

EPS Geof foam

**An Engineered, Light Weight, Fill
Alternative for Road Construction**

What is EPS Geofoam?

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- EPS Geof foam is an engineered foam polymer used in road construction applications where a lightweight fill is required to reduce stresses on underlying soils or lateral pressures to retaining walls, abutments or foundations



What is EPS Geof foam?

- EPS Geof foam is also used as a thermal barrier under buildings, roads, railways, retaining walls, and underground parking garages to reduce the effects of freezing, to prevent road deterioration and to avoid the collapse of the unstable ground
- For more than 30 years, Geof foam has been used in engineering and geotechnical applications worldwide
- EPS Geof foam is a strong, environmentally safe, foamed plastic with a very low density
 - Weighs approximately 1% of traditional earth materials
 - At least 20 to 30 times lighter than other lightweight fill alternatives
- This extreme difference in unit weight compared to other materials makes EPS Geof foam an attractive fill material
- The surface of EPS Geof foam is affected by UV light and should be covered in storage or cleaned prior to use

Why Use EPS Geofoam?

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Ideal Conditions for Geof foam:

- Soft soil is the number one driver for using Geof foam in roadway construction
Soft organic soil, i.e. soft clays, silt, and peat type soils
(Most ideal when the soft soil is deep and wet)
 - ▶ Geof foam provides excellent foundation stability
 - ▶ Geof foam reduces the rate of settlement to nil
- Relieves Lateral Pressure
- Stable protection in high seismic risk areas (California, etc)

Why Use EPS Geofoam?



- EPS Geofoam can be used as an embankment fill to reduce loads on underlying soils, or to build highways quickly without staged construction
- EPS Geofoam has been used to repair slope failures, reduce lateral load behind retaining structures, accelerate construction on fill for approach embankments, and minimize differential settlement at bridge abutments.

Why Use EPS Geofoam?

- Because EPS Geofoam weighs only 16 to 32 kilograms per cubic meter (1 to 2 pounds per cubic foot), large earthmoving equipment is not required for construction.
- Blocks easily can be trimmed to size and placed by hand



Why Use EPS Geofoam?

- EPS Geofoam provides:
 - ▶ Lot-to-lot product consistency...predictable performance
 - ▶ Manufactured to meet ASTM D6817
 - ▶ Block size and density customized for job needs
 - ▶ Super lightweight compared to other fills and is structurally rigid
 - ▶ Inert in long-term burial conditions, no leachates
 - ▶ Easily shaped in field or supplied prefabricated
 - ▶ Termite protection available (if needed)
 - ▶ Cost effective solution for many difficult applications
 - ▶ Contains no CFC, HCFC, or HFC

Why Use EPS Geof foam?

- Geof foam is among the most versatile lightweight materials available
- Traditional earth materials are heavy and can cause settlement, instability, or lateral pressures
- Other fill materials such as foamed concrete, waste tires, soil, woodchips, wood fiber, etc., have higher densities and are variable in their makeup
- These alternative fills have limitations in handling and can be weather sensitive, thus requiring staged construction and/or preloading, surcharging and draining, etc.

Why Use EPS Geofoam?

- Geofoam maximizes onsite installation efficiency:
 - ▶ Material arrives ready to place
 - ▶ No weather delays
 - ▶ Material can be prefabricated or cut at the jobsite
 - ▶ No staging required
 - ▶ Material can be inventoried but should be covered if stored outside for long periods to prevent surface dusting
 - ▶ Production efficiency improved
 - ▶ Easy to handle

When to Use EPS Geof foam?

- Protect buried utilities
- Congested highways and projects with tight time schedules (Urban Areas)
- Construction embankments or highway expansions over existing utilities
- Projects with limited space and in close proximity to nearby structures



When to Use EPS Geofoam?



- In areas where right-of-way is limited, EPS Geofoam can be constructed vertically and faced, unlike most other lightweight fill alternatives
- Can be constructed in adverse weather conditions
- Accelerates foundation construction, which reduces project schedules

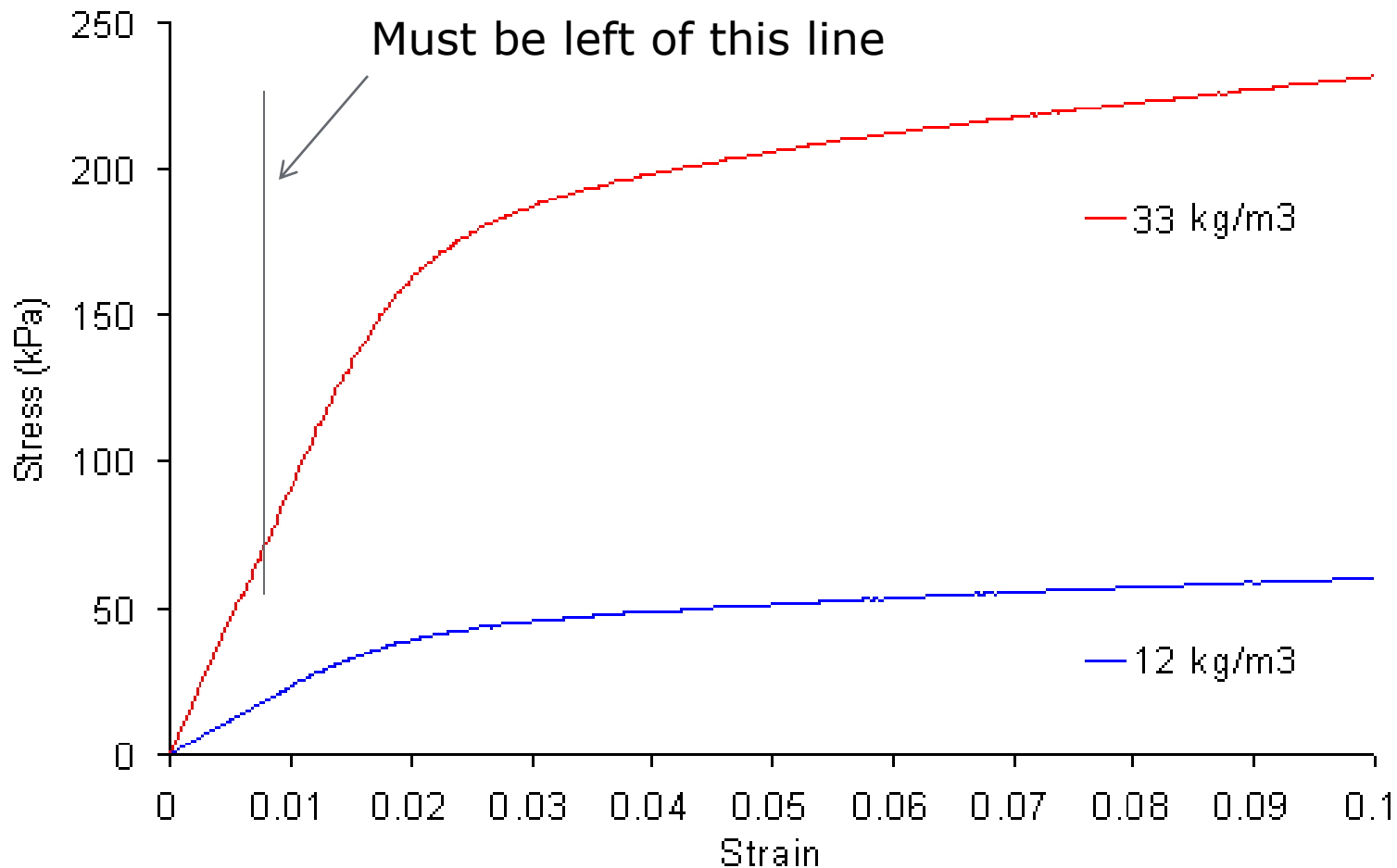
I-15 in Salt Lake City, UT

EPS Geof foam Research Data

EPS Geofoam Minimum Block/Test Properties

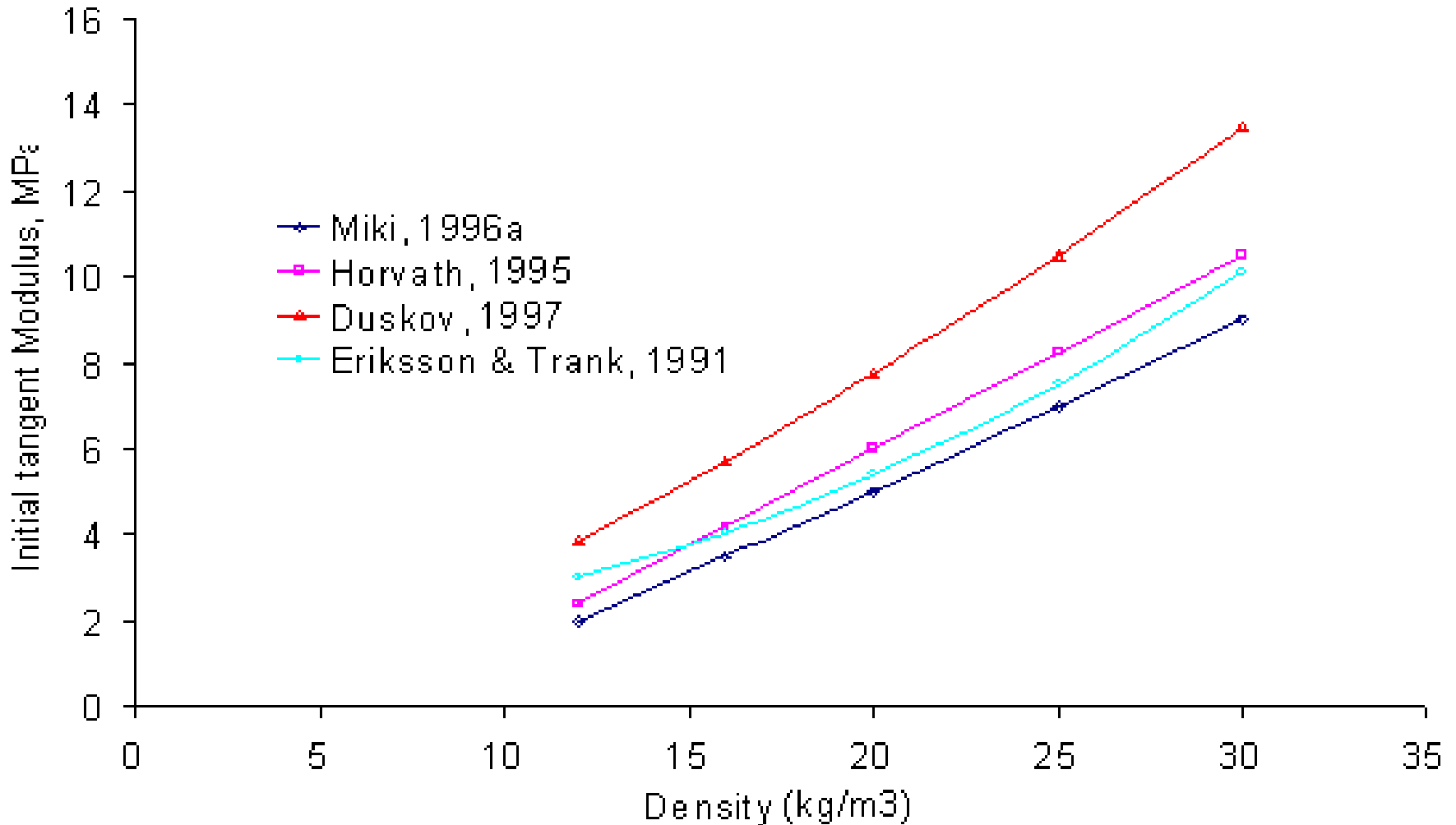
NCHRP 24-11 Material Designation	ASTM D-6817	Block Dry Density (pcf)	Elastic Limit Stress (psi)	Initial Tangent Young's Modulus (psi)
EPS 40	I	1.0	5.8	580
EPS 50	VII	1.25	7.2	725
EPS 70	II	1.5	10.1	1015
EPS 100	IX	2.0	14.5	1450

Stress and Strain at Two Foam Densities



Strength vs. Foam Density

Figure 2-4 Initial Tangent Modulus for EPS geof foam



Lightweight Fill Alternatives and Costs

1. <u>Granular</u>	<u>Unit Weight (pcf)</u>	<u>Cost (\$/c.y.)</u>
Wood Fiber	35-60	9-15
Blast Furnace Slag	70-95	6-15
Fly Ash	70-90	11-16
Boiler Slag	65-110	2-3
Expanded Clay or Shale	35-65	30-42
Shredded Tires	35-55	15-23
<u>Cohesive</u>	<u>Unit Weight (pcf)</u>	<u>Cost (\$/c.y.)</u>
Foamed Concrete	20-50	40-70
EPS Geofoam	1-2	100-140

EPS Geofoam in Action!

EPS Geofoam In Action!

- After years of searching for permanent solutions to failing slope problems, the New York State DOT and the Alabama DOT turned to EPS Geofoam. By replacing upper sections of the slide area, State engineers significantly reduced the driving forces that were causing the slide and successfully rehabilitated the roadway section

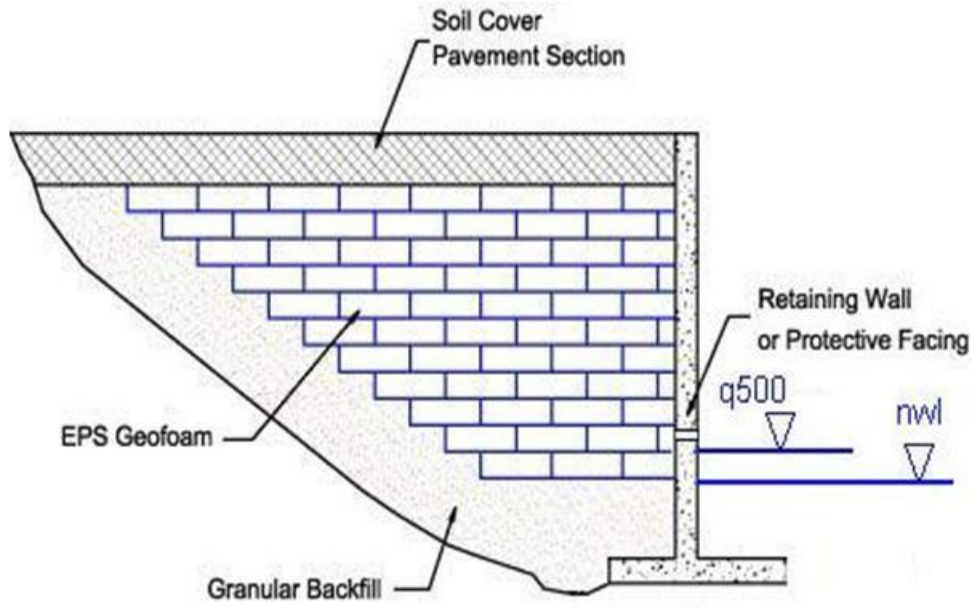
Delivery to Job-site



EPS Geofoam In Action!

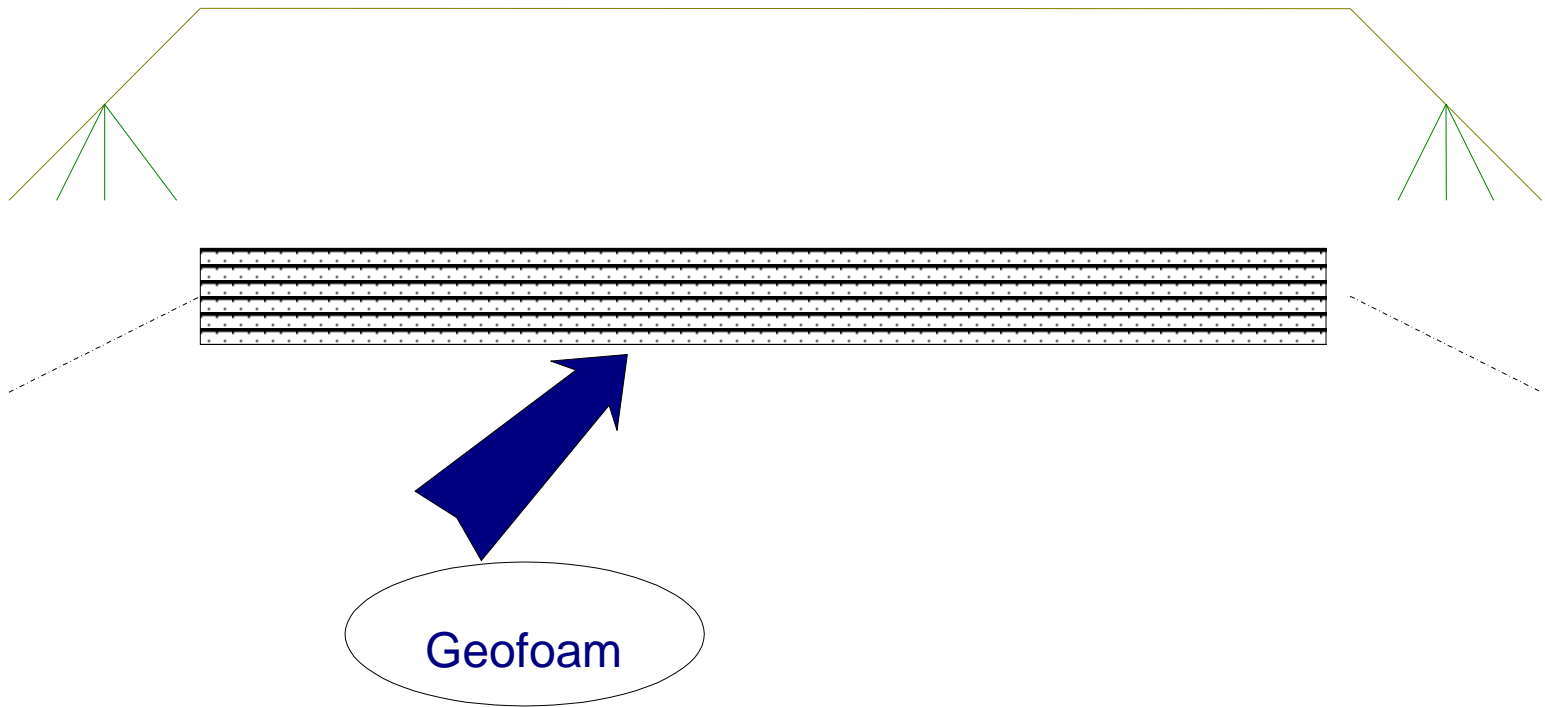


- The Big Dig in Massachusetts, I-15 in Utah, and the Woodrow Wilson Bridge in Virginia utilized EPS Geofoam to construct large embankment sections
- EPS Geofoam helped the projects maintain extremely tight construction schedules that would not have allowed enough time for conventional embankment construction
- Both projects illustrated the ease and speed with which EPS Geofoam can be constructed for highway embankments



Basic Design

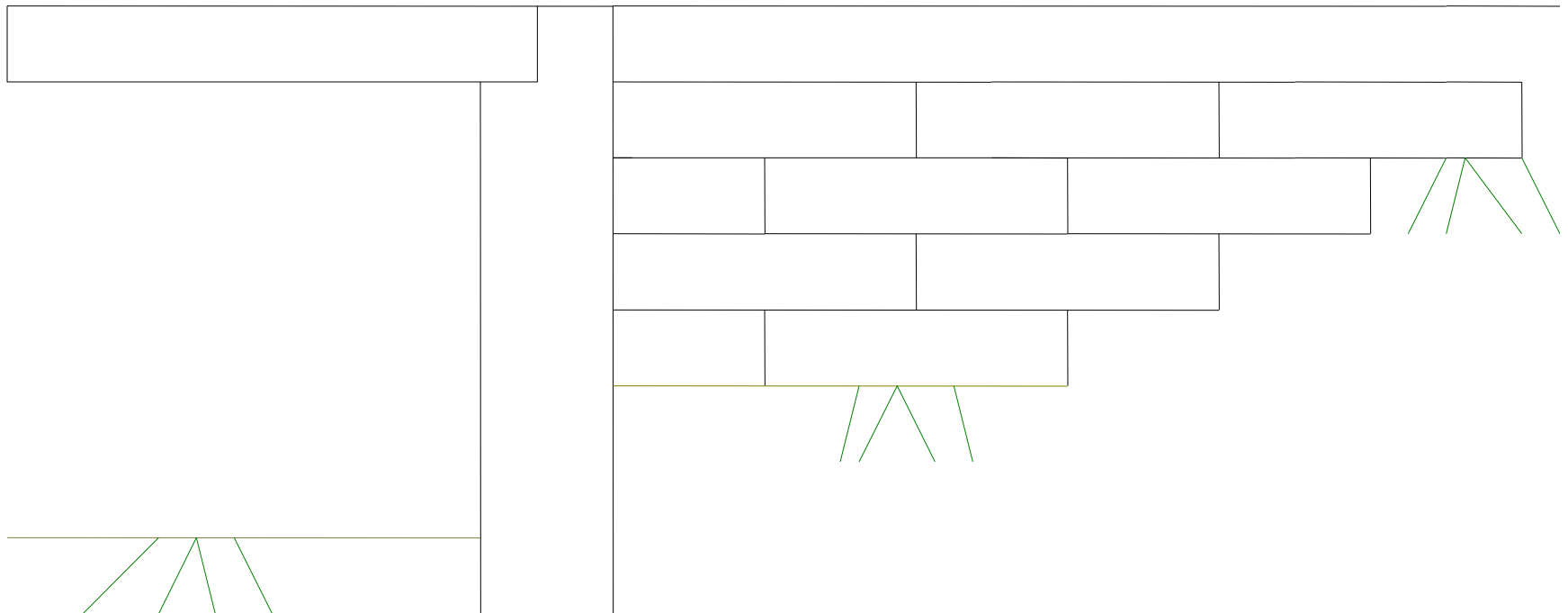
Roadway



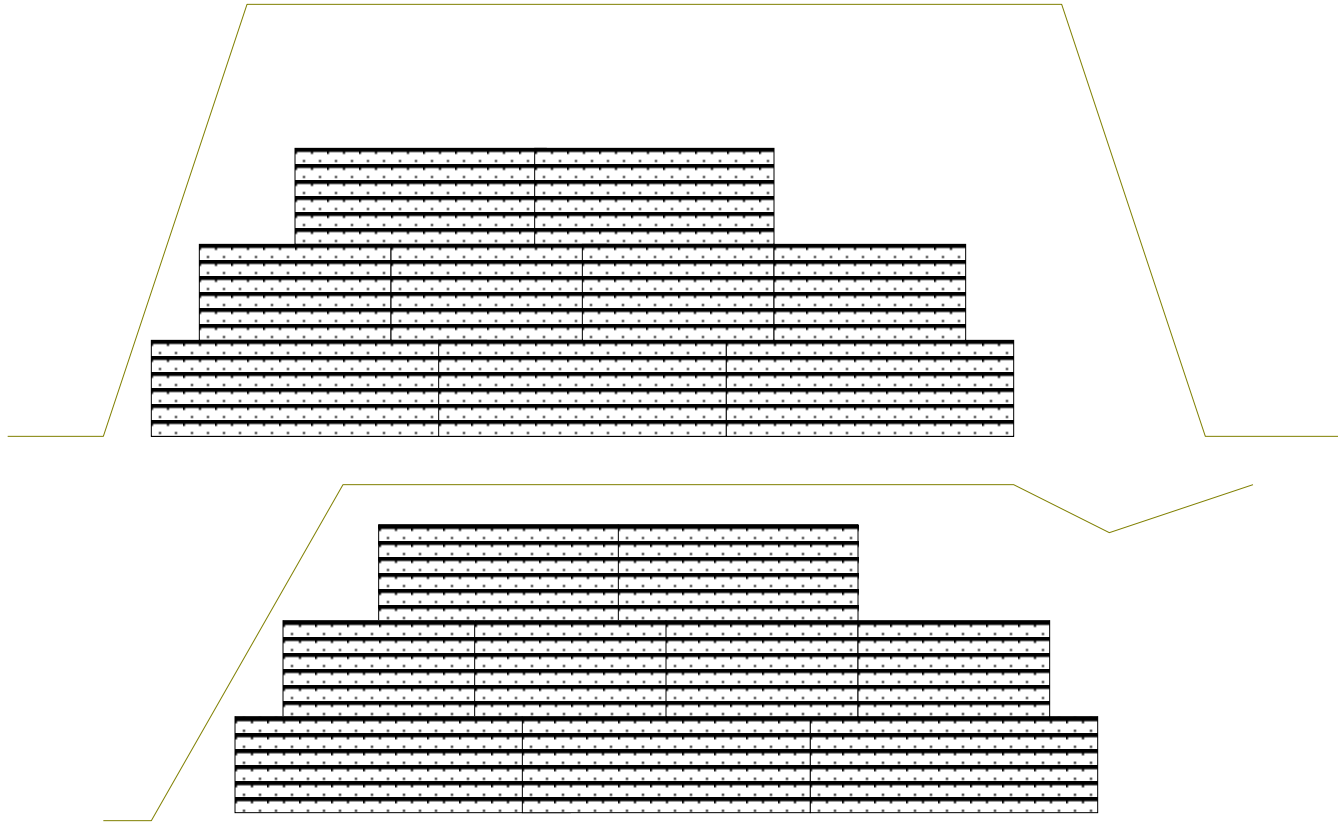
Retaining Walls

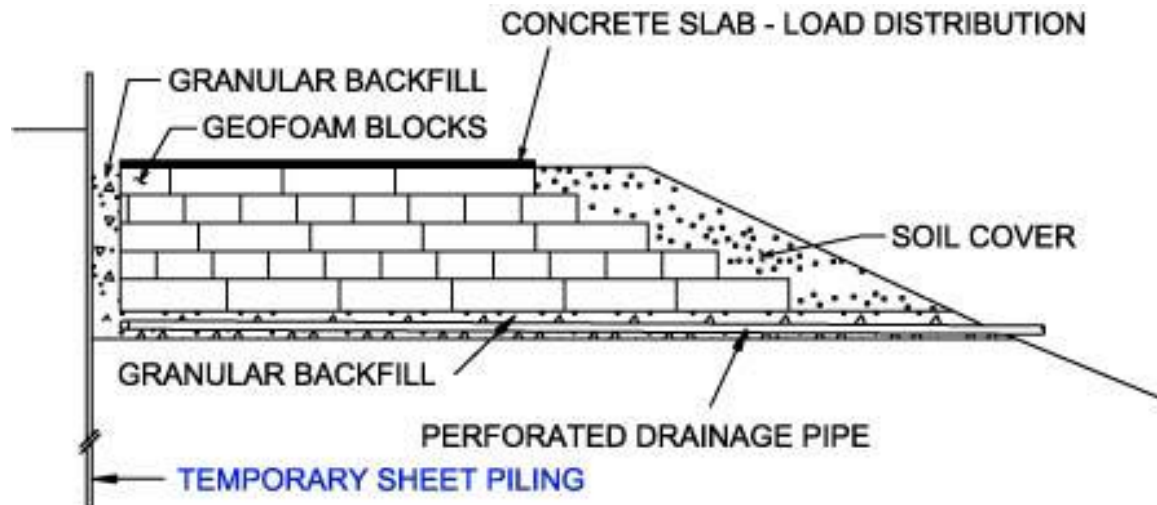
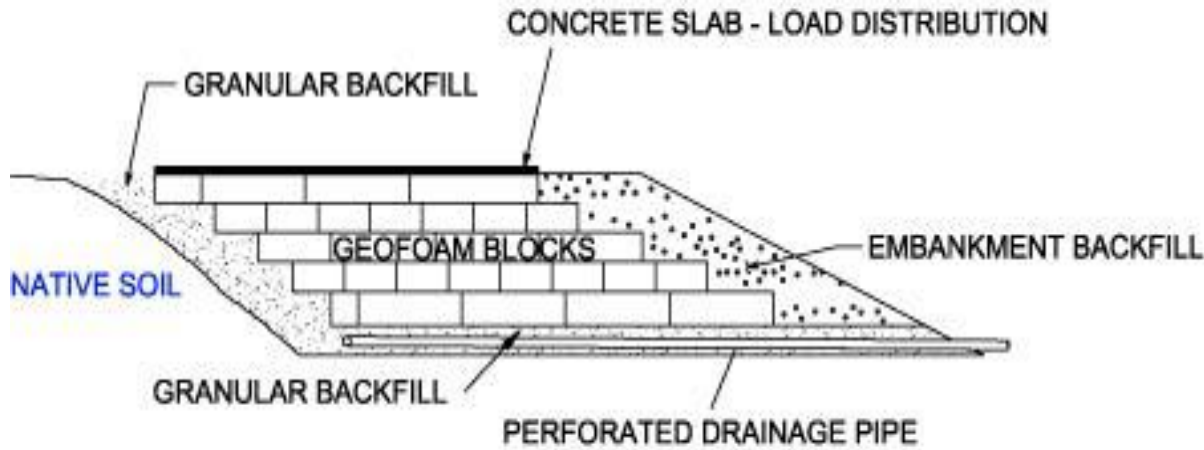


Bridge Abutments/Approach Fills

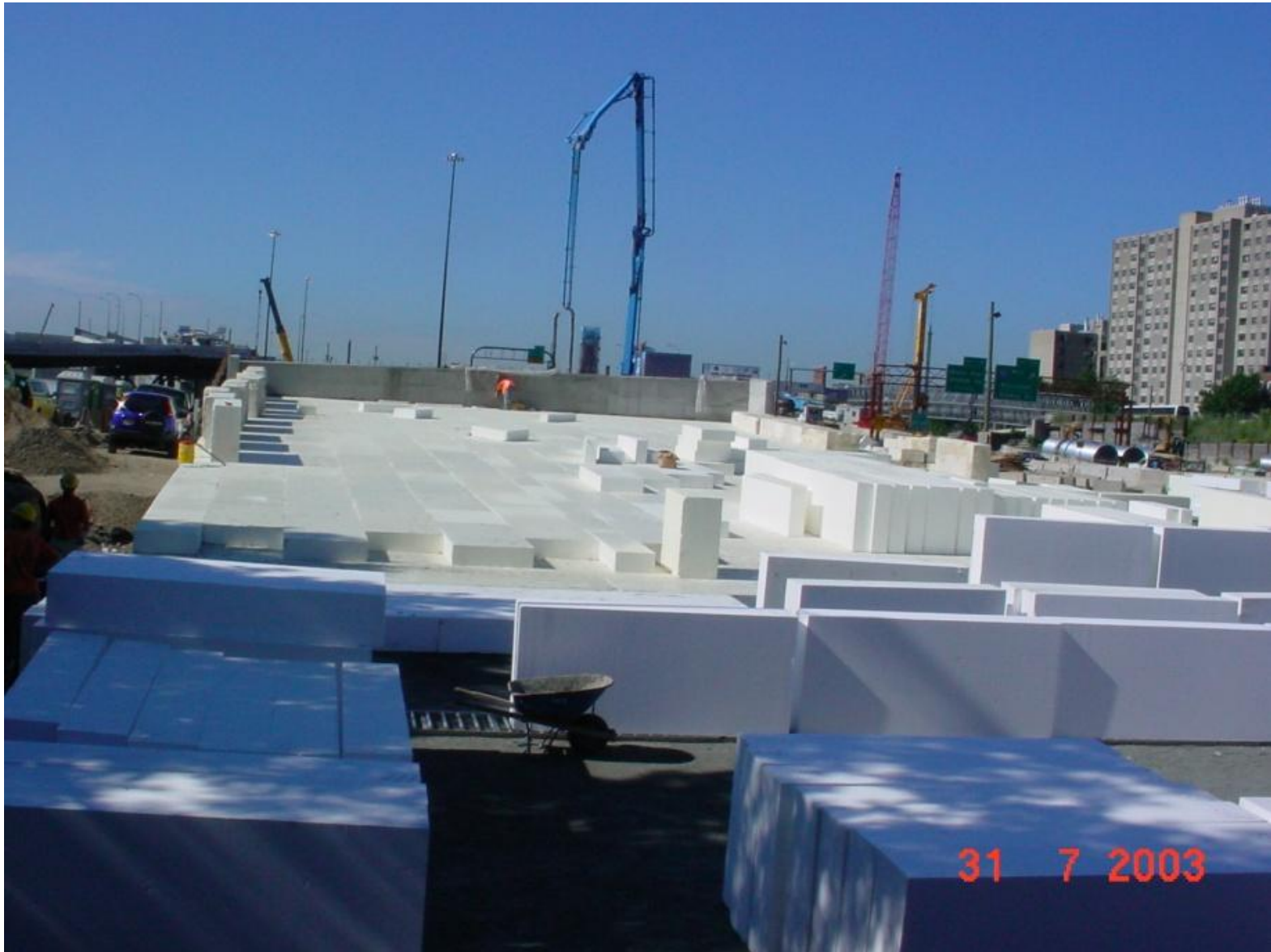


ULTRA-LIGHTWEIGHT FILL FUNCTION





Boston, MA – The Big Dig



Boston, MA – The Big Dig





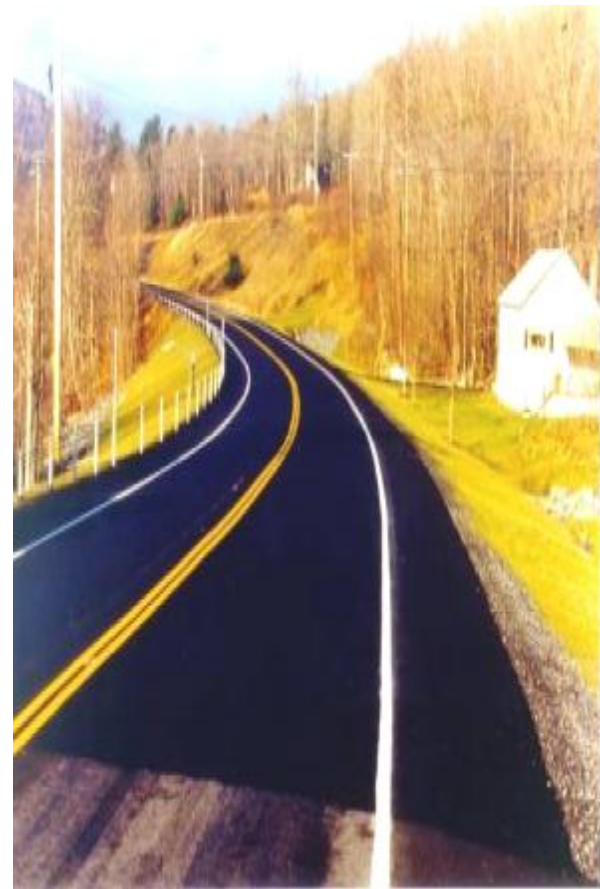
Adding Geosynthetic
Liner and Covering Fill



Route 23A – Greene County, NY



Before

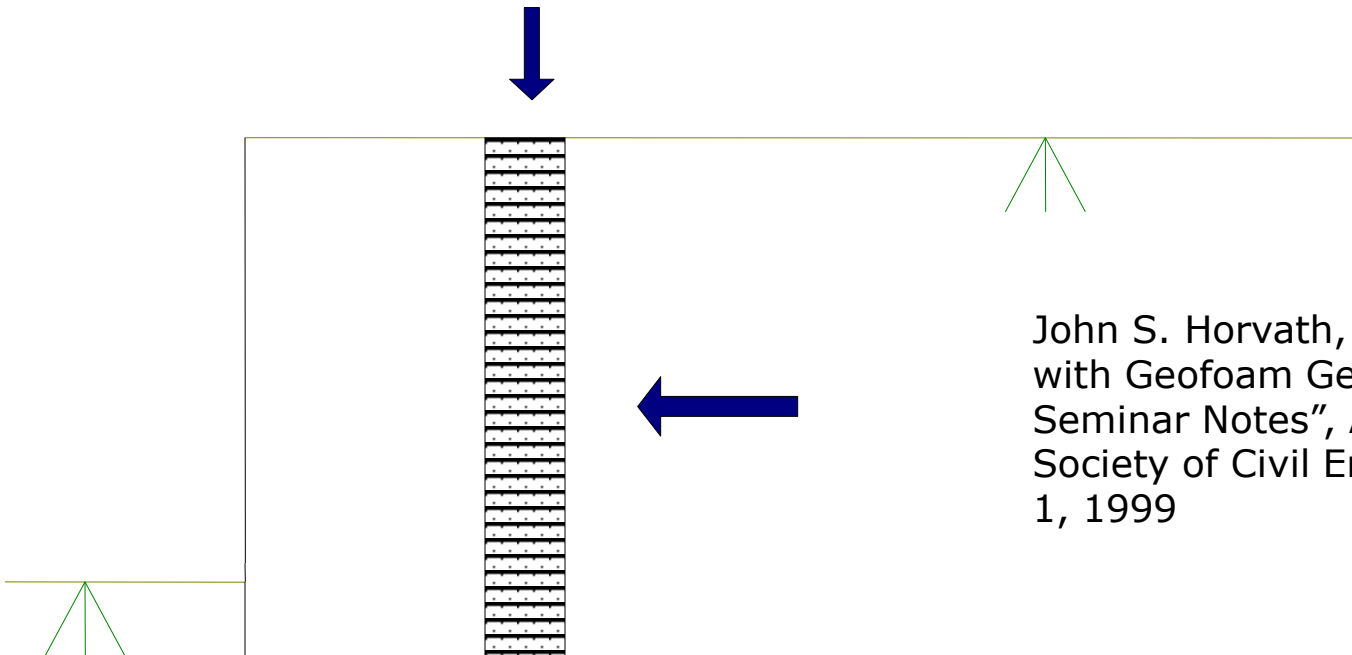


After

COMPRESSIBLE INCLUSION FUNCTION

Elasticized EPS

Reduced Earth Pressure Wall Concept



John S. Horvath, "Designing with Geofom Geosynthetic Seminar Notes", American Society of Civil Engineers, Dec. 1, 1999

Questions?