

TECHNICAL BULLETIN

# EPS Geofoam Installation Fire Safety

Expanded polystyrene (EPS) foam used in geofoam fill applications provides significant benefits such as its light weight, resistance to compression, speed of installation, and cost effectiveness. Like most materials, it must be handled and installed correctly to avoid posing any unexpected risk.

Like other materials used in the construction of roads or buildings, EPS foam is combustible. To mitigate this risk, the EPS foam used in geofoam applications is formulated with a flame retardant. Nonetheless, care must be taken in using open flames, welding torches or spark-generating equipment in the vicinity of the EPS geofoam during installation.

## Pentane In EPS

EPS foam is converted from a solid resin bead to a foam block using a blowing agent, pentane, during the expansion and molding phases of manufacture. About 80% of the pentane is released from the foam during manufacture and continues to decline as the block ages.

Most of the remaining pentane gradually diffuses out of the foam in the weeks following manufacture. The rate of this diffusion depends on the time since manufacture, ambient temperature, air circulation around the foam, and the thickness of the EPS geofoam block. It is impossible to predict the amount of pentane that may be present in or around the EPS foam during its installation on a geofoam jobsite.

To understand how to properly handle and install EPS geofoam, it is important to know some critical properties of the pentane that may be diffusing out of the foam. Pentane is a clear, colorless liquid with a mild gasoline odor. However, it does not exist in this form in the EPS foam; it is dissolved in the plastic and gradually diffuses as a vapor out of the foam.

Residual pentane may form ignitable vapor/air mixtures in fully or partially enclosed spaces, tanks or vaults. Avoiding sources of ignition, such as smoking, open flames, or hot work tasks, as well as spark-producing equipment are important safeguards when working where pentane vapor may be present.



## Physical Properties of Pentane<sup>1</sup>

Property	Value	For Comparison	What It Means
Boiling Point	97°F (36°C)	Water: 212°F (100°C)	Pentane is volatile
Vapor Density	2.48	Air: 1	Pentane vapor is heavier than air and settles in low-lying areas lacking air circulation
Flammable Range	LEL 1.5% UEL 7.8%	Gasoline: 1.2-7.1%	Between the Lower (LEL) and Upper (UEL) Explosive Limit, pentane can burn or explode if an ignition source is present

## Managing the Risk - Installing & Using EPS Geofoam Safely

EPS geofoam can be used in a variety of transportation applications, such as roadway and bridge construction, pavement insulation, and soil embankment stabilization. It is also used in building construction to level and stabilize foundations, as well as a void fill in concrete vaults.

Precautions may be necessary in all of these applications as the geofoam is confined and buried in a vault or trench or below grade. In these confined, low-lying areas the potential exists for pentane vapor accumulation. As there are often other construction activities occurring in and around the geofoam during its installation, the risk exists for hot work or ignition sources to be present particularly in construction trades that are not familiar with the pentane hazard associated with EPS geofoam.

Unless an LEL gas meter is used to measure the concentration of pentane in the vicinity of the EPS geofoam, precautions should be taken assuming pentane vapor is present. Note that pentane vapor can migrate to low-lying areas of stagnant air some distance from the EPS foam.



Important safety guidelines<sup>2</sup> include:

- Store the EPS blocks in a secure, well-ventilated area to allow for dispersal of any pentane vapors prior to geofoam installation.
- Put signage warning of the hazard around storage and installation areas.
- Prohibit smoking or any other ignition sources near the EPS block storage and staging area at the job site.
- Keep all sources of ignition away from the installed geofoam area, such as:
  - Welding
  - Open flames
  - Cutting torches
  - Cutting or grinding tools
  - Sources of static or electrical discharge
- If the EPS geofoam is encased in a pentane impervious vault or container, recognize that any penetrations, i.e., columns, pipes, conduit, etc., may serve to ventilate accumulated pentane to the surrounding environment and create a dangerous pentane/air mixture in the vicinity. Extra precautions including measurements and/or intentional ventilation should be considered before working in the area.

Note: It is the responsibility of the managing contractor to establish and enforce the proper safety guidelines for the installation and use of EPS geofoam. The information provided herein is meant to provide guidance but cannot be considered exhaustive, as the specific nature of the EPS geofoam application must be considered.

## References

<sup>1</sup> New Jersey Department of Health, Right to Know, *Hazardous Substance Fact Sheet - Pentane*, June 2009, <https://nj.gov/health/eoh/rtkweb/documents/fs/1476.pdf>

<sup>2</sup> WorkSafeBC, *WorkSafe Bulletin: Reducing the risk of pentane gas fires and explosions for users of expanded polystyrene foam*, WS 2018-04, 2018, <https://www.worksafebc.com/en/resources/health-safety/hazard-alerts/reducing-risk-of-pentane-gas-fires-and-explosions-for-users-of-expanded-polystyrene-foam?lang=en>