



# Aliphatic Isocyanate Monomers

## Health and Safety Information

Desmodur<sup>®</sup> H, Desmodur<sup>®</sup> I, Desmodur<sup>®</sup> W



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## Summary

When working with any of the aliphatic isocyanates, monomers, homopolymers, or prepolymers, you should:

- Become informed and aware of the hazard and appropriate control procedures, read the product literature, Safety Data Sheets (SDSs) and label, and consult with the supplier for additional information.
- Provide a medical surveillance program and monitor the workplace environment.
- Follow recommendations prescribed for use during handling and application. This includes use of adequate ventilation, protective clothing, eye protection and respirators.
- Maintain proper storage conditions and implement disposal procedures for aliphatic isocyanate products.

This document provides information on health effects, toxicity, medical/first aid, storage/handling procedures, skin contact precautions, air monitoring techniques, reactivity, fire characteristics, proper spill response and waste disposal methods.

Other sources of information pertaining to Desmodur® H, Desmodur® I and Desmodur® W include the SDS, precautionary labels and product data sheet. If you need copies of this literature or further information, contact your Covestro LLC representative or access the Covestro Product Safety First online resource center at [www.productsafetyfirst.covestro.com](http://www.productsafetyfirst.covestro.com).



## Introduction

This document provides a general overview of the safe use and handling recommendations for protection against potential exposure to aliphatic isocyanates. The three aliphatic isocyanate products addressed include:

Product	Chemical Name	Abbreviation	CAS Number
<b>Desmodur® H</b>	Hexamethylene diisocyanate	HDI	822-06-0
<b>Desmodur® I</b>	Isophorone diisocyanate	IPDI	4098-71-9
<b>Desmodur® W</b>	4,4'-Methylene dicyclohexyl diisocyanate	HMDI or H <sub>12</sub> MDI	5124-30-1

Aliphatic isocyanates are used to formulate polyurethanes for a variety of coating, elastomer, adhesive and sealant applications. Users of aliphatic isocyanates must be familiar with the potential hazards and have the knowledge needed to safely handle and use these products. The potential to experience health effects associated with overexposure to aliphatic isocyanates depends on the exposure level (e.g. airborne concentration in the breathing zone, volume of liquid in contact with unprotected skin), duration of exposure, and other factors including individual susceptibility.

Proper employee education and training in the safe use and handling of these chemicals, consistent with the SDS of the product is essential. This includes the use of personal protective equipment (PPE), proper response to spills and other emergencies and compliance with applicable local, state and federal regulations.

Always consult the most current SDS for your specific aliphatic isocyanate product. The SDS can be obtained through the Covestro Product Safety First online resource center at [www.productsafetyfirst.covestro.com](http://www.productsafetyfirst.covestro.com), or by calling the Covestro LLC Product Safety & Regulatory Affairs (PSRA) Department at 412-413-2835.

Additionally, the safety and health information in this document provides only a summary on the subject matter and is intended to inform the reader of the many factors that must be considered when handling products containing unreacted isocyanates.

# Health Effects

## Skin and Eye

Monomeric aliphatic isocyanates are skin and eye irritants. Irritation is an acute response which results from direct contact of liquid, vapors or mist on the body surface. Symptoms of skin irritation include reddening, itching and swelling, and may include severe symptoms such as necrosis and possible scarring. Direct eye contact (e.g. liquid splash, vapors, mist) with any of these products can cause reddening, tearing, stinging and/or swelling and can include severe symptoms such as eye burns, corneal injury and possible blindness. Consult the SDS for specific symptoms.

Sensitization is the body's hyper-active (allergy-like) response to a substance. Animal tests and other research indicate that skin contact with isocyanates can play a role in causing isocyanate sensitization and respiratory reaction<sup>1</sup>. This data reinforces the need to prevent direct skin contact. Prolonged contact with skin can cause reddening, swelling, rash and in some cases, skin sensitization. Sensitized individuals can experience allergic skin reaction with symptoms similar to that of prolonged contact with skin, as mentioned above. These symptoms can develop as a result of direct contact with very small amounts of liquid material or even as a result of an airborne (aerosol/vapor) exposure.

## Inhalation

Open transfer of Desmodur® H at room temperature or uses of Desmodur® H, I or W applications which can result in airborne releases (e.g. spray applications or heated processes) can result in airborne concentrations above the applicable occupational exposure limits (i.e. ACGIH Threshold Limit Value or TLV, OSHA Permissible Exposure Limit or PEL, or Covestro LLC Recommended Exposure Limit). Warning properties (irritation of the eyes, nose and throat or odor) are not adequate to prevent overexposure from inhalation. Isocyanate vapors or mist at concentrations above the occupational exposure limits (OELs) or guidelines can irritate the mucous membranes in the respiratory tract with symptoms of runny nose, sore throat, coughing, chest discomfort, shortness of breath and reduced lung function (breathing difficulty). Persons with pre-existing non-specific bronchial hyper-reactivity can respond to concentrations below the exposure limits or guidelines with similar symptoms as well as an asthma attack or asthma-like symptoms. Exposure well above the OEL may lead to bronchitis, bronchial spasm and pulmonary edema (fluid in lungs). Chemical or hypersensitivity pneumonitis, with flu-like symptoms (e.g. fever, chills) has also been reported. These symptoms can be delayed up to several hours after exposure. These effects usually subside when the individual is no longer exposed to isocyanates.

<sup>1</sup> Pauluhn, J. (2008). Brown Norway Rat Asthma Model of Diphenylmethane 4,4'-Isocyanate. Analysis of the Elicitation Dose-Response Relationship, 104 (2), 320-331

As a result of repeated exposure to airborne concentrations above the occupational exposure limit or a single large dose, certain individuals may develop isocyanate sensitization (asthma or asthma-like symptoms) that may cause them to react to a later exposure to isocyanates at levels well below the exposure limits or guidelines. These symptoms, which can include chest tightness, wheezing, cough, shortness of breath or asthmatic attack, could be immediate or delayed up to several hours after exposure. Extreme asthmatic reactions can be life threatening<sup>2</sup>. Similar to many non-specific asthmatic responses, there are reports that once sensitized an individual can experience these symptoms upon exposure to dust, cold air, or other irritants. The increased lung sensitivity can persist for weeks and in severe cases for several years. Sensitization can be permanent.

For a complete list of health effects and symptoms, consult the SDS for the specific aliphatic isocyanate product in use.

The following information addresses the potential for inhalation of aliphatic isocyanate products based on vapor pressure. In comparison to many common organic solvents, isocyanates have low volatility (i.e. low vapor pressure). To illustrate the great differences in speed of evaporation, one can compare the room temperature vapor pressures.

On a relative scale, if the vapor pressure of H<sub>12</sub>MDI, one of the least volatile isocyanates, is assigned a value of 1, the ease of evaporation (vapor pressure) numbers would be as follows:

Chemical	Vapor Pressure (mm Hg)	Relative Vapor Pressure
<b>Desmodur® W (H<sub>12</sub>MDI)</b>	0.00001	1
<b>Desmodur® I (IPDI)</b>	0.00048	48
<b>Desmodur® H (HDI)</b>	0.011	1,100
<b>Water</b>	18	1,800,000
<b>MEK (methyl ethyl ketone solvent)</b>	91	9,100,000

At room temperature, liquid Desmodur® H may evaporate to an airborne concentration approaching the OEL and therefore requires the use of respiratory protection when other controls are absent (i.e. local exhaust ventilation). However, the likelihood of exceeding the exposure limits for Desmodur® I or Desmodur® W is very low for non-spray applications at room temperature as long as the regular exchange of air is carried out as specified. It is advisable to provide exhaust air ventilation when opening drums because the airborne vapor concentration may have reached saturation within the head space of the drum.

# Toxicity

Covestro LLC continues to conduct research on aliphatic isocyanates to advance the understanding of how these chemicals behave in living systems. The table below is a summary of key toxicity study results with the three aliphatic isocyanates addressed in this document.

	Desmodur® H	Desmodur® I	Desmodur® W
<b>Acute Oral (LD<sub>50</sub> mg/kg)</b>	746	4,814	18,200
<b>Acute Inhalation (LC<sub>50</sub> mg/m<sup>3</sup>) 4 Hr</b>	124	31	434
<b>Acute Dermal (LD<sub>50</sub> mg/kg)</b>	>7,000	>7,000	>7,000
<b>Skin Irritation</b>	Corrosive	Corrosive	Irritant
<b>Eye Irritation</b>	Corrosive	Severe irritant	Slight irritant
<b>Skin Sensitization</b>	Sensitizer	Sensitizer	Sensitizer
<b>Respiratory Sensitization</b>	Sensitizer	Sensitizer	Sensitizer
<b>Mutagenicity (Ames)</b>	Non-mutagenic	Non-mutagenic	Non-mutagenic
<b>Carcinogenicity</b>	Non-carcinogenic	No data available	No data available

For more information on toxicity study results completed on Desmodur® H, Desmodur® I, and Desmodur® W, please consult the product SDS.

# Medical Surveillance and First Aid Procedures

## Medical Surveillance

All persons who are to be assigned to a work area where isocyanates are used should undergo a pre-placement medical evaluation. Special attention should be directed to pre-existing diseases of the respiratory system or abnormal pulmonary function.

Each employee or applicant should complete a medical and occupational disease questionnaire. Histories of asthma, respiratory allergies or other breathing difficulties are possible reasons for restricting persons from jobs in which they could be exposed to isocyanates. Persons with a history of prior isocyanate sensitization should be excluded from further work with isocyanates.

In addition to completing a medical questionnaire, persons who may be assigned to jobs with potential isocyanate exposure should undergo a physical examination, including a thorough skin inspection, examination of the heart and lungs, and a base-line pulmonary function test (PFT). A medical determination should be made of the person's ability to wear respiratory protective equipment appropriate for use with isocyanates. Referral to an occupational health or pulmonary specialist is recommended in all cases where evaluation results are abnormal.

To review the medical surveillance recommendations in more detail, refer to the Medical Surveillance Guidelines for Users of Isocyanates. This document is available at [www.productsafetyfirst.covestro.com](http://www.productsafetyfirst.covestro.com). If you have any questions on isocyanate-related medical issues contact Covestro LLC Medical Department (412-413-2554).





## First Aid Procedures

In all situations involving aliphatic isocyanates where first aid is necessary, the principles of general first aid should be followed. The affected persons should be moved from further immediate risk and relevant first aid should be given to treat any physical injury not directly connected with exposure to isocyanates. Rescuers and first responders should take care to protect themselves from exposure by wearing proper protective equipment. Do not use odor as an indicator for the presence of airborne isocyanates; it is not a reliable indicator of exposure.

The following paragraphs provide a brief overview of first aid procedures for exposure to aliphatic isocyanates. Additional information may be obtained by referring to the product SDS.

### ***Eye Contact***

In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Use lukewarm water if possible. Use fingers to ensure that eyelids are separated and that the eye is being irrigated. Remove contact lenses, if easily removable and continue irrigation for not less than 15 minutes. Get medical attention.

### ***Skin Contact***

If direct skin contact with isocyanates occurs, immediately remove contaminated clothing and shoes. Wipe off the isocyanate product from the skin using dry towels or other similar absorbent fabric. If readily available, apply a polyglycol-based cleanser (e.g. Colorimetric Laboratories, Inc. (CLI) D-TAM™ Skin Cleanser) or corn oil. Wash with soap and warm water and pat dry. If a polyglycol-based cleanser is not available, wash with soap and warm water for 15 minutes. If available, use a wipe test pad to verify decontamination is complete (e.g. CLI SWYPE™). Get medical attention if irritation develops. Discard or wash contaminated clothing before reuse.

### ***Inhalation***

Move to an area free from further exposure. Extreme asthmatic reactions can be life threatening. Get medical attention immediately. Administer oxygen or artificial respiration as needed. Asthmatic symptoms may develop and may be immediate or delayed up to several hours.

### ***Ingestion***

Do not induce vomiting. Wash mouth out with water. Do not give anything by mouth to an unconscious person. Get medical attention immediately.

### ***Safety Showers and Eyewash Facilities***

It is recommended that employees be provided with unimpeded access to a safety shower and eyewash facility in all areas where aliphatic isocyanates are being unloaded, transferred, mixed or handled.

## Engineering Controls and Recommended Practices

Since aliphatic isocyanates have the potential to irritate and sensitize, it is important that proper steps be taken to prevent skin contact and inhalation of vapors/aerosols (e.g., spray mist). This includes those handling the isocyanate product as well as those in the immediate vicinity.

Aliphatic isocyanates must be stored in tightly sealed containers. Precautions must be taken to avoid contamination by moisture and air. Water or humid air can react with isocyanates to produce urea and carbon dioxide. This reaction can generate pressure inside a closed container. Care must be taken to prevent introduction of moisture into a drum when resealing partial containers. Desiccant material may be used for partially used drums. For more information on desiccant material refer to a supplier such as [www.grainger.com](http://www.grainger.com) or <https://secure.drierite.com/catalog3/page11.cfm>.

All manufacturing and laboratory operations must be carefully reviewed for their potential for causing skin contact and emission of vapors/aerosols (e.g., spray mist). Particular caution should be exercised when handling any of these products at elevated temperatures. This is especially important since the concentration of the isocyanate vapor can increase with temperature. In addition, it must be emphasized that skin contact must be avoided due to the skin sensitization potential of these products.

### Engineering Controls

Hazard control from vapors and aerosols (e.g. spray mist) ideally is performed using engineering controls. Effective engineering controls should be used whenever possible to eliminate and/or reduce worker exposure to respiratory hazards.

There are several engineering controls available to reduce exposure to vapors and aerosols including:

- local exhaust ventilation
- isolation principles
- general ventilation.

The most effective engineering control is a properly designed, maintained and ventilated enclosure. An example of such a control would be a typical laboratory bench mounted hood. The goal of a ventilated enclosure is to keep airborne concentrations of chemicals below their respective OELs in the worker breathing zone. Whenever possible, effective local exhaust ventilation should be provided to minimize exposure of personnel to airborne aliphatic isocyanates. To control environmental air emissions, efficient air cleaning devices should be considered when using an industrial ventilation system. *Industrial Ventilation: A Manual of Recommended Practice for Design*, published by ACGIH, is recommended as a reference document for designing a ventilation system [www.acgih.org](http://www.acgih.org).

## Decontamination

If protective clothing has come into direct contact with an aliphatic isocyanate (i.e. from a liquid splash) during handling, the protective clothing must be carefully removed to reduce the potential for worker contact with contaminated clothing. Discard or wash contaminated clothing before reuse.

Tools must be decontaminated before being returned to their storage areas. Failure to decontaminate these items can lead to skin contact for people not associated with the operation. Under no circumstances should contaminated or potentially contaminated clothing or equipment be taken home by the worker.

Aliphatic isocyanates are not immediately reactive with moisture in the air and may be persistent or remain on surfaces (e.g. protective clothing, equipment and other objects) for a period of time after direct contact. It is important that decontamination of equipment, tools, work surfaces, spill areas, etc. be performed carefully and thoroughly. Surfaces, tools and equipment may be cleaned by wiping with absorbent cloths soaked in a neutralization solution. Recommended neutralization solutions for each of the aliphatic isocyanates can be found on the SDS.

## Operations

In order to reduce the risk of accidental contact from spills, sprays or splashes, operating procedures and equipment should be designed to minimize the amount of contaminated equipment an operator must handle. Maintenance may be the area of greatest risk of contact. These are generally operations in which exposure is least able to be controlled without the use of personal protective equipment. Flushing and decontaminating pumps, piping and other equipment prior to opening for maintenance tasks can reduce the potential for exposure.

For additional information on receiving, unloading and storing aliphatic isocyanates, please refer to the Distribution Safety Services document on Aliphatic Isocyanate Monomers - Safe Handling Guidance. This document can be obtained through the Covestro LLC Product Safety First online resource center at [www.productsafetyfirst.covestro.com](http://www.productsafetyfirst.covestro.com).

## Personal Protective Equipment (PPE)

When engineering controls (such as local exhaust ventilation) are not available, or cannot maintain levels below OELs, appropriate PPE must be used. This is especially important when handling bulk quantities of Desmodur® H due to its vapor pressure or when any of the aliphatic isocyanates are heated, sprayed or used in poorly ventilated areas. The following paragraphs provide a brief overview of the recommended PPE to be worn when handling aliphatic isocyanates. Consult the SDS for additional information specific to the product being handled.



### Eye Protection

When liquid product is handled or a splash hazard exists, such as transferring, pumping or pouring product into other containers, eye protection must be worn. Appropriate eye protection may include chemical safety goggles or safety glasses/goggles in combination with a full-face shield (in the absence of full-face respirator protection).

### Skin Protection

Any area of the skin that could potentially come in contact with an aliphatic isocyanate must be covered by a permeation-resistant barrier (e.g. butyl/nitrile/neoprene gloves, neoprene apron, chemical suit or coverall). Use of skin protection is especially important where liquid products are manually handled or transferred, and/or spray operations are performed. The actual PPE chosen will vary depending upon application and the potential for skin contact.

### Respiratory Protection

Open transfer of Desmodur® H at room temperature or applications where Desmodur® H, Desmodur® I or Desmodur® W are heated, sprayed or used in poorly ventilated areas typically require the use of respiratory protection. The type of respiratory protection selected must comply with the requirements set forth in OSHA's Respiratory Protection Standard (29 CFR 1910.134).

Types of respiratory protection available include:

- An atmosphere-supplying respirator such as a self-contained breathing apparatus (SCBA) or a supplied air respirator (SAR) in positive pressure or continuous flow mode.
- An air-purifying respirator (APR)

If an air-purifying respirator is selected, the following conditions must be met for the respirator's cartridges:

- a) A change out schedule based on objective information to ensure that the cartridges are changed before the end of their service life. The basis for the respirator cartridge change schedule must be described in a written respirator program.
- b) The airborne isocyanate concentration must be no greater than 10 times the appropriate standard/guideline.

When an air-purifying respirator is selected for use, an organic vapor/particulate filter combination cartridge (i.e. OV/P-100) is recommended where an aerosol (e.g. mist, dust) and vapor may be present (applications such as spray coatings). If an aerosol is not present but there are only isocyanate vapors, then an organic vapor and particulate (OV/P-100) cartridge is recommended for APR use.

Consult the SDS for the most current respiratory protection recommendations.

## **Spray Applications of Products Containing Aliphatic Isocyanates**

Prevention of skin contact is important when handling materials containing an aliphatic isocyanate monomer, including adducts, prepolymers, and formulations based on these products. Since spray application increases the potential for skin contact, stringent precautions must be taken to ensure the safety of the persons involved with the spray application as well as other persons working in the area who have the potential for skin contact with uncured material.

Because of the high potential for skin contact from overspray particles during spray applications, it is recommended that a permeation resistant suit or coverall with a hood be worn, as well as gloves and work shoes that remain at the facility.

Good industrial hygiene practice dictates that when isocyanate-based coatings are spray applied, respiratory protection should be worn. For example, a tight-fitting full-face supplied-air respirator or a loose-fitting hood/helmet supplied-air respirator operated in a continuous flow mode may be acceptable depending upon the airborne concentration of the isocyanate. In work situations where the airborne isocyanate concentration is not known, the use of a supplied-air respirator is required. Among supplied-air type respirators, tight-fitting full-face models typically have higher NIOSH assigned protection factors than other types of respirators. It is important to contact the respirator manufacturer to confirm the assigned protection factor for the model and type of respirator selected. Other persons entering the area for any reason must be similarly protected from all skin contact with the coating system and from inhalation of the spray mist.

## Additional Spray Application Precautions

Indoor spray applications involving formulations that contain an aliphatic isocyanate monomer should be separated from other work areas by walls and ventilated by local exhaust ventilation, properly designed and operated in accordance with ACGIH Industrial Ventilation guidelines (see Engineering Controls section) or other appropriate



guidelines for local ventilation. The ventilation system should have appropriate filtration to remove spray mist and vapors prior to exhausting air to the outside. The area and the equipment should be decontaminated after each use to ensure that no unsuspecting person comes in contact with any residual unreacted isocyanate monomer. Warning signs should be posted indicating that only properly protected and trained persons are allowed in the area.

Outdoor spray applications involving formulations that contain an aliphatic isocyanate monomer should be separated from other work areas to prevent exposure to overspray (i.e. spray mist or spray drift) either by inhalation or contact with contaminated surfaces. This may be accomplished by use of containment screens or by establishing perimeter protection (i.e. a boundary using warning tape/signs) to restrict access to only properly protected and trained personnel. When containment screens are not used, perimeter protection should be set at a distance sufficient to prevent any passersby from inhalation and direct skin contact with uncured coating overspray.

## Air Monitoring

At room temperature, liquid Desmodur® H can generate airborne concentrations of HDI above its established OELs. At room temperature conditions, airborne concentrations of Desmodur® W and Desmodur® I vapors above the OELs are not anticipated. Also, the odor threshold of aliphatic isocyanates is not a good indicator for the airborne concentration. Since heating, spraying or using any of the aliphatic products in poorly ventilated areas can potentially result in high airborne concentrations, it is important to perform air monitoring to determine the airborne concentration. This data is also helpful in selecting appropriate respiratory protection.

Air monitoring of the occupational environment is recommended to determine airborne concentrations. The type of monitoring depends on the type of work to be evaluated. Below are examples of the media that Covestro LLC may use:

### Types of Air Monitoring Devices

37 mm cassette with a 1-(2-pyridyl) piperazine (PP) coated filter (open faced)



Impingers containing 15 milliliters of a solution of toluene and PP backed up by a 13mm coated filter



For more detailed method information or for advice on air monitoring, contact Covestro Product Safety & Regulatory Affairs Department at 412-413-2835.

## Reactivity

Aliphatic isocyanates are reactive with compounds which contain active hydrogen (e.g. amines, ammonia, alcohols and water). Strong bases, such as tertiary amines, caustic soda and potash can catalyze the reaction with these compounds, as well as other reactions, and the result can be uncontrolled polymerization. The heat and products generated from this reaction can result in a pressure build-up in closed containers that is sometimes sufficient to rupture the vessel. Isocyanates react slowly with water to liberate carbon dioxide (CO<sub>2</sub>). If water contamination of an isocyanate is suspected, do not reseal the container or vessel. Contact CHEMTREC at 1-800-424-9300 for assistance and advice. Containers used to package isocyanate products must be dry, clean and airtight.

**FOR CHEMICAL EMERGENCY**  
Spill, Leak, Fire, Exposure or Accident  
**CALL CHEMTREC - DAY OR NIGHT**  
**800-424-9300**

## Fire Characteristics and Decomposition Products

With regards to fire characteristics of these products, Desmodur<sup>®</sup> H, Desmodur<sup>®</sup> I and Desmodur<sup>®</sup> W have relatively high flash points:

Product Name	Flash Point (°F/°C)
Desmodur <sup>®</sup> H	266/130
Desmodur <sup>®</sup> I	302/150
Desmodur <sup>®</sup> W	392/200

These products are not considered flammable; however, each will burn if heated sufficiently. The NFPA lists Desmodur<sup>®</sup> H, Desmodur<sup>®</sup> I and Desmodur<sup>®</sup> W, as Class IIIB combustible materials. Thus, they will burn in the presence of an existing fire or heat source and adequate oxygen.

During a fire or when exposed to high heat, any aliphatic isocyanate or a polyurethane derived from it, can generate isocyanate vapor and other irritating, highly toxic gases by thermal decomposition or combustion. Toxic chemicals released upon burning can include carbon dioxide (CO<sub>2</sub>), carbon monoxide (CO), oxides of nitrogen (NO<sub>x</sub>), hydrogen cyanide (HCN), isocyanate vapors, and isocyanic acid. Fire fighters should wear NFPA compliant structural firefighting protective equipment, including SCBA and NFPA complaint helmet, hood, boots and gloves. Avoid contact with the product. Decontaminate equipment and protective clothing prior to reuse.

To minimize the risk from rupture for containers exposed to the heat of a fire, spray water on the outside of the containers to aid in cooling.

Suitable extinguishing agents include:

- Dry chemical powder
- CO<sub>2</sub>
- Foam
- Water spray for large fires

After the fire has been extinguished, the area is not considered safe until a thorough inspection for residual isocyanate has been conducted by qualified persons wearing personal protective equipment. Refer to the SDS for recommended decontamination procedures and neutralization solutions.



## Hot Work

Many maintenance repair and construction projects involve hot work. Hot work is defined as any work activity that involves application of heat or generation of heat during execution. Hot work tasks include welding, brazing, soldering, cutting with torches or hot wire, grinding, sawing and use of a heat gun on a polyurethane coating or material.

When performing hot work on steel, coated or in contact with a polyurethane material, toxic decomposition products may be generated (metal fumes, particulate, gases and vapors). Generation of such products vary depending on the hot work task performed, the nature of the base metal, and the type of polyurethane material or coating.



One or more of the following control procedures should be used for welding or cutting on steel coated or in contact with a polyurethane material:

- Use a power brush or grinding wheel to strip the coating from the steel in the vicinity where the cut or weld is to be made. A well-fitted respirator, with a minimum N95 filter, and eye/face protection should be used while removing the paint from the surface.
- Use local exhaust ventilation to remove gases, vapors, fumes and particulate from the breathing zone of the employee during the welding or cutting activity.
- Wear a supplied-air respirator during welding or cutting work if local exhaust ventilation cannot be provided and/or the polyurethane coating is not removed.

# Spill Response, Handling Containers and Waste Disposal

## Spill Procedures

In preparation for accidental spills, it is advisable to have a written procedure for dealing with such an emergency and a trained emergency response team in place. A number of factors will affect the extent of hazard associated with a spill: the volume of the liquid spilled, volatility and flammability of the material, temperature of the material and location of the spill.

Anticipating how, when and where spills are likely to occur is critical to spill prevention and clean-up efforts. Clean-up of aliphatic isocyanates may be extremely difficult if a spill occurs on a porous surface. Therefore, non-porous flooring is recommended for high-potential spill areas. A suitable coating should be applied to porous surfaces such as wood or concrete to reduce porosity.

The overriding principle in spill response is to protect people first, then prevent or minimize the impact of the release on the environment. Only trained personnel should conduct a response to any release. Training requirements for releases that can be handled by those employees whose job is within the immediate area of the release are outlined in OSHA's Hazard Communication Standard (29 CFR 1910.1200). Should the quantity released or complexity of an incident require response of employees from outside the immediate work area or an organized emergency response team, those individuals must meet the training requirements of OSHA's Hazardous Waste Operations and Emergency Response Standard (29 CFR 1910.120) and the NFPA Standard 472 titled "Standard for Competence of Responders to Hazardous Materials Incidents".

Implement the site emergency response plan and evacuate non-emergency personnel. The magnitude of the evacuation depends upon the quantity released, site conditions and the ambient temperature. Isolate the area and prevent access of unauthorized personnel. Notify management. Call CHEMTREC at 1-800-424-9300 for assistance and advice.

Wear necessary PPE as specified in the SDS or the site emergency response plan. Ventilate and remove ignition sources. Control the source of the leak. Contain the released material by damming, diking, retaining, or diverting into an appropriate containment area. Absorb or pump off as much of the spilled material as possible. When using absorbent, completely cover the spill area with suitable absorbent material (e.g. vermiculite, kitty litter, Oil-Dry®, etc.). Allow for the absorbent material to absorb the spilled liquid. Shovel the absorbent material into an approved metal container (i.e. 55 gallon salvage drum). Do not fill the container more than 2/3 full to allow for expansion and do not tighten the lid on the container. Repeat application of absorbent material until all liquid has been removed from the surface. For spills involving a solid product, remove mechanically (sweep up, vacuum, shovel etc.) and collect and place into an approved metal container.

Decontaminate the spill surface area using a neutralization solution (see SDS); scrubbing the surface with a broom or brush helps the decontamination solution to penetrate into porous surfaces. Wait at least 15 minutes after first application of the neutralization solution. Cover the area with absorbent material and shovel this into an approved metal container. Residual surface contamination can be checked using a wipe test pad to verify decontamination is complete (e.g. CLI Surface Swype™). If the wipe test pad demonstrates that isocyanate remains on the surface (red color on pad), repeat applications of neutralization solution, with scrubbing, followed by absorbent until the surface is decontaminated (no color change on wipe pad).



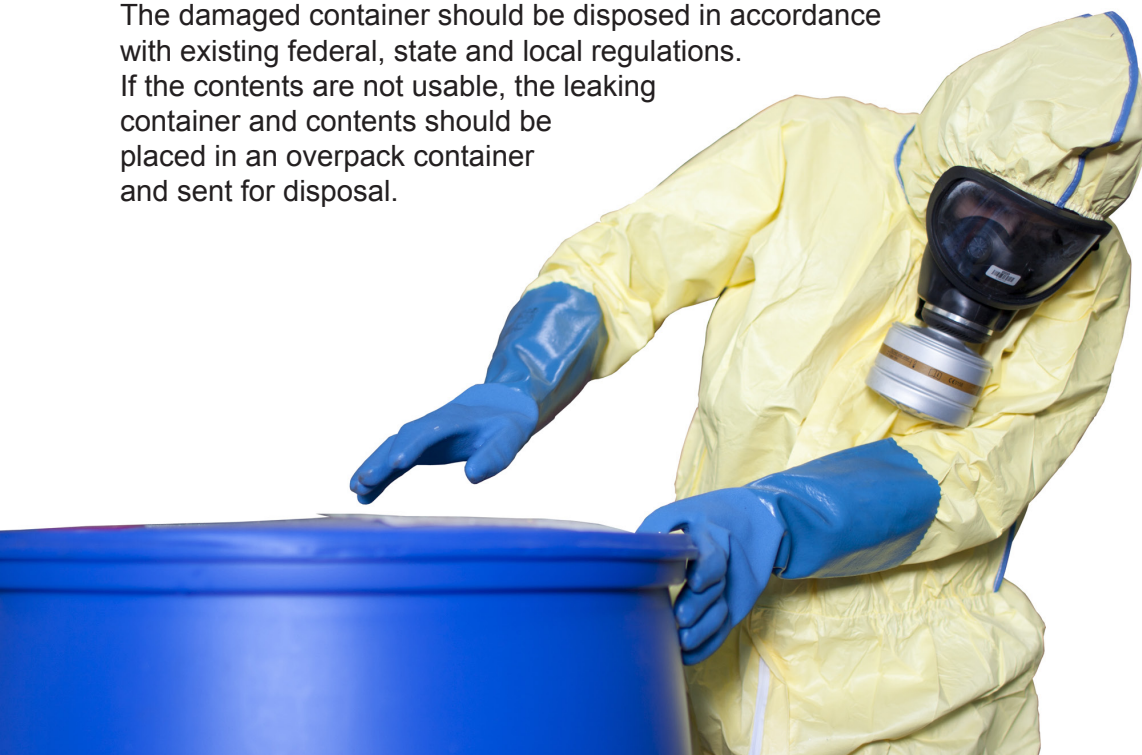
Apply the lid loosely to the metal waste container. Do not tighten the lid because CO<sub>2</sub> gas and heat can be generated from the neutralization process. With the lid still loosely in place, move the container to an isolated, well-ventilated area to allow release of CO<sub>2</sub>. After 72 hours, seal the container and properly dispose of the waste material and any contaminated equipment (i.e. broom or brush) in accordance with existing federal, state and local regulations.

## Leaking Containers

Leaking containers should be turned, if possible, so that the damage area of the container is facing up. It should be covered to protect against contact with rain, dirt or other combination. Further, leaking containers should be clearly marked or segregated as such. Any spillage should be dealt with as described in the Spill Control section. If the contents are still usable, they should be transferred to a clean, dry, undamaged container.

The damaged container should be disposed in accordance with existing federal, state and local regulations.

If the contents are not usable, the leaking container and contents should be placed in an overpack container and sent for disposal.



## Swollen Drums

Swollen drums (Figure 1) are potentially dangerous because they indicate a build-up of pressure that could rupture the drum, causing injury and harmful exposure of its contents. If a swollen drum is observed, clear the area immediately and contact Covestro's Distribution Safety Department (24-hrs a day) by calling CHEMTREC at 1-800-424-9300.



**Figure 1 - Swollen drums are potentially dangerous**

## Empty Container Precautions

Empty containers that have not been decontaminated will contain a residue of isocyanate and must be handled with care. With regard to 55-gallon drums, an empty drum is defined as “drip dry” when it has been emptied of all material using practices commonly employed to remove material from that type of drum (e.g. pouring, pumping or aspirating). The preferred method for disposing of empty drums is to contract with an approved re-conditioner. A state by state listing of drum re-conditioners can be obtained from the Reusable Industrial Packaging Association (RIPA) at [www.reusablepackaging.org](http://www.reusablepackaging.org). A SDS for the specific aliphatic isocyanate should be sent along with the drum so the re-conditioner will have information on the drum's previous contents.

If not sent to a re-conditioner, empty drums must be thoroughly decontaminated with a neutralizing solution prior to disposal. Refer to Section 6 of the product SDS for guidance on neutralizing solution formulations. After decontamination, bungs should be loosely applied to the drums until they can be destroyed. Empty drums should be crushed to prevent reuse. Empty drums that previously contained an aliphatic isocyanate should never be used for personal purposes (i.e. trash burning, grill pits, water collection and/or storage of other products).

Do not heat or cut empty drums that last contained an aliphatic isocyanate with an electric or gas torch. Applying a flame to an empty drum may result in explosive and/or toxic decomposition of residues. Destroy empty drums by mechanical means only.

Desmodur® H and Desmodur® I are shipped on a limited basis in DOT Specification 51 portable tanks referred to as MONOTAINERS®. Covestro LLC owns these MONOTAINERS® and assists the customer in their return to Covestro LLC when empty. Desmodur® W is shipped in UN31HA1 composite intermediate bulk containers commonly referred to as totes. These containers are returned to the tote manufacturer, not Covestro, when empty. Instructions on returning these containers when empty are provided with each container.

Customers may also receive samples of Desmodur® H, Desmodur® I and Desmodur® W from Covestro LLC in a 1 liter or 4 liter aluminum bullet container. These sample containers are non-returnable and should not be reused for any other purpose. All precautions on the SDS must be observed when handling and disposing of these containers. The sample containers should be decontaminated with an appropriate neutralizing solution as outlined in the SDS prior to disposal.

## Waste Disposal

The Resource Conservation and Recovery Act of 1976 (RCRA) was passed to promote the safe disposal of hazardous wastes, which are defined to include solid, liquid, semi-solid and gaseous materials. The applicable regulations are contained in 40 CFR parts 260-272. These regulations include an EPA listing of Hazardous Wastes under Section 261.33 (e) and (f) of EPA's Hazardous Waste Management System.

As of the publication of this document, HDI, IPDI and H<sub>12</sub>MDI are not specifically listed as a hazardous waste. However, wastes also may be defined as hazardous waste due to certain physical or chemical characteristics (e.g., ignitability, corrosivity, reactivity and toxicity as determined by the Toxicity Characteristic Leaching Procedure test). HDI, IPDI and H<sub>12</sub>MDI do not meet any of these characteristics. Any processing of these products may, however, result in reclassification of the resultant material. Even wastes that are not "hazardous" by EPA definition are typically subject to some form of disposal requirement. To ensure the waste is disposed of properly, contact the appropriate federal, state and local environmental agencies.

HDI is listed as a CERCLA Hazardous Substance with a Reportable Quantity (RQ) notification requirement of 100 lbs if released. There is not a notification requirement for IPDI or H<sub>12</sub>MDI. Further, HDI is listed as a Hazardous Air Pollutant (HAP) under the Clean Air Act (CAA) Section 112, Hazardous Air Pollutants, as amended by 40 CFR 63 (December 2005). IPDI and H<sub>12</sub>MDI are not listed as Hazardous Air Pollutants.

Incineration of organic materials in appropriately designed and licensed incinerators is the preferred method of disposal (of liquid product). However, whether incineration, drum reconditioning, or landfilling is considered, it is recommended that the operation be inspected by responsible personnel to determine whether the disposer can properly and safely handle the container and dispose of any waste.

Regulations may differ from state to state. Your regional EPA office or your state environmental agency can be helpful in interpreting the law and identifying approved disposers and re-conditioners. Covestro LLC does not have analytical facilities to evaluate waste, nor can Covestro LLC accept waste for treatment, storage and/or disposal. Covestro LLC assumes no responsibility for compliance with the customer's waste disposal and management and the customer is solely responsible for assuring that all legal requirements are satisfied.

## Transportation Emergencies

Covestro LLC requires that our Distribution Safety Department be notified immediately, day or night, when any amount of Covestro LLC material is unintentionally released during the course of distribution, including transportation, storage incidental to transportation, or loading and unloading. Such notification must be immediate and must be made by the person having knowledge of the release. Notification can be made through CHEMTREC at 1-800-424-9300.

Drivers delivering Covestro LLC products are required to contact Covestro LLC through CHEMTREC any time any amount of material is unintentionally released during transportation. CHEMTREC is not a federal agency. CHEMTREC is a 24-hour, manned emergency response call center that can provide first action, emergency response information and immediate consultation with Covestro LLC emergency response specialists.

## Other Information

### Contact Information

Contact	Phone Number/Website
CHEMTREC	1-800-424-9300
Covestro LLC Product Safety & Regulatory Affairs Department	412-413-2835
Covestro LLC Product Safety First	<a href="http://www.productsafetyfirst.covestro.com">www.productsafetyfirst.covestro.com</a>
Covestro LLC Medical Department	412-413-2554
Reusable Industrial Packaging Association (RIPA)	<a href="http://www.reusablepackaging.org">www.reusablepackaging.org</a>

### Acronyms

<b>ACGIH</b>	=	American Conference of Governmental Industrial Hygienists
<b>Ames</b>	=	A test to determine the mutagenic activity of chemicals by observing whether they cause mutations in sample bacteria.
<b>CAA</b>	=	Clear Air Act
<b>CAS</b>	=	Chemical Abstracts Service
<b>CERCLA</b>	=	Comprehensive Environmental Response, Compensation, and Liability Act
<b>DOT</b>	=	Department of Transportation
<b>EPA</b>	=	Environmental Protection Agency
<b>LD<sub>50</sub></b>	=	Lethal dose is the amount of a material, given all at once, which causes the death of 50% (one half) of a group of test animals. Dermal (applied to the skin) and oral (given by mouth) administration methods are the most common.
<b>LC<sub>50</sub></b>	=	is the lethal concentration required to kill 50% of the population.
<b>mg/kg</b>	=	milligrams per kilograms
<b>mg/m<sup>3</sup></b>	=	milligrams per cubic meter
<b>NIOSH</b>	=	National Institute of Occupational Safety and Health
<b>OSHA</b>	=	Occupational Safety and Health Administration
<b>OELs</b>	=	Occupational Exposure Limits
<b>PELs</b>	=	Permissible Exposure Limits
<b>TLV</b>	=	Threshold Limit Value





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The information contained herein is believed to be accurate as of the date of this document. The purpose for or manner in which you apply or utilize our products, technical assistance and information, whether verbal, written or by way of production evaluations, including any suggested formulations and recommendations, are beyond our control. It is imperative that you test our products to determine their suitability from a technical as well as health, safety, and environmental standpoint for your intended uses or applications. Unless we otherwise agree in writing, all products are sold strictly pursuant to the terms of our standard conditions of sale which are available upon request. All information and technical assistance is given without warranty or guarantee, expressed or implied, and is subject to change without notice. It is expressly understood and agreed that you assume and hereby expressly release us from all liability, in tort, contract or otherwise, incurred in connection with the use of our technical assistance and information. Any statement or recommendation not contained herein shall not bind us. Covestro assumes no legal responsibility for use of or reliance upon the information in this document. Nothing herein shall be construed as a recommendation to use any product in conflict with any claim of any patent relative to any material or its use. Before working with our products, you must read and become familiar with all available information on the risks, proper use, and handling. Information is available in several forms, e.g., safety data sheets, product labels and other safe use and handling literature for chemical substance(s). The most current health and safety information regarding our products, including Safety Data Sheets (SDSs), is available at the Product Safety First website ([www.productsafetyfirst.covestro.com](http://www.productsafetyfirst.covestro.com)). For further information contact your Covestro representative or the Product Safety and Regulatory Affairs Department in Pittsburgh, PA.