

Product Information Bulletin

Plasti-Fab® EPS Geofoam Applications

Introduction:

Plasti-Fab manufactures moulded expanded polystyrene (EPS) products that have been used successfully in a wide variety of geotechnical applications for more than 45 years. This bulletin provides an introduction to typical design considerations for geotechnical applications.

EPS performance properties that may be considered based upon application requirements include:

- Compressive resistance
- Flexural strength
- Thermal resistance
- Moisture resistance
- Water vapour permeance
- Freeze-thaw performance
- Drainage capabilities
- Resistance to vermin attacks
- Protection from ultraviolet light
- Chemical resistance

Table 1 below addresses some of the typical design considerations for Plasti-Fab EPS geofoam product with a brief highlight of the applicable properties.

Table 1 – Typical Design Considerations

Design Consideration	Material Property Discussion
Compressive resistance	Considered when used as a component in an application that will be subjected to structural load – e.g. road construction, structural slab, etc. (see PIB 1015)
Compressibility	Considered when used as a component in an application where EPS geofoam may be required to support a structural load initially, but act as a compressible medium on the long term – e.g., EPS compressible material between structural slab, grade beam, etc. supported on pile foundation and expansive soils below (see PIB 277)
Lateral load	Considered when EPS geofoam is used as backfill behind a vertical structure – e.g. retaining walls, bridge abutments, etc. – to reduce lateral load (PIB 1013).
Poisson's Ratio	Low Poisson's ratio for EPS geofoam considered used as backfill behind a vertical structure – e.g. retaining walls, bridge abutments, etc. – and reduction in lateral load transferred to the structure is a consideration (see PIB 277).
Lightweight	Typical EPS geofoam unit weights of 11 to 46 kg/m ³ (0.70 to 2.80 pcf) offer a range of compressive characteristics to meet project design loads while reducing dead load of backfill on underlying soils, structures and utilities (see PIB 1015).
Stability	EPS is inert to a wide range of chemicals. It has no food value and will not support the growth of insects, parasites or animal and plant life.
Insulation	The thermal resistance (RSI/R-value) is an inherent characteristic of EPS insulation is typically used for both above and below grade building applications, but is not always a primary consideration for geofoam applications (see PIB 1006 and 1016).
Buoyancy	Since EPS geofoam is a lightweight closed cell foam plastic, buoyancy effects must be considered and suitable drainage measures taken if there is any possibility of flooding (see PIB 1002).
Water Absorption	The closed cell structure of EPS resists water absorption. Moisture gain in long term exposure will typically be minimal .

EPS Geofoam Reference Standards:

The EPS industry standards that address material properties of EPS insulation used for geotechnical applications are:

1. **Canadian building code references:**

CAN/ULC-S701.1, ***Standard for Thermal Insulation, Polystyrene, Boards*** (formerly CAN/ULC-S701)

Plasti-Fab Product Information Bulletin No. 1006 provides material properties for the ***PlastiSpan*** insulation types addressed by this standard typically used for geotechnical applications.

2. **US building code references:**

ASTM C578, ***Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation***

Plasti-Fab Product Information Bulletin No. 1016 provides material properties for the ***PlastiSpan*** insulation types addressed by this specification typically used for geotechnical applications.

Consensus-based documents that specifically address EPS geofoam requirements are:

1. ASTM D6817, ***Standard Specification for Rigid Cellular Polystyrene Geofoam***

Plasti-Fab Product Information Bulletin 1015 provides material properties of the ***GeoSpec*** geofoam types addressed by this specification.

2. ASTM D7180, ***Standard Guide for Use of Expanded Polystyrene (EPS) Geofoam in Geotechnical Projects***

Guide provides the basic considerations for the use of expanded polystyrene (EPS) geofoam in geotechnical projects.

3. ASTM D7557, ***Standard Practice for Sampling of Expanded Polystyrene Geofoam Specimens***

EPS Geofoam Technical Resources:

EPS geofoam has been in use around the world since the early 1960's. Technical papers on a wide variety of EPS geofoam applications have been published at international symposiums held in various locations around the world. The most recent symposium was the 4th International Conference on the use of EPS geofoam in construction applications held in Norway in 2011.

John Horvath, Ph. D., PE has been involved in EPS geofoam research since 1980. He has published two monographs regarding EPS geofoam material properties and design considerations:

1. ***Geofoam Geosynthetic***, published 1995.

2. ***Lateral Reduction on Earth-Retaining Structures Using Geofoam***, published 2018.

The United States Transportation Research Board of the National Academies through the National Cooperative Highway Research Program (NCHRP) has worked with academia at US colleges to conduct research on EPS geofoam design requirements. Two products of this research have been:

1. NCHRP Report 529: ***Guideline and Recommended Standard for Geofoam Applications in Highway Embankments***: A design guideline for EPS geofoam use in the construction of highway embankments.

2. NCHRP Research Results Digest 380: ***Guidelines for Geofoam Applications in Slope Stability Projects***: Addresses design requirements for the use of EPS geofoam for slope stabilization projects in new roadways as well as for repair of existing roadways that have been damaged by slope instability or slope movement

Copies of both of these documents are available for download from the Transportation Research Board website at www.trb.org/NCHRP/NCHRP.aspx.