

# CC5/65 PART A



Version

2.0

Chemwatch25-9877

Chemwatch Material Safety Data Sheet (Conforms to Reg. (EC) No 1907/2006, Reg. (EC) No 1272/2008 and their amendments)

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CHEMWATCHSDS

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## SAFETY DATASHEET

### SECTION 1: Identification of the substance / mixture and of the company / undertaking

#### 1.1. Product Identifier

Product name:	CC5/65 PART A
Chemical product name:	No data available
Synonyms:	No data available
Proper shipping name:	ISOCYANATES, TOXIC, N.O.S. or ISOCYANATE SOLUTION, TOXIC, N.O.S.(contains toluene-2,4-diisocyanate)
Chemical formula:	No data available
Other means of identification:	No data available
Index number:	No data available
ID number:	No data available
CAS number:	No data available
REACH registration number:	No data available
EC number:	Not Available

#### 1.2. Relevant identified uses of the substance or mixture and uses advised against

Relevant identified uses:	Used according to manufacturer's directions. Polyurethane prepolymer.
Uses advised against:	No data available

#### 1.3. Details of the supplier of the safety data sheet

Registered company name:	Era Polymers Pty Ltd
Address:	25-27 Green Street, Banksmeadow, NSW, 2019, AUS
Telephone:	+61 2 9666 3788
Fax:	+61 2 9666 4805
Email:	
Website:	www.erapdl.com.au

#### 1.4. Emergency telephone number

Association / Organisation:	
Other emergency telephone numbers:	1800 039 008 (AUS)
Other emergency telephone numbers:	+61 3 9573 3112; +800 243 62255

### SECTION 2: Hazards identification

#### 2.1. Classification of the substance or mixture

DSD classification:	In case of mixtures, classification has been prepared by following DPD (Directive 1999/45/EC) or CLP (Regulation (EC) No 1272/2008) regulations	
DSD classification (additional):	No data available	
DPD classification:	R23	• Toxic by inhalation.
	R36/37/38	• Irritating to eyes, respiratory system and skin.
	R40	• Limited evidence of a carcinogenic effect.
	R42/43	• May cause SENSITISATION by inhalation and skin contact.
CLP classification:	Acute Toxicity (Inhalation) Category 2 Acute Toxicity (Inhalation) Category 3 Skin Corrosion/Irritation Category 2 Eye Irritation Category 2A Respiratory Sensitizer Category 1 Skin Sensitizer Category 1 Carcinogen Category 2 STOT - SE (Resp. Irr.) Category 3	
CLP classification (additional):	No data available	

#### 2.2. Label elements

##### CLP label elements



<b>Signal word:</b>	DANGER	
<b>Hazard statement(s):</b>	H330	Fatal if inhaled
	H331	Toxic if inhaled
	H315	Causes skin irritation
	H319	Causes serious eye irritation
	H334	May cause allergic or asthmatic symptoms or breathing difficulties if inhaled
	H317	May cause allergic skin reaction
	H351	Suspected of causing cancer
	H335	May cause respiratory irritation
<i>Determined by Chemwatch using CLP criteria</i>		
<b>Additional Statement(s):</b>	No data available	
<b>Supplementary statement(s):</b>	No data available	
<b>Precautionary statement(s):</b>	<b>Prevention</b>	<b>Phrase</b>
	<b>Code</b>	
	P201	Obtain special instructions before use.
	P202	Do not handle until all safety precautions have been read and understood.
	P260	Do not breathe dust/fume/gas/mist/vapours/spray.
	P261	Avoid breathing dust/fume/gas/mist/vapours/spray.
	P264	Wash ... thoroughly after handling.
	P270	Do not eat, drink or smoke when using this product.
	P271	Use only outdoors or in a well-ventilated area.
	P272	Contaminated work clothing should not be allowed out of the workplace.
	P280	Wear protective gloves/protective clothing/eye protection/face protection.
	P281	Use personal protective equipment as required.
	P284	Wear respiratory protection.
	P285	In case of inadequate ventilation wear respiratory protection.
	<b>Response</b>	
	<b>Code</b>	<b>Phrase</b>
	P301+P312	IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell.
	P302+P352	IF ON SKIN: Wash with plenty of soap and water.
	P304+P340	IF INHALED: Remove to fresh air and keep at rest in a position comfortable for breathing.
	P304+P341	IF INHALED: If breathing is difficult, remove to fresh air and keep at rest in a position comfortable for breathing.
	P305+P351+P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
	P308+P313	IF exposed or concerned: Get medical advice/ attention.
	P310	Immediately call a POISON CENTER or doctor/physician.
	P312	Call a POISON CENTER or doctor/physician if you feel unwell.
	P320	Specific treatment is urgent (see MSDS).
	P330	Rinse mouth.
	P333+P313	If skin irritation or rash occurs: Get medical advice/attention.
	P337+P313	If eye irritation persists: Get medical advice/attention.
	P342+P311	If experiencing respiratory symptoms: Call a POISON CENTER or doctor/physician.
	P363	Wash contaminated clothing before reuse.
	<b>Storage</b>	
	<b>Code</b>	<b>Phrase</b>
	P403+P233	Store in a well-ventilated place. Keep container tightly closed.
	P405	Store locked up.
	<b>Disposal</b>	
	<b>Code</b>	<b>Phrase</b>
	P501	Dispose of contents/container to ...

#### DSD / DPD label elements



Relevant risk statements are found in section 2.1

Indication(s) of danger:	CONSIDERED A DANGEROUS MIXTURE ACCORDING TO DIRECTIVE 1999/45/EC AND ITS AMENDMENTS.	
Safety advice:	S01	<ul style="list-style-type: none"> <li>Keep locked up.</li> </ul>
	S23	<ul style="list-style-type: none"> <li>Do not breathe gas/fumes/vapour/spray.</li> </ul>
	S24	<ul style="list-style-type: none"> <li>Avoid contact with skin.</li> </ul>
	S25	<ul style="list-style-type: none"> <li>Avoid contact with eyes.</li> </ul>
	S36	<ul style="list-style-type: none"> <li>Wear suitable protective clothing.</li> </ul>
	S38	<ul style="list-style-type: none"> <li>In case of insufficient ventilation, wear suitable respiratory equipment.</li> </ul>
	S37	<ul style="list-style-type: none"> <li>Wear suitable gloves.</li> </ul>
	S39	<ul style="list-style-type: none"> <li>Wear eye/face protection.</li> </ul>
	S51	<ul style="list-style-type: none"> <li>Use only in well ventilated areas.</li> </ul>
	S09	<ul style="list-style-type: none"> <li>Keep container in a well ventilated place.</li> </ul>
	S401	<ul style="list-style-type: none"> <li>To clean the floor and all objects contaminated by this material, use water and detergent.</li> </ul>
	S07	<ul style="list-style-type: none"> <li>Keep container tightly closed.</li> </ul>
	S35	<ul style="list-style-type: none"> <li>This material and its container must be disposed of in a safe way.</li> </ul>
	S13	<ul style="list-style-type: none"> <li>Keep away from food, drink and animal feeding stuffs.</li> </ul>
	S27	<ul style="list-style-type: none"> <li>Take off immediately all contaminated clothing.</li> </ul>
	S26	<ul style="list-style-type: none"> <li>In case of contact with eyes, rinse with plenty of water and contact Doctor or Poisons Information Centre.</li> </ul>
	S60	<ul style="list-style-type: none"> <li>This material and its container must be disposed of as hazardous waste.</li> </ul>
	S63	<ul style="list-style-type: none"> <li>In case of accident by inhalation: remove casualty to fresh air and keep at rest.</li> </ul>

2.3. Other hazards

No data available

PBT/vPvB criteria                      No data available

SECTION 3: Composition / information on ingredients

3.1. Substances

See 'Composition on ingredients' in section 3.2

3.2. Mixtures

1. CAS No 2. EC No 3. Index No 4. REACH No	%[weight]	Name	Classification according to Directive 1999/45/EC [DPD]		Classification according to (EC) No 1272/2008 [CLP]
1. 2. 3. 4.	>60	polyurethane prepolymer			
1. 584-84-9 2. 209-544-5, 247-722-4 3. 615-006-00-4 4. No data available	1-10	toluene-2,4-diisocyanate	T+	R26 R36/37/38 R40 R42/43 R52/53	Carc. 2 Acute Tox. 2 * Eye Irrit. 2 STOT SE 3 Skin Irrit. 2 Resp. Sens. 1 Skin Sens. 1 Aquatic Chronic 3  CLP classification according to Annex VI of CLP (Regulation (EC) No 1272/2008)

SECTION 4: First aid measures

4.1. Description of first aid measures

General:                                      No data available

Ingestion:

- For advice, contact a Poisons Information Centre or a doctor.
- 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:

If this product comes in contact with the eyes:

- 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:

If skin contact occurs:

- 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.

**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, without delay.

**4.2. Most important symptoms and effects, both acute and delayed****Inhaled:**

- Inhalation of aerosols (mists, fumes), generated by the material during the course of normal handling, may produce toxic effects; these may be fatal.
- The vapour/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 characterised by nausea and vomiting. Pulmonary sensitisation 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. Sensitised people can react to very low doses, and should not be allowed to work in situations allowing exposure to this material. Continued exposure of sensitised persons may lead to possible long term respiratory impairment.

Inhalation hazard is increased at higher temperatures.

- In addition to producing pulmonary sensitisation, toluene diisocyanate (TDI) is active in contracting smooth muscle such as that found in the airway. So-called bronchoconstriction is often mistaken for sensitisation and lung function tests, including measurement of forced expiratory volume (FEV<sub>1</sub>) and forced vital capacity (FCV) may distinguish acute reaction. Severe irritation is produced by inhalation of low vapour concentrations. At 0.02 ppm, TDI does not produce immediate irritation but this may become apparent after an extended period of exposure. Symptoms may include a burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea and vomiting. Overexposure or repeated exposure may produce bronchial spasm and asthma which may not appear for several hours. Symptoms may persist for several weeks. Most individuals recover completely. Both allergy-prone and non allergy-prone individuals may become sensitised. Cross-sensitisation to other isocyanates may occur.

**Ingestion:**

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 characterised 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 blood-stream 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 characterised by 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. Practical evidence shows that inhalation of the material is capable of inducing a sensitisation reaction in a substantial number of individuals at a greater frequency than would be expected from the response of a normal population. Pulmonary sensitisation, 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 sensitisation reaction in a substantial number of individuals, and/or of producing a positive response in experimental animals.

Persons with a history of asthma or other respiratory problems or are known to be sensitised, should not be engaged in any work involving the handling of isocyanates. [CCTRADE-Bayer, APMF]

With most allergens, removal of the offending agent results in the individual becoming asymptomatic. Toluene diisocyanate (TDI)-induced asthma may continue for months or even years after exposure ceases. This may be due to a non-allergic condition known as reactive airway dysfunction syndrome (RADS) which can occur following exposure to high levels of highly irritating compound. Evidence of carcinogenic potential of commercial grade TDI in female mice included induction of haemangiomas in the spleen and subcutaneous tissues, hepatocellular adenomas, and haemangiosarcomas in the liver, ovary and peritoneum. Ingestion of commercial grade TDI produced subcutaneous fibromas, pancreatic acinar cell adenomas, mammary gland fibroadenomas and subcutaneous fibromas and fibrosarcomas in female rats. No treatment related tumours were induced in male mice.

Isocyanate vapours/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 characterised by nausea and vomiting. Pulmonary sensitisation 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 sensitisation is possible and may result in allergic dermatitis responses including rash, itching, hives and swelling of extremities.

Isocyanate-containing vapours/ mists may cause inflammation of eyes and nasal passages.

Onset of symptoms may be immediate or delayed for several hours after exposure. Sensitised people can react to very low levels of airborne isocyanates. Unprotected or sensitised persons should not be allowed to work in situations allowing exposure to this material.

**4.3. Indication of any immediate medical attention and special treatment needed**

Toluene diisocyanate is a known pulmonary sensitiser. Annual medical surveillance should be conducted including pulmonary history, examination of the heart and lungs, 14 x 17 inch (35 x 47 cm) x-ray and pulmonary function testing (FCV, FEV<sub>1</sub>).

In normal commercial preparations of toluene diisocyanate, the 2,4-isomer dominates in the ratio 4:1. However it is also hydrolysed, in air, more rapidly than the 2,6-isomer. Airway sensitivities may result from the appearance of immunoglobulins in the blood. Frequent inability to detect antibodies to TDI in clinical cases may result from the routine use of diagnostic antigens containing predominantly 2,4-TDI, whereas individuals may have been exposed to atmospheres in which 2,6-TDI was the predominant isomer. [Karol & Jin, Frontiers of Molecular Toxicology, pp 55-61, 1992]

For sub-chronic and chronic exposures to isocyanates:

- This material may be a potent pulmonary sensitiser 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 sensitised workers.

[Elenhorn and Barceloux; Medical Toxicology]

**NOTE** Isocyanates cause airway restriction in naive individuals with the degree of response dependant 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 FEV<sub>1</sub>, 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 sensitisation 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: Firefighting measures

### 5.1. 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.

### 5.2. Special hazards arising from the substrate or mixture

#### Fire Incompatibility:

- Avoid contamination with oxidising agents i.e. nitrates, oxidising acids, chlorine bleaches, pool chlorine etc. as ignition may result

### 5.3. 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 fire fighting procedures suitable for surrounding area.
- **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.
- Equipment should be thoroughly decontaminated after use.

#### Fire/Explosion Hazard:

- Combustible.
- Moderate fire hazard when exposed to heat or flame.
- When heated to high temperatures decomposes rapidly generating vapour which pressurises and may then rupture containers with release of flammable and highly toxic isocyanate vapour.
- Burns with acrid black smoke and poisonous fumes.
- 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

nitrogen oxides (NO<sub>x</sub>)

other pyrolysis products typical of burning organic material

When heated at high temperatures many isocyanates decompose rapidly generating a vapour which pressurises containers, possibly to the point of rupture. Release of toxic and/or flammable isocyanate vapours may then occur

May emit poisonous fumes.

## SECTION 6: Accidental release measures

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

#### Personal Protective Equipment:

Breathing apparatus. Gas tight chemical resistant suit. Limit exposure duration to 1 BA set 30 mins.

#### Minor Spills:

- Remove all ignition sources.
- Clean up all spills immediately.
- Avoid breathing vapours and contact with skin and eyes.
- Control personal contact by using protective equipment.
- Contain and absorb spill with sand, earth, inert material or vermiculite.
- Wipe up.
- Place in a suitable, labelled container for waste disposal.

#### Major Spills:

- Liquid Isocyanates and high isocyanate vapour concentrations will penetrate seals on self contained breathing apparatus - SCBA should be used inside encapsulating suit where this exposure may occur.

For isocyanate spills of less than 40 litres (2 m<sup>2</sup>):

- Evacuate area from everybody not dealing with the emergency, keep them upwind and prevent further access, remove ignition sources and, if inside building, ventilate area as well as possible.
- Notify supervision and others as necessary.
- Put on personal protective equipment (suitable respiratory protection, face and eye protection, protective suit, gloves and impermeable boots).
- Control source of leakage (where applicable).

- Dike the spill to prevent spreading and to contain additions of decontaminating solution.
- Prevent the material from entering drains.
- Estimate spill pool volume or area.
- Absorb and decontaminate. - Completely cover the spill with wet sand, wet earth, vermiculite or other similar absorbent. - Add neutraliser (for suitable formulations: see below) to the adsorbent materials (equal to that of estimated spill pool volume). Intensify contact between spill, absorbent and neutraliser by carefully mixing with a rake and allow to react for 15 minutes
- Shovel absorbent/decontaminant solution mixture into a steel drum
- Decontaminate surface. - Pour an equal amount of neutraliser solution over contaminated surface. - Scrub area with a stiff bristle brush, using moderate pressure. - Completely cover decontaminant with vermiculite or other similar absorbent. - After 5 minutes, shovel absorbent/decontamination solution mixture into the same steel drum used above.
- Monitor for residual isocyanate. If surface is decontaminated, proceed to next step. If contamination persists, repeat decontaminate procedure immediately above
- Place loosely covered drum (release of carbon dioxide) outside for at least 72 hours. Label waste-containing drum appropriately. Remove waste materials for incineration.
- Decontaminate and remove personal protective equipment.
- Return to normal operation.
- Conduct accident investigation and consider measures to prevent reoccurrence.

#### Decontamination:

Treat isocyanate spills with sufficient amounts of isocyanate decontaminant preparation ("neutralising fluid"). Isocyanates and polyisocyanates are generally not miscible with water. Liquid surfactants are necessary to allow better dispersion of isocyanate and neutralising fluids/ preparations. Alkaline neutralisers react faster than water/surfactant mixtures alone.

Typically, such a preparation may consist of:

Saw dust: 20 parts by weight Kieselguhr 40 parts by weight plus a mixture of {ammonia (s.g. 0.880) 8% v/v non-ionic surfactant 2% v/v water 90% v/v}.

Let stand for 24 hours

Three commonly used neutralising fluids each exhibit advantages in different situations.

#### Formulation A :

liquid surfactant	0.2-2%
sodium carbonate	5-10%
water to	100%

#### Formulation B

liquid surfactant	0.2-2%
concentrated ammonia	3-8%
water to	100%

#### Formulation C

ethanol, isopropanol or butanol	50%
concentrated ammonia	5%
water to	100%

After application of any of these formulae, let stand for 24 hours.

Formulation B reacts faster than Formulation A. However, ammonia-based neutralisers should be used only under well-ventilated conditions to avoid overexposure to ammonia or if members of the emergency team wear suitable respiratory protection. Formulation C is especially suitable for cleaning of equipment from unreacted isocyanate and neutralizing under freezing conditions. Regard has to be taken to the flammability of the alcoholic solution.

- Avoid contamination with water, alkalies and detergent solutions.
- Material reacts with water and generates gas, pressurises containers with even drum rupture resulting.
- **DO NOT** reseal container if contamination is suspected.
- Open all containers with care.
- Clear area of personnel and move upwind.
- 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.
- Stop leak if safe to do so.
- Contain spill with sand, earth or vermiculite.
- Collect recoverable product into labelled containers for recycling.
- Neutralise/decontaminate residue (see Section 13 for specific agent).
- Collect solid residues and seal in labelled drums for disposal.
- Wash area and prevent runoff into drains.
- After clean up operations, decontaminate and launder all protective clothing and equipment before storing and re-using.
- If contamination of drains or waterways occurs, advise emergency services.

## 6.2. Environmental precautions

The maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to one hour WITHOUT experiencing or developing

life-threatening health effects is:

toluene-2,4-diisocyanate	0.6ppm
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irreversible or other serious effects or symptoms which could impair an individual's ability to take protective action is:

toluene-2,4-diisocyanate	0.15ppm
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other than mild, transient adverse effects without perceiving a clearly defined odour is:

toluene-2,4-diisocyanate	0.01ppm
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American Industrial Hygiene Association (AIHA)

Ingredients considered according to the following cutoffs

Very Toxic (T+)  $\geq$  0.1% Toxic (T)  $\geq$  3.0%

R50  $\geq$  0.25% Corrosive (C)  $\geq$  5.0%

R51  $\geq$  2.5%

else  $\geq$  10%

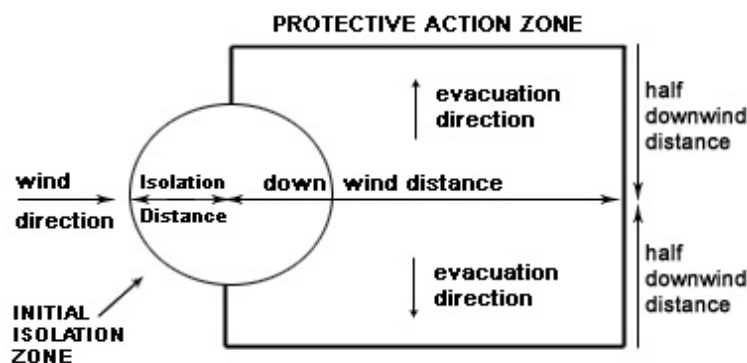
where percentage is percentage of ingredient found in the mixture

## 6.3. Methods and material for containment and cleaning up

is taken from the US DOT emergency response guide book.

6 IERG information is derived from CANUTEC - Transport Canada.

#### PROTECTIVE ACTIONS FOR SPILL



From IERG (Canada/Australia)  
Isolation Distance 25 metres  
Downwind Protection Distance 250 metres  
IERG Number 38

#### FOOTNOTES

1 PROTECTIVE ACTION ZONE is defined as the area in which people are at risk of harmful exposure. This zone assumes that random changes in wind direction confine the vapour plume to an area within 30 degrees on either side of the predominant wind direction, resulting in a crosswind protective action distance equal to the downwind protective action distance.

2 PROTECTIVE ACTIONS should be initiated to the extent possible, beginning with those closest to the spill and working away from the site in the downwind direction. Within the protective action zone a level of vapour concentration may exist resulting in nearly all unprotected persons becoming incapacitated and unable to take protective action and/or incurring serious or irreversible health effects.

3 INITIAL ISOLATION ZONE is determined as an area, including upwind of the incident, within which a high probability of localised wind reversal may expose nearly all persons without appropriate protection to life-threatening concentrations of the material.

4 SMALL SPILLS involve a leaking package of 200 litres (55 US gallons) or less, such as a drum (jerrican or box with inner containers). Larger packages leaking less than 200 litres and compressed gas leaking from a small cylinder are also considered "small spills".

LARGE SPILLS involve many small leaking packages or a leaking package of greater than 200 litres, such as a cargo tank, portable tank or a "one-tonne" compressed gas cylinder.

5

From US Emergency Response Guide 2000 Guide 155

#### 6.4. Reference to other sections

Personal Protective Equipment advice is contained in Section 8 of the MSDS

### SECTION 7: Handling and storage

#### 7.1. 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.
- **DO NOT** allow material to contact humans, exposed food or food utensils.
- 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. Launder contaminated clothing before re-use.
- Use good occupational work practice.
- Observe manufacturer's storing and handling recommendations.
- Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions are maintained.

##### Fire and explosion protection

See section 5

##### Other information

for commercial quantities of isocyanates:

- Isocyanates should be stored in adequately bunded 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 vapour 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.
- Store in original containers.
- Keep containers securely sealed.
- 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 storing and handling recommendations.



## SAFE STORAGE WITH OTHER CLASSIFIED CHEMICALS



X



X



+



X



X



+

+: May be stored together.

O: May be stored together with specific precautions.

X: Must not be stored together.

## 7.2. Conditions for safe storage, including any incompatibilities

### Suitable container:

- Lined metal can, lined metal pail/ can.
- Plastic pail.
- Polyliner drum
- Packing as recommended by manufacturer.
- Check all containers are clearly labelled and free from leaks.

For low viscosity materials

- Drums and jerricans must be of the non-removable head type.
- Where a can is to be used as an inner package, the can must have a screwed enclosure.

For materials with a viscosity of at least 2680 cSt. (23 deg. C) and solids (between 15 C deg. and 40 deg C):

- Removable head packaging;
- Cans with friction closures and
- low pressure tubes and cartridges

may be used.

- Where combination packages are used, and the inner packages are of glass, there must be sufficient inert cushioning material in contact with inner and outer packages \*.

- In addition, where inner packagings are glass and contain liquids of packing group I and II there must be sufficient inert absorbent to absorb any spillage \*.

\* unless the outer packaging is a close fitting moulded plastic box and the substances are not incompatible with the plastic.

### Storage incompatibility:

- Avoid reaction with water, alcohols and detergent solutions.
- 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 oxidisers, hydrides, phenols, and peroxides can cause vigorous releases of heat. Acids and bases initiate polymerisation reactions in these materials.
- 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 in confined spaces may produce pressure in confined spaces or containers. Gas generation may pressurise drums to the point of rupture.
- Do NOT reseal container if contamination is expected
- Open all containers with care
- Base-catalysed 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.
- 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.

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### Package Material

### Incompatibilities:

No data available

## 7.3. Specific end use(s)

See section 1.2

## SECTION 8: Exposure controls / personal protection

### 8.1. Control parameters

#### Derived No Effect Level (DNEL)

Exposure Pattern	Workers	General Population	Exposure Pattern	Workers	General Population
Long term - dermal, systemic effects	-	-	Short term - dermal, systemic effects	No data available	No data available
Long term - inhalation, systemic effects	-	-	Short term - inhalation, systemic effects	No data available	No data available
Long term - oral, systemic effects	-	-	Short term - oral, systemic effects	No data available	No data available
Long term - dermal, local effects	-	-	Short term - dermal, local effects	No data available	No data available
Long term - inhalation, local effects	-	-	Short term - inhalation, local effects	No data available	No data available

### Occupational Exposure Limits (OEL)

TAA TAA STE STE PEL PEL TAA



Source	Material	TWA ppm	TWA mg/m <sup>3</sup>	STEL ppm	STEL mg/m <sup>3</sup>	Peak ppm	Peak mg/m <sup>3</sup>	TWA F/CC	Notes
UK Workplace Exposure Limits (WELs)	toluene-2,4-diisocyanate (Isocyanates, all (as -NCO))		0.02		0.07				Sen, HSC/E plans to review the limit values for this substance

No data available

CC5/65 PART A:

Not available

TOLUENE-2,4-DIISOCYANATE

for toluene diisocyanate:

NOTE: Detector tubes for toluene diisocyanate, measuring in excess of 0.02 ppm, are commercially available.

The odour recognition threshold, 0.05-0.4 ppm in air, is not reliable and being above exposure standard, gives no warning of exposure.

A substantial proportion of the working population (4.3% to 25%) can be sensitised to TDI at the ES-TWA. Such sensitisation was not limited to highly susceptible individuals and workers often developed symptoms early. Replacement exams have been unsuccessful in identifying those who may develop sensitisation. Allergy, bronchial asthma and chronic bronchitis sufferers should be excluded from exposure to TDI. Chronic low level exposures below 0.02 ppm have been reported to cause sensitisation. Workers complained of cough, phlegm production, breathlessness and wheezing 2 to 17 years after the last exposure and it is reported that several workers developed chronic bronchitis 40 months after removal from exposure. Effects of TDI appear to be dose-related and there is a threshold (0.005 ppm) below which no respiratory effects are produced by at least the isomer 2,4-TDI. It should be noted that some polyurethane production facilities also emit amines which are the most important cause of respiratory symptoms and occupational asthma.

Odour Safety Factor (OSF)

OSF=0.029 ("2,4-TOLUENEDIISOCYANATE")

## 8.2. Exposure controls

### 8.2.1. Appropriate engineering 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 vapours 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.
- Local exhaust ventilation with full face positive-pressure air supplied breathing apparatus (hood or helmet type) is normally 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.

**NOTE** Isocyanate vapours will not be adequately absorbed by organic vapour 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:

direct spray, spray painting in shallow booths, drum filling, conveyer loading, crusher dusts, gas discharge (active generation into zone of rapid air motion)

Air Speed:

1-2.5 m/s (200-500 f/min.)

Within each range the appropriate value depends on:

Lower end of the range

- 1: Room air currents minimal or favourable to capture
- 2: Contaminants of low toxicity or of nuisance value only
- 3: Intermittent, low production.
- 4: Large hood or large air mass in motion

Upper end of the range

- 1: Disturbing room air currents
- 2: Contaminants of high toxicity
- 3: High production, heavy use
- 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.

### 8.2.2. Personal protection



#### Eye and face protection:

- Safety glasses with side shields.
- Chemical goggles.
- Contact lenses may pose a special hazard; soft contact lenses may absorb and concentrate irritants. A written policy document, describing the wearing of lens 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]

**Skin protection:** See Hand protection: below

**Hand protection:** **NOTE**

- The material may produce skin sensitisation in predisposed individuals. Care must be taken, when removing gloves and other protective equipment, to avoid all possible skin contact.
- Contaminated leather items, such as shoes, belts and watch-bands should be removed and destroyed.
- Do NOT wear natural rubber (latex gloves).
- Isocyanate resistant materials include Teflon, Viton, nitrile rubber and some PVA gloves.
- Protective gloves and overalls should be worn as specified in the appropriate national standard.
- Contaminated garments should be removed promptly and should not be re-used until they have been decontaminated.
- NOTE Natural rubber, neoprene, PVC can be affected by isocyanates
- **DO NOT use skin cream unless necessary and then use only minimum amount.**
- Isocyanate vapour may be absorbed into skin cream and this increases hazard.

**Body protection:** See Other protection: below

**Other protection:** 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. 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.

- Overalls.
- Eyewash unit.
- Barrier cream
- Skin cleansing cream

**Respiratory protection:** •Type A Filter of sufficient capacity. (AS/NZS 1716 & 1715, EN 143:2000 & 149:2001, ANSI Z88 or national equivalent)

Cartridge respirators should never be used for emergency ingress or in areas of unknown vapour concentrations or oxygen content. The wearer must be warned to leave the contaminated area immediately on detecting any odours through the respirator. The odour may indicate that the mask is not functioning properly, that the vapour 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.

- 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, minimising 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 standard must be used.
- Organic vapour 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.

**Thermal hazards:** No data available

**Recommended material(s):** Glove selection is based on a modified presentation of the:  
**"Forsberg Clothing Performance Index".**  
The effect(s) of the following substance(s) are taken into account in the **computer-generated** selection:  
**Material** **CPI**

\* CPI - Chemwatch Performance Index  
A: Best Selection  
B: Satisfactory; may degrade after 4 hours continuous immersion  
C: Poor to Dangerous Choice for other than short term immersion  
**NOTE** As a series of factors will influence the actual performance of the glove, a final selection must be based on detailed observation. -  
\* Where the glove is to be used on a short term casual or infrequent basis, factors such as "feel" or convenience (e.g. disposability), may dictate a choice of gloves which might otherwise be unsuitable following long-term or frequent use. A qualified practitioner should be consulted.

### 8.2.3. Environmental exposure controls

See section 12

## SECTION 9: Physical and chemical properties

### 9.1. Information on basic physical and chemical properties

<b>Appearance</b>	Clear light amber liquid; reacts with water.
<b>Odour</b>	No data available
<b>Odour threshold</b>	No data available
<b>Taste</b>	No data available
<b>pH (1% solution)</b>	No data available
<b>pH (as supplied)</b>	No data available
<b>Melting point / freezing point (°C)</b>	No data available
<b>Initial boiling point and boiling range (°C)</b>	>300
<b>Flash point (°C)</b>	>200
<b>Evaporation rate</b>	No data available
<b>Flammability</b>	No data available
<b>Vapour pressure (kPa)</b>	No data available
<b>Vapour density (Air = 1)</b>	No data available
<b>Relative density (Water = 1)</b>	1.07
<b>Solubility in Water (g/L)</b>	Reacts
<b>Partition coefficient: n-octanol / water</b>	No data available
<b>Auto-ignition temperature (°C)</b>	No data available
<b>Critical temperature (°C)</b>	No data available

Viscosity (cSt)	No data available
Explosive properties	No data available
Oxidising properties	No data available
Physical state	Liquid
Upper Explosive Limit (%)	No data available
Lower Explosive Limit (%)	No data available
Surface Tension	No data available
Volatile Component (%vol)	No data available
Gas group	No data available
Molecular weight (g/mol)	No data available
Evaporation Rate (BuAc = 1   EtAc = 1   Ether = 1)	No data available
IUCLID Remarks	No data available

## 9.2. Other information

No data available

## SECTION 10: Stability and reactivity

10.1.	Reactivity	See section 7.2
10.2.	Chemical stability	<ul style="list-style-type: none"> <li>• Presence of incompatible materials.</li> <li>• Product is considered stable.</li> <li>• Hazardous polymerisation will not occur.</li> </ul>
10.3.	Possibility of hazardous reactions	See section 7.2
10.4.	Conditions to avoid	See section 7.2
10.5.	Incompatible materials	See section 7.2
10.6.	Hazardous decomposition products	See section 5.3

## SECTION 11: Toxicological information

11.1. Information on toxicological effects	
Mutagenicity:	No data available
Reproductive Toxicity:	No data available
Carcinogenicity:	No data available
STOT - single exposure:	No data available

CC5/65 PARTA: Not available. Refer to individual constituents. TOLUENE-2,4-DIISOCYANATE: unless otherwise specified data extracted from RTECS - Register of Toxic Effects of Chemical Substances.

TOXICITY	IRRITATION
Inhalation (human) TCLo: 20 ppb/2 yr	Skin (rabbit): 500 mg(open)-SEVERE
Inhalation (human) TCLo: 80 ppb	Skin (rabbit):500 mg/24hr-Moderate
Inhalation (human) TCLo: 500 ppb	Eye (rabbit): 100 mg - SEVERE
Oral (rat) LD50: 5800 mg/kg	
Inhalation (rat) LC50: 14 ppm/14 hr	
Inhalation (rat) LC50: 600 ppm/6 hr	

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 sensitisation potential: the distribution of the substance and the opportunities for contact with it are equally important. A weakly sensitising substance which is widely distributed can be a more important allergen than one with stronger sensitising 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 hyperactivity 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 characterised by dyspnea, cough and mucus production. Allergic reactions which develop in the respiratory passages as bronchial asthma or rhinoconjunctivitis, 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 sensitisation, 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 characterised 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. The material may produce severe irritation to the eye causing pronounced inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis. The material may produce severe skin irritation after prolonged or repeated exposure, and may produce a contact dermatitis (nonallergic). This form of dermatitis is often characterised by skin redness (erythema) thickening of the epidermis. Histologically there may be intercellular oedema of the spongy layer (spongiosis) and intracellular oedema of the epidermis. Prolonged

contact is unlikely, given the severity of response, but repeated exposures may produce severe ulceration. 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'-dimethoxy-benzidine-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 an 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. Isocyanate vapours/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 characterised by nausea and vomiting. Pulmonary sensitisation 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 sensitisation is possible and may result in allergic dermatitis responses including rash, itching, hives and swelling of extremities. Isocyanate-containing vapours/ 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 sensitised persons should not be allowed to work in situations allowing exposure to this material. WARNING: This substance has been classified by the IARC as Group 2B: Possibly Carcinogenic to Humans. Tenth Annual Report on Carcinogens: Substance anticipated to be Carcinogen [National Toxicology Program: U.S. Dep. of Health & Human Services 2002]. CARCINOGEN toluene-2,4-diisocyanate International Agency for Research on Cancer (IARC) - Agents Reviewed by the IARC Monographs Group 2B

## SECTION 12: Ecological information

### 12.1. Toxicity

<b>Fish:</b>	No data available
<b>Daphnia Magna:</b>	No data available
<b>Algae:</b>	No data available
<b>Toxic to aquatic micro-organisms:</b>	No data available

#### TOLUENE-2,4-DIISOCYANATE

**Hazardous Air Pollutant:** Yes

Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Do NOT allow product to come in contact with surface waters or to intertidal areas below the mean high water mark. Do not contaminate water when cleaning equipment or disposing of equipment wash-waters.

Wastes resulting from use of the product must be disposed of on site or at approved waste sites.

Hydrolysis would represent the primary fate mechanism for the majority of the commercial isocyanate monomers, but, is tempered somewhat by the lack of water solubility. In the absence of hydrolysis, sorption to solids (e.g., sludge and sediments) will be the primary mechanism of removal. Biodegradation is minimal for most compounds and volatilisation is negligible. Atmospheric degradation is not expected with removal from air occurring by washout or dry deposition. Volatilisation from surface waters (e.g., lakes and rivers) is expected to take years. In wastewater treatment this process is not expected to be significant.

Review of the estimated properties of the isocyanates suggest that sorption is the primary removal mechanism in the ambient environment and in wastewater treatment in the absence of significant hydrolysis. Sorption to solids in wastewater treatment is considered strong to very strong for most compounds. Sorption to sediments and soils in the ambient environment is very strong in most instances. Migration to groundwater and surface waters is not expected due to sorption or hydrolysis.

Hydrolysis of the N=C=O will occur in less than hours in most instances and within minutes for more than 90% of the commercial isocyanates. However, the low to very low solubility of these substances will generally lessen the effectiveness of hydrolysis as a fate pathway. But hydrolysis should be considered one of the two major fate processes for the isocyanates.

Aerobic and/or anaerobic biodegradation of the isocyanates is not expected to occur at significant levels. Most of the substances take several months to degrade.

Degradation of the hydrolysis products will occur at varying rates depending on the moiety formed.

**DO NOT discharge into sewer or waterways.**

Half-life (hr) air: 3.3 Toxicity Fish: LC50(96) 0.0045-57.68mg/L Toxicity invertebrate: cell mult. inhib. 26-456mg/L Bioaccumulation: low-moderate Nitrif. inhib.: inhib at 350mg/L Effects on algae and plankton: cell mult. inhib. algae 105->400mg/L Degradation Biological: sig processes Abiotic: nophotol&hydrol,sig oxid,RxnOH\*

### 12.2. Persistence and degradability

No data available

### 12.3. Bioaccumulative potential

Ingredient	Bioaccumulation
toluene-2,4-diisocyanate	LOW

### 12.4. Mobility in soil

Ingredient	Mobility
toluene-2,4-diisocyanate	MED (ESTIMATED)

#### 12.5. Results of PBT and vPvB assessment

	P	B	T
Relevant available data	No data available	No data available	No data available
PBT and vPvB Criteria fulfilled?	No data available	No data available	No data available

#### 12.6. Other adverse effects

No data available

### SECTION 13: Disposal considerations

#### 13.1. Waste treatment methods

<b>Product / Packaging disposal:</b>	<p>Legislation addressing waste disposal requirements may differ by country, state and/ or territory. Each user must refer to laws operating in their area. In some areas, certain wastes must be tracked.</p> <p>A Hierarchy of Controls seems to be common - the user should investigate:</p> <ul style="list-style-type: none"> <li>• Reduction</li> <li>• Reuse</li> <li>• Recycling</li> <li>• Disposal (if all else fails)</li> </ul> <p>This material may be recycled if unused, or if it has not been contaminated so as to make it unsuitable for its intended use. If it has been contaminated, it may be possible to reclaim the product by filtration, distillation or some other means. Shelf life considerations should also be applied in making decisions of this type. Note that properties of a material may change in use, and recycling or reuse may not always be appropriate.</p> <ul style="list-style-type: none"> <li>• <b>DO NOT</b> allow wash water from cleaning or process equipment to enter drains.</li> <li>• It may be necessary to collect all wash water for treatment before disposal.</li> <li>• In all cases disposal to sewer may be subject to local laws and regulations and these should be considered first.</li> <li>• Where in doubt contact the responsible authority.</li> <li>• <b>DO NOT</b> recycle spilled material.</li> <li>• Consult State Land Waste Management Authority for disposal.</li> <li>• Neutralise spill material carefully and decontaminate empty containers and spill residues with 10% ammonia solution plus detergent or a proprietary decontaminant prior to disposal.</li> <li>• <b>DO NOT</b> seal or stopper drums being decontaminated as CO2 gas is generated and may pressurise containers.</li> <li>• Puncture containers to prevent re-use.</li> <li>• Bury or incinerate residues at an approved site.</li> </ul>
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#### Waste treatment options:

<b>Sewage disposal options:</b>	No relevant data
<b>Other disposal recommendations:</b>	

### SECTION 14: Transport information

<b>Labels Required:</b>	TOXIC
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#### Land transport (ADR / RID / GGVSE)



14.1. UN number	2206	14.4. Packing group	III	
14.2. UN proper shipping name	Shipping Name: ISOCYANATES, TOXIC, N.O.S. or ISOCYANATE SOLUTION, TOXIC, N.O.S.(contains toluene-2,4-diisocyanate)	14.5. Environmental hazard	No relevant data	
14.3. Transport hazard class(es)	6.1	14.6. Special precautions for user	Hazard identification (Kemler)	60
			Classification Code	T1
			Hazard Label	6.1
			Special provisions	274 551
			Add limited quantity	5 L

#### Air transport (ICAO-IATA / DGR)



14.1. UN number	2206	14.4. Packing group	III	
14.2. UN proper shipping name	Shipping Name: Isocyanate solution, toxic, n.o.s. * †(contains toluene-2,4-diisocyanate)	14.5. Environmental hazard	No relevant data	
14.3. Transport hazard class(es)		14.6. Special precautions for user	Special provisions	A3
			Com. Only Packing	



ICAO/IATA Class 6.1  
 (Subrisk):  
 ERG Code 6L

Cargo Only Packing Instructions 663  
 Cargo Only Maximum Qty / Pack 220 L  
 Passenger and Cargo Packing Instructions 655  
 Passenger and Cargo Maximum Qty / Pack 60 L  
 Passenger and Cargo Limited Quantity Packing Instructions Y642  
 Passenger and Cargo Maximum Qty / Pack 2 L

#### Sea transport (IMDG-Code / GGVSee)



14.1. UN number	2206	14.4. Packing group	III
14.2. UN proper shipping name	Shipping Name: ISOCYANATES, TOXIC, N.O.S. or ISOCYANATE SOLUTION, TOXIC, N.O.S.(contains toluene-2,4-diisocyanate)		
14.3. Transport hazard class(es)	6.1	14.5. Environmental hazard	No relevant data
	IMDG Subrisk None	14.6. Special precautions for user	EMS Number F-A,S-A Special provisions 223 274 Limited Quantities 5 L

#### Inland waterways transport (ADNR/ River Rhine)



14.1. UN number	2206	14.4. Packing group	III
14.2. UN proper shipping name	Shipping Name: ISOCYANATES, TOXIC, N.O.S. or ISOCYANATE SOLUTION, TOXIC, N.O.S.(contains toluene-2,4-diisocyanate)		
14.3. Transport hazard class(es)	6.1	14.5. Environmental hazard	No relevant data
	ADNR Label 6.1	14.6. Special precautions for user	Classification code T1 Limited quantity LQ17 Equipment required PP; EP; TOX; A Fire cones number 2

#### 14.7. Transport in bulk according to Annex II of MARPOL 73 / 78 and the IBC code

No data available

### SECTION 15: Regulatory information

#### 15.1. Safety, health and environmental regulations / legislation specific for the substance or mixture

##### Regulations for ingredients

**toluene-2,4-diisocyanate (CAS: 584-84-9) is found on the following regulatory lists;**

"EU Cosmetic Directive 76/768/EEC Annex II: List of Substances which must not form part of the Composition of Cosmetic Products(English)", "EU Directive 2002/72/EC Plastic materials and articles intended to come into contact with foodstuffs - Annex II Section A: List of authorised monomers and other starting substances", "European Chemicals Agency (ECHA) List of substances identified for registration in 2010", "European Customs Inventory of Chemical Substances (English)", "European Union - European Inventory of Existing Commercial Chemical Substances (EINECS) (English)", "European Union (EU) Annex I to Directive 67/548/EEC on Classification and Labelling of Dangerous Substances - updated by ATP 31", "European Union (EU) Carcinogenic Substances", "European Union (EU) Regulation (EC) No 1272/2008 on Classification, Labelling and Packaging of Substances and Mixtures - Annex VI", "GESAMP/BHS Composite List - GESAMP Hazard Profiles", "International Council of Chemical Associations (ICCA) - High Production Volume List", "Scotland Pollution Inventory"

**No data for CC5/65 PART A (CW: 25-9877)**

This safety data sheet is in compliance with the following EU legislation and its adaptations – as far as applicable - : 67/548/EEC, 1999/45/EC, 98/24/EC, 92/85/EEC, 94/33/EC, 91/689/EEC, 1999/13/EC, Regulation (EU) No 453/2010, Regulation (EC) No 1907/2006, Regulation (EC) No 1272/2008, and their amendments as well as the following British legislation:

- The Control of Substances Hazardous to Health Regulations (COSHH) 2002
- COSHH Essentials
- The Management of Health and Safety at Work Regulations 1999

#### 15.2. Chemical safety assessment

##### ANNEX 1

Ingredient	Annex 1 67/548/EEC
toluene-2,4-diisocyanate	615-006-00-4
toluene-2,4-diisocyanate	615-006-00-4

##### Annex VI

Acute Toxicity (Inhalation) Category 2

Acute Toxicity (Inhalation) Category 3

Skin Corrosion/Irritation Category 2

Eye Irritation Category 2A

Respiratory Sensitizer Category 1

Skin Sensitizer Category 1

Carcinogen Category 2

STOT - SE (Resp. Irr.) Category 3

## RISK

Risk Codes	Risk Phrases
R23	Toxic by inhalation.
R36/37/38	Irritating to eyes, respiratory system and skin.
R40	Limited evidence of a carcinogenic effect.
R42/43	May cause SENSITISATION by inhalation and skin contact.

## SECTION 16: Other information

### ANNEX 2: Indications of Danger

T+ Very toxic

### OTHER

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

A list of reference resources used to assist the committee may be found at:

[www.chemwatch.net/references](http://www.chemwatch.net/references)

- The (M)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.

- For detailed advice on Personal Protective Equipment, refer to the following EU CEN Standards:

EN 16 Personal eye-protection

EN 340 Protective clothing

EN 374 Protective gloves against chemicals and micro-organisms

EN 13832 Footwear protecting against chemicals

EN 133 Respiratory protective devices

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[www.chemwatch.net](http://www.chemwatch.net)

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Not applicable