WorkSafe Bulletin

Reducing the risk of pentane gas fires and explosions for users of expanded polystyrene foam

Expanded polystyrene (EPS) foam releases flammable pentane gas. If the pentane has not completely off-gassed and the EPS foam is encased within a structure, the pentane becomes trapped within the structure. If an ignition source, such as a welding torch or drill, cuts into the structure, the pentane can ignite and cause a fire or explosion. This bulletin gives an overview of EPS foam and its uses, explains the pentane gas hazard, and discusses steps you can take as an employer to reduce the risk of fires and explosions.

Expanded polystyrene is a synthetic foam material that has a wide range of uses in industry. EPS foam releases pentane, a highly flammable gas. While most pentane will off-gas during manufacturing, some residual pentane remains and continues to off-gas for a period of time after manufacturing. Off-gassing often continues after the foam blocks are shipped to customers.

EPS foam blocks may be used within enclosed structures and forms. The residual pentane can continue to off-gas from the EPS foam while inside the enclosed structure.

If the structure is then exposed to a source of ignition, such as a drill or a welding or cutting torch, the trapped pentane could ignite. This can lead to a fire or explosion and result in serious injuries or fatalities.

Typical uses of EPS foam

EPS foam is typically distributed in large blocks. The blocks are often custom-moulded or cut into shapes for many different uses.

To help you determine if you have EPS foam on your worksite, here are some of its more common uses:

- Wharf and float manufacturing
- Flotation components in pontoons, marinas, boats, jet skis, and surfboards
- Insulated concrete formwork (ICF) for buildings
- Insulation for buildings, especially cold storage buildings, piping, and rendered wall systems
- Lightweight core or fill (geofoam) used in the construction of roadways, insulated pavement, embankments, and bridges
- Decorative architectural mouldings for buildings and other structures
- Various applications on movie sets and in amusement parks
- Insulation for wine tanks

When does EPS foam become safe?

Manufacturers should, and generally do, build in a period for off-gassing that will reduce the amount of pentane within the EPS foam before shipping. Despite this, residual amounts of pentane remain in shipped EPS foam blocks and other products.

The off-gassing time for any particular foam block depends on many factors, including the size, density, and type of EPS, as well as the manufacturing and storage conditions.

Unless you determine through testing that the pentane is completely off-gassed, you will not know whether some residual pentane remains.

Some products manufactured from EPS, such as coolers, silviculture trays, and takeout food containers, are not generally enclosed in airtight structures. As a result, they are able to safely off-gas.

How to reduce the risk

As an employer, you can reduce the risk of pentane gas fires or explosions by following these safe work practices:

- Find out if you have EPS foam at your worksite. Foam manufacturers and suppliers in B.C. generally provide a safety data sheet (SDS) to clients. If in doubt, ask your suppliers.
- If you have EPS foam, ensure it is located in a well-ventilated area where it can safely off-gas.
- Put up signage at or near the location of the EPS foam, and make sure all workers know the importance of not encasing it.
- When doing hot work (such as welding or hot wire cutting) on or near EPS foam or products containing it, take the following precautions:
  - Allow for additional space and do the work outside if possible.
  - Use appropriate personal protective equipment, such as flame-resistant apparel.
  - Minimize the number of workers in the area at the time the hot work is being done.
- If it is absolutely necessary to encase EPS foam, allow it sufficient time to off-gas before encasing it. If EPS foam is already encased in a structure, you won't be able to tell if the foam had time to off-gas before it was encased. In either case, ensure that:
  - Ignition sources are prevented from coming near the structure encasing the EPS foam.
  - No hot work is done on these structures.

Legal and regulatory requirements

Under **section 120** of the *Workers Compensation Act*, suppliers are required to label any chemical agent they supply and to provide directions for its safe use.

Additional requirements related to EPS foam and pentane can be found in the Occupational Health and Safety Regulation and its related guidelines (available on **worksafebc.com**), including the following sections:

- **Section 4.13, Risk assessment**
- **Section 4.14, Emergency procedures**
- **Section 4.16(1), Training** (in fire prevention and emergency evacuation procedures)
- **Section 5.27, Ignition sources**
- **Section 12.116, Flammable and explosive substances**

Resources

- **Explosion or fire of pentane released from expandable polystyrene (EPS) foam blocks** (WorkSafeBC)
- **Fire and explosion risks from pentane in expandable polystyrene (EPS)** (Health and Safety Executive, UK)