



Geofoam Applications & Recent Trends

Charleston, WV

October, 2010

GEOFOAM



**Bridge Abutment
With Piles**



**Slope
Widening**



**Levee
Applications**



**MSE Wall
Transition**

Physical Properties

Typical Physical Properties of InsulFoam GF*

Type- ASTM D6817	Units	EPS12	EPS15	EPS19	EPS22	EPS29	EPS39	EPS46
Density, min.	lb/ft ³ (kg/m ³)	0.70 (11.2)	0.90 (14.4)	1.15 (18.4)	1.35 (21.6)	1.80 (28.8)	2.40 (38.4)	2.85 (45.7)
Compressive Resistance** min. @ 1% deformation	psi (kPa)	2.2 (15)	3.6 (25)	5.8 (40)	7.3 (50)	10.9 (75)	15.0 (103)	18.6 (128)
Compressive Resistance** min. @ 5% deformation	psi (kPa)	5.1 (35)	8.0 (55)	13.1 (90)	16.7 (115)	24.7 (170)	35.0 (241)	43.5 (300)
Compressive Resistance** min. @ 10% deformation	psi (kPa)	5.8 (40)	10.2 (70)	16.0 (110)	19.6 (135)	29.0 (200)	40.0 (276)	50.0 (345)
Flexural Strength, min.	psi (kPa)	10.0 (69)	25.0 (172)	30.0 (207)	40.0 (276)	50.0 (345)	60.0 (414)	75.0 (517)
Oxygen Index, min.	volume %	24.0	24.0	24.0	24.0	24.0	24.0	24.0
Dimensional Stability	(max. %)	< 2%	< 2%	< 2%	< 2%	< 2%	< 2%	< 2%
Buoyancy Force	lb/ft ³ (kg/m ³)	61.7 (990)	61.5 (980)	61.3 (980)	61.1 (980)	60.6 (970)	60.0 (960)	59.5 (950)
Poisson's Ratio	–	.05	.05	.05	.05	.05	.05	.05
Coefficient of Friction	–	.6	.6	.6	.6	.6	.6	.6
Absorption	volume %	< 4.0	< 4.0	< 3.0	< 3.0	< 2.0	< 2.0	< 2.0
Elastic Modulus, min.	psi (kPa)	220 (1500)	360 (2500)	580 (4000)	730 (5000)	1090 (7500)	1500 (10300)	1860 (12800)

*Properties are based on data provided by resin manufacturers, independent test agencies and Insulfoam.

** For InsulFoam GF applications the design load stresses should not exceed 1% strain for combined live and dead loads.

ELIMINATE OR REDUCE LATERAL LOADING ON
RETAINING STRUCTURES

ZERO NET LOADING FOR
SOFT SOIL REMEDIATION

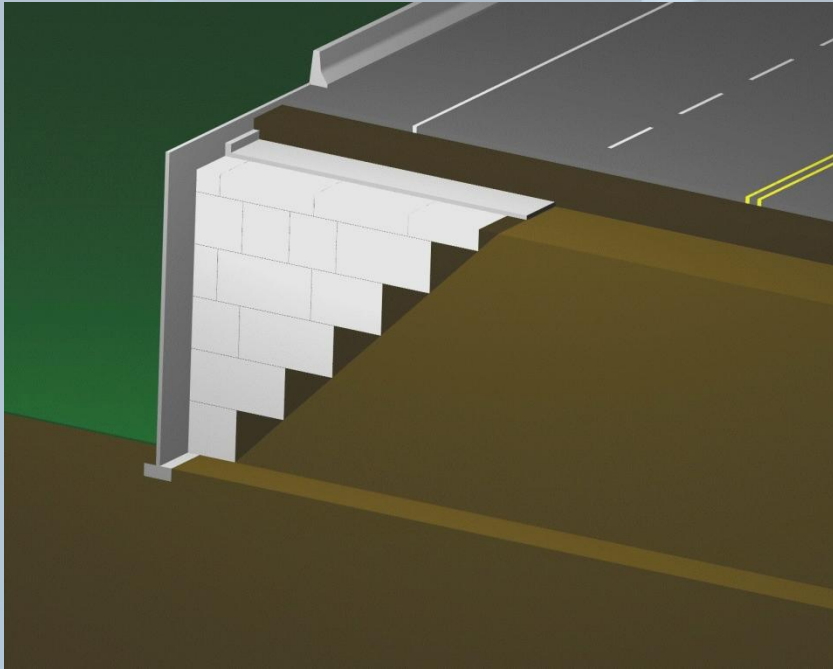
ENGINEERED FOR
SLOPE STABILIZATION

PROTECT AND LIGHTEN THE LOAD ON
BURIED UTILITIES

KEEP IT SIMPLE AND FAST WITH
**STRUCTURAL VOID FILL
CONCRETE APPLICATIONS**

Lighten the Load

**5 MAJOR APPLICATIONS
TO CONSIDER GEOFOAM**



- InsulFoam GF replaces the sliding soil wedge
- Native soils are self supporting when excavated back to the angle of repose
- InsulFoam GF is self supporting
- End result: ZERO lateral load on the retaining structure

Eliminate or Reduce Lateral Loads for

RETAINING STRUCTURES

180 & 148th Street Waverly, NE



I-680 & Pacific St - Omaha, NE



University Student Housing Morgantown, WV





I-680 Interchange – Martinez, CA

- Soft soils only settle when more weight is added on top
- Calculate the weight of the Geofoam and all other loads
- Excavate an equivalent weight of native soil
- End Result: Net ZERO loading

Net Zero Load Designs for

SOFT SOIL REMEDIATION

Topaz Bridge Southeast, Idaho



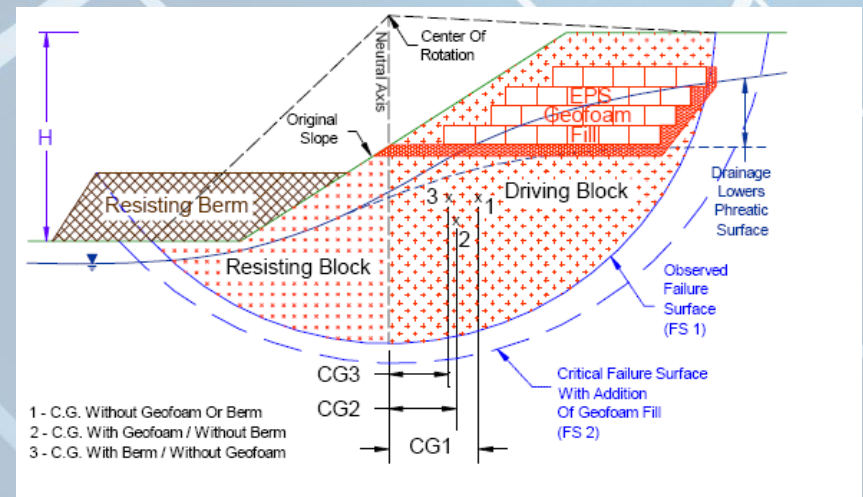
I-405 Totem Lake Freeway Kirkland, WA



Louis Armstrong Int'l Airport New Orleans, LA



- Heavy Soils + Gravity + H₂O = High Landslide Potential
- Geof foam is up to 100 times lighter than soil
- Using Geof foam reduces the weight and the risk



Lighten the driving block for

SLOPE STABILIZATION

US 101 - Willits, CA



US 160 Durango, CO



- Reduces dead and lateral loads on underground pipes, culverts and tunnels
- Protects utility during seismic activity by reducing axial strain
- Provides high thermal insulation values that protect against severe temperature fluctuations



Protect and lighten the load on top of

BURIED UTILITY PROTECTION

Route 1 & 9 Interchange Jersey City, NJ



Hanging Lake Tunnel Glenwood Canyon, CO





- Eliminates separate concrete pours for vertical wall sections
- Reduces overall amount of concrete or other heavy fills
- Reduces dead loads on underlying structures
- Any shape or slope can be easily fabricated on site

Keep it Simple and Fast with

STRUCTURAL VOID FILL CONCRETE APPLICATIONS

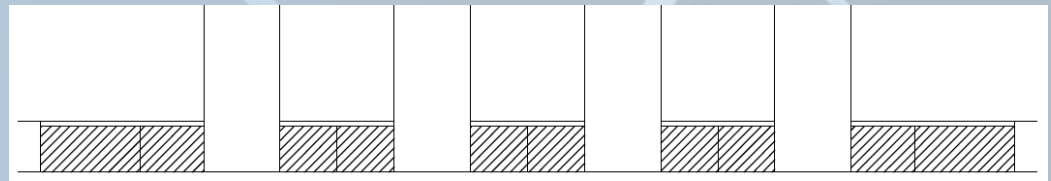
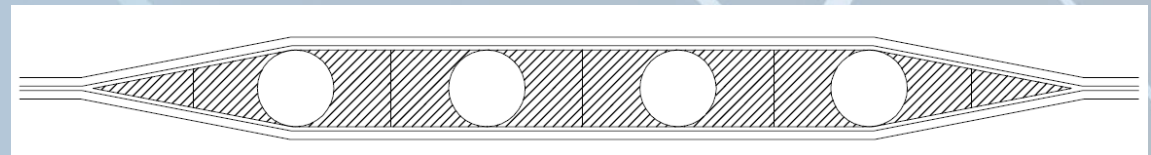
Bridge Beam Voids



Concrete Cap on Median Barrier



- No need for any compaction in between and around the columns prior to concrete cap pour

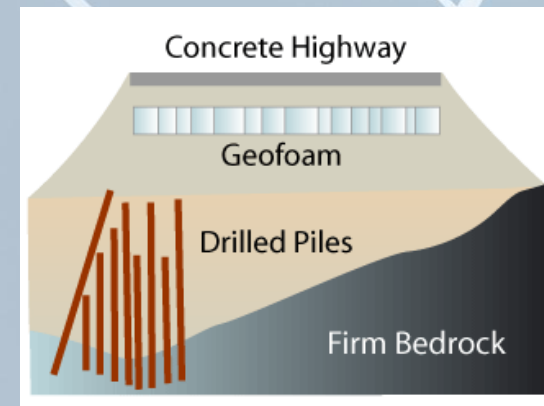


Recent Trends



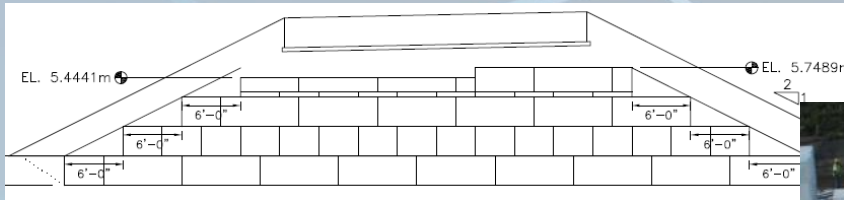
UTA TRAX, Salt lake City, UT

Combination of Remediations



Highway 241, St. Michael, MN

Sloped vs. Vertical



Rte 1 & 9, Jersey City, NJ



Port of Longview, Longview, WA

Seismic Considerations



- Shear keys should be used to interrupt horizontal interfaces and improve sliding stability for large near source earthquakes
- Geofoam blocks with higher strength should be placed in the basal layers of the geofoam embankment
- An alternate is to utilize a moisture cured polyurethane adhesive, which works well in a wide range of temperatures

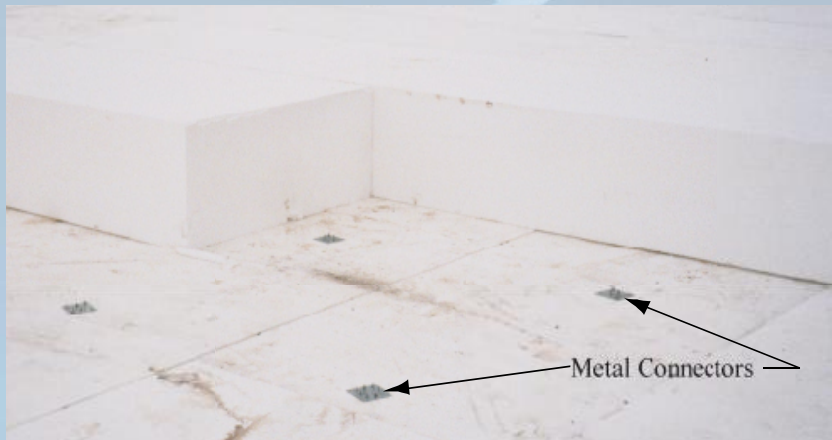
Levee Applications



North Creek Levee – Bothell, WA

InsulGrip / Flexible Fast™

- 4" x 4" 20 ga. galvanized steel plate
- 60 lbs designed lateral load per plate
- Minimum of two plates per 4' x 8' area



- moisture cured polyurethane adhesive
- works well in a wide range of temperatures

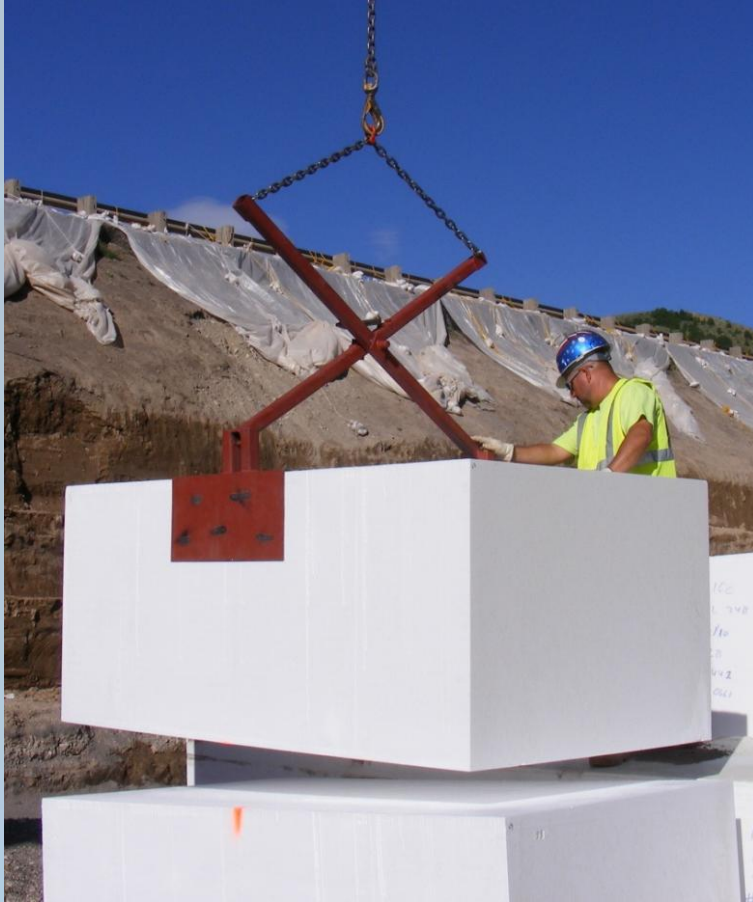
Utilization of Geomembrane



Shotcrete Over Geof foam



Faster Installation & Less Handling

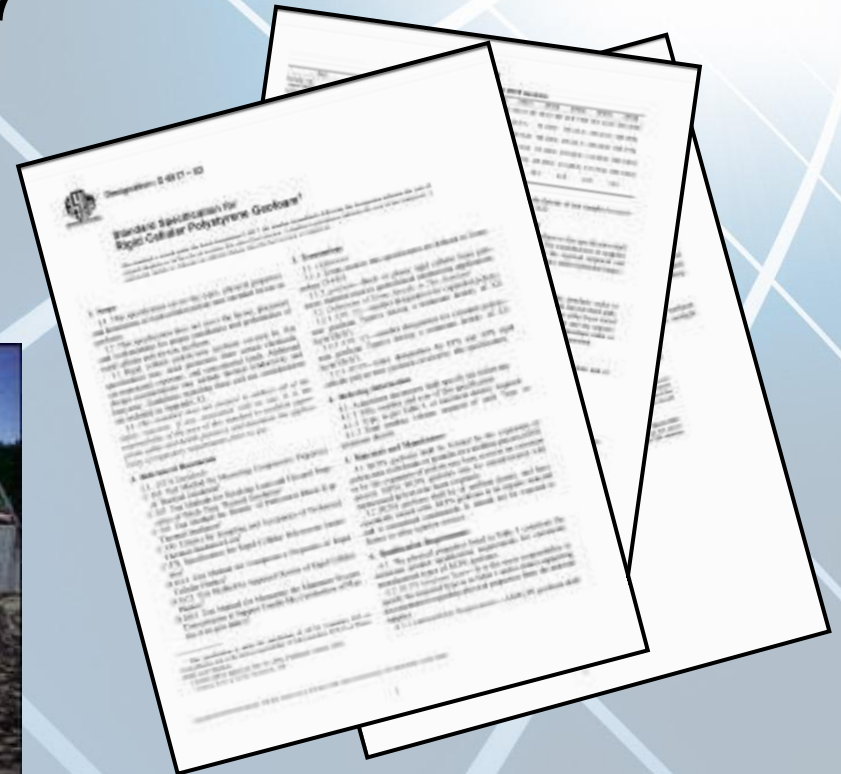


FHWA National Deployment Goal

- By October 2010, EPS geof foam will be a routinely used lightweight fill alternative for State DOTs on embankment projects where the construction schedule is of concern.
- By October 2011, all States will have evaluated EPS geof foam as a lightweight fill alternative.

It's not all in the density!

Understanding ASTM D6817
(different than ASTM C578)
(different than NCHRP 529)



ASTM D6817 vs. C578

↑
Geotechnical

↑
Insulation

Density lb/ft³,
min.

Compressive
Resistance,
min. psi @
10%
deformation

Flexural
Strength, Min.,
psi

ASTM D6817	EPS 15	.90	10.2	25
ASTM C578	Type I	.90	10.0	25
ASTM D6817	EPS 19	1.15	16.0	30
ASTM C578	Type VIII	1.15	13.0	30
ASTM D6817	EPS 22	1.35	19.6	40
ASTM C578	Type II	1.35	15.0	35
ASTM D6817	EPS 29	1.80	29.0	50
ASTM C578	Type IX	1.80	25.0	50

ASTM D6817 vs. NCHRP 529



Density lb/ft³,
min.

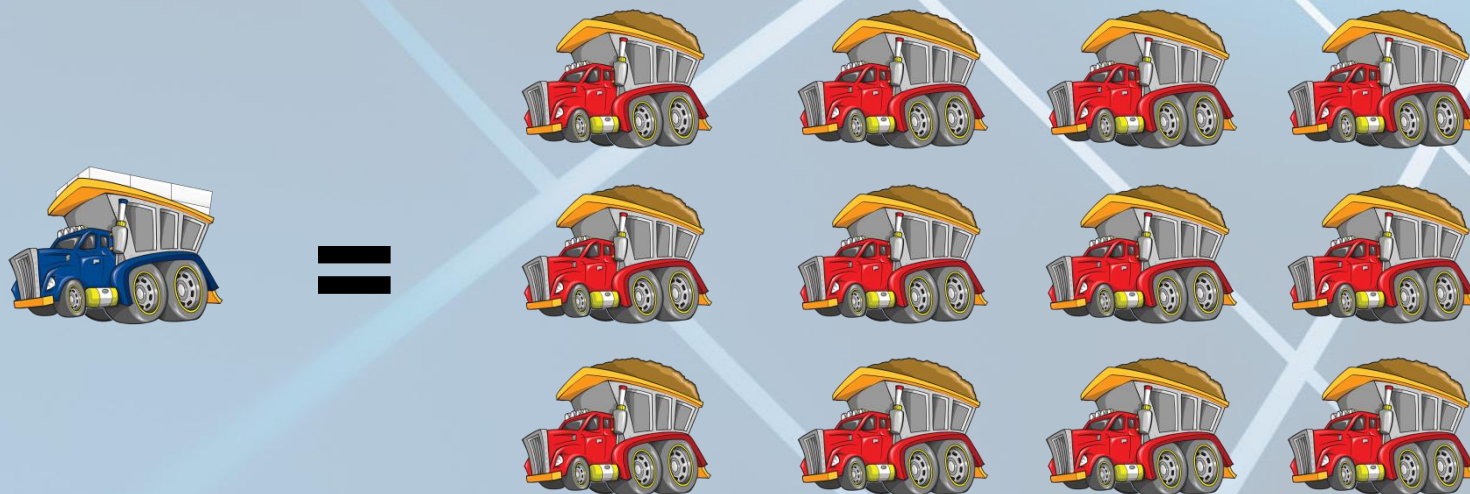
Compressive
Resistance,
min. psi @ 1%
deformation

Elastic
Modulus,
lbs/in² min.

ASTM D6817	EPS 15	.90	3.6	360
NCHRP 529	EPS 40	.90	5.8	580
ASTM D6817	EPS 19	1.15	5.8	580
NCHRP 529	EPS 50	1.15	7.2	725
ASTM D6817	EPS 22	1.35	7.3	730
NCHRP 529	EPS 70	1.35	10.2	1015
ASTM D6817	EPS 29	1.80	10.9	1090
NCHRP 529	EPS 100	1.80	14.5	1450
ASTM D6817	EPS 39	2.40	15.0	1500
NCHRP 529	-	-	-	-

What are the alternatives to using InsulFoam GF?

1 truckload of InsulFoam GF = 12 trucks of soil



Other alternatives include: Wood Chips, Tires, Waste, Concrete

When to use Geof foam

- Soil fill is expensive to bring in due to access and job location
- A reduction in wall lateral stress is required
- The construction schedule is tight
- Underlying soils have low bearing capacity which would cause unacceptable soil settlement.

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