allowing the GC to source their material locally and therefore, obtain LEED credits.

Geofoam International is one of the leading companies in the design industry that has taken a fresh approach to protecting the build environment and employing sustainable building practices. Over the past few years, the design and construction professions have turned their focus to the "Greening of America."

The U.S. Green Building Council has developed a nationally accepted system to rate the design, construction and operations of buildings. The USGBC's leadership in Energy and Environmental Design (LEED) is a standard that recognizes the life-cycle cost of construction and helps guide the performance of projects. The LEED rating system allows owners to acquire credits by meeting certain conditions pertaining to the use of sustainable, energy efficient and environmentally friendly products and systems.

The use of EPS Geofoam in design and construction addresses each of these criteria and provides a product that is both environmentally responsible and a cost efficient fill material solution.

- EPS manufacturing uses minimal energy and creates nominal pollution. Steam is the primary component in the manufacturing process and the water from this process is collected and reused numerous times.
- With manufacturing facilities throughout North America, EPS is manufactured in close proximity to most building projects minimizing the distribution radius.
- Because EPS is very lightweight, transportation costs are minimized and less fuel is used.



Energy Efficient

- According to the U.S. Green Building Council, using EPS in building construction helps reduce energy consumption.
- EPS Geofoam EPS blocks can be placed directly on compacted fill, thus eliminating the need for a concrete slab. Because of the characteristics of EPS, it minimizes thermal transfer, inhibits mold growth, and is resistant to insects.

Green House Gas Reduction

EPS, unlike Extruded Polystyrene (XPS), has never utilized any greenhouse gases in the manufacturing process and the manufacturing process itself does not result in emissions of greenhouse gases.

In addition to the energy and environmental benefits inherent in the use of EPS, there are a large number of efficiencies that can be realized using the EPS Geofoam.

The EPS Geofoam approach will typically save weeks off the installation schedule and reduce overall costs by as much as 20-25% compared to traditional methods of construction.

The incorporation of a EPS Geofoam System is not only more cost efficient, but also an environmentally responsible, sustainable, “green” approach.

Made with Recycled Material

- EPS Geofoam building products can be made with recycled material content. In 2004 more than 57 million pounds of EPS was recycled.
- EPS Geofoam can be made with approximately 10% recycled content.
- EPS Geofoam fill material can easily be removed and recycled.
- EPS Geofoam does not contain harmful formaldehydes, CFC's or HCFC's. The American Lung Association's Health House guideline acknowledges that EPS is a safe material for insulation and structural support in construction.
- EPS Geofoam has a high degree of resistance to moisture absorption controlling humidity and air infiltration thus reducing the development of mold.

