

## Exterior Applications 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) containing methylene diphenyl diisocyanate (MDI) and/or polymeric MDI (PMDI) to exterior applications.

This document provides guidance to spray polyurethane foam (SPF) contractors about important health and safety aspects when working with MDI during the spraying of polyurethane foam. Although MDI is a commonly used material in the spraying of exterior applications such as roofs and tanks, it is not the only material in the system that can present health hazards. SPF systems also contain a “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 the information contained in your supplier’s Material Safety Data Sheet (MSDS) for the particular SPF product you are using. MSDSs are the primary sources of extensive and specific information on MDI, PMDI and other SPF system ingredients.

This guidance document is intended to help SPF companies applying SPF to exterior applications 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; 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 spray polyurethane foam, typically referred to as the “A-side” or the “iso-side” of the system. Although the use of SPF insulates and protects exterior applications, the actual spraying application 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

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irritate your nose and lungs. With overexposure, you may feel tightness in your chest and have difficulty 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 (i.e., 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 an 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

### 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 SPF on exterior applications.

**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 an exterior application (e.g., roofs, tanks, top coatings), both sprayers and helpers directly assisting the sprayer (e.g. holding windscreens, hoses), should wear:

- A NIOSH-approved air purifying respirator (APR) with organic vapor/particulate (P100) cartridges or a supplied air respirator (SAR), as outlined in your company's Respiratory Protection Program.\*
- Safety goggles (where respirator does not cover the eyes).
- Fabric gloves fully coated in nitrile, neoprene, butyl, or PVC; or cotton gloves over nitrile gloves.
- Disposable coveralls. Where heat stress may be a concern, consider the use of lightweight disposable coveralls

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- Disposable overboots with skid-resistant soles. In circumstances where over-boots may create a slip/fall hazard, their use 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 at [www.americanchemistry.com/polyurethane](http://www.americanchemistry.com/polyurethane).



#### 4. Wearing a Respirator

According to the U.S. Occupational Safety and Health Administration's 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, [www.americanchemistry.com/polyurethane](http://www.americanchemistry.com/polyurethane).

#### 5. Containing the Overspray

When applying SPF to an exterior application, care must be taken to shield spray mists or vapors from entering the building air intake ventilation system. A typical approach is first, turn off the building ventilation system. Second, apply plastic sheeting (generally polyethylene) over the air intakes to seal and secure them. Third, protect overspray from coating cars or equipment below with SPF particles. All workers applying SPF to an exterior application during spraying (as well as any other workers in the vicinity) should be upwind from the application of SPF. Only fully protected workers, as outlined in Point 3B, will be allowed in the spray area. Remember, the coatings applied over the exterior application also may contain chemicals of concern. Check each coating manufacturer's MSDS for information on potential health hazards and PPE recommendations.

#### 6. Completing the Job

Remove PPE after completion of clean-up and exiting the spray area. Continue to wear PPE 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.

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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 cleaned. Leather items cannot be decontaminated. Any contaminated leather items including shoes, belts, and watch bands or clothing, which 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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