

IN-T-O-U-G-H

INFORMATION ON

FLEXIBLE POLYURETHANE FOAM

Proper Handling and Storage of Flexible Polyurethane Foam

Flexible polyurethane foam is an organic material and is combustible like all organic materials. Organic materials include a wide variety of substances like wood, wool, paper, cotton, nylon, polyester, and polyethylene.

Polyurethane foam, once ignited, can burn rapidly, consuming oxygen at a high rate and generating great heat. Like any other organic material, when it ignites and burns, polyurethane foam liberates smoke containing toxic gases, the primary one being carbon monoxide. Hazardous gases released by burning foam can be incapacitating or fatal to human beings if inhaled in sufficient quantities. Oxygen depletion in an enclosed space can present a danger of suffocation.

Therefore, fire safety is critical in relation to any storage and handling of flexible polyurethane foam.

Foam should not be exposed to open flames or other direct or indirect high-temperature ignition sources such as burning cigarettes, matches, fireplaces, space heaters, forklift tailpipes, welding sparks, or bare light bulbs.

Foam is often stored in large quantities. Foam fabricators may keep large blocks of foam in inventory. Finished goods

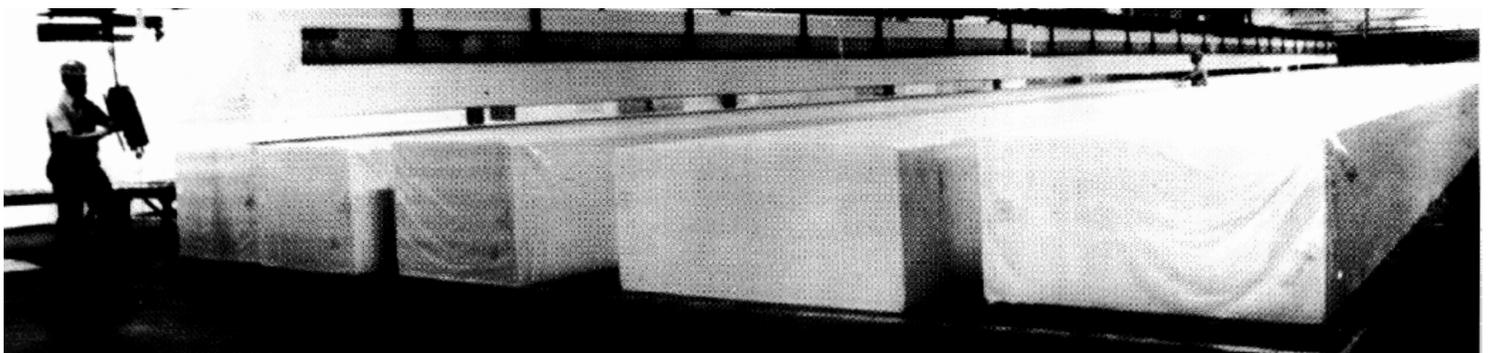
manufacturers may store individual cushions or cores for use in products such as furniture, bedding, packaging, or automobiles. Retailers and wholesalers may warehouse quantities of slab foam for resale to customers, or in the form of products such as replacement parts or carpet cushion.

As with any combustible material, proper care must be taken with foam to minimize potential fire hazards. Even foams formulated to meet specific flammability regulations will burn, including those foams specifically identified as meeting flammability requirements. Safe and proper storage and handling of the material is essential.

Different business will face different foam storage situations, depending on the amount of foam they use and the manner in which it is stored.

Storage and Handling in Foam Manufacturing and Fabrication Operations

Foam manufacturing and fabrication companies are likely to inventory the largest quantities of flexible polyurethane foam. Depending on the size of a particular manufacturing or fabrication operation, small pieces of foam or large "bun" sections containing hundreds of cubic feet of foam may be stored.



Large amounts of foam represent a significant fuel source for a fire. Flexible polyurethane fires generally tend to create very high temperatures - high enough to damage steel framework of buildings if enough of a fuel load is involved. Once ignited, foam fires can spread rapidly, producing intense heat, dense smoke, flammable liquids, and toxic gases.

Therefore, **all areas where significant amounts of foam are stored should be protected by automatic sprinkler systems.** Many fire districts and insurance policies require sprinklers.

In fact, all storage areas for flexible polyurethane foam should be analyzed for three key principles of fire safety:

- **Detection**, by using smoke detectors and/or other devices.
- **Alarm**, to alert people in case of fire, so employees can exit the building and safety crews can respond.
- **Suppression**, via sprinklers, fire extinguishers, fire doors, and other methods.

Foam and fabricated parts should be stored away from fabrication operations, machinery, or other sources that have the potential to cause ignition. In some cases, insurance carriers require a fire wall between storage and fabrication areas. Scrap foam should not be allowed to accumulate.

Welding operations are a frequent but avoidable cause of many fires in manufacturing operations. Whether performed by employees or outside contractors, these operations are often subject

to strict insurance company guidelines, and extreme caution should be taken if heat or sparks could be generated around flexible polyurethane foam. Plant supervisors should be notified before welding or cutting takes place, so that proper precautions can be administered.

| Commodity | Approximate Storage Height, ft. (m) | Approximate Clearance Sprinkler to Storage, ft. (m) | Density gpm/ft ² (mm/min) | Area of Demand, ft ² (m ²) | Sprinkler Temperature Rating, °F (°C) | Minimum Orifice Size, in. (mm) |
|-------------------|-------------------------------------|---|--------------------------------------|---|---------------------------------------|--------------------------------|
| Polyurethane Foam | 5 (1.5) | 10 (3) | 0.30 (12) | 2000 (186) 3500 (325) | 286 (141.1) 165 (73.8) | 1/2 (13) |
| | 10 (3) | 10 (3) | 0.60 (24) | 3000 (279) 5000 (464) | 286 (141.1) 165 (73.8) | |
| | 15 (4.6) | 10 (3) | 0.60 (24) | 5000 (464) | 286 (141.1) | 17/31 (14) |

Some foam fabrication processes, such as hot wire cutting, bonding or laminating can also pose potential fire hazards. Caution should be exercised when engaging in the processes.

FME&R recommendations for sprinkler coverage for palletized, solid pile, and shelf storage of flexible polyurethane foam.

In certain fabrication processes, potentially dangerous fumes are emitted which should be exhausted through properly engineered ventilation systems. The fabricator should be guided by a Materials Safety Data Sheet, or MSDS, from his foam supplier to determine the proper procedures for handling the foam and to be aware of any special handling requirements in the fabrication steps.

Factory Mutual Engineering and Research (FME&R) recommends the following storage heights and sprinkler coverage.



Many foam suppliers offer quick delivery programs that reduce the quantities of foam a manufacturer stores for production requirements. Keeping the volume of stored foam to a minimum is another important approach to safety in storing and handling foam.

Avoidable Danger: Fires From Smoking

Cigarette smoking is still the most common cause of fires in the home. The furniture industry, through its Upholstered Furniture Action Council (UFAC) program, has taken voluntary steps to minimize danger by making finished furniture resistant to ignition by smoldering cigarettes. Within the bedding industry, the Federal Flammability Standard mandates that all mattresses be resistant to cigarette ignition.

Carelessness with cigarettes is a very real danger in foam storage and handling. Virtually all foam plants ban smoking, and cigarette smoking should be avoided anywhere flexible polyurethane foam is being handled or stored. A smoldering fire started by a cigarette may not be immediately detected, and such fires pose tremendous danger. Simply put, there should be no smoking around foam.

Storage and Handling in Finished Goods Manufacturing Operations

Finished goods manufacturers, such as furniture and bedding producers, will usually keep smaller amounts of foam than fabricators, but these amounts may still warrant storage and handling procedures similar to that of the foam manufacturer or fabricators. In fact, FME&R recommends that storage of large quantities of covered polyurethane foam mattresses be protected in the same manner as "raw" polyurethane foam. Even in minimal quantities, it is recommended that foam be stored in a fully sprinklered area.

Foam is a difficult material for most manufacturers to warehouse because of its bulk. The foam industry has traditionally provided a variety of quick shipment or "just-in-time" delivery systems to provide manufacturers with the quantities of foam they need for production. In such cases, shipments of foam are usually quickly dispersed through a manufacturing plant to assembly locations and customers.

This combination of smaller shipments and quick dispersal can minimize storage of raw foam and reduce the finished goods manufacturer's need to provide protected areas.

These types of program offer convenience, but they can be just as important for helping manufacturers improve plant safety through proper handling of flexible foam and other materials.

Storage and Handling in Wholesale or Retail Operations

Wholesale and retail operations, such as upholstery businesses, distributors, carpet dealers, or fabric shops may store flexible polyurethane foam in the form of spare parts, cut cushions, slabs, or carpet underlay. While quantities may be either small or large, care must be taken to avoid possible fire safety problems.

For example, one carpet dealer suffered a fire loss when stacked rolls of cushion inadvertently came in contact with an uncovered light bulb. Foam should be kept away from any ignition source such as smoking materials, naked lights, heating equipment, forklift tailpipes, sparks or open flames.

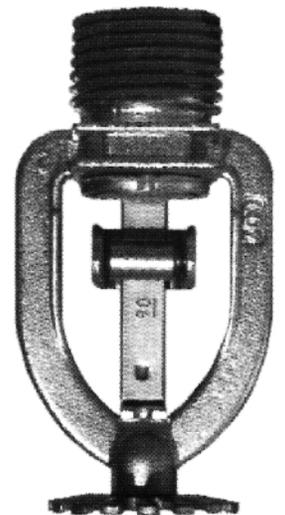
Again, foam should be stored in areas that are protected by fire sprinkler systems.

In Case A Fire Does Occur

Should a fire involving flexible polyurethane foam occur, evacuate the building immediately. Contact the local fire department and leave the fire fighting to the fire safety professionals.

Firefighters should drench burning foam with water with a spray nozzle. Firefighters should use self-contained breathing apparatus in areas where foam is burning. Manual firefighting may be difficult due to dense smoke and gases.

Automatic sprinkler systems are the best suppression protection device against fire. They should be used in any situation where large quantities of combustibles (foams or other materials) are present.



When flexible polyurethane foam is properly stored and protected, the risk of fire can be minimized. It is critical that proper caution be used to make sure that foam does not come into contact with potential ignition sources, and that all management and employees be properly instructed on safety procedures regarding foam and other combustible materials.

Flexible polyurethane foam suppliers can provide additional information on proper safety procedures, as can local fire safety officials and insurance company guidelines.

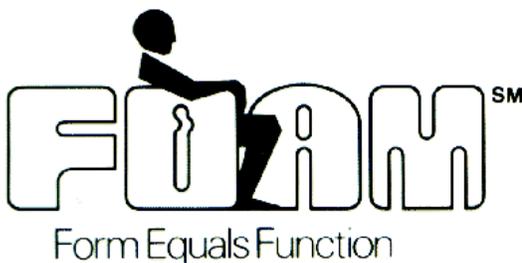
Summary

- ▶ 1. Like all organic materials, flexible polyurethane foam is a combustible material that requires proper care and attention to minimize fire hazards in storage and handling.
- ▶ 2. All areas where foam is handled or stored should be analyzed for the three basic principles of fire safety: detection, alarm, and suppression.
- ▶ 3. It is strongly recommended that all areas where foam is stored or handled be protected by automatic sprinkler systems.
- ▶ 4. Flexible polyurethane foam should not be exposed to open flames or other direct or indirect high-temperature ignition sources such as burning cigarettes, matches, fireplaces, space heaters, forklift tailpipes, welding sparks, or uncovered lights.
- ▶ 5. Foam suppliers, fire safety officials, and insurance companies can provide additional information to individual businesses on safety practices regarding flexible polyurethane foam.

This information is provided as a service of the Polyurethane Foam Association to improve the understanding of key issues that affect flexible polyurethane foam cushioning. To learn more about specific foams, contact your foam supplier.

This bulletin is intended to serve as a reference regarding the general properties and uses of polyurethane foam, and has been developed as a service for the Polyurethane Foam Association's (PFA) members and their customers. The information contained in this bulletin is offered in good faith, developed from sources to be reliable, and believed to be accurate when prepared, but is offered without warranty, express or implied, as to merchantability, fitness for a particular purpose, or any other matter. The PFA and its members disclaim all responsibility for any loss or damage arising from reliance on such information by any party. This bulletin is not intended to be all inclusive on any subject matter. The PFA makes no endorsements, assurances, warranties or guarantees concerning the quality, uses, or applications of polyurethane foam or specific products produced from polyurethane foam. PFA does not endorse the proprietary products or processes of any manufacturer. PFA and its members do not assume any responsibility for compliance with applicable laws and regulations. The PFA makes no representations regarding the combustibility of polyurethane foam under different applications or in different formulations. It is the responsibility of readers and purchasers or users of polyurethane foam to acquaint themselves with its combustibility characteristics both as to usage and storage, and any questions concerning applications and the combustibility of polyurethane foam must be directed to individual foam manufacturers or suppliers.

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