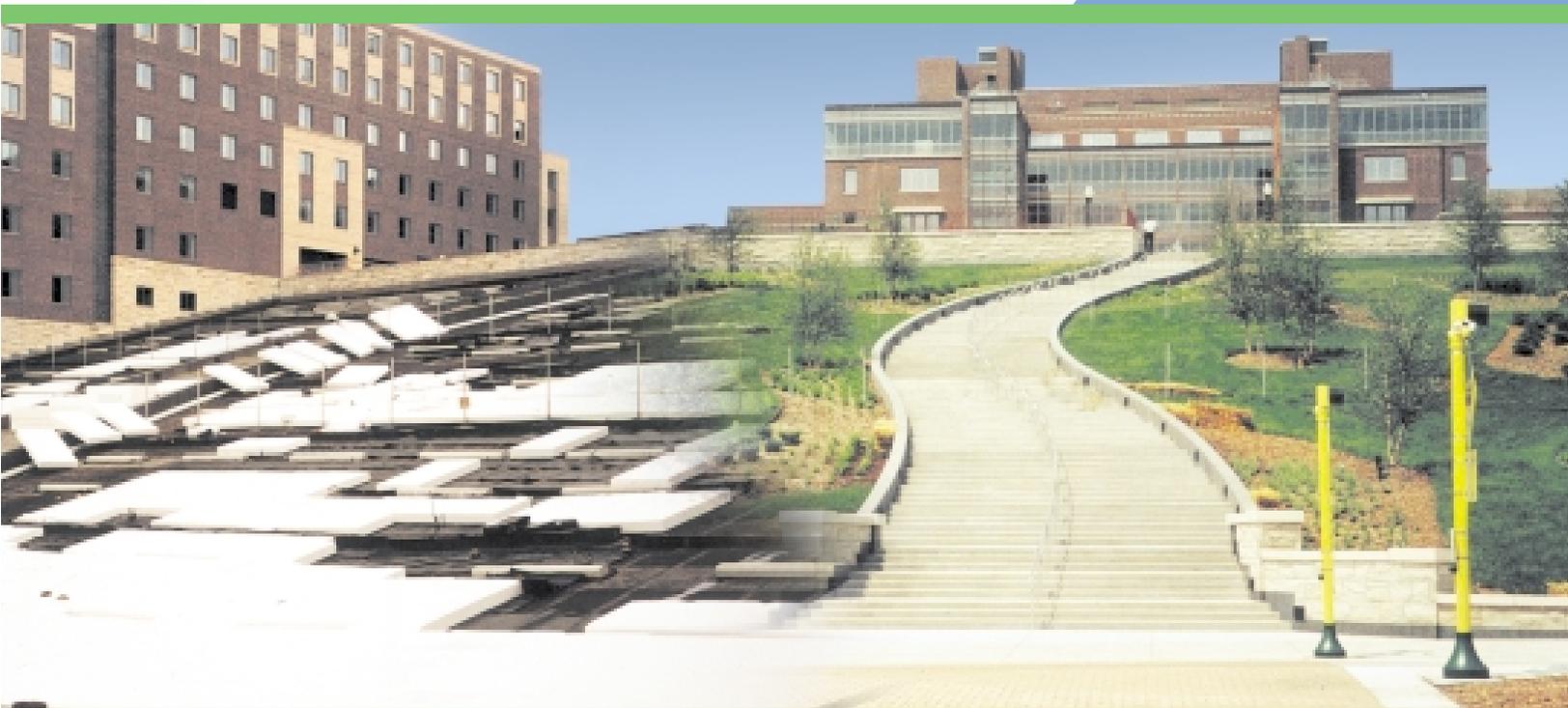


Ultra-Lightweight
Fill Material

GEOFOAM

Geotechnical Applications for Expanded Polystyrene Foam



STYROTECH

Innovative Foam Solutions

GEOFOAM

A Modern Solution For Age-Old Problems

Expanded polystyrene (EPS) geofoam has been used throughout the world for over 30 years in applications where ultra-lightweight fill material has been specified for:

- **Site development on poor load-bearing foundation soils**
- **Reduction of lateral pressure on vertical walls**
- **Stress reduction on underground structures and/or utilities**
- **Temperature control and/or frost protection**

STYRO-FLEX EPS Geofoam provides cost-effective solutions where conventional construction methods have failed or shown sub-standard performance. Unlike traditional engineering and construction practices that work to **resist** the forces of nature, geofoam is designed to work **with** them. Geofoam's success derives from the fact that it is often more cost-effective to reduce the forces acting on a structure or foundation soil than it is to reinforce them to withstand the forces that would exist without geofoam substitution.

**University of Minnesota
Minneapolis, Minnesota**
Riverbend Commons, at the University of Minnesota, reclaimed its view of the Mississippi River by replacing an above-ground parking ramp with an underground structure. Concerned over the stress that landscape soils would impose on the structure, engineers significantly reduced structural loads by specifying geofoam to create their landscape.

Top Photo: *Geofoam blocks being installed*

Middle Photo: *Landscape soils being distributed to specified depths over geofoam*

Bottom Photo: *Finished landscape design*



Proven Performance Makes EPS Geofoam the Right Choice

Although relatively new to the U.S. engineering community, EPS geofoam has a long history of success dating back to the 1960s when the Norwegian Road Research Laboratory (NRRL) began using geofoam to construct road embankments over peat bogs. In fact, geofoam samples from these early projects were recently excavated and submitted for testing. These test results indicate that even **after 30 plus years of service**, EPS geofoam experienced no depreciation of its physical properties.

EPS geofoam is the material of choice for engineers around the world because of its unique physical properties, cost-effectiveness, design flexibility and documented history of performance.

EPS Geofoam Advantages

- **Ultra-Lightweight**
EPS geofoam weighs only 1.00-2.00 lb/ft³, approximately 1% the density of soil or rock.
- **Reduced Construction Times**
EPS geofoam construction is very fast, particularly beneficial with compressed project timelines.
- **Predictable Material Behavior**
EPS geofoam is an engineered product, unlike other lightweight fill materials that can be variable in composition.
- **Non-Biodegradable**
EPS geofoam physical properties will not degrade, assuring long-term performance in engineered geotechnical applications.
- **Inert**
EPS geofoam will not leach into surrounding soils or groundwater and provides no nutritive value for plants or animals.



County Highway 12 Elk River, Minnesota
Constructed over peat deposits 22'-28' deep, County Highway 12 experienced severe settlement even after previous attempts to correct the problem were made. With minimal excavation, a geofoam road embankment was constructed to reduce the overburden on the underlying poor soils.



Top Photo: Construction of geofoam road embankment
Bottom Photo: New 200' road section completed in 8 working days

Geofoam Applications

STYRO-FLEX EPS Geofoam is a versatile material that provides innovative solutions to many common, and not so common, geotechnical challenges. A cost-effective alternative to traditional construction practices, EPS geofoam has documented benefits in the following applications:

- **Road Embankments**
- **Bridge Approach Fill**
- **Slope Stabilization**
- **Earth Retaining Structures**
- **Plaza Decks**
- **Structural Foundations**
- **Compressible Inclusions**
- **Dikes/Berms/Levees**
- **Landscape Fill**
- **Insulation/Frost Protection**

Note: Other engineered applications may also be appropriate for STYRO-FLEX EPS Geofoam.



County Highway A Bayfield, Wisconsin
For over 20 years, County Highway A had a history of slope failures, and conventional remedies had failed to correct the problem. Geofoam enabled engineers to reduce the landslide driving force without lowering the grade at the head of the slide.



Top Photo: Geofoam blocks being installed in the area of failure
Bottom Photo: Compacted base course ready for asphalt application

Typical Physical Properties of Styro-Flex EPS Geofoam

Nominal Density			1.00#	1.25#	1.50#	2.00#
Specification Reference: ASTM C578-01			Type I	Type VIII	Type II	Type IX
Property	Units	ASTM Test				
Density, Minimum	(pcf)	C303 or D1622	0.90	1.15	1.35	1.80
Thermal Conductivity (K factor)	at 25°F	C177 or C518	0.23	0.22	0.21	0.20
	at 40°F		0.24	0.235	0.22	0.21
	at 75°F		0.26	0.255	0.24	0.23
Thermal Resistance (R-Value)	at 25°F	per inch thickness	4.35	4.54	4.76	5.00
	at 40°F		4.17	4.25	4.55	4.76
	at 75°F		3.85	3.92	4.17	4.35
Strength Properties						
Compressive 10% Deformation	psi	D1621	10-14	13-18	15-21	25-33
Flexural	psi	C203	25-30	30-38	35-50	50-75
Tensile	psi	D1623	16-20	17-21	18-22	23-27
Shear	psi	D732	18-22	23-25	26-32	33-37
Shear Modulus	psi	-	280	370	460	600
Modulus of Elasticity	psi	-	180	250	320	460
Moisture Resistance						
Water Vapor Transmission (WVT)	perm. in	E96	2.0-5.0	1.5-3.5	1.0-3.5	0.6-2.0
Absorption	% (vol.)	C272	less than 4.0	less than 3.0	less than 3.0	less than 2.0
Capillarity	-	-	none	none	none	none
Coefficient of Thermal Expansion	in./(in.)(F)	D696	0.000035	0.000035	0.000035	0.000035
Maximum Service Temperature						
Long Term	°F	-	167	167	167	167
Intermittent			180	180	180	180
Flame Spread		E84	Less than 25 for all densities			
Smoke Development		E84	Less than 450 for all densities			

Styro-Flex EPS products are third-party certified by Underwriters Laboratories to ensure compliance with ASTM C578-01 specifications.

Why Styrotech for your geofoam requirements?

Whether considering or actively specifying geofoam in your designs, give Styrotech a call and let us go to work for you. For over a decade we have produced geofoam for a variety of applications, both large and small. Our early commitment to geofoam technology has provided us with the background to help your projects proceed efficiently.

Experience – Styrotech has produced numerous geofoam projects, for both the private and public sectors, throughout the upper Midwest.

Knowledge – Styrotech employs people who are experts in the industry, many with over 25 years of experience, ready to work for you.

Capacity – Styrotech has one of the largest, state-of-the-art production facilities in the country, allowing us to meet geofoam requirements for even the largest projects.

Service – Styrotech takes a "hands on" approach with geofoam projects from start to finish.

Design Considerations

Flammability – Like many construction materials, EPS is combustible and should not be exposed to flame or other ignition sources. Current model building code requirements should be met for adequate protection.

Solvent Exposure – EPS is subject to attack by petroleum-based solvents. Care should be taken to prevent contact between EPS and these solvents or their vapors. Use only adhesives approved for EPS applications.

Ultraviolet Exposure – Prolonged exposure of EPS to sunlight will cause slight discoloration and surface dusting, however, insulating properties will not be significantly affected. If stored outside, EPS insulation should be protected with a light-colored, opaque tarp.

Exposure/Application Temperatures – EPS should not be exposed for prolonged periods to temperatures in excess of 170°F.



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