CHEMICAL BLOWING AGENT USE AND STORAGE

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1.0 SCOPE

This data sheet covers the use and storage of chemical blowing agents.

This data sheet does not address the following subjects:

A. Manufacturing of chemical blowing agents. See Data Sheet 7-46, *Chemical Reactors and Reactions*, and Data Sheet 7-111, *Chemical Process Industries*.

B. Classification of ignitable liquids. See Data Sheet 7-32A, *Ignitable Liquid Evaluation and Classification*.

C. Dispensing, transferring, and use of ignitable liquids. See Data Sheet 7-32, *Ignitable Liquid Operations*.

D. Storage of ignitable liquids. See Data Sheet 7-29, *Ignitable Liquid Storage in Portable Containers*.

E. Storage and handling of flammable gases. See Data Sheet 7-50, *Compressed Gases in Cylinders and Bulk Storage* or Data Sheet 7-55, *Liquified Petroleum Gas (LPG) Storage in Stationary Installations*.

F. Storage and handling of organic peroxides or other oxidizing materials. See Data Sheet 7-80, *Organic Peroxides and Oxidizing Materials*.

G. Processes that mix chemical blowing agents with oxidizers.

1.1 Hazard

Chemical blowing agents are used to create cellular structures in materials like plastics and foams by generating gas during use. Chemical blowing agents decompose or react chemically to release gases such as nitrogen, carbon dioxide, or ammonia. These agents are often used in thermoplastics and elastomers, offering more uniform cell structures and compatibility with various processing conditions.

The primary hazards of chemical blowing agents are flammability and explosion, typically driven by runaway exothermic decomposition, dust combustion during handling, or the release of flammable gases during the foaming process.

1.1 Changes

October 2026. This document has been completely revised. Significant changes include the following:

A. Changed title to *Chemical Blowing Agent Use and Storage* (from *Blowing Agents*).

B. The scope of the data sheet has been revised to include only the use and storage of chemical blowing agents. The manufacturing of chemical blowing agents has been removed. Physical blowing agents, which are ignitable liquids or flammable gases, are no longer included in this standard.

C. The classification groups for chemical blowing agents have been revised. The current document includes five groups, while the previous revision had three groups.

The table below compares the current and previous classification groups for the blowing agents included in the prior revision.

CAS Number	*Chemical Name*	*Group (New)*	*Group (Previous)*
123-77-3	Azodicarbonamide	C	C
78-67-1	2,2’-Azobisisobutyronitrile	A	B
80-51-3	4,4’-Oxybis (benzenesulfonyl hydrazide)	B	B
101-25-7	Dinitrosopentamethylenetetramine	A	A
133-55-1	N, N’-dimethyl-N, N’ - dinitrosoterephthalamide	B	A

D. Recommendations for damage-limiting construction (DLC) have been updated in Section 2.2. Group A and some Group B blowing agents can now be stored in detached buildings with minimum space separation in lieu of DLC. Guidance has been added on how to properly design DLC.

E. Recommendations for protection have been revised for both use and storage areas in Section 2.4. Protection options have been added, including guidance for rack storage of Group C, Group D and Group E blowing agents.

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F. Recommendations for rated electrical equipment have been revised in Section 2.9.1. The updated guidance includes more specific information on the required ratings and the locations where rated electrical equipment is needed.

2.0 LOSS PREVENTION RECOMMENDATIONS

2.1 Introduction

Use FM Approved equipment, materials and services whenever they are applicable and available. For a list of products and services that are FM Approved, see the *Approval Guide*, an online resource of FM Approvals.

2.1.1 General

2.1.1.1 Evaluate and protect combustible dust exposures in accordance with Data Sheet 7-76, *Combustible Dusts*.

2.1.1.2 Design, install and protect ovens and dryers in accordance with Data Sheet 6-9, *Industrial Ovens and Dryers*.

2.1.1.3 Design, install and protect exhaust ducts in accordance with Data Sheet 7-78, *Industrial Exhaust Systems*.

2.1.2 Classification

2.1.2.1 Classify chemical blowing agents in accordance with the following groups.

- **Group A -** Thermally unstable materials that can undergo strong exothermic decomposition reactions. These materials need to be refrigerated and generally have a self-accelerating decomposition temperature (SADT) less than or equal to 120°F (50°C). Due to the decomposition reaction expected, an overpressure event is possible in a storage room. The products of decomposition may include flammable gases.
- **Group B -** Thermally unstable materials that can undergo exothermic decomposition reactions. These materials generally have an SADT greater than 120°F (50°C). If decomposition gases are flammable, a room explosion hazard is possible in a storage room.
- **Group C -** Self-reactive solids that may undergo an exothermic decomposition reaction when exposed to heat or flame. Materials in this group can be easily ignited, burn rapidly and form explosive dust-air mixtures.
- **Group D -** Flammable solids that may present a combustible dust hazard. These materials are not self-reactive and do not undergo significant exothermic decomposition under normal storage conditions.
- **Group E -** Noncombustible solids that do not present a combustible dust or dust explosion hazard. These materials are thermally stable under normal storage conditions and are not expected to contribute significantly to fire growth or explosion hazards.

See Section 3.2 for more information on classification, including the groups for commonly used chemical blowing agents.

2.2 Construction and Location

2.2.1 Locate and construct cutoff rooms and attached or detached storage areas in accordance with Figure 2.2.1 and the recommendations in this section.

2.2.2 For all Group A blowing agents, and for Group B blowing agents that produce flammable decomposition gases, when stored in detached buildings, provide a minimum separation distance of 50 ft (15 m) from important buildings and critical equipment.

2.2.2.1 Construct detached buildings using noncombustible, lightweight construction.

2.2.2.2 Where the separation distance is less than 50 ft (15 m), provide DLC designed in accordance with Data Sheet 1-44, *Damage-Limiting Construction,* using Fuel Group B.

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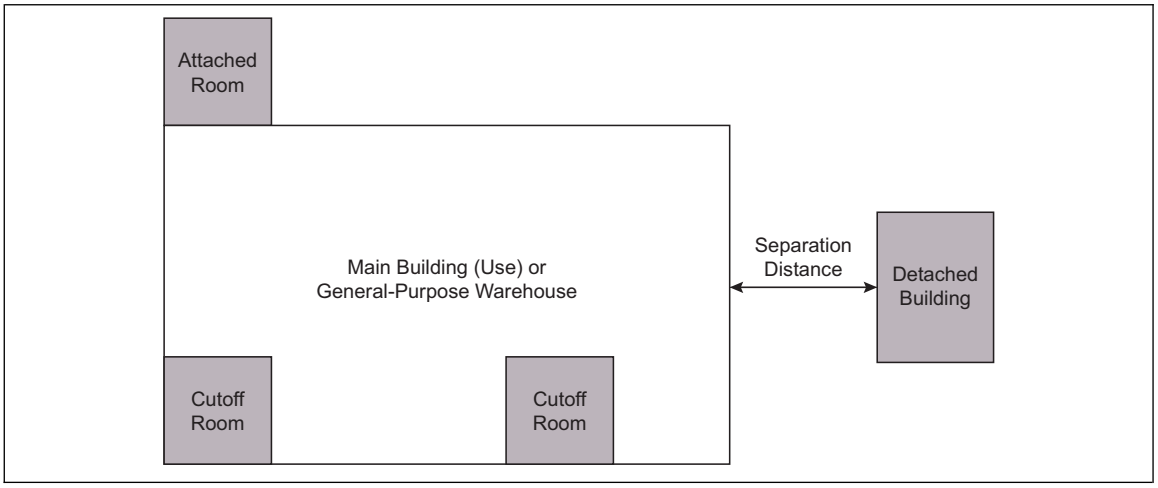


Fig. 2.2.1. Locations for chemical blowing agent storage

2.2.3 For all Group A blowing agents and for Group B blowing agents that produce flammable decomposition gases, when stored in attached rooms or cutoff rooms, do both of the following:

A. Provide DLC designed in accordance with Data Sheet 1-44 using Fuel Group B.

B. Provide noncombustible, two-hour fire-rated walls per ASTM E1529, *Standard Test Methods for Determining Effects of Large Hydrocarbon Pool Fires on Structural Members and Assemblies*.

2.2.4 For Group B blowing agents that do not produce flammable decomposition gases, and Group C or Group D blowing agents stored in attached rooms or cutoff rooms, provide non-combustible, one-hour fire rated walls per ASTM E119, *Standard Test Methods for Fire Tests of Building Construction and Materials*, or local equivalent.

2.2.5 For Group E blowing agents, provide noncombustible construction.

2.2.6 Protect interior openings with a properly fire-rated, normally closed, automatically closing, FM Approved fire door, installed on the storage side of the wall.

2.2.7 Locate all storage at ground level.

2.3 Occupancy

2.3.1 Storage Arrangements

2.3.1.1 Limit the storage of blowing agents to the quantities listed in Table 2.3.1.1, depending on the group and location.

Table 2.3.1.1 Quantity Limits for Chemical Blowing Agent Storage

Classification Group	*Main Building (Use Area) (Note 1)*	*Attached Room or Cutoff Room (lb [kg])*	*Detached Building [lb (kg)]*	*General-Purpose Warehouse*
A	Immediate Needs	2,000 (900)	100,000 (45,000)	Not allowed
B	Shift Supply	50,000 (22,500)	1,000,000 (450,000)	Not allowed
C	Shift Supply	Unlimited	Unlimited	Unlimited
D	One Day Supply	Unlimited	Unlimited	Unlimited
E	Unlimited	Unlimited	Unlimited	Unlimited

Note 1. Immediate needs can be determined by the amount of material used for one batch. For a shift supply, the limit would be the amount of material used for all of the batches manufactured during one shift.

2.3.1.2 For use areas, arrange the blowing agents as follows and as shown in Figure 2.3.1.2.

2.3.1.2.1 Store in palletized or solid-piled arrangements.

2.3.1.2.2 Limit height to maximum 5 ft (1.5 m).

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2.3.1.2.3 Limit footprint to maximum 64 ft^2 (6 m^2) (approximately four pallets).

2.3.1.2.4 Provide separation distances as follows:

A. Minimum 4 in (0.1 m) between pallets
B. Minimum 8 ft (2.4 m) around pallets
C. Minimum 2 ft (0.6 m) between the pallet and the wall

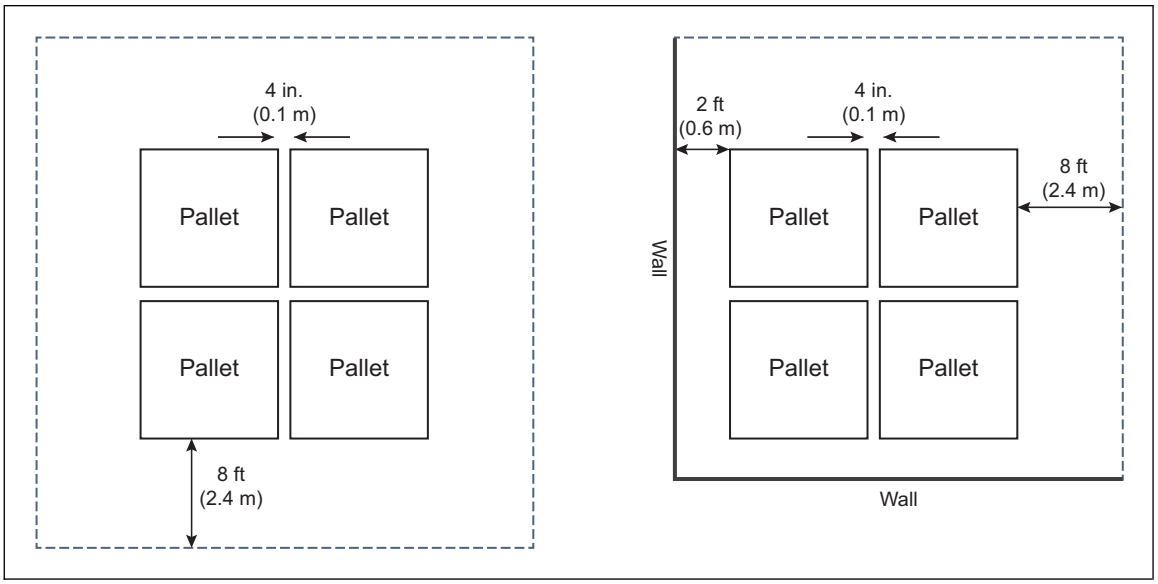


Fig. 2.3.1.2. Storage arrangement in use areas - Plan View

2.3.1.3 For storage areas, arrange the blowing agents in accordance with Table 2.3.1.3:

Table 2.3.1.3. Storage Limitations for Blowing Agents in Storage Areas

Classification Group	*Allowable Storage Arrangement*	*Maximum Storage Height (ft [m])*
A	Palletized or solid-piled	5 (1.5)
B	Palletized or solid-piled	10 (3.0)
C or D	Palletized, solid-piled or rack storage	10 (3.0)
E	Palletized, solid-piled or rack storage	Any

2.3.1.4 Store and handle blowing agents in cool, dry, well-ventilated areas.

2.3.1.4.1 Provide storage areas with natural ventilation.

2.3.1.5 Store blowing agents in original shipping containers, provided by manufacturers and approved for transportation.

2.3.1.6 Store blowing agents within the temperature range specified by the manufacturer.

2.3.1.6.1 Store away from heat sources, including direct sunlight.

2.3.1.7 Use pallets that are clean and free of oil or combustible substances or materials.

2.3.1.8 Use clean, compatible tools and equipment for handling.

2.3.1.9 Keep containers securely closed in storage areas to prevent contamination.

2.3.2 Housekeeping

2.3.2.1 Keep use and storage areas clean and free of combustible materials.

2.3.2.2 Remove leaking or broken containers immediately, and clean any spills.

2.3.2.3 Avoid accumulation of empty containers in use or storage areas.

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2.3.2.4 Follow manufacturer's instructions for cleanup and disposal procedures, including spill cleanup, disposal of unused or contaminated materials, and disposal of empty containers.

2.4 Protection

2.4.1 Install automatic sprinklers in accordance with Data Sheet 2-0, *Installation Guidelines for Automatic Sprinklers*.

2.4.2 Provide protection for use areas as an HC-3 occupancy in accordance with Data Sheet 3-26, *Fire Protection for Nonstorage Occupancies*.

2.4.3 Provide automatic sprinkler protection for storage areas in accordance with Table 2.4.3.

Table 2.4.3. Protection for Chemical Blowing Agent Storage Areas

Classification Group	*Maximum Storage Height (ft [m])*	*Sprinkler Temp Rating*	*Type of System*	*Density (gpm/ft^2 [mm/min])*	*Demand Area (ft^2 [m^2])*
A	5 (1.5)	N/A (open nozzles)	Deluge	0.6 (24)	Entire Area
B	5 (1.5)	N/A (open nozzles)	Deluge	0.6 (24)	Entire Area
	10 (3.0)	N/A (open nozzles)	Deluge	0.9 (37)	Entire Area
C or D	10 (3.0)	Protect by packaging materials (per Data Sheet 8-9) as follows: • Treat products stored in plastic containers or plastic bags as Uncartoned Unexpanded Plastic (UUP). • Treat products stored in non-plastic containers, such as fiber drums or boxes, as Cartoned Unexpanded Plastic (CUP).			
E	Any	Provide sprinkler protection designed for the surrounding occupancy, but not less than 0.2 gpm/ft^2 (8 mm/min).			

2.4.4 Provide a 500 gpm (1900 L/min) hose stream allowance.

2.4.5 Design the water supply to provide full demand for 60 minutes.

2.5 Equipment and Processes

2.5.1 Provide stock rotation procedures (first-in, first-out) for storage areas to prevent material decomposition due to long storage periods.

2.5.2 For blowing agents requiring refrigeration, arrange the storage area as follows:

2.5.2.1 Provide a temperature monitoring system and a minimum of two independent temperature alarms set at the emergency temperature of the materials.

2.5.2.2 Design the system to alarm to a constantly attended location.

2.5.2.3 Provide an independent dual power supply for the alarm system.

2.5.2.4 Provide a minimum of two independent refrigeration systems, with one serving as a backup.

2.5.3 Provide an emergency control system to monitor temperature and pressure set points in process equipment.

2.5.3.1 Interlock the system to shut down when the setpoint is reached.

2.5.4 For all equipment containing Group A blowing agents and Group B blowing agents that produce flammable decomposition gases, provide ventilation in accordance with Data Sheet 6-9.

2.5.4.1 Use the expected flammable gas generation rates to calculate the ventilation.

2.5.4.2 Ensure the enclosure is maintained at maximum 25% of the lower explosive limit (LEL).

2.5.5 For all closed equipment containing Group A blowing agents and Group B blowing agents that produce flammable decomposition gases, provide one of the following:

A. Explosion vents designed in accordance with Data Sheet 1-44 using Fuel Group B

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B. An inerting system designed in accordance with Data Sheet 7-59, *Inerting and Purging Vessels and Equipment*

C. Other equivalent means

2.6 Operation and Maintenance

2.6.1 Provide an inspection, testing and maintenance program for alarms and temperature indicators in accordance with Data Sheet 7-45, *Safety Controls, Alarms and Interlocks (SCAI)*.

2.7 Training

2.7.1 Create a training program for all employees who work in or have access to areas containing or using chemical blowing agents. At a minimum, include the following:

- Hazards and hazard classifications
- Handling and storage procedures
- Cleanup and disposal procedures
- Normal and emergency procedures

2.7.2 Provide training for new employees (including operators, emergency response team members and security personnel), as well as refresher programs for current employees.

2.8 Human Factor

2.8.1 Implement management of change procedures to review and evaluate any changes to blowing agents, equipment, processes or storage conditions in accordance with Data Sheet 7-43, *Process Safety*.

2.8.2 Create an emergency response plan in accordance with Data Sheet 10-1, *Pre-Incident and Emergency Response Planning*. Include actions for areas where temperature control is required.

2.8.3 Prohibit hot work operations in areas containing Group A or Group B blowing agents. Relocate hot work operations to a nonhazardous location.

2.8.3.1 Hot work operations in areas containing Group C, Group D or Group E blowing agents are acceptable only when conducted in accordance with Data Sheet 10-3, *Hot Work Management*.

2.8.3.2 Prohibit smoking in all areas where blowing agents are present.

2.9 Ignition Source Control

2.9.1 Provide FM Approved, hazardous location-rated electrical equipment in accordance with Table 2.9.1 and Data Sheet 5-1, *Electrical Equipment in Hazardous (Classified) Locations*.

Table 2.9.1. Electrical Equipment Ratings

Classification Group	*Location (Note 1)*	*Required Rating*
A, B, C or D	Use areas - immediate loading areas	Class II, Division 1, Group G OR Zone 20 or 21, Group IIIA or IIIB
	Use areas – surrounding areas	Class II, Division 2, Group G OR Zone 22, Group IIIA or IIIB
	All other areas, including storage	Ordinary
E	Any	Ordinary

Note 1. Immediate loading areas are locations where dust would be expected during typical loading operations. Surrounding areas are locations that would be exposed to a dust hazard during an upset condition.

2.9.2 Electrically bond and ground equipment handling blowing agents in accordance with Data Sheet 5-8, *Static Electricity*.

2.9.3 Isolate blowing agents from all sources of ignition, such as open flames, electrical devices, heating equipment and sparking tools.

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2.9.4 Provide lightning protection in accordance with Data Sheet 5-11, *Lightning and Surge Protection for Electrical Systems*.

2.9.5 In areas where flammable gases can be present, including finished product areas, provide rated electrical equipment in accordance with Data Sheet 5-1.

3.0 SUPPORT FOR RECOMMENDATIONS

Chemical blowing agents are materials used to produce cellular or foamed structures by releasing gases during decomposition. Typically supplied as fine powders or additives that are readily dispersed within a polymer, they generate gases such as nitrogen, carbon dioxide, or ammonia when heated, creating a uniform foam structure that reduces density and can improve properties such as thermal insulation, cushioning and elasticity.

The decomposition process is generally controllable, allowing gas generation to be tailored for specific manufacturing applications, including plastic molding and rubber processing. Most chemical blowing agents produce predominantly nitrogen, which can help reduce flame propagation of the released gases. Many leave a solid residue that is compatible with the finished product. The ability of chemical blowing agents to generate gas without the need for high-pressure equipment makes them widely used in polymer processing and foam manufacturing.

3.1 Types of Chemical Blowing Agents

Chemical blowing agents fall into two main categories - organic and inorganic. Organic chemical blowing agents primarily consist of elements such as carbon, hydrogen and nitrogen. They undergo exothermic decomposition, releasing heat as they break down. Their reactions typically generate nitrogen (N_2) as the primary gas, along with possible secondary gases such as carbon monoxide (CO) and ammonia (NH_3), depending on the specific chemical structure and temperature conditions. This high energy decomposition produces large gas volumes and supports the formation of fine, uniform foam cells used in closed cell foams and various engineered polymers. However, because the reactions release heat, the process requires precise temperature control to avoid thermal runaway.

The exothermic reactions increase the risk of overheating, and the formation of potentially harmful byproducts such as CO and NH_3 introduces significant respiratory and environmental concerns. Some organic systems also exhibit stability or handling risks due to their reactive functional groups, making their safe use highly dependent on controlled processing conditions. Although they offer superior control over foam structure, these agents require more stringent safeguards due to their higher thermal and chemical hazard potential.

Inorganic chemical blowing agents primarily consist of inorganic compounds such as carbonates and bicarbonates that undergo endothermic decomposition. Their decomposition generally yields carbon dioxide (CO_2) and water vapor, producing a controlled expansion effect suited for applications such as open cell foams and rubber sponges. Because these reactions are endothermic, they are inherently easier to regulate, reducing the probability of overheating during processing.

In terms of hazards, inorganic blowing agents present a comparatively low risk profile. Their decomposition gases—primarily CO_2—are less toxic than the mixed gases produced by many organic alternatives. However, one drawback is that some inorganic blowing agents exhibit limited long term storage stability; as they can prematurely decompose under unfavorable environmental conditions. This instability can cause processing inconsistencies, such as early gas release or foam collapse. Despite this drawback, their mild reaction products and lower thermal hazards make inorganic agents a safe and predictable choice for foam forming processes.

3.2 Classification of Chemical Blowing Agents

Chemical blowing agents can present a range of fire, explosion, and decomposition hazards, depending on their chemical composition, thermal stability and transportation classification. To support hazard-based protection and storage requirements, these materials can be categorized into Groups A through E, with Group A representing the highest level of thermal instability and Group E representing the lowest hazard.

The most hazardous blowing agents are typically classified for transportation as UN Class 4.1 self-reactive substances, including Type C and Type D self-reactive materials. These products can undergo exothermic decomposition reactions that generate large volumes of gas and heat, potentially resulting in pressure explosions, fires or self-accelerating decomposition if exposed to elevated temperatures. Many also present

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combustible dust hazards when handled in powder form. As the hazard level decreases, materials may be classified as flammable solids with reduced self-reactivity but continued fire and dust explosion potential. At the lowest hazard level are noncombustible or otherwise stable blowing agents. The classification scheme is intended to provide a practical method for evaluating chemical blowing agents based on their decomposition behavior, explosion potential, flammability, combustible dust characteristics and transportation classifications.

The classifications for commonly used chemical blowing agents are listed in Table 3.2.

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Table 3.2. Classifications of Common Chemical Blowing Agents

CAS Number	*Chemical Name*	*Abbreviation*	*Classification Group*	*Hazard Type*
123-77-3	Azodicarbonamide	ADC, ADCA, ADA	C	Self-Reactive
78-67-1	2,2'-Azobisisobutyronitrile	AIBN	A	Self-Reactive
80-51-3	4,4'-Oxybis (benzenesulfonyl hydrazide)	OBSH	B	Self-Reactive
80-17-1	Benzene-1,3-disulfonyl hydrazide	BDSH	B	Self-Reactive
1576-35-8	p-Toluene Sulfonyl Hydrazide	TSH, PTSH	B	Self-Reactive
13472-08-7	2,2'-Azobis (2-methylbutyronitrile)	AMBN	A	Self-Reactive
4419-11-8	2,2'-Azobis (2,4-dimethylvaleronitrile)	ACHN, ABCN	A	Self-Reactive
2094-98-6	1,1'-Azobis (cyclohexanecarbonitrile)	ABCNH, ACHC	B	Self-Reactive
2997-92-4	2,2'-Azobis (2-methylpropionamidine) HCl	AIBA·HCl	B	Self-Reactive
2638-94-0	4,4'-Azobis (4-cyanovaleric acid)	ACVA	A	Self-Reactive
15545-97-8	2,2'-Azobis (2,4,4-trimethylpentanenitrile)	ABMPN	A	Self-Reactive
20858-12-2	Benzene sulfonyl semicarbazide	BSSC	B	Self-Reactive
61551-69-7	4,4'-Oxydibenzene sulfonyl semicarbazide	OBSSC, ODSSC	B	Self-Reactive
2589-57-3	2,2'-Azobis (2-methylpropionohydrazide)	AAPH	B	Self-Reactive
101-25-7	Dinitrosopentamethylenetetramine	DNPT, DPT	A	Self-Reactive
133-55-1	N, N'-dimethyl-N, N' -dinitrosoterephthalamide	NTA	B	Self-Reactive
10396-10-8	p-Toluene Sulfonyl Semicarbazide	PTSS, TSSC	D	Flammable Solid
18039-42-4	5-Phenyltetrazole	5-PT, PTZ	D	Flammable Solid
144-55-8	Sodium Bicarbonate ($NaHCO_3$)		E	Noncombustible
1066-33-7	Ammonium Bicarbonate (NH_4HCO_3)		E	Noncombustible
513-77-9	Barium Carbonate		E	Noncombustible
506-87-6	Ammonium Carbonate		E	Noncombustible
1336-21-6	Ammonium Hydroxide		E	Noncombustible
13446-48-5	Ammonium Nitrite		E	Noncombustible
471-34-1	Calcium Carbonate		E	Noncombustible

3.3 Processes that Use Chemical Blowing Agents

3.3.1 Plastics

Plastics are the largest application for chemical blowing agents, which are widely used to create controlled cellular structures in materials such as polyvinylchloride (PVC), polyethylene (PE), polypropylene (PP), and expanded polystyrene (EPS). These agents enable manufacturers to produce lightweight, insulating, and structurally adaptable foam plastics. In PVC, they support both soft and rigid foam products. In PE and PP, they are used for packaging, cushioning, flotation and automotive components. In EPS, newer blended systems combining chemical and physical methods improve environmental performance while enhancing foam strength.

3.3.2 Rubber

Chemical blowing agents used in rubber products help lower material density while maintaining elasticity, enabling a wide range of performance enhancing applications. In tires, blowing agents such as DNPT form closed cell structures within cushion and airtight layers, improving shock absorption, airtightness, and reducing overall weight. In sealing applications, blowing agents used in rubber compounds promote cellular structures that enhance compression recovery and durability, supporting long lasting performance in components like gaskets and automotive seals. In everyday rubber goods, the use of blowing agents enables

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lightweight, porous structures in items such as footwear, improving comfort, slip resistance, and breathability. In products like medical gloves, controlled foaming reduces hardness and enhances

4.0 REFERENCES

4.1 FM

Data Sheet 1-44, *Damage-Limiting Construction*
Data Sheet 2-0, *Installation Guidelines for Automatic Sprinklers*
Data Sheet 3-26, *Fire Protection for Nonstorage Occupancies*
Data Sheet 5-1, *Electrical Equipment in Hazardous (Classified) Locations*
Data Sheet 5-8, *Static Electricity*
Data Sheet 5-11, *Lightning and Surge Protection for Electrical Systems*
Data Sheet 6-9, *Industrial Ovens and Dryers*
Data Sheet 7-29, *Ignitable Liquid Storage in Portable Containers*
Data Sheet 7-32, *Ignitable Liquid Operations*
Data Sheet 7-32A, *Ignitable Liquid Evaluation and Classification*
Data Sheet 7-43, *Process Safety*
Data Sheet 7-45, *Safety Controls, Alarms and Interlocks (SCAI)*
Data Sheet 7-46, *Chemical Reactors and Reactions*
Data Sheet 7-50, *Compressed Gases in Cylinders and Bulk Storage*
Data Sheet 7-55, *Liquified Petroleum Gas (LPG) Storage in Stationary Installations*
Data Sheet 7-59, *Inerting and Purging Vessels and Equipment*
Data Sheet 7-76, *Combustible Dusts*
Data Sheet 7-78, *Industrial Exhaust Systems*
Data Sheet 7-80, *Organic Peroxides and Oxidizing Materials*
Data Sheet 7-111, *Chemical Process Industries*
Data Sheet 10-1, *Pre-Incident and Emergency Response Planning*
Data Sheet 10-3, *Hot Work Management*

4.2 Other

ASTM E119, *Standard Test Methods for Fire Tests of Building Construction and Materials*

ASTM E1529, *Standard Test Methods for Determining Effects of Large Hydrocarbon Pool Fires on Structural Members and Assemblies*

APPENDIX A GLOSSARY OF TERMS

Blowing Agent: A substance that produces gas to create a foam structure in polymers or other materials. It can be either physical, releasing gas through phase change, or chemical, generating gas via chemical reaction or decomposition.

Chemical Blowing Agent: A substance that produces gas through a chemical reaction or decomposition when heated or reacted with other components, forming a foam structure in materials like plastics or rubber. These agents are often used to control cell size and density in foamed products.

Decomposition Temperature: The temperature at which a substance chemically breaks down into simpler substances due to heat, releasing trapped gases.

Endothermic Reaction: A reaction that absorbs energy from its surroundings, which causes the immediate environment to lose heat and feel colder.

Exothermic Reaction: A reaction that releases energy into its surroundings (usually as heat or light), making the environment feel warmer.

Flammable Solid: A solid material that can readily ignite and sustain combustion when exposed to an ignition source. Flammable, solid, chemical blowing agents contribute fuel to a fire and may, in some cases, release flammable gases during thermal decomposition.

Ignitable Liquid: Refer to Data Sheet 7-32A.

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Noncombustible: A material that will not ignite, burn or contribute fuel to a fire. Although noncombustible chemical blowing agents may decompose when heated and release gases, they do not support combustion or flame spread.

Physical Blowing Agent: A substance that creates foam by undergoing a physical change, such as evaporation or expansion, without a chemical reaction. These agents typically include gases or volatile liquids like CO_2, nitrogen or hydrocarbons.

Self-Accelerating Decomposition Temperature (SADT): The lowest ambient temperature at which a packed chemical blowing agent will undergo a self-heating, runaway decomposition reaction that can lead to fires or explosions. It represents the temperature at which the chemical becomes unstable during storage or transit and is often lower than the activation temperature.

Self-Reactive: Thermally unstable compounds that can undergo a rapid, uncontrolled and strongly exothermic decomposition. These materials release the required gases without needing to mix with oxygen, and they pose safety risks if not properly controlled.

APPENDIX B DOCUMENT REVISION HISTORY

The purpose of this appendix is to capture the changes that were made to this document each time it was published. Please note that section numbers refer specifically to those in the version published on the date shown (i.e., the section numbers are not always the same from version to version).

October 2026. This document has been completely revised. Significant changes include the following:

A. Changed title to *Chemical Blowing Agent Use and Storage* (from *Blowing Agents*).

B. The scope of the data sheet has been revised to include only the use and storage of chemical blowing agents. The manufacturing of chemical blowing agents has been removed. Physical blowing agents, which are ignitable liquids or flammable gases, are no longer included in this standard.

C. The classification groups for chemical blowing agents have been revised. The current document includes five groups, while the previous revision had three groups.

The table below compares the current and previous classification groups for the blowing agents included in the prior revision.

CAS Number	*Chemical Name*	*Group (New)*	*Group (Previous)*
123-77-3	Azodicarbonamide	C	C
78-67-1	2,2'-Azobisisobutyronitrile	A	B
80-51-3	4,4'-Oxybis (benzenesulfonyl hydrazide)	B	B
101-25-7	Dinitrosopentamethylenetetramine	A	A
133-55-1	N, N'-dimethyl-N, N' - dinitrosoterephthalamide	B	A

D. Recommendations for damage-limiting construction (DLC) have been updated in Section 2.2. Group A and Group B blowing agents can now be stored in detached buildings with minimum space separation in lieu of DLC. Guidance has been added on how to properly design DLC.

E. Recommendations for protection have been revised for both use and storage areas in Section 2.4. Protection options have been added, including guidance for rack storage of Group C, Group D and Group E blowing agents.

F. Recommendations for rated electrical equipment have been revised in Section 2.9.1. The updated guidance includes more specific information on the required ratings and the locations where rated electrical equipment is needed.

January 2012. Terminology related to ignitable liquids has been revised to provide increased clarity and consistency with regard to FM Global's loss prevention recommendations for ignitable liquid hazards.

June 1999. This document has been reorganized to provide a consistent format.

May 1973. First published.

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