



# Loss Control TIPS

## Technical Information Paper Series

*Innovative Safety and Health Solutions<sup>SM</sup>*

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## Special Building Material: Cellular Plastic Insulation

### Introduction

The term *cellular plastic* is used to describe a range of materials with widely varying properties and fields of application.

Virtually any polymer, thermoplastic, or thermoset can be made into a cellular or foamed form. Cellular plastics can be produced in the forms of slabs, blocks, boards, sheets, molded shapes, and sprayed coatings. Some can also be foamed-in-place in open cavities.

Cellular plastics are also referred to as *expanded* or *foamed* plastics. Polystyrene, polyurethane, and polyisocyanurate are most commonly used for interior insulation in construction.

Foamed plastics have gained wide acceptance in the building construction industry because of their excellent thermal insulation properties. These plastics are derived from petroleum based materials and are organic chemical compounds; thus, foamed plastics will burn under certain conditions.

### Large Fire Losses

Foamed plastic insulation was a contributing factor in these fires:

- A fire seriously damaged a one story, 60,000 sq. ft., agricultural packing and cold storage facility. The facility was under construction at the time of the fire, and investigators believe that an on-site electrician may have caused a short circuit in the fixed wiring. The short circuit ignited foam insulation in the ground level electrical and mechanical room, causing \$10 million in physical damages.
- A commercial fishing vessel at a waterfront pier complex caught on fire while the ship was undergoing final construction stages. Hot slag from a welding operation ignited foam insulation, which spread heavy smoke throughout the superstructure, and resulted in \$20 million in damages.

## Hazards Associated with Cellular Plastic Insulation

The primary fire hazards associated with cellular plastic insulation when used in buildings are:

- **Ignition and Rate of Burning.** Generally, plastics tend to have a higher ignition temperature (e.g., polyurethane, 600F°-700°F; polystyrene, 900F°-950F°) than wood and other cellulosic products. Some are easily ignited with a small flame and burn vigorously. Very high surface flame spread rates have been reported: up to two feet per second, or 10 times the rate of flame spread across most wood surfaces.
- **Smoke Development.** The burning of some plastics is characterized by the rapid generation of copious amounts of very dense, black smoke. Smoke development can be an important factor for life safety and in damages to susceptible contents, machinery, and equipment.
- **Toxic Gases.** Any fire will generate lethal combustion products, principally carbon monoxide. Depending on the plastics, highly toxic gases, such as hydrogen cyanide, hydrogen chloride, and phosgene, may also evolve.
- **Flaming Drips.** Plastic tends to melt and flow when heated. In a fire, this characteristic may produce flaming and tar-like dripping, which is difficult to extinguish, and which may start secondary fires.

## Controlling Risks

When an exposed foamed plastic is used as an interior building insulation, consider and evaluate the following factors:

- **Information about the material used.** Find out what materials are in your building. Procure labeling information as to the type of foam, name of manufacturer, and Underwriter's Laboratories listing (which identifies the flame spread and smoke developed ratings).
- **Extent of and location of material.** Determine the location and thickness of the foamed plastic, and protective sheathing (thermal barrier), if applicable. In multi-story buildings, does exposed foam insulation communicate from floor to floor?
- **Presence and extent of protective sheathing.** Determine the presence and extent of protective sheathing, if any. Does the protective sheathing extend into concealed spaces, like dropped ceiling areas? (In other words, is foamed plastic located in concealed spaces adequately protected?)
- **Presence of electrical wiring.** Electrical wiring imbedded in the plastic may overheat unless it is specially designed for such installations.

Exposed cellular plastics used for interior insulation in buildings should either be *removed* or should be protected by an *acceptable thermal barrier*. A thermal barrier is a fire resistant application that is placed over the exposed interior foamed plastic.

Among several acceptable thermal barriers for interior exposure of foam plastics are:

- 1/2" gypsum board
- 1/2" gypsum plaster on metal lathe
- 5/8" Portland cement on metal lathe
- Zonolite 3300
- URE-K
- Foam Koat
- Durespray

Consult the plastic manufacturer to find out which thermal barrier would be the most effective for the specific type of plastic.

## References

1. Cohn, Bert M. "Plastics and Rubber," in *Fire Protection Handbook*, 18th ed., ed. by Arthur E. Cote, et al. (Section 4, Chapter 10) Quincy, Mass: National Fire Protection Association, c1997.
2. "Construction: Special Building Materials," in *Property Technical Resource Manual*. (Section C-I.1) Hartford, Conn: Hartford Insurance Group, Loss Control Department, c1992-1997.
3. Fire, Frank L. *Combustibility of Plastics*. New York: Van Nostrand Reinhold, 1991.

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