

# Guidance Document

center for the polyurethanes industry • spray polyurethane foam alliance

## Indoor Commercial and Residential Insulation Using Spray Polyurethane Foam Containing MDI/PMDI: Seven Important Points for Spray Polyurethane Foam Contractors

Here are seven important points you will want to know when applying spray polyurethane foam (SPF) products for indoor commercial and residential insulation containing methylene diphenyl diisocyanate (MDI) and/or polymeric MDI (PMDI).

This document provides general guidance to spray polyurethane foam contractors about important health and safety aspects of working with MDI during the spraying of polyurethane foam. Although MDI is a commonly used material in spray polyurethane foam (SPF) for commercial and home insulation systems, it is not the only material in the system that can present health hazards. SPF systems also contain “B-side,” which is a mixture of other chemicals, including polyols, amine catalysts, flame retardants, and surfactants, among other ingredients that may pose potential health hazards. Therefore, it is important to read all information contained in your supplier’s Material Safety Data Sheet (MSDS) for the particular SPF product you are using. MSDSs are the primary source of extensive and specific information on MDI, PMDI and other SPF system ingredients.

This guidance document is intended to help SPF companies educate their workers and provide appropriate worker protection related to MDI/PMDI. This document does not include a discussion of the “B-side” chemicals present in the SPF system. Consult the MSDS for more information. Always follow the product-specific information in the MSDS.



### 1. What is MDI?

The acronym MDI was derived from one of the chemical’s many names, methylene diphenyl diisocyanate. Polymeric MDI is a mixture of monomeric MDI and polymeric MDI and is a brownish liquid at room temperature. MDI/PMDI is one component used in the application of SPF products; typically referred to as the “A-side” or the “iso-side” of the system and requires special handling and care.

### 2. Recognizing Potential Health Hazards

Contact with excessive amounts of MDI can be harmful to your health. When MDI is sprayed, you may be overexposed by:

- Breathing high airborne concentrations of MDI
- Getting MDI on your skin
- Getting MDI in your eyes
- Swallowing MDI

In addition to what is identified in the product’s MSDS, here are some examples of the effects of overexposure and some commonly used first-aid procedures:

**Inhalation:** If MDI is sprayed or heated, there is a chance of overexposure. Overexposure means airborne concentrations greater than either 1) the U.S. Occupational Safety & Health Administration (OSHA) Permissible Exposure Limit-Ceiling of 20 parts per billion (ppb) at any time during the workday, or 2) the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value (TLV) of 5 ppb as an 8-hour time weighted average (TWA). MDI can irritate your nose and lungs. With overexposure, you may feel tightness in your chest and have difficulty

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breathing. If you continue to be overexposed, you may become sensitized (i.e., allergic) to MDI. Once sensitized, the effects may start as soon as you begin to work with the product, or later on in the day after you've stopped working with the product (e.g., when you've left work). If you are sensitized, you may experience health effects even when airborne MDI levels are very low and may be at risk for experiencing an asthma attack. If this happens, DO NOT CONTINUE TO WORK WITH MDI; asthma attacks can be life-threatening. If you start to feel any of the symptoms listed above, let your supervisor know immediately and seek medical attention.

If you suspect someone has become overexposed, remove the person to an area with fresh air, and try to keep them calm and warm, but not hot. If they are having difficulty breathing, a qualified person may provide oxygen. If they stop breathing, have trained first-aid personnel give artificial resuscitation. Seek emergency medical attention.

**Skin Contact:** Getting MDI on your skin may result in allergic sensitization. In addition, animal tests have indicated that skin contact, followed by inhalation exposure, may result in lung sensitization. If these symptoms occur, seek immediate medical attention. Repeatedly getting MDI on your skin may cause discoloration, redness, and swelling or blistering; this also could lead to skin sensitization. It is best, therefore, to conduct your work to avoid skin contact, but if you get MDI on your skin, wash it thoroughly with soap and flowing water as soon as possible after exposure.



**Eye Contact:** Getting MDI in your eyes can be painful and could cause tearing and irritation. If you get MDI in your eyes, wash them immediately with a continuous flow of lukewarm, low pressure water, preferably from an eyewash station, for at least 15 minutes. Seek immediate medical attention.

**Ingestion:** Swallowing MDI can cause irritation. If you swallow MDI, do not induce vomiting. Wash out the

mouth with water. The person affected should be made to rest and seek immediate medical attention.

Additional information about these potential health hazards is available through the product's MSDS and in materials on the American Chemistry Council's Center for the Polyurethanes Industry (CPI) website at [www.americanchemistry.com/polyurethane](http://www.americanchemistry.com/polyurethane).

### 3. Protecting Yourself from MDI Exposure

With proper precautions and the use of personal protective equipment (PPE), you can protect yourself from overexposure to MDI during the application of the SPF system.

**A:** For tasks that do not involve spraying (such as equipment cleaning), but where you may have direct contact with MDI liquid (at room temperature), use:



- Safety glasses or goggles
- MDI-resistant chemical gloves (e.g., nitrile, neoprene, butyl, or PVC)
- MDI-resistant clothing (e.g., apron or coveralls)
- Safety shoes or boots

**B:** When spraying a spray polyurethane foam system indoors, sprayers and helpers should wear:



- A NIOSH-approved full face or hood-type supplied air respirator (SAR) (as outlined in your company's Respiratory Protection Program)\*

- Note: In some cases, such as when a work area is well ventilated or when helpers are not working in the immediate vicinity of the sprayer, helpers may be able to wear full face air purifying respirators (APR), with organic vapor/particulate (P100) cartridges instead of an SAR. Professional judgment must be exercised in making this determination, taking into consideration the specific circumstances of the job site/application.

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- Fabric gloves fully coated in nitrile, neoprene, butyl, or PVC; or cotton gloves over nitrile gloves. Helpers may wear nitrile, neoprene, butyl, or PVC gloves instead of the previously

mentioned glove types.

- Disposable coveralls with attached hood. Where heat stress may be a concern, consider the use of lightweight disposable coveralls.



- Disposable overboots with skid-resistant soles. Evaluate whether overboots are to be used by helpers, depending on site conditions. In circumstances where over

boots may create a slip/fall hazard, the use of overboots may be omitted.

For other tasks where there is the potential for exposure to MDI vapor/mist, follow the guidelines suggested in Point 3B. Workers not wearing the correct PPE should not enter the perimeter where spraying is occurring until the airborne MDI levels are below the allowable limits mentioned previously. Additional information to help protect you is available through the product's MSDS and in literature on the CPI website, [www.americanchemistry.com/polyurethane](http://www.americanchemistry.com/polyurethane).



#### 4. Wearing a Respirator

According to the Occupational Safety and Health Administration's (OSHA) Respiratory Protection Standard, you are required to have a

medical evaluation and receive medical approval before using a respirator. After approval is given, a fit test is required. The fit test is conducted using the respirator you will be wearing on the job. Each time you use a tight-fitting facepiece, you must conduct a 'user seal check'. However, tight-fitting facepiece respirators are not permitted for use if:

- You have facial hair that interferes with either the sealing surface of the respirator and the face, or interferes with the valve function;

- You wear corrective glasses/goggles or if other personal protective equipment interferes with the seal of the facepiece; and,
- Any other condition interferes with the facepiece seal.

Respirators should be regularly cleaned and disinfected according to the instructions provided by the respirator manufacturer. Deteriorated parts must be replaced prior to equipment use. Respirators should be inspected regularly for:

- Cracks, tears, holes, facemask distortion, cracked or loose lenses/face shield;
- Breaks, tears, broken buckles/clasps, over-stretched elastic bands in head strap;
- Residue/dirt, cracks or tears in valve and absence of valve flap; and,
- Breathing air quality/grade, condition of supply hoses, hose connections; settings on regulators and valves.

\*The level of respiratory protection provided by the supplied air system is dependent upon the facepiece that is chosen; therefore consult your company's Respiratory Protection Program and MSDS for guidance.

Take defective respirators or those with defective parts out of service immediately. Notify your supervisor about all respirator defects.

Additional information about respirators is available through the product's MSDS, in your company's Respiratory Protection Program, and in materials on the CPI website at [www.americanchemistry.com/polyurethane](http://www.americanchemistry.com/polyurethane).

#### 5. Containing the Overspray

When applying SPF indoors, marking the area with caution tape or other signage can help prevent workers from entering the spraying area. While this is a dynamic process which changes as each room is completed, it is possible to prevent entry into the spray area. In addition, depending on the weather and conditions of the job site (e.g., proximity to other buildings, vehicles,

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bystanders/passersby), ventilation of the application area may be necessary. For example, if a room has windows and/or doors on opposite sides, these can be opened to allow air to flow through the spray area. Other techniques for containing and ventilating the spray area also may be used. Further detail on these techniques is being developed and will be available in the near future. Adequate ventilation is especially important in confined areas such as attics and crawlspaces. Only fully protected workers, as described in Point 3B, will be allowed in the spray area.

Ventilation of the application area for a period of time following installation helps purge aerosols and vapors from the structure (preferably via fans exhausting air at one side, and open windows/doors on the opposite side). The post-installation ventilation time will vary based on the size of the area, amount of foam applied, the particular foam formulation applied, ventilation rate, and other relevant factors. Discourage entrance by others during the ventilation period. Contact your SPF supplier for recommendations as to ventilation and reoccupancy time.

## 6. Completing the Job

Remove PPE after completion of clean-up and exiting the spray area. Continue to wear while cleaning MDI-contaminated equipment and while handling any containers with MDI (e.g., drums, buckets). Point 3 provides guidance on PPE during clean-up.

It is good workplace practice to keep all work clothing at work. Any clothing contaminated with MDI should be removed and properly disposed of or decontaminated with a neutralizer solution (See the product's MSDS for the recommended neutralizer solution). Leather items cannot be decontaminated. Any contaminated leather items including shoes, belts, and watch bands or clothing, that have been exposed to MDI should be properly discarded. MDI is a reactive chemical; therefore, the MDI container should be kept sealed to reduce contamination. However, resealing MDI containers contaminated with water or polyol can cause a buildup of pressure in the container due to the

generation of carbon dioxide. A pressurized container may rupture. MDI can self-react in a fire or at very high temperatures and release carbon dioxide. Carbon dioxide can build pressure in sealed containers sufficient to cause rupturing of the container.

Additional information to help protect you is available through the product's MSDS and in materials on the CPI website at [www.americanchemistry.com/polyurethane](http://www.americanchemistry.com/polyurethane).

## 7. Responding to Emergencies

Fires, spills, and other emergencies involving MDI require an immediate response by trained and knowledgeable personnel. **If you have not been trained to respond to an emergency, leave the area immediately and notify the appropriate emergency response personnel. If you need additional guidance, CHEMTREC®, the Chemical Transportation Emergency Center, is available to provide assistance by telephone 24-hours a day in the event of an emergency involving a fire, leak, spill or personnel exposure. CHEMTREC's emergency number is 1-800-424-9300.**

The seven important points in this guidance document are exhaustive and do not identify all the safety measures or legal requirements that may apply to your particular worksite. Consult the supplier's MSDS for additional information.



### For more information, visit:

**The American Chemistry Council's Center for the Polyurethanes Industry**

[www.americanchemistry.com/polyurethane](http://www.americanchemistry.com/polyurethane) or  
[www.spraypolyurethane.com](http://www.spraypolyurethane.com)

**Spray Polyurethane Foam Alliance**

[www.sprayfoam.org](http://www.sprayfoam.org)

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This document was prepared by the American Chemistry Council (ACC) Center for the Polyurethanes Industry (CPI) and the Spray Polyurethane Foam Alliance (SPFA). It is intended to provide general information to persons who may handle or apply spray polyurethane foam chemicals. It is not intended to serve as a substitute for in-depth training or specific handling or application requirements, nor is it designed or intended to define or create legal rights or obligations. It is not intended to be a "how-to" manual, nor is it a prescriptive guide. All persons involved in handling and applying spray polyurethane foam chemicals have an independent obligation to ascertain that their actions are in compliance with current federal, state and local laws and regulations and should consult with their employer concerning such matters. Any mention of specific products in this document is for illustration purposes only and is not intended as a recommendation or endorsement of such products.

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