

## SAFETY DATA SHEET 2022

### SECTION 1: IDENTIFICATION OF MATERIAL AND SUPPLIER

<b>Product Name</b>	: ShieldFoam PLF Part B
<b>Other means of Identification</b>	: None
<b>Relevant Identified Uses</b>	: Part B Liquid component of Polyurethane Foam
<b>Supplier's Information</b>	
<b>Name</b>	: ShieldCrete® International
<b>Company Name</b>	: ShieldCrete® International Sdn Bhd
<b>Address</b>	: 66 Jalan Setiakasih 9 Bukit Damansara, Kuala Lumpur, Malaysia 50490
<b>Contact Numbers</b>	: +66 928 639 833   +63 966 465 5362
<b>Email</b>	: info@shieldcreteinternational.com
<b>Website</b>	: www.shieldcreteinternational.com

### SECTION 2: HAZARDS IDENTIFICATION

#### Classification of the substance or mixture:

Poison Schedule:	S6
Classification:	Acute Toxicity (Inhalation) Category 2, Skin Corrosion/Irritation Category 2, Eye Irritation Category 2A, Skin Sensitizer Category 1, Respiratory Sensitizer Category 1, Carcinogenicity Category 2, Specific target organ toxicity - single exposure Category 3 (respiratory tract irritation), Specific target organ toxicity - repeated exposure Category 1
Legend:	1. Classified by ShieldCrete® International; 2. Classification drawn from HCIS; 3. Classification drawn from Regulation (EU) No 1272/2008 - Annex VI

#### Label Elements:



Signal Word: **Danger**

#### Hazard Statements:

<b>H330</b>	Fatal if inhaled.
<b>H315</b>	Causes skin irritation.
<b>H319</b>	Causes serious eye irritation.
<b>H317</b>	May cause an allergic skin reaction.
<b>H334</b>	May cause allergy or asthma symptoms or breathing difficulties if inhaled.
<b>H351</b>	Suspected of causing cancer.
<b>H335</b>	May cause respiratory irritation.
<b>H372</b>	Causes damage to organs through prolonged or repeated exposure.

#### Precautionary Statement(s) Prevention:

<b>P201</b>	Obtain special instructions before use.
<b>P260</b>	Do not breathe mist/vapors/spray.
<b>P271</b>	Use only outdoors or in a well-ventilated area.
<b>P280</b>	Wear protective gloves/protective clothing/eye protection/face protection.
<b>P281</b>	Use personal protective equipment as required.
<b>P270</b>	Do not eat, drink, or smoke when using this product.

<b>P284</b>	Wear respiratory protection.
<b>P272</b>	Contaminated work clothing should not be allowed out of the workplace.

**Precautionary Statement(s) Response:**

<b>P304+P340</b>	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
<b>P308+P313</b>	IF exposed or concerned: Get medical advice/attention.
<b>P310</b>	Immediately call a POISON CENTER or doctor/physician.
<b>P320</b>	Specific treatment is urgent (see advice on this label).
<b>P342+P311</b>	If experiencing respiratory symptoms: Call a POISON CENTER or doctor/physician.
<b>P362</b>	Take off contaminated clothing and wash before reuse.
<b>P302+P352</b>	IF ON SKIN: Wash with plenty of water and soap.
<b>P305+P351+P338</b>	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
<b>P333+P313</b>	If skin irritation or rash occurs: Get medical advice/attention.
<b>P337+P313</b>	If eye irritation persists: Get medical advice/attention.

**Precautionary Statement(s) Storage:**

<b>P403+P233</b>	Store in a well-ventilated place. Keep container tightly closed.
<b>P405</b>	Store locked up.

**Precautionary Statement(s) Disposal:**

<b>P501</b>	Dispose of contents/container to authorized hazardous or special waste collection point in accordance with any local regulation.
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**SECTION 3: COMPOSITES / INFORMATION ON INGREDIENTS**

**Substances:** See section below for composition of Mixtures

**Mixtures:**

INGREDIENTS	WEIGHT %	CAS No.
Polymeric Diphenylmethane Diisocyanate	>60	9016-87-9

**SECTION 4: FIRST AID MEASURES**
**Description of first aid measures**

**Inhalation:** If fumes or combustion products are inhaled remove from contaminated area. Lay patient down. Keep warm and rested. Prostheses such as false teeth, which may block airway, should be removed, where possible, prior to initiating first aid procedures. Apply artificial respiration if not breathing, preferably with a demand valve resuscitator, bag-valve mask device, or pocket mask as trained. Perform CPR if necessary. Transport to hospital, or doctor.

**Ingestion:** If swallowed do NOT induce vomiting. If vomiting occurs, lean patient forward or place on left side (head-down position, if possible) to maintain open airway and prevent aspiration. Observe the patient carefully. Never give liquid to a person showing signs of being sleepy or with reduced awareness, i.e., becoming unconscious. Give water to rinse out mouth, then provide liquid slowly and as much as casualty can comfortably drink. Seek medical advice.

**Eye Contact:** Immediately hold eyelids apart and flush the eye continuously with running water. Ensure complete irrigation of the eye by keeping eyelids apart and away from eye and moving the eyelids by occasionally lifting the upper and lower lids. Continue flushing until advised to stop by the Poisons Information Centre or a doctor, or for at least 15 minutes. Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

**Skin Contact:** Immediately remove all contaminated clothing, including footwear. Flush skin and hair with running water (and soap if available). Seek medical attention in event of irritation.

**Indication of any immediate medical attention and special treatment needed:**

For sub-chronic and chronic exposures to isocyanates:

- This material may be a potent pulmonary sensitizer which causes bronchospasm even in patients without prior airway hyperreactivity.
- Clinical symptoms of exposure involve mucosal irritation of respiratory and gastrointestinal tracts.
- Conjunctival irritation, skin inflammation (erythema, pain vesiculation) and gastrointestinal disturbances occur soon after exposure.
- Pulmonary symptoms include cough, burning, substernal pain and dyspnoea.
- Some cross-sensitivity occurs between different isocyanates.
- Noncardiogenic pulmonary oedema and bronchospasm are the most serious consequences of exposure. Markedly symptomatic patients should receive oxygen, ventilatory support and an intravenous line.
- Treatment for asthma includes inhaled sympathomimetics (epinephrine [adrenalin], terbutaline) and steroids.
- Activated charcoal (1 g/kg) and a cathartic (sorbitol, magnesium citrate) may be useful for ingestion.
- Mydriatics, systemic analgesics and topical antibiotics (Sulamyd) may be used for corneal abrasions.
- There is no effective therapy for sensitized workers.

[Ellenhorn and Barceloux; Medical Toxicology]

NOTE: Isocyanates cause airway restriction in naive individuals with the degree of response dependent on the concentration and duration of exposure. They induce smooth muscle contraction which leads to bronchoconstrictive episodes. Acute changes in lung function, such as decreased FEV1, may not represent sensitivity.

[Karol & Jin, Frontiers in Molecular Toxicology, pp 56-61, 1992]

Personnel who work with isocyanates, isocyanate prepolymers or polyisocyanates should have a pre-placement medical examination and periodic examinations, thereafter, including a pulmonary function test. Anyone with a medical history of chronic respiratory disease, asthmatic or bronchial attacks, indications of allergic responses, recurrent eczema or sensitization conditions of the skin should not handle or work with isocyanates. Anyone who develops chronic respiratory distress when working with isocyanates should be removed from exposure and examined by a physician. Further exposure must be avoided if a sensitivity to isocyanates or polyisocyanates has developed.

## SECTION 5: FIRE FIGHTING MEASURES

**Extinguishing Media:** Small quantities of water in contact with hot liquid may react violently with generation of a large volume of rapidly expanding hot sticky semi-solid foam. Presents additional hazard when fire fighting in a confined space. Cooling with flooding quantities of water reduces this risk. Water spray or fog may cause frothing and should be used in large quantities. Foam. Dry chemical powder. BCF (where regulations permit). Carbon dioxide. Water spray or fog - large fires only.

### Special Hazards arising from the Substrate or Mixture

**Fire Incompatibility:** Avoid contamination with oxidizing agents i.e., nitrates, oxidizing acids, chlorine bleaches, pool chlorine etc. as ignition may result.

### Advice for Firefighters

**Fire Fighting:** Alert Fire Brigade and tell them location and nature of hazard. Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or water course. Use water delivered as a fine spray to control fire and cool adjacent area. Avoid spraying water onto liquid pools. DO NOT approach containers suspected to be hot. Cool fire exposed containers with water spray from a protected location. If safe to do so, remove containers from path of fire.

- Fire/Explosion Hazard:** Combustible.  
 Moderate fire hazard when exposed to heat or flame.  
 When heated to high temperatures decomposes rapidly generating vapor which pressures and may then rupture containers with release of flammable and highly toxic isocyanate vapor.  
 Burns with acrid black smoke and poisonous fumes.  
 Due to reaction with water producing CO<sub>2</sub>-gas, a hazardous build-up of pressure could result if contaminated containers are re-sealed.  
 Combustion yields traces of highly toxic hydrogen cyanide HCN, plus toxic nitrogen oxides NO<sub>x</sub> and carbon monoxide.  
 Combustion products include carbon dioxide (CO<sub>2</sub>), isocyanates, and minor amounts of hydrogen cyanide, other pyrolysis products typical of burning organic material. May emit corrosive fumes.  
 When heated at high temperatures many isocyanates decompose rapidly generating a vapor which pressurizes containers, possibly to the point of rupture. Release of toxic and/or flammable isocyanate vapors may then occur
- HAZCHEM:** Not Applicable.

## SECTION 6: ACCIDENTAL RELEASE MEASURES

### Personal precautions, protective equipment, and emergency procedures

See section 8

### Environmental precautions

See section 12

### Methods and material for containment and cleaning up

<b>Minor Spills</b>	Remove all ignition sources.
	Clean up all spills immediately.
	Avoid breathing vapors and contact with skin and eyes.
	Control personal contact with the substance, by using protective equipment.
	Contain and absorb spill with sand, earth, inert material, or vermiculite.
	Wipe up.
<b>Major Spills</b>	Place in a suitable, labelled container for waste disposal.
	Avoid contamination with water, alkalies and detergent solutions.
	Material reacts with water and generates gas, pressurizes containers with even drum rupture resulting.
	DO NOT reseal container if contamination is suspected.
	Open all containers with care.
	DO NOT touch the spill material.
	Moderate hazard.
	Clear area of personnel and move upwind.
	Alert Fire Brigade and tell them location and nature of hazard.
	Wear breathing apparatus plus protective gloves.
	Prevent, by any means available, spillage from entering drains or water course.
	No smoking, naked lights, or ignition sources.
	Increase ventilation.
	Stop leak if safe to do so.
	Contain spill with sand, earth, or vermiculite.
Collect recoverable product into labelled containers for recycling.	
Absorb remaining product with sand, earth, or vermiculite.	
Collect solid residues and seal in labelled drums for disposal.	
Wash area and prevent runoff into drains.	
If contamination of drains or waterways occurs, advise emergency services.	

Personal Protective Equipment advice is contained in Section 8 of the SDS.

## SECTION 7: HANDLING AND STORAGE

### Precautions for Safe Handling

**Safe Handling:**

- DO NOT allow clothing wet with material to stay in contact with skin
- Avoid all personal contact, including inhalation.
- Wear protective clothing when risk of exposure occurs.
- Use in a well-ventilated area.
- Prevent concentration in hollows and sumps.
- DO NOT enter confined spaces until atmosphere has been checked.
- Avoid smoking, naked lights or ignition sources.
- Avoid contact with incompatible materials.
- When handling, DO NOT eat, drink, or smoke.
- Keep containers securely sealed when not in use.
- Avoid physical damage to containers.
- Always wash hands with soap and water after handling.
- Work clothes should be laundered separately.
- Use good occupational work practice.
- Observe manufacturer's storage and handling recommendations contained within this SDS.
- Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions.

**Other Information:**

For commercial quantities of isocyanates:

Isocyanates should be stored in adequately banded areas. Nothing else should be kept within the same bunding. Pre-polymers need not be segregated. Drums of isocyanates should be stored under cover, out of direct sunlight, protected from rain, protected from physical damage and well away from moisture, acids, and alkalis.

Where isocyanates are stored at elevated temperatures to prevent solidifying, adequate controls should be installed to prevent the high temperatures and precautions against fire should be taken.

Where stored in tanks, the more reactive isocyanates should be blanketed with a non-reactive gas such as nitrogen and equipped with absorptive type breather valve (to prevent vapor emissions).

Transfer systems for isocyanates in bulk storage should be fully enclosed and use pump or vacuum systems. Warning signs, in appropriate languages, should be posted where necessary.

Areas in which polyurethane foam products are stored should be supplied with good general ventilation. Residual amounts of unreacted isocyanate may be present in the finished foam, resulting in hazardous atmospheric concentrations.

Rotate all stock to prevent ageing. Use on FIFO (First In-First Out) basis:

- Store in original containers.
- Keep containers securely sealed.
- No smoking, naked lights, or ignition sources.
- Store in a cool, dry, well-ventilated area.
- Store away from incompatible materials and foodstuff containers.
- Protect containers against physical damage and check regularly for leaks.
- Observe manufacturer's storage and handling recommendations contained within this SDS.

### Conditions for Safe Storage, including any Incompatibilities

**Suitable Container:**

- Metal can or drum.
- Packaging as recommended by manufacturer.
- Check all containers are clearly labelled and free from leaks.

**Storage incompatibility:** Avoid cross contamination between the two liquid parts of product (kit). If two-part products are mixed or allowed to mix in proportions other than manufacturer's recommendation, polymerization with gelation and evolution of heat (exotherm) may occur. This excess heat may generate toxic vapor.

Avoid reaction with water, alcohols, and detergent solutions. Isocyanates are electrophiles, and as such they are reactive toward a variety of nucleophiles including alcohols, amines, and even water. Upon treatment with an alcohol, an isocyanate forms a urethane linkage. If a di-isocyanate is treated with a compound containing two or more hydroxyl groups, such as a diol or a polyol, polymer chains are formed, which are known as polyurethanes. Reaction between a di-isocyanate and a compound containing two or more amine groups, produces long polymer chains known as polyurea.

Isocyanates and thioisocyanates are incompatible with many classes of compounds, reacting exothermically to release toxic gases. Reactions with amines, strong bases, aldehydes, alcohols, alkali metals, ketones, mercaptans, strong oxidizers, hydrides, phenols, and peroxides can cause vigorous releases of heat. Acids and bases initiate polymerization reactions in these materials.

Isocyanates also can react with themselves. Aliphatic di-isocyanates can form trimers, which are structurally related to cyanuric acid. Isocyanates participate in Diels-Alder reactions, functioning as dienophiles.

Isocyanates easily form adducts with carbodiimides, isothiocyanates, ketenes, or with substrates containing activated CC or CN bonds.

Some isocyanates react with water to form amines and liberate carbon dioxide. This reaction may also generate large volumes of foam and heat. Foaming spaces may produce pressure in confined spaces or containers. Gas generation may pressurize drums to the point of rupture.

Do NOT reseal container if contamination is expected.

Open all containers with care.

Base-catalyzed reactions of isocyanates with alcohols should be carried out in inert solvents. Such reactions in the absence of solvents often occur with explosive violence.

Isocyanates will attack and embrittle some plastics and rubbers.

The isocyanate anion is a pseudohalide (syn pseudohalogen) whose chemistry, resembling that of the true halogens, allows it to substitute for halogens in several classes of chemical compounds. The behavior and chemical properties of the several pseudohalides are identical to that of the true halide ions.

A range of exothermic decomposition energies for isocyanates is given as 20-30 kJ/mol.

The relationship between energy of decomposition and processing hazards has been the subject of discussion; it is suggested that values of energy released per unit of mass, rather than on a molar basis (J/g) be used in the assessment.

For example, in "open vessel processes" (with man-hole size openings, in an industrial setting), substances with exothermic decomposition energies below 500 J/g are unlikely to present a danger, whilst those in "closed vessel processes" (opening is a safety valve or bursting disk) present some danger where the decomposition energy exceeds 150 J/g.

BREThERICK: Handbook of Reactive Chemical Hazards, 4th Edition

## SECTION 8: EXPOSURE CONTROLS / PERSONAL PROTECTION

### Control Parameters

OCCUPATIONAL EXPOSURE LIMITS (OEL)

### Ingredient Data:

Source	Ingredient	Material name	TWA	STEL	Peak	Notes
Australia Exposure Standards	polymeric diphenylmethane diisocyanate	Isocyanates, all (as-NCO)	0.02 mg/m <sup>3</sup>	0.07 mg/m <sup>3</sup>	Not Available	Not Available

### Emergency Limits:

Ingredient	Material name	TEEL-1	TEEL-2	TEEL-3
Polymeric Diphenylmethane Diisocyanate	Polymethylene polyphenyl isocyanate; (Polymeric diphenylmethane diisocyanate)	0.15 mg/m <sup>3</sup>	3.6 mg/m <sup>3</sup>	22 mg/m <sup>3</sup>
Ingredient	Original IDLH	Revised IDLH		
Polymeric Diphenylmethane Diisocyanate	Not Available	Not Available		

**Material Data****Exposure Controls:**

- All processes in which isocyanates are used should be enclosed wherever possible.
- Total enclosure, accompanied by good general ventilation, should be used to keep atmospheric concentrations below the relevant exposure standards.
- If total enclosure of the process is not feasible, local exhaust ventilation may be necessary. Local exhaust ventilation is essential where lower molecular weight isocyanates (such as TDI or HDI) is used or where isocyanate or polyurethane is sprayed.
- Where other isocyanates or pre-polymers are used and aerosol formation cannot occur, local exhaust ventilation may not be necessary if the atmospheric concentration can be kept below the relevant exposure standards.
- Where local exhaust ventilation is installed, exhaust vapors should not be vented to the exterior in such a manner as to create a hazard.

Engineering controls are used to remove a hazard or place a barrier between the worker and the hazard. Well-designed engineering controls can be highly effective in protecting workers and will typically be independent of worker interactions to provide this high level of protection.

**The basic types of engineering controls are:**

Process controls which involve changing the way a job activity or process is done to reduce the risk. Enclosure and/or isolation of emission source which keeps a selected hazard "physically" away from the worker and ventilation that strategically "adds" and "removes" air in the work environment. Ventilation can remove or dilute an air contaminant if designed properly. The design of a ventilation system must match the particular process and chemical or contaminant in use. Employers may need to use multiple types of controls to prevent employee overexposure.





- Spraying of material or material in admixture with other components must be carried out in conditions conforming to local state regulations (AS/NZS 4114, UNI EN 12215:2010, ANSI/AIHA Z9.3-2007 or national equivalent).
- Local exhaust ventilation with full face positive-pressure air supplied breathing apparatus (hood or helmet type) is required.
- Spraying should be performed in a spray booth fitted with an effective exhaust system which complies with local environmental legislation.
- The spray booth area must be isolated from unprotected personnel whilst spraying is in progress and until all spraying mist has cleared.

**Appropriate Engineering Controls**

**NOTE:** Isocyanate vapors will not be adequately absorbed by organic vapor respirators. Air contaminants generated in the workplace possess varying "escape" velocities which, in turn, determine the "capture velocities" of fresh circulating air required to effectively remove the contaminant.

Type of Contaminant	Air Speed
Direct spray, spray painting in shallow booths, drum filling, conveyer loading, crusher dusts, gas discharge (active generation into zone of rapid air motion)	1-2.5 m/s (200-500 f/min.)
<b>Within each range the appropriate value depends on:</b>	
Lower end of the range	Upper end of the range
1: Room air currents minimal or favorable to capture.	1: Disturbing room air currents
2: Contaminants of low toxicity or of nuisance value only.	2: Contaminants of high toxicity
3: Intermittent, low production.	3: High production, heavy use
4: Large hood or large air mass in motion.	4: Small hood-local control only

Simple theory shows that air velocity falls rapidly with distance away from the opening of a simple extraction pipe. Velocity generally decreases with the square of distance from the extraction point should be adjusted, accordingly, after reference to distance from the contaminating source. The air velocity at the extraction fan, for example, should be a minimum of 4-10 m/s (800-2000 f/min.) for extraction of solvents generated by spraying at a point 2 meters distant from the extraction point. Other mechanical considerations, producing performance deficits within the extraction apparatus, make it essential that theoretical air velocities are multiplied by factors of 10 or more when extraction systems are installed or used.

<b>Personal Protection</b>	    
<b>Eye and Face Protection</b>	<ul style="list-style-type: none"> <li>▪ Safety glasses with side shields.</li> <li>▪ Chemical goggles.</li> <li>▪ Contact lenses may pose a special hazard; soft contact lenses may absorb and concentrate irritants. A written policy document, describing the wearing of lenses or restrictions on use, should be created for each workplace or task. This should include a review of lens absorption and adsorption for the class of chemicals in use and an account of injury experience. Medical and first-aid personnel should be trained in their removal and suitable equipment should be readily available. In the event of chemical exposure, begin eye irrigation immediately and remove contact lens as soon as practicable. Lens should be removed at the first signs of eye redness or irritation - lens should be removed in a clean environment only after workers have washed hands thoroughly. [CDC NIOSH Current Intelligence Bulletin 59], [AS/NZS 1336 or national equivalent].</li> </ul>
<b>Skin Protection</b>	See Hand Protection below
<b>Hands/Feet Protection</b>	<p><b>Note:</b></p> <ul style="list-style-type: none"> <li>▪ The material may produce skin sensitization in predisposed individuals. Care must be taken, when removing gloves and other protective equipment, to avoid all possible skin contact.</li> <li>▪ Contaminated leather items, such as shoes, belts and watchbands should be removed and destroyed.</li> <li>▪ Do NOT wear natural rubber (latex gloves).</li> <li>▪ Isocyanate resistant materials include Teflon, Viton, nitrile rubber and some PVA gloves.</li> <li>▪ Protective gloves and overalls should be worn as specified in the appropriate national standard.</li> <li>▪ Contaminated garments should be removed promptly and should not be re-used until they have been decontaminated.</li> <li>▪ NOTE: Natural rubber, neoprene, PVC can be affected by isocyanates.</li> <li>▪ DO NOT use skin cream unless necessary and then use only minimum amount.</li> <li>▪ Isocyanate vapour may be absorbed into skin cream, and this increases hazard.</li> <li>▪ Avoid contact with moisture.</li> </ul>
<b>Body Protection</b>	See Other Protection below
<b>Other Protection</b>	<p>All employees working with isocyanates must be informed of the hazards from exposure to the contaminant and the precautions necessary to prevent damage to their health. They should be made aware of the need to carry out their work so that as little contamination as possible is produced, and of the importance of the proper use of all safeguards against exposure to themselves and their fellow workers. Adequate training, both in the proper execution of the task and in the use of all associated engineering controls, as well as of any personal protective equipment, is essential.</p> <p>Employees exposed to contamination hazards should be educated in the need for, and proper use of, facilities, clothing, and equipment and thereby maintain a high standard of personal cleanliness. Special attention should be given to ensuring that all personnel understand instructions, especially newly recruited employees and those with local-language difficulties, where they are known.</p> <ul style="list-style-type: none"> <li>▪ Overalls</li> <li>▪ P.V.C. apron</li> <li>▪ Barrier cream</li> <li>▪ Skin cleansing cream</li> <li>▪ Eye wash unit</li> </ul>



## Respiratory Protection

Full face respirator with supplied air.

- Cartridge respirators should never be used for emergency ingress or in areas of unknown vapors concentrations or oxygen content.
- The wearer must be warned to leave the contaminated area immediately on detecting any odors through the respirator. The odor may indicate that the mask is not functioning properly, that the vapor concentration is too high, or that the mask is not properly fitted. Because of these limitations, only restricted use of cartridge respirators is considered appropriate.
- Cartridge performance is affected by humidity. Cartridges should be changed after 2 hours of continuous use unless it is determined that the humidity is less than 75%, in which case, cartridges can be used for 4 hr. Used cartridges should be discarded daily, regardless of the length of time used.
- In certain circumstances, personal protection of the individual employee is necessary. Personal protective devices should be regarded as being supplementary to substitution and engineering control and should not be used in preference to them as they do nothing to eliminate the hazard.
- However, in some situations, minimizing exposure to isocyanates by enclosure and ventilation is not possible, and occupational exposure standards may be exceeded, particularly during on-site mixing of paints, spray-painting, foaming and maintenance of machine and ventilation systems. In these situations, air-line respirators or self-contained breathing apparatus complying with the appropriate national's standard must be used.
- Organic vapor respirators with particulate pre- filters and powered, air-purifying respirators are NOT suitable.
- Personal protective equipment must be appropriately selected, individually fitted and workers trained in their correct use and maintenance. Personal protective equipment must be regularly checked and maintained to ensure that the worker is being protected.
- Air- line respirators or self-contained breathing apparatus complying with the appropriate national standard should be used during the clean-up of spills and the repair or clean-up of contaminated equipment and similar situations which cause emergency exposures to hazardous atmospheric concentrations of isocyanate.

## SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

### Information on basic physical and chemical properties

<b>Appearance</b>	Clear dark amber liquid with mild musty odor, does not mix with water.
<b>Physical State</b>	Liquid
<b>Odor</b>	Not Available
<b>Odor Threshold</b>	Not Available
<b>pH (as supplied)</b>	Not Applicable
<b>Melting Point / Freezing Point (°C)</b>	<0
<b>Initial Boiling Point and Boiling Range (°C)</b>	200 @ 1 atm
<b>Flash Point (°C)</b>	>204 (DIN 51758)
<b>Evaporation Rate</b>	Not Available
<b>Flammability</b>	Not Applicable
<b>Upper Explosive Limit (%)</b>	Not Available
<b>Lower Explosive Limit (%)</b>	Not Available
<b>Vapor Pressure (kPa)</b>	0
<b>Solubility in Water</b>	Immiscible
<b>Vapor Density (Air = 1)</b>	>1
<b>Relative Density (Water = 1)</b>	1.22
<b>Partition Coefficient N-octanol / Water</b>	Not Available
<b>Auto-ignition temperature (°C)</b>	Not Available

<b>Decomposition Temperature</b>	Not Available
<b>Viscosity (cSt)</b>	Not Available
<b>Molecular Weight (g/mol)</b>	Not Applicable
<b>Taste</b>	Not Available
<b>Explosive Properties</b>	Not Available
<b>Oxidizing Properties</b>	Not Available
<b>Surface Tension (dyn/cm or mN/m)</b>	Not Available
<b>Volatile Component (%vol)</b>	Not Available
<b>Gas Group</b>	Not Available
<b>pH as a Solution (1%)</b>	Not Available
<b>VOC g/L</b>	Not Available

## SECTION 10: STABILITY AND REACTIVITY

<b>Reactivity:</b>	See section 7
<b>Chemical Stability:</b>	Unstable in the presence of incompatible materials. Product is considered stable. Hazardous polymerization will not occur. Presence of elevated temperatures.
<b>Possibility of hazardous reactions:</b>	See section 7
<b>Conditions to avoid:</b>	See section 7
<b>Incompatible materials:</b>	See section 7
<b>Hazardous decomposition products:</b>	See section 5

## SECTION 11: TOXICOLOGICAL INFORMATION

### Information on toxicological effects

<b>Inhaled:</b>	<p>Inhalation of aerosols (mists, fumes), generated by the material during the course of normal handling, may produce toxic effects; these may be fatal.</p> <p>Evidence shows, or practical experience predicts, that the material produces irritation of the respiratory system, in a substantial number of individuals, following inhalation. In contrast to most organs, the lung is able to respond to a chemical insult by first removing or neutralizing the irritant and then repairing the damage. The repair process, which initially evolved to protect mammalian lungs from foreign matter and antigens, may however, produce further lung damage resulting in the impairment of gas exchange, the primary function of the lungs. Respiratory tract irritation often results in an inflammatory response involving the recruitment and activation of many cell types, mainly derived from the vascular system.</p> <p>The vapor/mist may be highly irritating to the upper respiratory tract and lungs; the response may be severe enough to produce bronchitis and pulmonary oedema. Possible neurological symptoms arising from isocyanate exposure include headache, insomnia, euphoria, ataxia, anxiety neurosis, depression, and paranoia. Gastrointestinal disturbances are characterized by nausea and vomiting. Pulmonary sensitization may produce asthmatic reactions ranging from minor breathing difficulties to severe allergic attacks; this may occur following a single acute exposure or may develop without warning for several hours after exposure. Sensitized people can react to very low doses and should not be allowed to work in situations allowing exposure to this material. Continued exposure of sensitized persons may lead to possible long term respiratory impairment.</p> <p>Inhalation hazard is increased at higher temperatures.</p>
<b>Ingestion:</b>	Accidental ingestion of the material may be damaging to the health of the individual.

**Skin Contact:** Evidence exists, or practical experience predicts, that the material either produces inflammation of the skin in a substantial number of individuals following direct contact, and/or produces significant inflammation when applied to the healthy intact skin of animals, for up to four hours, such inflammation being present twenty-four hours or more after the end of the exposure period. Skin irritation may also be present after prolonged or repeated exposure; this may result in a form of contact dermatitis (nonallergic). The dermatitis is often characterized by skin redness (erythema) and swelling (oedema) which may progress to blistering (vesiculation), scaling and thickening of the epidermis. At the microscopic level there may be intercellular oedema of the spongy layer of the skin (spongiosis) and intracellular oedema of the epidermis.

The material may accentuate any pre-existing dermatitis condition.

Open cuts abraded or irritated skin should not be exposed to this material.

Entry into the bloodstream through, for example, cuts, abrasions, puncture wounds or lesions, may produce systemic injury with harmful effects.

Examine the skin prior to the use of the material and ensure that any external damage is suitably protected.

**Eye:** Evidence exists, or practical experience predicts, that the material may cause eye irritation in a substantial number of individuals and/or may produce significant ocular lesions which are present twenty-four hours or more after instillation into the eye(s) of experimental animals. Repeated or prolonged eye contact may cause inflammation characterized by a temporary redness (similar to windburn) of the conjunctiva (conjunctivitis); temporary impairment of vision and/or other transient eye damage/ulceration may occur.

**Chronic:** On the basis, primarily, of animal experiments, concern has been expressed that the material may produce carcinogenic or mutagenic effects; in respect of the available information, however, there presently exists inadequate data for making a satisfactory assessment. Long-term exposure to respiratory irritants may result in disease of the airways involving difficult breathing and related systemic problems. Practical evidence shows that inhalation of the material is capable of inducing a sensitization reaction in a substantial number of individuals at a greater frequency than would be expected from the response of a normal population.

Pulmonary sensitization, resulting in hyperactive airway dysfunction and pulmonary allergy may be accompanied by fatigue, malaise, and aching. Significant symptoms of exposure may persist for extended periods, even after exposure ceases. Symptoms can be activated by a variety of nonspecific environmental stimuli such as automobile exhaust, perfumes, and passive smoking. Practical experience shows that skin contact with the material is capable either of inducing a sensitization reaction in a substantial number of individuals, and/or of producing a positive response in experimental animals.

Toxic: danger of serious damage to health by prolonged exposure through inhalation.

Serious damage (clear functional disturbance or morphological change which may have toxicological significance) is likely to be caused by repeated or prolonged exposure. As a rule, the material produces, or contains a substance which produces severe lesions. Such damage may become apparent following direct application in sub chronic (90 day) toxicity studies or following sub-acute (28 day) or chronic (two-year) toxicity tests. Limited evidence suggests that repeated or long-term occupational exposure may produce cumulative health effects involving organs or biochemical systems.

Isocyanate vapors/mists are irritating to the upper respiratory tract and lungs; the response may be severe enough to produce bronchitis with wheezing, gasping and severe distress, even sudden loss of consciousness, and pulmonary oedema. Possible neurological symptoms arising from isocyanate exposure include headache, insomnia, euphoria, ataxia, anxiety neurosis, depression, and paranoia. Gastrointestinal disturbances are characterized by nausea and vomiting. Pulmonary sensitization may produce asthmatic reactions ranging from minor breathing difficulties to severe allergic attacks; this may occur following a single acute exposure or may develop without warning after a period of tolerance.

A respiratory response may occur following minor skin contact. Skin sensitization is possible and may result in allergic dermatitis responses including rash, itching, hives and swelling of extremities. Isocyanate-containing vapors/ mists may cause inflammation of eyes and nasal passages. Onset of symptoms may be immediate or delayed for several hours after exposure. Sensitized people can react to very low levels of airborne isocyanates. Unprotected or sensitized persons should not be allowed to work in situations allowing exposure to this material.

Respiratory sensitization may result in allergic/asthma like responses, from coughing and minor breathing difficulties to bronchitis with wheezing, gasping.

ShieldFoam PLF Part B	TOXICITY		IRRITATION	
	Dermal (Rabbit) LD50: >5000 mg/kg[2]		Not Available	
	Oral (Rat) LD50: >10000 mg/kg[2]			
Polymeric diphenylmethane diisocyanate	TOXICITY		IRRITATION	
	Dermal (rabbit) LD50: >9400 mg/kg[2]		Eye (rabbit): 100 mg - mild	
	Inhalation (rat) LC50: 0.49 mg/l/4h[2]			
	Oral (rat) LD50: >2000 mg/kg[1]			
Legend:	1. Value obtained from Europe ECHA Registered Substances - Acute toxicity 2.* Value obtained from manufacturer's SDS. Unless otherwise specified data extracted from RTECS - Register of Toxic Effect of chemical Substances			

### POLYMERIC DIPHENYLMETHANE DIISOCYANATE

The following information refers to contact allergens as a group and may not be specific to this product. Contact allergies quickly manifest themselves as contact eczema, more rarely as urticaria or Quincke's oedema. The pathogenesis of contact eczema involves a cell-mediated (T lymphocytes) immune reaction of the delayed type. Other allergic skin reactions, e.g., contact urticaria, involve antibody-mediated immune reactions. The significance of the contact allergen is not simply determined by its sensitization potential: the distribution of the substance and the opportunities for contact with it are equally important. A weakly sensitizing substance which is widely distributed can be a more important allergen than one with stronger sensitizing potential with which few individuals come into contact. From a clinical point of view, substances are noteworthy if they produce an allergic test reaction in more than 1% of the persons tested.

Asthma-like symptoms may continue for months or even years after exposure to the material ceases. This may be due to a non-allergenic condition known as reactive airways dysfunction syndrome (RADS) which can occur following exposure to high levels of highly irritating compound. Key criteria for the diagnosis of RADS include the absence of preceding respiratory disease, in a non-atopic individual, with abrupt onset of persistent asthma-like symptoms within minutes to hours of a documented exposure to the irritant. A reversible airflow pattern, on spirometry, with the presence of moderate to severe bronchial hyperreactivity on methacholine challenge testing and the lack of minimal lymphocytic inflammation, without eosinophilia, have also been included in the criteria for diagnosis of RADS. RADS (or asthma) following an irritating inhalation is an infrequent disorder with rates related to the concentration of and duration of exposure to the irritating substance.

Industrial bronchitis, on the other hand, is a disorder that occurs as result of exposure due to high concentrations of irritating substance (often particulate in nature) and is completely reversible after exposure ceases. The disorder is characterized by dyspnea, cough, and mucus production.

Allergic reactions which develop in the respiratory passages as bronchial asthma or rhino conjunctivitis, are mostly the result of reactions of the allergen with specific antibodies of the IgE class and belong in their reaction rates to the manifestation of the immediate type. In addition to the allergen-specific potential for causing respiratory sensitization, the amount of the allergen, the exposure period and the genetically determined disposition of the exposed person are likely to be decisive. Factors which increase the sensitivity of the mucosa may play a role in predisposing a person to allergy. They may be genetically determined or acquired, for example, during infections or exposure to irritant substances.

Immunologically the low molecular weight substances become complete allergens in the organism either by binding to peptides or proteins (haptens) or after metabolism (prohaptens). Particular attention is drawn to so-called atopic diathesis which is characterized by an increased susceptibility to allergic rhinitis, allergic bronchial asthma, and atopic eczema (neurodermatitis) which is associated with increased IgE synthesis. Exogenous allergic alveolitis is induced essentially by allergen specific immune-complexes of the IgG type; cell-mediated reactions (T lymphocytes) may be involved. Such allergy is of the delayed type with onset up to four hours following exposure.

Isocyanate vapors/mists are irritating to the upper respiratory tract and lungs; the response may be severe enough to produce bronchitis with wheezing, gasping and severe distress, even sudden loss of consciousness, and pulmonary oedema. Possible neurological symptoms arising from isocyanate exposure include headache, insomnia, euphoria, ataxia, anxiety neurosis, depression, and paranoia. Gastrointestinal disturbances are characterized by nausea and vomiting. Pulmonary sensitization may produce asthmatic reactions ranging from minor breathing difficulties to severe allergic attacks; this may occur following a single acute exposure or may develop without warning after a period of tolerance.

A respiratory response may occur following minor skin contact. Skin sensitization is possible and may result in allergic dermatitis responses including rash, itching, hives and swelling of extremities. Isocyanate-containing vapors/ mists may cause inflammation of eyes and nasal passages. Onset of symptoms may be immediate or delayed for several hours after exposure. Sensitized people can react to very low levels of airborne isocyanates. Unprotected or sensitized persons should not be allowed to work in situations allowing exposure to this material. The material may produce moderate eye irritation leading to inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.

For diisocyanates: In general, there appears to be little or no difference between aromatic and aliphatic diisocyanates as toxicants. In addition, there are insufficient data available to make any major distinctions between polymeric (<1000 MW) and monomeric diisocyanates. Based on repeated dose studies in animals by the inhalation route, both aromatic and aliphatic diisocyanates appear to be of high concern for pulmonary toxicity at low exposure levels. Based upon a very limited data set, it appears that diisocyanate prepolymers exhibit the same respiratory tract effects as the monomers in repeated dose studies. There is also evidence that both aromatic and aliphatic diisocyanates are acutely toxic via the inhalation route. Most members of the diisocyanate category have not been tested for carcinogenic potential. Though the aromatic diisocyanates tested positive and the one aliphatic diisocyanate tested negative in one species, it is premature to make any generalizations about the carcinogenic potential of aromatic versus aliphatic diisocyanates. In the absence of more human data, it would be prudent at this time to assume that both aromatic and aliphatic diisocyanates are respiratory sensitizers. Diisocyanates are moderate to strong dermal sensitizers in animal studies. Skin irritation studies performed on rabbits and guinea pigs indicate no difference in the effects of aromatic versus aliphatic diisocyanates.

For monomers, effects on the respiratory tract (lungs and nasal cavities) were observed in animal studies at exposure concentrations of less than 0.005 mg/L. The experimental animal data available on prepolymeric diisocyanates show similar adverse effects at levels that range from 0.002 mg/L to 0.026 mg/L. There is also evidence that both aromatic and aliphatic diisocyanates are acutely toxic via the inhalation route.

**Oncogenicity:** Most members of the diisocyanate category have not been tested for carcinogenic potential. Commercially available Poly-MDI was tested in a 2-year inhalation study in rats. The tested material contained 47% aromatic 4,4'-methylenediphenyl diisocyanate (MDI) and 53% higher molecular weight oligomers. Interim sacrifices at one year showed that males and females in the highest dose group (6 mg/m<sup>3</sup>) had treatment related histological changes in the nasal cavity, lungs, and mediastinal lymph nodes. The incidence and severity of degeneration and basal cell hyperplasia of the olfactory epithelium and Bowman's gland hyperplasia were increased in males at the mid and high doses and in females at the high dose following the two-year exposure period. Pulmonary adenomas were found in 6 males and 2 females, and pulmonary adenocarcinoma in one male in the high dose group. However, aliphatic hexamethylene diisocyanate (HDI) was found not to be carcinogenic in a two-year repeated dose study in rats by the inhalation route. HDI has not been tested in mice by the inhalation route.

Though the oral route is not an expected route of exposure to humans, it should be noted that in two-year repeated dose studies by the oral route, aromatic toluene diisocyanate (TDI) and 3,3'-dimethoxybenzidine-4,4'-diisocyanate (dianisidine diisocyanate, DADI) were found to be carcinogenic in rodents. TDI induced a statistically significant increase in the incidence of liver tumors in rats and mice as well as dose-related hemangiosarcomas of the circulatory system and has been classified by the Agency as a B2 carcinogen. DADI was found to be carcinogenic in rats, but not in mice, with a statistically increase in the incidence of pancreatic tumors observed.

**Respiratory and Dermal Sensitization:** Based on the available toxicity data in animals and epidemiologic studies of humans, aromatic diisocyanates such as TDI and MDI are strong respiratory sensitizers. Aliphatic diisocyanates are generally not active in animal models for respiratory sensitization. However, HDI and possibly isophorone diisocyanate (IPDI), are reported to be associated with respiratory sensitization in humans. Symptoms resulting from occupational exposure to HDI include shortness of breath, increased bronchoconstriction reaction to histamine challenges, asthmatic reactions, wheezing and coughing. Two case reports of human exposure to IPDI by inhalation suggest IPDI is a respiratory sensitizer in humans. In view of the information from case reports in humans, it would be prudent at this time to assume that both aromatic and aliphatic diisocyanates are respiratory sensitizers. Studies in both human and mice using TDI, HDI, MDI and dicyclohexylmethane 4,4'-diisocyanate (HMDI) suggest cross-reactivity with the other diisocyanates, irrespective of whether the challenge compound was aliphatic or aromatic diisocyanate. Diisocyanates are moderate to strong dermal sensitizers in animal studies. There seems to be little or no difference in the level of reactivity between aromatic and aliphatic diisocyanates.

**Dermal Irritation:** Skin irritation studies performed on rabbits and guinea pigs indicate no difference in the effects of aromatic versus aliphatic diisocyanates. The level of irritation ranged from slightly to severely irritating to the skin. One chemical, hydrogenated MDI (1,1-methylenebis 4-isocyanatocyclohexane) was found to be corrosive to the skin in guinea pigs.

The substance is classified by IARC as Group 3: NOT classifiable as to its carcinogenicity to humans. Evidence of carcinogenicity may be inadequate or limited in animal testing.

Acute Toxicity	✓	Carcinogenicity	✓
Skin Irritation/Corrosion	✓	Reproductivity	✗
Serious Eye Damage/Irritation	✓	STOT - Single Exposure	✓
Respiratory or Skin Sensitization	✓	STOT - Repeated Exposure	✓
Mutagenicity	✗	Aspiration Hazard	✗
<b>Legend:</b>	✗	Data either not available or does not fill the criteria for classification	
	✓	Data available to make classification	

## SECTION 12: ECOLOGICAL INFORMATION

### Toxicity

ShieldFoam PLF Part B	ENDPOINT	TEST DURATION (HR)	SPECIES	VALUE	SOURCE
	Not Available	Not Available	Not Available	Not Available	Not Available
Polymeric Diphenylmethane Diisocyanate	ENDPOINT	TEST DURATION (HR)	SPECIES	VALUE	SOURCE
	LC50	96	Fish	>1-mg/L	2
	EC50	72	Algae or other aquatic plants	>1-640mg/L	2

**Legend:** Extracted from 1. IUCLID Toxicity Data 2. Europe ECHA Registered Substances - Ecotoxicological Information - Aquatic Toxicity 3. EPIWIN Suite V3.12 (QSAR) - Aquatic Toxicity Data (Estimated) 4. US EPA, Ecotox database - Aquatic Toxicity Data 5. ECETOC Aquatic Hazard Assessment Data 6. NITE (Japan) - Bioconcentration Data 7. METI (Japan) - Bioconcentration Data 8. Vendor Data

DO NOT discharge into sewer or waterways.

**Persistence and Degradability:**

Ingredient	Persistence: Water/Soil	Persistence: Air
	No Data available for all ingredients	No Data available for all ingredients

**Bioaccumulative Potential:**

Ingredient	Bioaccumulation
	No Data available for all ingredients

**Mobility in Soil:**

Ingredient	Mobility
	No Data available for all ingredients

**SECTION 13: DISPOSAL CONSIDERATIONS****Waste treatment methods**

**Product / Packaging disposal:** DO NOT allow wash water from cleaning or process equipment to enter drains. It may be necessary to collect all wash water for treatment before disposal. In all cases, disposal to sewer may be subject to local laws and regulations and these should be considered first.

Where in doubt contact the responsible authority.  
 DO NOT recycle spilled material.  
 Consult State Land Waste Management Authority for disposal.  
 Neutralize spill material carefully and decontaminate empty containers and spill residues with 10% ammonia solution plus detergent or a proprietary decontaminant prior to disposal.

DO NOT seal or stopper drums being decontaminated as CO<sub>2</sub> gas is generated and may pressurize containers.  
 Puncture containers to prevent re-use.  
 Bury or incinerate residues at an approved site.

**SECTION 14: TRANSPORT INFORMATION****Labels Required**

Marine Pollutant: No  
 HAZCHEM: Not Applicable

**Land transport (ADG):** NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS

**Air transport (ICAO-IATA / DGR):** NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS

**Sea transport (IMDG-Code/GGVSee):** NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS

**Transport in bulk according to Annex II of MARPOL and the IBC code:** Not Applicable

**SECTION 15: REGULATORY INFORMATION****Safety, Health, and Environmental regulations / legislation specific for the Substance or Mixture**

Polymeric Diphenylmethane Diisocyanate is found on the following regulatory lists:

- Australia Exposure Standards
- Australia Hazardous Chemical Information System (HCIS) - Hazardous Chemicals
- Australia Inventory of Chemical Substances (AICS)
- Australia Model Work Health and Safety Regulations - Hazardous chemicals (other than lead) requiring health monitoring

- Australia Standard for the Uniform Scheduling of Medicines and Poisons (SUSMP) - Schedule 6
- GESAMP/EHS Composite List - GESAMP Hazard Profiles
- IMO IBC Code Chapter 17: Summary of minimum requirements
- IMO MARPOL (Annex II) - List of Noxious Liquid Substances Carried in Bulk
- International Agency for Research on Cancer (IARC) - Agents Classified by the IARC Monographs
- International FOSFA List of Banned Immediate Previous Cargoes

### National Inventory Status

National Inventory	Status
Australia - AICS	Yes
Canada - DSL	Yes
Canada - NDSL	No (polymeric diphenylmethane diisocyanate)
China - IECSC	Yes
Europe - EINEC / ELINCS / NLP	No (polymeric diphenylmethane diisocyanate)
Japan - ENCS	Yes
Korea - KECI	Yes
New Zealand - NZIoC	Yes
Philippines - PICCS	Yes
USA - TSCA	Yes
Taiwan - TCSI	Yes
Mexico - INSQ	Yes
Vietnam - NCI	Yes
Russia - ARIPS	Yes
<b>Legend:</b>	Yes = All CAS declared ingredients are on the inventory No = One or more of the CAS listed ingredients are not on the inventory and are not exempt from listing (see specific ingredients in brackets)

## SECTION 16: OTHER INFORMATION

Classification of the preparation and its individual components has drawn on official and authoritative sources as well as independent review by the ShieldCrete® International using available literature references.

The SDS is a Hazard Communication tool and should be used to assist in the Risk Assessment. Many factors determine whether the reported Hazards are Risks in the workplace or other settings. Risks may be determined by reference to Exposures Scenarios. Scale of use, frequency of use and current or available engineering controls must be considered.

### Definitions and Abbreviations:

PC-TWA: Permissible Concentration-Time Weighted Average  
 PC-STEL: Permissible Concentration-Short Term Exposure Limit  
 IARC: International Agency for Research on Cancer  
 ACGIH: American Conference of Governmental Industrial Hygienists  
 STEL: Short Term Exposure Limit  
 TEEL: Temporary Emergency Exposure Limit  
 IDLH: Immediately Dangerous to Life or Health Concentrations  
 OSF: Odour Safety Factor  
 NOAEL: No Observed Adverse Effect Level  
 LOAEL: Lowest Observed Adverse Effect Level  
 TLV: Threshold Limit Value  
 LOD: Limit of Detection  
 OTV: Odour Threshold Value  
 BCF: BioConcentration Factors  
 BEI: Biological Exposure Index