



FLEXANE HIGH PERFORMANCE BRUSHABLE RESIN #692-889

Chemwatch Independent Material Safety Data Sheet

Issue Date: 19-Feb-2008

NA317TC

CHEMWATCH 4523-68

Version No:2.0

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Section 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME

FLEXANE HIGH PERFORMANCE BRUSHABLE RESIN #692-889

SYNONYMS

CP0154/1, "RS Components"

PROPER SHIPPING NAME

COATING SOLUTION

PRODUCT USE

Protection against impact, abrasion, shock, wear, noise and corrosion.

■ Base or Part A of a 2 pack epoxy system.

SUPPLIER

Company: RS Components

Company: RS Components

Address:

Address:

Units 30 & 31

25 Pavesi Street

Warehouse World

Smithfield

761 Great South Road

NSW2164

Penrose Auckland

AUS

Telephone: 1300 656 636

Emergency Tel: 1800 039 008

Emergency Tel: 03 9573 3112

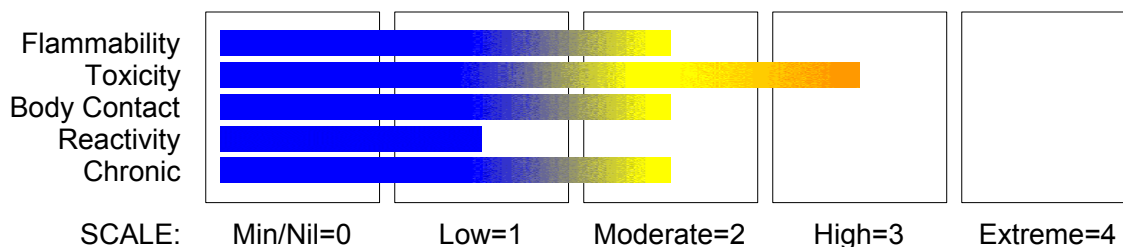
Fax: 1300 656 696

Section 2 - HAZARDS IDENTIFICATION

STATEMENT OF HAZARDOUS NATURE

HAZARDOUS SUBSTANCE. DANGEROUS GOODS. According to the Criteria of NOHSC, and the ADG Code.

CHEMWATCH HAZARD RATINGS



continued...

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Section 2 - HAZARDS IDENTIFICATION



POISONS SCHEDULE

S6

RISK

- Flammable.
- Harmful if swallowed.
- Toxic by inhalation.

- Irritating to eyes respiratory system and skin.
- Limited evidence of a carcinogenic effect.
- May cause SENSITISATION by inhalation and skin contact.
- Harmful to aquatic organisms may cause long-term adverse effects in the aquatic environment.
- Skin contact may produce health damage*.
- Cumulative effects may result following exposure*.
- May affect fertility*.

* (limited evidence).

SAFETY

- Keep locked up.
- Do not breathe gas/fumes/vapour/spray.
- In case of insufficient ventilation wear suitable respiratory equipment.
- Use only in well ventilated areas.

- Keep container in a well ventilated place.
- Avoid exposure - obtain special instructions before use.
- To clean the floor and all objects contaminated by this material use water and detergent.

- Keep container tightly closed.
- This material and its container must be disposed of in a safe way.
- Keep away from food drink and animal feeding stuffs.
- Take off immediately all contaminated clothing.
- In case of contact with eyes rinse with plenty of water and contact Doctor or Poisons Information Centre.
- This material and its container must be disposed of as hazardous waste.
- In case of accident by inhalation: remove casualty to fresh air and keep at rest.

Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

NAME	CAS RN	%
4, 4' - diphenylmethane diisocyanate (MDI) and related polymers	101-68-8	<5 10-20
methylene bis(4- cyclohexylisocyanate) and related polymers	5124-30-1	<5 10-20
isophorone diisocyanate and related polymers	4098-71-9	<5 30-60
cyclohexanone	108-94-1	<5
methylene chloride	75-09-2	15-25

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Section 4 - FIRST AID MEASURES

SWALLOWED

- For advice, contact a Poisons Information Centre or a doctor at once.
- Urgent hospital treatment is likely to be needed.
- 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.
- Transport to hospital or doctor without delay.

EYE

- 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

- 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.

INHALED

- 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.

NOTES TO PHYSICIAN

- Treat symptomatically.

Section 5 - FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA

- Foam.
- Dry chemical powder.
- BCF (where regulations permit).
- Carbon dioxide.
- Water spray or fog - Large fires only.

FIRE FIGHTING

- Alert Fire Brigade and tell them location and nature of hazard.
- May be violently or explosively reactive.
- Wear full body protective clothing with breathing apparatus.
- Prevent, by any means available, spillage from entering drains or water course.

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Section 5 - FIRE FIGHTING MEASURES

- If safe, switch off electrical equipment until vapour fire hazard removed.
- 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.
- Equipment should be thoroughly decontaminated after use.

FIRE/EXPLOSION HAZARD

- Liquid and vapour are flammable.
- Moderate fire hazard when exposed to heat or flame.
- Vapour forms an explosive mixture with air.
- Moderate explosion hazard when exposed to heat or flame.
- Vapour may travel a considerable distance to source of ignition.
- Heating may cause expansion or decomposition leading to violent rupture of containers.
- On combustion, may emit toxic fumes of carbon monoxide (CO).

May emit poisonous fumes.

Other decomposition products include: carbon dioxide (CO₂), nitrogen oxides (NO_x) and isocyanates.

FIRE 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.

HAZCHEM: 3[Y]E

Personal Protective Equipment

Gas tight chemical resistant suit.

Section 6 - ACCIDENTAL RELEASE MEASURES

MINOR SPILLS

- 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

- Pollutant
- Clear area of personnel and move upwind.
- Alert Fire Brigade and tell them location and nature of hazard.
- May be violently or explosively reactive.
- Wear breathing apparatus plus protective gloves.

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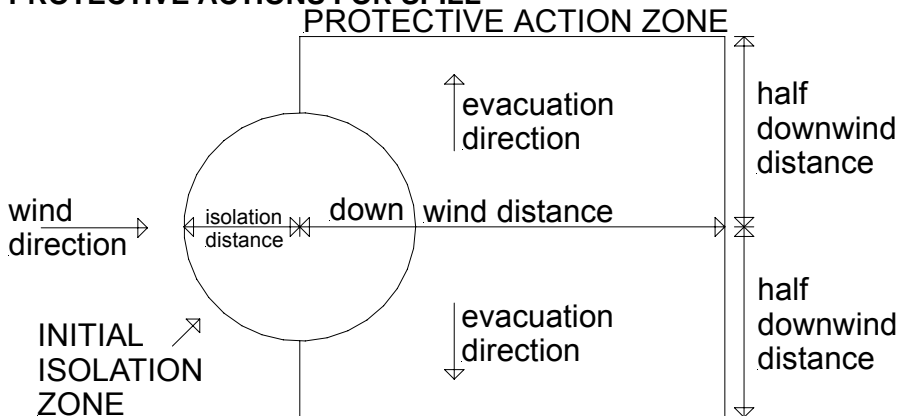
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Section 6 - ACCIDENTAL RELEASE MEASURES

- 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.
- Water spray or fog may be used to disperse vapour.
- Contain or absorb spill with sand, earth or vermiculite.
- Use only spark-free shovels and explosion proof equipment.
- Collect recoverable products into labelled containers for recycling.
- 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.

PROTECTIVE ACTIONS FOR SPILL



From IERG (Canada/Australia)

Isolation Distance	25 metres
Downwind Protection Distance	300 metres
IERG Number	14

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 confines 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 Guide 127 is taken from the US DOT emergency response guide book.
- 6 IERG information is derived from CANUTEC - Transport Canada.

EMERGENCY RESPONSE PLANNING GUIDELINES (ERPG)

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

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Section 6 - ACCIDENTAL RELEASE MEASURES

life-threatening health effects is:

methylene chloride 4000ppm

irreversible or other serious effects or symptoms which could impair an individual's ability to take protective action is:

methylene chloride 750ppm

other than mild, transient adverse effects without perceiving a clearly defined odour is:

methylene chloride 200ppm

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

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

Section 7 - HANDLING AND STORAGE

PROCEDURE FOR HANDLING

- Avoid all personal contact, including inhalation.
- Wear protective clothing when risk of overexposure 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 generation of static electricity.
- DO NOT use plastic buckets.
- Earth all lines and equipment.
- Use spark-free tools when handling.
- 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 storing and handling recommendations.
- Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions.

SUITABLE CONTAINER

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

STORAGE INCOMPATIBILITY

- Avoid storage with oxidisers and strong acids.
- 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.

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Section 7 - HANDLING AND STORAGE

STORAGE REQUIREMENTS

- Keep dry.
- 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.
- Protect containers against physical damage.
- 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 preventions

X: Must not be stored together

Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE CONTROLS

Source	Material	TWA ppm	TWA mg/m ³	STEL mg/m ³	Notes
Australia Exposure Standards	4, 4' - diphenylmethane diisocyanate (MDI) (Isocyanates, all (as-NCO))		0.02	0.07	Sen
Australia Exposure Standards	methylene bis(4-cyclohexylisocyanate) (Isocyanates, all (as-NCO))		0.02	0.07	Sen
Australia Exposure Standards	isophorone diisocyanate (Isocyanates, all (as-NCO))		0.02	0.07	Sen
Australia Exposure Standards	cyclohexanone (Cyclohexanone)	25	100		Sk
Australia Exposure Standards	methylene chloride (Methylene chloride)	50	174		Sk

EMERGENCY EXPOSURE LIMITS

Material	Revised IDLH Value (mg/m ³)	Revised IDLH Value (ppm)
4, 4' - diphenylmethane diisocyanate (MDI)	75	
cyclohexanone		700
methylene chloride		2,000

ODOUR SAFETY FACTOR (OSF)

OSF=28 (CYCLOHEXANONE)

■ Exposed individuals are reasonably expected to be warned, by smell, that the Exposure Standard is being exceeded.

Odour Safety Factor (OSF) is determined to fall into either Class A or B.

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Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

The Odour Safety Factor (OSF) is defined as:

OSF= Exposure Standard (TWA) ppm/ Odour Threshold Value (OTV) ppm

Classification into classes follows:

Class	OSF	Description
A	550	Over 90% of exposed individuals are aware by smell that the Exposure Standard (TLV- TWA for example) is being reached, even when distracted by working activities
B	26- 550	As " A" for 50- 90% of persons being distracted
C	1- 26	As " A" for less than 50% of persons being distracted
D	0.18- 1	10- 50% of persons aware of being tested perceive by smell that the Exposure Standard is being reached
E	<0.18	As " D" for less than 10% of persons aware of being tested

MATERIAL DATA

FLEXANE HIGH PERFORMANCE BRUSHABLE RESIN #692-889:

- None assigned. Refer to individual constituents.

4,4'-DIPHENYLMETHANE DIISOCYANATE (MDI):

- for diphenylmethane diisocyanate (methylene bisphenyl isocyanate; MDI)

Odour Threshold Value: 0.39 ppm

IDLH Level: 10 mg/m³

Mean MDI exposures of less than 0.003 ppm appear to have no acute or chronic effect on pulmonary function.

MDI produces identical toxicological responses to those produced by TDI and the recommended TLV-TWA is identical for the two isocyanates. Exposure at or below the recommended value is thought to protect the worker against pulmonary function decrements as well as to minimise the potential for respiratory tract sensitisation. Individuals who may be hypersusceptible or otherwise unusually responsive to exposure to certain industrial chemicals may not adequately protected from adverse health effects caused by MDI at the recommended TLV-TWA. Ceiling values recommended by NIOSH and OSHA are synonymous with normal excursions allowable for exposures to the TLV-TWA (in excess of 3 x TLV-TWA for no more than a total of 30 minutes during a work day but in any case not exceeding 5 x TLV-TWA).

METHYLENE BIS(4-CYCLOHEXYLISOCYANATE):

- for methylene bis(4-cyclohexylisocyanate):

The TLV-TWA is thought to be protective against the significant risk eye, skin and pulmonary

Individuals who may be hypersusceptible or otherwise unusually responsive from exposure to industrial chemicals may not be adequately protected at this limit.

ISOPHORONE DIISOCYANATE:

Not available

CYCLOHEXANONE:

- For cyclohexanone

Odour Threshold Value: 0.12 ppm (detection and recognition)

Exposure at the TLV-TWA produces minimal irritation and this limit is significantly lower than the concentration reported to just induce demonstrable changes in the liver and kidneys of rabbits repeatedly exposed to the substance (190 ppm).

Odour Safety Factor (OSF)

OSF=28 (CYCLOHEXANONE).

Exposed individuals are reasonably expected to be warned, by smell, that the Exposure Standard is being exceeded.

Odour Safety Factor (OSF) is determined to fall into either Class A or B.

The Odour Safety Factor (OSF) is defined as:

OSF= Exposure Standard (TWA) ppm/ Odour Threshold Value (OTV) ppm

Classification into classes follows:

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Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

Class	OSF	Description
A	550	Over 90% of exposed individuals are aware by smell that the Exposure Standard (TLV- TWA for example) is being reached, even when distracted by working activities
B	26- 550	As " A" for 50- 90% of persons being distracted
C	1- 26	As " A" for less than 50% of persons being distracted
D	0.18- 1	10- 50% of persons aware of being tested perceive by smell that the Exposure Standard is being reached
E	<0.18	As " D" for less than 10% of persons aware of being tested

METHYLENE CHLORIDE:

- For methylene chloride

Odour Threshold Value: 158 ppm (detection), 227 ppm (recognition)

NOTE: Detector tubes for methylene chloride, measuring in excess of 25 ppm are commercially available.

Long-term measurements (4 hrs) may be conducted to detect concentrations exceeding 13 ppm.

Exposure at or below the recommended TLV-TWA (and in the absence of occupational exposure to carbon monoxide) is thought to minimise the potential for liver injury and to provide protection against the possible weak carcinogenic effects which have been demonstrated in laboratory rats and mice. Enhancement of tumours of the lung, liver, salivary glands and mammary tissue in rodent studies has lead NIOSH to recommend a more conservative outcome. The ACGIH however concludes that in the absence of documentation of health-related injuries at higher exposures after a long history of methylene chloride use and a number of epidemiologic studies, the recommended TLV-TWA provides an adequate margin of safety.

Concentration effects:

Concentration	Clinical effects
>300 ppm	Sweet odour
500-1000 ppm (1-2 h)	Unpleasant odour, slight anaesthetic effects, headache, light-headedness, eye irritation and elevated COHb concentration
2300 ppm (5 min.)	Odour strong, intensely irritating; dizziness
7200 ppm (8-16 min)	Paraesthesia, tachycardia
>50000 ppm	Immediately life-threatening.

Established occupational exposure limits frequently do not take into consideration reproductive end points that are clearly below the thresholds for other toxic effects. Occupational reproductive guidelines (ORGs) have been suggested as an additional standard. These have been established after a literature search for the reproductive no-observed-adverse effect-level (NOAEL) and the lowest-observed-adverse-effect-level (LOAEL). In addition the US EPA's procedures for risk assessment for hazard identification and dose-response assessment as applied by NIOSH were used in the creation of such limits. Uncertainty factors (UFs) have also been incorporated.

PERSONAL PROTECTION

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Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION



EYE

- Safety glasses with side shields; or as required,
- 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].

HANDS/FEET

- Wear chemical protective gloves, eg. PVC.
- Wear safety footwear.

OTHER

- Overalls.
- P.V.C. apron.
- Barrier cream.
- Skin cleansing cream.
- Eye wash unit.

RESPIRATOR

- Selection of the Class and Type of respirator will depend upon the level of breathing zone contaminant and the chemical nature of the contaminant. Protection Factors (defined as the ratio of contaminant outside and inside the mask) may also be important.

Breathing Zone Level ppm (volume)	Maximum Protection Factor	Half- face Respirator	Full- Face Respirator
1000	10	AXNO- AUS	-
1000	50	-	AXNO- AUS
5000	50	Airline *	-
5000	100	-	AXNO- 2
10000	100	-	AXNO- 3
	100+		Airline**

* - Continuous Flow

** - Continuous-flow or positive pressure demand.

The local concentration of material, quantity and conditions of use determine the type of personal protective equipment required. For further information consult site specific CHEMWATCH data (if available), or your Occupational Health and Safety Advisor.

ENGINEERING CONTROLS

- Spraying must be carried out in conditions conforming to local State regulations. Local exhaust ventilation and full face air supplied breathing apparatus (hood or helmet type) are required. Unprotected personnel must vacate the spraying area.

Note: Organic vapour respirators are not protection for sensitised workers. Refer to protective measures for other components used with this product. Avoid breathing dust when sanding. If dust inhalation risk exists

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wear S.A.A. approved dust respirator. If possible use wet sanding techniques to avoid generating dust.

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 or rapid air motion)	1- 2.5 m/s (200- 500 f/min.)

Within each range the appropriate value depends on:

Lower end of the range	Upper end of the range
1: Room air currents minimal or favourable 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 (in simple cases). Therefore the air speed at 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.

Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE

Clear flammable liquid with an ether like odour; does not mix with water.

PHYSICAL PROPERTIES

Liquid.

Does not mix with water.

Sinks in water.

Toxic or noxious vapours/gas.

Molecular Weight: Not applicable	Boiling Range (°C): 40	Melting Range (°C): Not available
Specific Gravity (water=1): 1.06	Solubility in water (g/L): Immiscible	pH (as supplied): 7.0
pH (1% solution): Not available	Vapour Pressure (kPa): 46.5 @ 20 deg C	Volatile Component (%vol): Not available
Evaporation Rate: Not available	Relative Vapour Density (air=1): >1	Flash Point (°C): 47
Lower Explosive Limit (%): Not available	Upper Explosive Limit (%): Not available	Autoignition Temp (°C): Not available
Decomposition Temp (°C): Not available	State: Liquid	

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Section 10 - CHEMICAL STABILITY AND REACTIVITY INFORMATION

CONDITIONS CONTRIBUTING TO INSTABILITY

- Presence of incompatible materials.
- Product is considered stable.
- Hazardous polymerisation will not occur.

For incompatible materials - refer to Section 7 - Handling and Storage.

Section 11 - TOXICOLOGICAL INFORMATION

POTENTIAL HEALTH EFFECTS

ACUTE HEALTH EFFECTS

SWALLOWED

- The liquid is discomforting to the gastro-intestinal tract and is harmful if swallowed. Considered an unlikely route of entry in commercial/industrial environments.

EYE

- The vapour/mist is discomforting to the eyes.

The liquid is highly discomforting to the eyes and is capable of causing severe damage with loss of sight.

The material may produce moderate eye irritation leading to inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.

SKIN

- The liquid is highly discomforting to the skin and is capable of causing skin sensitisation and allergic skin reactions.

Toxic effects may result from skin absorption.

Exposure limits with "skin" notation indicate that vapour and liquid may be absorbed through intact skin.

Absorption by skin may readily exceed vapour inhalation exposure. Symptoms for skin absorption are the same as for inhalation. Contact with eyes and mucous membranes may also contribute to overall exposure and may also invalidate the exposure standard.

Sensitisation may result in allergic dermatitis responses including rash, itching, hives or swelling of extremities.

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.

INHALED

- The vapour is discomforting to the upper respiratory tract and repeated exposure may cause sensitisation and/or allergic reactions.

Inhalation hazard is increased at higher temperatures.

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

CHRONIC HEALTH EFFECTS

- Principal routes of exposure are usually by skin contact/absorption and inhalation of vapour.

Sensitisation may give severe responses to very low levels of exposure, in situations where exposure may occur.

- As with any chemical product, contact with unprotected bare skin; inhalation of vapour, mist or dust in work place atmosphere; or ingestion in any form, should be avoided by observing good occupational work practice.

continued...

FLEXANE HIGH PERFORMANCE BRUSHABLE RESIN #692-889

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Section 11 - TOXICOLOGICAL INFORMATION

TOXICITY AND IRRITATION

■ unless otherwise specified data extracted from RTECS - Register of Toxic Effects of Chemical Substances.

TOXICITY

For the resin:

Oral (rat) LD50: >50 mg/kg

Dermal (rabbit) >200 mg/kg

Inhalation (rabbit) LC50: 123 mg/m³

IRRITATION

[RS Components]

4,4'-DIPHENYLMETHANE DIISOCYANATE (MDI):

■ unless otherwise specified data extracted from RTECS - Register of Toxic Effects of Chemical Substances.

TOXICITY

Oral (rat) LDLo: 9200 mg/kg

IRRITATION

Skin (rabbit): 500 mg /24 hours

Inhalation (rat) LC50: 178 mg/m³/4h Dermal Sensitiser *

Oral (mouse) LD50: 2200 mg/kg Respiratory Sensitiser (g.pig) *

Dermal (rabbit) LD50: >6200 mg/kg [* = Bayer CCINFO 2133615]

Oral (Rat) LD50: 9200 mg/kg

■ 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/m³) 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

continued...

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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.

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 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 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 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.

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 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.

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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.

The material may produce moderate eye irritation leading to inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.

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.

Inhalation (human) TCLo: 0.13 ppm/30 mins Eye (rabbit): 0.10 mg moderate

METHYLENE BIS(4-CYCLOHEXYLISOCYANATE):

■ unless otherwise specified data extracted from RTECS - Register of Toxic Effects of Chemical Substances.

TOXICITY

Oral (rat) LD50: 9900 mg/kg

Oral (rat) LD50: >11000 mg/kg*

Dermal (rabbit) LD50: >10000 mg/kg* *[Bayer]

Inhalation (rat) LC50: 20 ppm/5h

■ 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 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 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.

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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

IRRITATION

Eye (rabbit): slight irritant*

Skin (guinea pig): sensitiser*

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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.

The material may be irritating to the eye, with prolonged contact causing inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.

Inhalation (Rat, adult female) LC50: 307 mg/m³/4h *

Inhalation (Rat, adult male) LC50: 295 mg/m³/4h *

* Vendor MSDS

ISOPHORONE DIISOCYANATE:

■ unless otherwise specified data extracted from RTECS - Register of Toxic Effects of Chemical Substances.

TOXICITY

Inhalation (rat) LC50: 123 mg/m³/4h

Oral (rat) LD50: 5490 mg/kg* *[Bayer]

■ 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 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 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.

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

IRRITATION

Nil Reported

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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.

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 sensitisers. Diisocyanates are moderate to strong dermal sensitisers 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/m³) 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 sensitisers. 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 sensitiser 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 sensitisers. 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 sensitisers in animal studies. There seems to be little or no difference in the

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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.

CYCLOHEXANONE:

■ unless otherwise specified data extracted from RTECS - Register of Toxic Effects of Chemical Substances.

TOXICITY

Oral (rat) LD50: 1535 mg/kg

Inhalation (human) TCLo: 75 ppm

Inhalation (rat) LC50: 8000 ppm/4h

Dermal (rabbit) LD50: 948 mg/kg

■ Cyclohexanone:

Acute toxicity: Cyclohexanone exhibits low to slight acute toxicity by the oral and inhalation routes and is moderately toxic by the dermal route. It is an eye and skin irritant; however, it did not induce skin sensitisation.

There has been no consistent indication that cyclohexanone causes neurotoxicity, although signs of CNS depression were noted at doses near the LD50. Therefore, this material could not be classified regarding its potential neurotoxicity to humans.

Repeat dose toxicity: Upon repeated administration to rats in drinking water, the NOAEL was 4700 ppm after 25 weeks and the LOAEL was 3300 ppm after 2 years. Effects at higher concentrations were primarily body weight decreases. The NOAEL in published repeated dose inhalation studies was 100-190 ppm. Those values were based on either gray mottling of the lungs or ocular irritation and degenerative changes in the liver and kidney at higher concentrations. However, the NOAEL in those studies was not confirmed in more conclusive and GLP inhalation studies for reproductive and developmental effects (NOAEL = 650-1000 ppm).

Genotoxicity: The majority of the experimental evidence indicates that cyclohexanone is not genotoxic, and this material was not considered to be carcinogenic in mice or rats following two years of exposure via the drinking water.

Reproductive toxicity: In a two-generation reproduction study, decreased fertility was observed in rats exposed via inhalation at 1400 ppm but not at 500 ppm; however, the effect was found to be reversible following a post-exposure recovery period. The NOAEL of 500 ppm for this reproductive effect is 1000 times greater than the highest occupational personal monitoring value (0.5 ppm) reported.

Developmental toxicity: Developmental studies indicate that foetal toxicity was present only at concentrations which were maternally toxic, and no malformations were detected.

The material may produce severe irritation to the eye causing pronounced inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.

The material may cause 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) and swelling epidermis. Histologically there may be intercellular oedema of the spongy layer (spongiosis) and intracellular oedema of the epidermis.

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.

METHYLENE CHLORIDE:

■ unless otherwise specified data extracted from RTECS - Register of Toxic Effects of Chemical Substances.

TOXICITY

Oral (human) LDLo: 357 mg/kg

Oral (rat) LD50: 1600 mg/kg

Inhalation (human) TCLo: 500 ppm/ 8 hr

Inhalation (rat) LC50: 88000 mg/m³/30 m

■ The material may produce moderate eye irritation leading to 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.

IRRITATION

Skin (rabbit): 500 mg(open) Mild

Eye (human): 75 ppm

Eye (rabbit): 0.25 mg/24h SEVERE

Eye (rabbit): 4.74 mg SEVERE

continued...

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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.

WARNING: This substance has been classified by the IARC as Group 2B: Possibly Carcinogenic to Humans.

Inhalation (human) TCLo: 500 ppm/ 1 y - I Eye(rabbit): 10 mg - mild

CARCINOGEN

4, 4' - Methylenediphenyl diisocyanate	International Agency for Research on Cancer (IARC) - Agents Reviewed by the IARC Monographs	Group	3
Cyclohexanone	International Agency for Research on Cancer (IARC) - Agents Reviewed by the IARC Monographs	Group	3
Dichloromethane (methylene chloride)	International Agency for Research on Cancer (IARC) - Agents Reviewed by the IARC Monographs	Group	2B
	Australia Exposure Standards - Carcinogens	Carcinogen Category	3

REPROTOXIN

methylene chloride	ILO Chemicals in the electronics industry that have toxic effects on reproduction	Reduced fertility or sterility
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SKIN

cyclohexanone	Australia Exposure Standards - Skin	Notes	Sk
methylene chloride	Australia Exposure Standards - Skin	Notes	Sk

Section 12 - ECOLOGICAL INFORMATION

Refer to data for ingredients, which follows:

4,4'-DIPHENYLMETHANE DIISOCYANATE (MDI):

METHYLENE CHLORIDE:

CYCLOHEXANONE:

ISOPHORONE DIISOCYANATE:

METHYLENE BIS(4-CYCLOHEXYLISOCYANATE):

■ DO NOT discharge into sewer or waterways.

4,4'-DIPHENYLMETHANE DIISOCYANATE (MDI):

ISOPHORONE DIISOCYANATE:

METHYLENE BIS(4-CYCLOHEXYLISOCYANATE):

■ 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

continued...

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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.

FLEXANE HIGH PERFORMANCE BRUSHABLE RESIN #692-889:

Marine Pollutant: Not Determined

4,4'-DIPHENYLMETHANE DIISOCYANATE (MDI):

■ Half- life Soil - High (hours):	24
■ Half- life Soil - Low (hours):	6
■ Half- life Air - High (hours):	5.8
■ Half- life Air - Low (hours):	0.58
■ Half- life Surface water - High (hours):	24
■ Half- life Surface water - Low (hours):	6
■ Half- life Ground water - High (hours):	24
■ Half- life Ground water - Low (hours):	6
■ Aqueous biodegradation - Aerobic - High (hours):	672
■ Aqueous biodegradation - Aerobic - Low (hours):	168
■ Aqueous biodegradation - Anaerobic - High (hours):	2688
■ Aqueous biodegradation - Anaerobic - Low (hours):	672
■ Photooxidation half- life air - High (hours):	5.8
■ Photooxidation half- life air - Low (hours):	0.58
■ First order hydrolysis half- life (hours):	12

Toxicity Fish: LC50(96)95.24-134.37mg/L

METHYLENE BIS(4-CYCLOHEXYLISOCYANATE):

■ Substance has been evaluated and categorised as not being persistent, bioaccumulative, toxic (PBT) or very persistent, very bioaccumulative (vPvB).

■ for methylene bis(4-cyclohexylisocyanate):

Fish toxicity:

Acute (Brachydanio rerio) LC0: 0.69 mg/l/96h*

Acute (Brachydanio rerio) LC50: 1.20 mg/l/96h*

Acute (Brachydanio rerio) LC100: 2.76 mg/l/96h*

Bacterial toxicity:

Acute EC50: 19mg/L*

The product reacts with water at the interface forming CO₂ and a solid insoluble product with high melting point (polyurea). This reaction is accelerated by surfactants (eg. detergents) or by water soluble solvents.*

*[Bayer]

Persistence: does not meet the P criterion for aquatic environment due to a fast hydrolysis. Based on data of structurally similar hexamethylene diisocyanate (CAS 822-06-6) and considering the available hydrolysis test results for this substance, the expected hydrolysis product under environmental conditions is 4,4'-diaminodicyclohexylmethane (CAS 1761-71-3). This substance is, based on limited data, not inherently biodegradable and it is therefore considered fulfilling the screening P/vP criteria.

Bioaccumulation: The substance fulfils due to the high logKow (6.11) the screening B criterion but no further testing is necessary due to the overall conclusion and due to the fast hydrolysis of the substance. For the environmentally relevant hydrolysis product 4,4'-diaminodicyclohexylmethane log Kow -values of 2.03 and 3.26 are available. It is concluded, that the hydrolysis product does not fulfill the screening B criterion.

This substance fulfils the P/vP criteria based on screening data, but it does not fulfill the screening B criterion.

ISOPHORONE DIISOCYANATE:

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

continued...

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■ 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.

CYCLOHEXANONE:

- Algae IC50 (72hr.) (mg/l): 52- 370
- log Kow (Sangster 1997): 0.81
- log Pow (Verschueren 1983): 0.81

■ For cyclohexanone:

Koc : 10
Half-life (hr) air : 24-100
Half-life (hr) H2O surface water : 74-100
Henry's atm m3 /mol: 1.20E-05
BOD 5 : 1.232,32%
COD : 100%
ThOD : 2.605
log BCF : 0.39
Bioaccumulation : not sig
Degradation Biological: sig
processes Abiotic: RxnOH*,oxid&hydrl&photl notsig
Environmental fate;

Cyclohexanone degrades rapidly by reaction with sunlight and is biodegradable in water. On soil surfaces and in water, cyclohexanone is expected to be eliminated by volatilisation, photolysis, and biodegradation. Based on the low Koc, this material is considered to be highly mobile in soil. Fugacity level Ib environmental modeling indicates that cyclohexanone will partition almost exclusively to the air (31%) and water (69%). . The low octanol/water coefficient suggests that cyclohexanone is unlikely to bioconcentrate in aquatic organisms; therefore, potential for secondary poisoning is low.

Ecotoxicity:

Fish LC50 (96 h): 720-1100 mg/L

Experimentally, cyclohexanone has exhibited low acute toxicity towards freshwater fish species and the microcrustacean *Daphnia magna*, slight acute toxicity to algae and protozoa, and moderate acute toxicity to bacteria.

■ Hydrolysis may also involve the addition of water to ketones to yield ketals under mild acid conditions. However, this addition of water is thermodynamically favorable only for low molecular weight ketones. This addition is an equilibrium reaction that is reversible upon a change of water concentration and the reaction ultimately leads to no permanent change in the structure of the ketone substrate. The higher molecular weight ketones do not form stable ketals. Therefore, the ketones are stable to water under ambient environmental conditions. Another possible reaction of ketones in water involves the enolic hydrogen on the carbons bonded to the carbonyl function. Under conditions of high pH (pH greater than 10), the enolic proton is abstracted by base (OH⁻) forming a carbanion intermediate that may react with other organic substrates (e.g., ketones, esters, aldehydes) containing a center for nucleophilic attack. The reactions, commonly recognized as condensation reactions, produce higher molecular weight products. Under ambient conditions of temperature, pH, and low concentration, these condensation reactions are unfavorable.

Based on its reactions in air, it seems likely that ketones undergo photolysis in water. It is probable that ketones will be biodegraded to an appreciable degree by micro-organisms in soil and water. They are unlikely to bioconcentrate or biomagnify.

METHYLENE CHLORIDE:

- Fish LC50 (96hr.) (mg/l): 147.6- 193
- *Daphnia magna* EC50 (48hr.) (mg/l): 224
- BCF<100: 5
- log Kow (Prager 1995): 1.25
- Half- life Soil - High (hours): 672
- Half- life Soil - Low (hours): 168
- Half- life Air - High (hours): 4584
- Half- life Air - Low (hours): 458
- Half- life Surface water - High (hours): 672
- Half- life Surface water - Low (hours): 168

continued...

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■ Half- life Ground water - High (hours):	1344
■ Half- life Ground water - Low (hours):	336
■ Aqueous biodegradation - Aerobic - High (hours):	672
■ Aqueous biodegradation - Aerobic - Low (hours):	168
■ Aqueous biodegradation - Anaerobic - High (hours):	2688
■ Aqueous biodegradation - Anaerobic - Low (hours):	672
■ Aqueous biodegradation - Removal secondary treatment - High (hours):	94.50%
■ Photolysis maximum light absorption - High (nano- m):	250
■ Photolysis maximum light absorption - Low (nano- m):	220
■ Photooxidation half- life air - High (hours):	4584
■ Photooxidation half- life air - Low (hours):	458
■ First order hydrolysis half- life (hours):	704 YR

■ For methylene chloride:

log Kow : 1.25

log Koc : 1.68

log Kom : 1.44

Henry's atm m3 /mol: 2.68E-03

BCF : 5

Environmental fate:

Methylene chloride is a volatile liquid, and tends to volatilise to the atmosphere from water and soil. The half-life of methylene chloride volatilisation from water has been found to be 21 minutes under experimental conditions but actual volatilisation from natural waters will depend on the rate of mixing, wind speed, temperature, and other factors. The Henry's law constant value (H) of 0.002 atm/m³/mol indicates that methylene chloride will volatilise rapidly from moist soil and water surfaces.

Methylene chloride is not strongly sorbed to soils or sediments. Based on its low soil organic carbon partitioning coefficient (Koc) of 25, methylene chloride is likely to be very highly mobile in soils and may be expected to leach from soils into groundwater.

Based on a reported log octanol/water partition coefficient (Kow) of 1.3 an estimated bioconcentration factor (BCF) of 2.3 was derived. There is no evidence of biomagnification, but because the estimated BCF is low, significant biomagnification of methylene chloride in aquatic food chains is not expected.

Air: The main degradation pathway for methylene chloride in air is its reaction with photochemically generated hydroxyl radicals. Thus, the atmospheric lifetime of methylene chloride may be predicted from the hydroxyl radical concentration in air and the rate of reaction. Most reported rates for hydroxyl radical reaction with methylene chloride range from 1.0 x10⁻¹³ to 1.5 x10⁻¹³ cm³/mol/sec, and estimates of average atmospheric hydroxyl radical concentration range from 2.5 x10⁺⁵ to 1x10⁺⁶ mol/cm³. Using this information, the average atmospheric lifetime for methylene chloride may be calculated to be 130 days. Because this degradation pathway is relatively slow, methylene chloride may become widely dispersed but is not likely to accumulate in the atmosphere. The small amount of methylene chloride which reaches the stratosphere (about 1%) may undergo direct photolytic degradation; however, photolysis in the troposphere is not expected.

Reactions of methylene chloride with ozone or other common atmospheric species (e.g., oxygen atoms, chlorine atoms, and nitrate radicals) are not believed to contribute to its breakdown.

Water: Methylene chloride undergoes slow hydrolysis in water. The experimental half-life reported for the hydrolysis reaction, at neutral conditions, is approximately 18 months at 25 C.

However, the rate of reaction varies greatly with changes in temperature and pH. A hydrolytic half-life of 14 days was reported for methylene chloride in acidic solutions at 80-150 C. This experimental value, when extrapolated to 25 C, is about 700 years. Different mechanisms of hydrolyses may be responsible for these two widely different values.

Both aerobic and anaerobic biodegradation may be an important fate process for methylene chloride in water. Methylene chloride has been observed to undergo degradation at a rapid rate under aerobic conditions.

Reported total methylene chloride loss was 100% after 7 days in a static culture flask biodegradability screening test.

Sediment and Soil: The rate of biodegradation was found to be dependent on soil type, substrate concentration, and redox state of the soil. Methylene chloride biodegradation has been reported to occur under both aerobic conditions and anaerobic conditions. The biodegradation of methylene chloride appears to be accelerated by the presence of elevated levels of organic carbon.

Methylene chloride has a low tendency to absorb to soil; therefore, there is a potential for leaching to groundwater. Also, because of the high vapor pressure, volatilisation to air is also a likely fate process from dry soil. Its high Henry's law constant (0.002 atm/m³/mol) indicates that volatilization from moist soil

continued...

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is also likely.

■ The UK Department of Environment have established that methylene chloride is not a greenhouse gas and the Organisation for Economic Cooperation and Development (OECD) in a Monograph have affirmed that there was no single international view that risk reduction measures are required for the solvent. The Monograph suggests that alternatives may pose a greater risk to the environment.

In the atmosphere methylene chloride degrades by reaction with photochemically produced hydroxy radicals (half-life 6 months). Methylene chloride rapidly volatilises from water and soil to the atmosphere (estimated half-life for volatilisation from water 3-5.6 hours). In soil methylene chloride may partially leach to ground water. It is not expected to bioaccumulate or bioconcentrate in the food chain.

Drinking Water Standards:

hydrocarbon total: 10 ug/l (UK max)

dichloromethane: 20 ug/l (WHO guideline)

Soil Guidelines: Dutch Criteria: detection threshold (target)

20 mg/kg (intervention)

Air Quality Standards:

3 mg/m³ averaging time 24 hours (WHO guideline).

Ecotoxicity

Ingredient	Persistence: Water/Soil	Persistence: Air	Bioaccumulation	Mobility
Flexane High Performance Brushable Resin #692- 889		No data		
4, 4' - diphenylmethane diisocyanate (MDI)	LOW	LOW	LOW	LOW
methylene bis(4- cyclohexylisocya- na te)	HIGH	No data	LOW	LOW
isophorone diisocyanate	HIGH	No data	LOW	LOW
cyclohexanone	LOW	No data	LOW	HIGH
methylene chloride	LOW	HIGH	LOW	HIGH

Section 13 - DISPOSAL CONSIDERATIONS

- DO NOT recycle spilled material.
- Consult State Land Waste Management Authority for disposal.
- Neutralise 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 CO₂ gas is generated and may pressurise containers.
- Puncture containers to prevent re-use.
- Bury or incinerate residues at an approved site.

Section 14 - TRANSPORTATION INFORMATION



Labels Required: FLAMMABLE LIQUID

continued...

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Section 14 - TRANSPORTATION INFORMATION

HAZCHEM: 3[Y]E (ADG6)

Land Transport UNDG:

Class or division:	3	Subsidiary risk:	None
UN No.:	1139	UN packing group:	III

Shipping Name: COATING SOLUTION (includes surface treatments or coatings used for industrial or other purposes such as vehicle undercoating, drum or barrel lining)

Air Transport IATA:

ICAO/IATA Class:	3	ICAO/IATA Subrisk:	None
UN/ID Number:	1139	Packing Group:	III

Special provisions: A3
Shipping Name: COATING SOLUTION

Maritime Transport IMDG:

IMDG Class:	3	IMDG Subrisk:	None
UN Number:	1139	Packing Group:	III
EMS Number:	F- E, S- E	Special provisions:	944
Limited Quantities:	5 L	Marine Pollutant:	Not Determined

Shipping Name: COATING SOLUTION (includes surface treatments or coatings used for industrial purposes such as vehicle under-coating, drum or barrel lining)

Section 15 - REGULATORY INFORMATION

POISONS SCHEDULE: S6

REGULATIONS

Regulations for ingredients

4,4'-diphenylmethane diisocyanate (MDI) (CAS: 101-68-8,26447-40-5) is found on the following regulatory lists;

"Australia - Queensland Hazardous Materials and Prescribed Quantities for Major Hazard Facilities", "Australia Hazardous Substances", "Australia High Volume Industrial Chemical List (HVICL)", "Australia Inventory of Chemical Substances (AICS)", "Australia National Pollutant Inventory", "GESAMP/EHS Composite List of Hazard Profiles - Hazard evaluation of substances transported by ships", "IMO IBC Code Chapter 17: Summary of minimum requirements", "IMO MARPOL 73/78 (Annex II) - List of Noxious Liquid Substances Carried in Bulk", "International Agency for Research on Cancer (IARC) - Agents Reviewed by the IARC Monographs", "International Air Transport Association (IATA) Dangerous Goods Regulations", "OECD Representative List of High Production Volume (HPV) Chemicals"

methylene bis(4-cyclohexylisocyanate) (CAS: 5124-30-1) is found on the following regulatory lists;

"Australia Hazardous Substances", "Australia Inventory of Chemical Substances (AICS)", "International Council of Chemical Associations (ICCA) - High Production Volume List", "OECD Representative List of High Production Volume (HPV) Chemicals"

isophorone diisocyanate (CAS: 4098-71-9) is found on the following regulatory lists;

"Australia Hazardous Substances", "Australia Inventory of Chemical Substances (AICS)", "GESAMP/EHS Composite List of Hazard Profiles - Hazard evaluation of substances transported by ships", "IMO IBC Code Chapter 17: Summary of minimum requirements", "IMO MARPOL 73/78 (Annex II) - List of Noxious Liquid Substances Carried in Bulk", "International Council of Chemical Associations (ICCA) - High Production Volume List", "OECD Representative List of High Production Volume (HPV) Chemicals", "OSPAR Substances removed from the List of Substances of Possible Concern"

cyclohexanone (CAS: 108-94-1) is found on the following regulatory lists;

"Australia Exposure Standards", "Australia Hazardous Substances", "Australia Illicit Drug Reagents/Essential Chemicals - Category III", "Australia Inventory of Chemical Substances (AICS)", "GESAMP/EHS Composite List of Hazard Profiles - Hazard evaluation of substances transported by ships", "IMO IBC Code Chapter 17: Summary of minimum requirements", "IMO MARPOL 73/78 (Annex II) - List of Noxious Liquid Substances Carried in Bulk", "International Agency for Research on Cancer (IARC) - Agents Reviewed by the IARC Monographs", "OECD Representative List of High Production Volume (HPV) Chemicals"

methylene chloride (CAS: 75-09-2) is found on the following regulatory lists;

"Australia - Australian Capital Territory - Environment Protection Regulation: Ambient environmental standards (Domestic water supply - organic compounds)", "Australia - Australian Capital Territory - Environment Protection Regulation: Pollutants entering waterways taken to cause environmental harm (Aquatic habitat)", "Australia - Australian Capital Territory Environment Protection Regulation Ecosystem maintenance - Organic chemicals - Non-pesticide anthropogenic organics", "Australia - Australian Capital Territory Environment Protection Regulation Pollutants entering waterways - Domestic water quality", "Australia Exposure Standards", "Australia Hazardous Substances", "Australia High Volume Industrial Chemical List (HVICL)", "Australia Inventory of Chemical Substances (AICS)", "Australia National Pollutant Inventory", "Australia Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP) - Appendix E (Part 2)", "Australia Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP) - Appendix F (Part 3)", "Australia Standard for the Uniform Scheduling of Drugs and Poisons"

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Section 15 - REGULATORY INFORMATION

(SUSDP) - Appendix I,"Australia Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP) - Schedule 5","GESAMP/EHS Composite List of Hazard Profiles - Hazard evaluation of substances transported by ships","IMO IBC Code Chapter 17: Summary of minimum requirements","IMO MARPOL 73/78 (Annex II) - List of Noxious Liquid Substances Carried in Bulk","International Agency for Research on Cancer (IARC) - Agents Reviewed by the IARC Monographs","International Council of Chemical Associations (ICCA) - High Production Volume List","OECD Representative List of High Production Volume (HPV) Chemicals","WHO Guidelines for Drinking-water Quality - Guideline values for chemicals that are of health significance in drinking-water"

No data for Flexane High Performance Brushable Resin #692-889 (CW: 4523-68)

Section 16 - OTHER INFORMATION

Denmark Advisory list for selfclassification of dangerous substances

Substance	CAS	Suggested codes
4, 4' - diphenylmethane diisocyanate (MDI)	26447- 40- 5	R43

INGREDIENTS WITH MULTIPLE CAS NUMBERS

Ingredient Name	CAS
4, 4' - diphenylmethane diisocyanate (MDI)	101- 68- 8, 26447- 40- 5

REPRODUCTIVE HEALTH GUIDELINES

■ Established occupational exposure limits frequently do not take into consideration reproductive end points that are clearly below the thresholds for other toxic effects. Occupational reproductive guidelines (ORGs) have been suggested as an additional standard. These have been established after a literature search for the reproductive no-observed-adverse effect-level (NOAEL) and the lowest-observed-adverse-effect-level (LOAEL). In addition the US EPA's procedures for risk assessment for hazard identification and dose-response assessment as applied by NIOSH were used in the creation of such limits. Uncertainty factors (UFs) have also been incorporated.

Ingredient	ORG	UF	Endpoint	CR	Adeq TLV
cyclohexanone	100 mg/m ³	NA	NA	NA	Yes
methylene chloride	2.4 mg/m ³	100	R	14	-

■ These exposure guidelines have been derived from a screening level of risk assessment and should not be construed as unequivocally safe limits. ORGS represent an 8-hour time-weighted average unless specified otherwise.

CR = Cancer Risk/10000; UF = Uncertainty factor:

TLV believed to be adequate to protect reproductive health:

LOD: Limit of detection

Toxic endpoints have also been identified as:

D = Developmental; R = Reproductive; TC = Transplacental carcinogen

Jankovic J., Drake F.: A Screening Method for Occupational Reproductive

American Industrial Hygiene Association Journal 57: 641-649 (1996).

■ 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.

■ 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.

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Section 16 - OTHER INFORMATION

permission from CHEMWATCH. TEL (+61 3) 9572 4700.

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This is the end of the MSDS.



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Section 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME

FLEXANE HIGH PERFORMANCE BRUSHABLE HARDENER #692-889

SYNONYMS

"RS Components", CP0154/1

PROPER SHIPPING NAME

COATING SOLUTION

PRODUCT USE

Hardener component of a two part Flexane High Performance Coating System.

- Requires that the two parts be mixed by hand before use, in accordance with manufacturers directions.

SUPPLIER

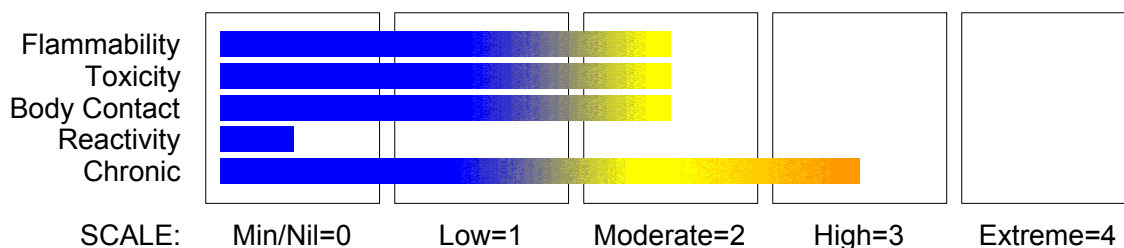
Company: RS Components	Company: RS Components
Address:	Address:
Units 30 & 31	25 Pavesi Street
Warehouse World	Smithfield
761 Great South Road	NSW2164
Penrose Auckland	AUS
	Telephone: 1300 656 636
	Emergency Tel: 1800 039 008
	Emergency Tel: 03 9573 3112
	Fax: 1300 656 696

Section 2 - HAZARDS IDENTIFICATION

STATEMENT OF HAZARDOUS NATURE

HAZARDOUS SUBSTANCE. DANGEROUS GOODS. According to the Criteria of NOHSC, and the ADG Code.

CHEMWATCH HAZARD RATINGS



continued...

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Section 2 - HAZARDS IDENTIFICATION



POISONS SCHEDULE

None

RISK

- Flammable.
 - Harmful in contact with skin and if swallowed.
 - Irritating to eyes.

 - May cause harm to the unborn child.
 - HARMFUL- May cause lung damage if swallowed.
 - Inhalation may produce health damage*.
 - Cumulative effects may result following exposure*.
 - May produce discomfort of the respiratory system and skin*.
 - Vapours potentially cause drowsiness and dizziness*.
- * (limited evidence).

SAFETY

- Keep locked up.
- Do not breathe gas/fumes/vapour/spray.

- In case of insufficient ventilation wear suitable respiratory equipment.
- Use only in well ventilated areas.
- Keep container in a well ventilated place.

- Avoid exposure - obtain special instructions before use.

- To clean the floor and all objects contaminated by this material use water and detergent.
- Keep container tightly closed.

- This material and its container must be disposed of in a safe way.
- Keep away from food drink and animal feeding stuffs.
- In case of contact with eyes rinse with plenty of water and contact Doctor or Poisons Information Centre.
- This material and its container must be disposed of as hazardous waste.

Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

NAME	CAS RN	%
propylene glycol monomethyl ether acetate, alpha- isomer	108-65-6	>60
polyamine		10-30

Section 4 - FIRST AID MEASURES

SWALLOWED

- 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.

continued...

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Section 4 - FIRST AID MEASURES

EYE

- 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

- 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.

INHALED

- 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.

NOTES TO PHYSICIAN

- Treat symptomatically.

Section 5 - FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA

- Water spray or fog.
- Foam.
- Dry chemical powder.
- BCF (where regulations permit).
- Carbon dioxide.

FIRE FIGHTING

- Alert Fire Brigade and tell them location and nature of hazard.
- May be violently or explosively reactive.
- Wear breathing apparatus plus protective gloves.
- Prevent, by any means available, spillage from entering drains or water course.
- If safe, switch off electrical equipment until vapour fire hazard removed.
- 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

- Liquid and vapour are flammable.
 - Moderate fire hazard when exposed to heat or flame.
 - Vapour may travel a considerable distance to source of ignition.
 - Heating may cause expansion or decomposition leading to violent rupture of containers.
 - On combustion, may emit toxic fumes of carbon monoxide (CO).
- Other combustion products include: carbon dioxide (CO₂).

continued...

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Section 5 - FIRE FIGHTING MEASURES

FIRE INCOMPATIBILITY

- Avoid contamination with strong oxidising agents as ignition may result.

HAZCHEM: 3[Y]E

PERSONAL PROTECTION

Glasses:

Chemical goggles.

Gloves:

PVC chemical resistant type.

Nitrile.

Respirator:

Type A Filter of sufficient capacity

Section 6 - ACCIDENTAL RELEASE MEASURES

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 small quantities with vermiculite or other absorbent material.
- Wipe up.
- Collect residues in a flammable waste container.

MAJOR SPILLS

- Clear area of personnel and move upwind.
- Alert Fire Brigade and tell them location and nature of hazard.
- May be violently or explosively reactive.
- 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.
- Water spray or fog may be used to disperse / absorb vapour.
- Contain spill with sand, earth or vermiculite.
- Use only spark-free shovels and explosion proof equipment.
- 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.

PROTECTIVE ACTIONS FOR SPILL

continued...

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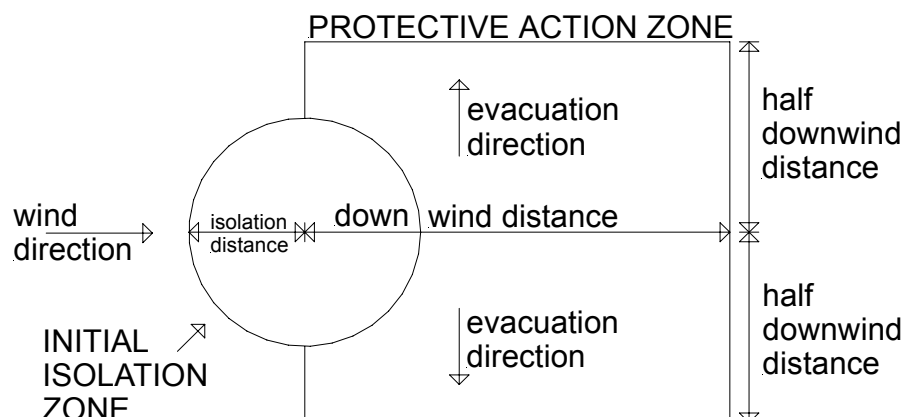
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Section 6 - ACCIDENTAL RELEASE MEASURES



From IERG (Canada/Australia)

Isolation Distance	25 metres
Downwind Protection Distance	300 metres
IERG Number	14

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 confines 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 Guide 127 is taken from the US DOT emergency response guide book.

6 IERG information is derived from CANUTEC - Transport Canada.

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

Section 7 - HANDLING AND STORAGE

PROCEDURE FOR HANDLING

- Avoid generating and breathing mist.
- Avoid all personal contact, including inhalation.
- Wear protective clothing when risk of overexposure 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 generation of static electricity.
- DO NOT use plastic buckets.
- Earth all lines and equipment.
- Use spark-free tools when handling.
- Avoid contact with incompatible materials.

continued...

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Section 7 - HANDLING AND STORAGE

- 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 storing and handling recommendations.
- Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions.

SUITABLE CONTAINER

- Packing as supplied by manufacturer.
- Plastic containers may only be used if approved for flammable liquid.
- Check that containers are clearly labelled and free from leaks.

STORAGE INCOMPATIBILITY

- Avoid storage with oxidisers.

Avoid storage with zinc, galvanised or diecast metal (including bungs).

STORAGE REQUIREMENTS

- Store in original containers in approved flammable liquid storage area.
- Store away from incompatible materials in a cool, dry, well-ventilated area.
- DO NOT store in pits, depressions, basements or areas where vapours may be trapped.
- No smoking, naked lights, heat or ignition sources.
- Storage areas should be clearly identified, well illuminated, clear of obstruction and accessible only to trained and authorised personnel - adequate security must be provided so that unauthorised personnel do not have access.
- Store according to applicable regulations for flammable materials for storage tanks, containers, piping, buildings, rooms, cabinets, allowable quantities and minimum storage distances.
- Use non-sparking ventilation systems, approved explosion proof equipment and intrinsically safe electrical systems.
- Have appropriate extinguishing capability in storage area (e.g. portable fire extinguishers - dry chemical, foam or carbon dioxide) and flammable gas detectors.
- Keep adsorbents for leaks and spills readily available.
- Protect containers against physical damage and check regularly for leaks.
- Observe manufacturer's storing and handling recommendations.

In addition, for tank storages (where appropriate):

- Store in grounded, properly designed and approved vessels and away from incompatible materials.
- For bulk storages, consider use of floating roof or nitrogen blanketed vessels; where venting to atmosphere is possible, equip storage tank vents with flame arrestors; inspect tank vents during winter conditions for vapour/ ice build-up.
- Storage tanks should be above ground and diked to hold entire contents.

SAFE STORAGE WITH OTHER CLASSIFIED CHEMICALS



X



X



+



X



X



+

+: May be stored together

O: May be stored together with specific preventions

X: Must not be stored together

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Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE CONTROLS

Source	Material	TWA ppm	TWA mg/m ³	STEL ppm	STEL mg/m ³	Notes
Australia Exposure Standards	propylene glycol monomethyl ether acetate, alpha-isomer (1- Methoxy-2- propanol acetate)	50	274	100	548	Sk

MATERIAL DATA

FLEXANE HIGH PERFORMANCE BRUSHABLE HARDENER #692-889:

- None assigned. Refer to individual constituents.

PROPYLENE GLYCOL MONOMETHYL ETHER ACETATE, ALPHA-ISOMER:

- for propylene glycol monomethyl ether acetate (PGMEA)

Saturated vapour concentration: 4868 ppm at 20 C.

A two-week inhalation study found nasal effects to the nasal mucosa in animals at concentrations up to 3000 ppm. Differences in the teratogenic potential of the alpha (commercial grade) and beta isomers of PGMEA may be explained by the formation of different metabolites. The beta-isomer is thought to be oxidised to methoxypropionic acid, a homologue to methoxyacetic acid which is a known teratogen. The alpha- form is conjugated and excreted. PGMEA mixture (containing 2% to 5% beta isomer) is a mild skin and eye irritant, produces mild central nervous system effects in animals at 3000 ppm and produces mild CNS impairment and upper respiratory tract and eye irritation in humans at 1000 ppm. In rats exposed to 3000 ppm PGMEA produced slight foetotoxic effects (delayed sternabral ossification) - no effects on foetal development were seen in rabbits exposed at 3000 ppm.

PERSONAL PROTECTION



EYE

- Safety glasses with side shields; or as required,
- 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].

HANDS/FEET

- Nitrile gloves.
- PVC gloves.
- Safety footwear.

continued...

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Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

OTHER

- Overalls.
- Eyewash unit.

RESPIRATOR

■ Selection of the Class and Type of respirator will depend upon the level of breathing zone contaminant and the chemical nature of the contaminant. Protection Factors (defined as the ratio of contaminant outside and inside the mask) may also be important.

Breathing Zone Level ppm (volume)	Maximum Protection Factor	Half- face Respirator	Full- Face Respirator
1000	10	A- AUS	-
1000	50	-	A- AUS
5000	50	Airline *	-
5000	100	-	A- 2
10000	100	-	A- 3
	100+		Airline**

* - Continuous Flow

** - Continuous-flow or positive pressure demand.

The local concentration of material, quantity and conditions of use determine the type of personal protective equipment required. For further information consult site specific CHEMWATCH data (if available), or your Occupational Health and Safety Advisor.

ENGINEERING CONTROLS

■ Use in a well-ventilated area.

General exhaust is adequate under normal operating conditions. If risk of overexposure exists, wear SAA approved respirator. Correct fit is essential to obtain adequate protection. Provide adequate ventilation in warehouse or closed storage areas. 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:
solvent, vapours, degreasing etc., evaporating from tank (in still air)	0.25- 0.5 m/s (50- 100 f/min)
aerosols, fumes from pouring operations, intermittent container filling, low speed conveyer transfers, welding, spray drift, plating acid fumes, pickling (released at low velocity into zone of active generation)	0.5- 1 m/s (100- 200 f/min.)
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)
grinding, abrasive blasting, tumbling, high speed wheel generated dusts (released at high initial velocity into zone of very high rapid air motion).	2.5- 10 m/s (500- 2000 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

continued...

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Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

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 (in simple cases). Therefore the air speed at 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 1-2 m/s (200-400 f/min.) for extraction of solvents generated in a tank 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.

Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE

Black mobile flammable liquid with a pungent odour; partly mixes with water.

PHYSICAL PROPERTIES

Liquid.

Does not mix with water.

Molecular Weight: Not applicable

Specific Gravity (water=1): 1.0

pH (1% solution): Not available

Evaporation Rate: >1

Lower Explosive Limit (%): 1.3

Decomposition Temp (°C): Not available

Boiling Range (°C): 149

Solubility in water (g/L): Partly miscible

Vapour Pressure (kPa): 0.39 @ 20 deg C

Relative Vapour Density (air=1): Not available

Upper Explosive Limit (%): 13.1

State: Liquid

Melting Range (°C): Not available

pH (as supplied): <7

Volatile Component (%vol): Not available

Flash Point (°C): 46

Autoignition Temp (°C): Not available

Section 10 - CHEMICAL STABILITY AND REACTIVITY INFORMATION

CONDITIONS CONTRIBUTING TO INSTABILITY

- Presence of incompatible materials.
- Product is considered stable.
- Hazardous polymerisation will not occur.

For incompatible materials - refer to Section 7 - Handling and Storage.

Section 11 - TOXICOLOGICAL INFORMATION

POTENTIAL HEALTH EFFECTS

ACUTE HEALTH EFFECTS

SWALLOWED

- Considered an unlikely route of entry in commercial/industrial environments.

The liquid is discomfiting to the gastro-intestinal tract and may be harmful if swallowed.

Ingestion may result in nausea, abdominal irritation, pain and vomiting.

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Section 11 - TOXICOLOGICAL INFORMATION

EYE

■ The liquid may produce eye discomfort and is capable of causing temporary impairment of vision and/or transient eye inflammation, ulceration.

The vapour is mildly discomforting to the eyes.

SKIN

■ The liquid is mildly discomforting to the skin if exposure is prolonged and is capable of causing skin reactions and may cause drying of the skin.

The material may accentuate any pre-existing dermatitis condition.

INHALED

■ The vapour is discomforting to the upper respiratory tract and lungs.

Inhalation hazard is increased at higher temperatures.

Acute effects from inhalation of high vapour concentrations may be chest and nasal irritation with coughing, sneezing, headache and even nausea.

If exposure to highly concentrated solvent atmosphere is prolonged this may lead to narcosis, unconsciousness, even coma and possible death.

Central nervous system (CNS) depression may include nonspecific discomfort, symptoms of giddiness, headache, dizziness, nausea, anaesthetic effects, slowed reaction time, slurred speech and may progress to unconsciousness. Serious poisonings may result in respiratory depression and may be fatal.

CHRONIC HEALTH EFFECTS

■ Principal routes of exposure are usually by inhalation of vapour and skin contact with the material.

Prolonged or continuous skin contact with the liquid may cause defatting with drying, cracking, irritation and dermatitis following.

Studies with some glycol ethers (principally the monoethylene glycols) and their esters indicate reproductive changes, testicular atrophy, infertility and kidney function changes. The metabolic acetic acid derivatives of glycol ethers (alkoxyacetic acids), not the ether itself, have been found to be the proximal reproductive toxin in animals. The potency of these metabolites decreases significantly as the chain length of the ether increases. Consequently glycol ethers with longer substituents (e.g diethylene glycols, triethylene glycols) have not generally been associated with reproductive effects. One of the most sensitive indicators of toxic effects observed from many of the glycol ethers is an increase in the erythrocytic osmotic fragility in rats (which produces haemolytic anaemia). This appears to be related to the development of haemoglobinuria (blood in the urine) at higher exposure levels or as a result of chronic exposure.

Glycol ethers based on propylene oxides, propylene glycol ethers, dipropylene glycol ethers and tripropylene glycol ethers are mainly available, commercially, as alpha-isomers (because of thermodynamic considerations); these are incapable of forming alkoxyacetic or alkoxypropionic acids as metabolites and therefore do not produce erythrocyte fragility unless contaminated by ethylene glycol ethers or to a significant degree by the beta-isomer. beta-Isomers are able to form the alkoxypropionic acids and these are linked to teratogenic effects (and possibly haemolytic effects).

As with any chemical product, contact with unprotected bare skin; inhalation of vapour, mist or dust in work place atmosphere; or ingestion in any form, should be avoided by observing good occupational work practice.

TOXICITY AND IRRITATION

■ unless otherwise specified data extracted from RTECS - Register of Toxic Effects of Chemical Substances.

TOXICITY

For the polyamine:

Oral (rat) LD50: 485 mg/kg

Dermal (rabbit) LD50: 700 mg/kg

Inhalation (rat) LC50: >4345 ppm/6hr [RS Components]

IRRITATION

PROPYLENE GLYCOL MONOMETHYL ETHER ACETATE, ALPHA-ISOMER:

■ unless otherwise specified data extracted from RTECS - Register of Toxic Effects of Chemical Substances.

TOXICITY

Oral (rat) LD50: 8532 mg/kg

Dermal (rabbit) LD50: >5000 mg/kg* * [CCINFO]

Inhalation (rat) LC50: 4345 ppm/6h

IRRITATION

Nil Reported

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Section 11 - TOXICOLOGICAL INFORMATION

■ A BASF report (in ECETOC) showed that inhalation exposure to 545 ppm PGMEA (beta isomer) was associated with a teratogenic response in rabbits; but exposure to 145 ppm and 36 ppm had no adverse effects. The beta isomer of PGMEA comprises only 10% of the commercial material, the remaining 90% is alpha isomer. Hazard appears low but emphasizes the need for care in handling this chemical. [I.C.I].

for propylene glycol ethers (PGEs):

Typical propylene glycol ethers include propylene glycol n-butyl ether (PnB); dipropylene glycol n-butyl ether (DPnB); dipropylene glycol methyl ether acetate (DPMA); tripropylene glycol methyl ether (TPM).

Testing of a wide variety of propylene glycol ethers Testing of a wide variety of propylene glycol ethers has shown that propylene glycol-based ethers are less toxic than some ethers of the ethylene series. The common toxicities associated with the lower molecular weight homologues of the ethylene series, such as adverse effects on reproductive organs, the developing embryo and fetus, blood (haemolytic effects), or thymus, are not seen with the commercial-grade propylene glycol ethers. In the ethylene series, metabolism of the terminal hydroxyl group produces an alkoxyacetic acid. The reproductive and developmental toxicities of the lower molecular weight homologues in the ethylene series are due specifically to the formation of methoxyacetic and ethoxyacetic acids.

Longer chain length homologues in the ethylene series are not associated with the reproductive toxicity but can cause haemolysis in sensitive species, also through formation of an alkoxyacetic acid. The predominant alpha isomer of all the PGEs (thermodynamically favored during manufacture of PGEs) is a secondary alcohol incapable of forming an alkoxypropionic acid. In contrast beta-isomers are able to form the alkoxypropionic acids and these are linked to teratogenic effects (and possibly haemolytic effects).

This alpha isomer comprises greater than 95% of the isomeric mixture in the commercial product.

Because the alpha isomer cannot form an alkoxypropionic acid, this is the most likely reason for the lack of toxicity shown by the PGEs as distinct from the lower molecular weight ethylene glycol ethers. More importantly, however, very extensive empirical test data show that this class of commercial-grade glycol ether presents a low toxicity hazard. PGEs, whether mono, di- or tripropylene glycol-based (and no matter what the alcohol group), show a very similar pattern of low to non-detectable toxicity of any type at doses or exposure levels greatly exceeding those showing pronounced effects from the ethylene series. One of the primary metabolites of the propylene glycol ethers is propylene glycol, which is of low toxicity and completely metabolised in the body.

As a class, the propylene glycol ethers are rapidly absorbed and distributed throughout the body when introduced by inhalation or oral exposure. Dermal absorption is somewhat slower but subsequent distribution is rapid. Most excretion for PGEs is via the urine and expired air. A small portion is excreted in the faeces.

As a group PGEs exhibits low acute toxicity by the oral, dermal, and inhalation routes. Rat oral LD50s range from >3,000 mg/kg (PnB) to >5,000 mg/kg (DPMA). Dermal LD50s are all > 2,000 mg/kg (PnB, & DPnB; where no deaths occurred), and ranging up to >15,000 mg/kg (TPM). Inhalation LC50 values were higher than 5,000 mg/m³ for DPMA (4-hour exposure), and TPM (1-hour exposure). For DPnB the 4-hour LC50 is >2,040 mg/m³. For PnB, the 4-hour LC50 was >651 ppm (>3,412 mg/m³), representing the highest practically attainable vapor level. No deaths occurred at these concentrations. PnB and TPM are moderately irritating to eyes while the remaining category members are only slightly irritating to nonirritating. PnB is moderately irritating to skin while the remaining category members are slightly to non-irritating

None are skin sensitisers.

In repeated dose studies ranging in duration from 2 to 13 weeks, few adverse effects were found even at high exposure levels and effects that did occur were mild in nature. By the oral route of administration, NOAELs of 350 mg/kg-d (PnB – 13 wk) and 450 mg/kg-d (DPnB – 13 wk) were observed for liver and kidney weight increases (without accompanying histopathology). LOAELs for these two chemicals were 1000 mg/kg-d (highest dose tested).

Dermal repeated-dose toxicity tests have been performed for many PGEs. For PnB, no effects were seen in a 13-wk study at doses as high as 1,000 mg/kg-d. A dose of 273 mg/kg-d constituted a LOAEL (increased organ weights without histopathology) in a 13-week dermal study for DPnB. For TPM, increased kidney weights (no histopathology) and transiently decreased body weights were found at a dose of 2,895 mg/kg-d in a 90-day study in rabbits. By inhalation, no effects were observed in 2-week studies in rats at the highest tested concentrations of 3244 mg/m³ (600 ppm) for PnB and 2,010 mg/m³ (260 ppm) for DPnB. TPM caused increased liver weights without histopathology by inhalation in a 2-week study at a LOAEL of 360 mg/m³ (43 ppm). In this study, the highest tested TPM concentration, 1010 mg/m³ (120 ppm), also caused increased liver weights without accompanying histopathology. Although no repeated-dose studies are available for the oral route for TPM, or for any route for DPMA, it is anticipated that these chemicals would behave similarly to other category members.

One and two-generation reproductive toxicity testing has been conducted in mice, rats, and rabbits via the oral or inhalation routes of exposure on PM and PMA. In an inhalation rat study using PM, the NOAEL for

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Section 11 - TOXICOLOGICAL INFORMATION

parental toxicity is 300 ppm (1106 mg/m³) with decreases in body and organ weights occurring at the LOAEL of 1000 ppm (3686 mg/m³). For offspring toxicity the NOAEL is 1000 ppm (3686 mg/m³), with decreased body weights occurring at 3000 ppm (11058 mg/m³). For PMA, the NOAEL for parental and offspring toxicity is 1000 mg/kg/d. in a two generation gavage study in rats. No adverse effects were found on reproductive organs, fertility rates, or other indices commonly monitored in such studies. In addition, there is no evidence from histopathological data from repeated-dose studies for the category members that would indicate that these chemicals would pose a reproductive hazard to human health.

In developmental toxicity studies many PGEs have been tested by various routes of exposure and in various species at significant exposure levels and show no frank developmental effects. Due to the rapid hydrolysis of DPMA to DPM, DPMA would not be expected to show teratogenic effects. At high doses where maternal toxicity occurs (e.g., significant body weight loss), an increased incidence of some anomalies such as delayed skeletal ossification or increased 13th ribs, have been reported. Commercially available PGEs showed no teratogenicity.

The weight of the evidence indicates that propylene glycol ethers are not likely to be genotoxic. In vitro, negative results have been seen in a number of assays for PnB, DPnB, DPMA and TPM. Positive results were only seen in 3 out of 5 chromosome aberration assays in mammalian cells with DPnB. However, negative results were seen in a mouse micronucleus assay with DPnB and PM. Thus, there is no evidence to suggest these PGEs would be genotoxic in vivo. In a 2-year bioassay on PM, there were no statistically significant increases in tumors in rats and mice.

A BASF report (in ECETOC) showed that inhalation exposure to 545 ppm PGMEA (beta isomer) was associated with a teratogenic response in rabbits; but exposure to 145 ppm and 36 ppm had no adverse effects.

The beta isomer of PGMEA comprises only 10% of the commercial material, the remaining 90% is alpha isomer. Hazard appears low but emphasizes the need for care in handling this chemical. [I.C.]

SKIN

propylene glycol monomethyl ether acetate, alpha- isomer	Australia Exposure Standards - Skin	Notes	Sk
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Section 12 - ECOLOGICAL INFORMATION

Refer to data for ingredients, which follows:

FLEXANE HIGH PERFORMANCE BRUSHABLE HARDENER #692-889:

Marine Pollutant: Not Determined

PROPYLENE GLYCOL MONOMETHYL ETHER ACETATE, ALPHA-ISOMER:

■ For glycol ethers:

Environmental fate:

Ether groups are generally stable to hydrolysis in water under neutral conditions and ambient temperatures. OECD guideline studies indicate ready biodegradability for several glycol ethers although higher molecular weight species seem to biodegrade at a slower rate. No glycol ethers that have been tested demonstrate marked resistance to biodegradative processes. Upon release to the atmosphere by evaporation, high boiling glycol ethers are estimated to undergo photodegradation (atmospheric half lives = 2.4-2.5 hr). When released to water, glycol ethers undergo biodegradation (typically 47-92% after 8-21 days) and have a low potential for bioaccumulation (log Kow ranges from -1.73 to +0.51).

Ecotoxicity:

Aquatic toxicity data indicate that the tri- and tetra ethylene glycol ethers are "practically non-toxic" to aquatic species. No major differences are observed in the order of toxicity going from the methyl- to the butyl ethers.

Glycols exert a high oxygen demand for decomposition and once released to th environments cause the death of aquatic organisms if dissolved oxygen is depleted.

■ for propylene glycol ethers:

Environmental fate:

Most are liquids at room temperature and all are water-soluble.

Typical propylene glycol ethers include propylene glycol n-butyl ether (PnB); dipropylene glycol n-butyl

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Section 12 - ECOLOGICAL INFORMATION

ether (DPnB); dipropylene glycol methyl ether acetate (DPMA); tripropylene glycol methyl ether (TPM)
Environmental fate: Log octanol-water partition coefficients (log Kow's) range from 0.309 for TPM to 1.523 for DPnB. Calculated BCFs range from 1.47 for DPnB to 3.16 for DPMA and TPM, indicating low bioaccumulation. Henry's Law Constants, which indicate propensity to partition from water to air, are low for all category members, ranging from 5.7×10^{-9} atm-m³/mole for TPM to 2.7×10^{-9} atm-m³/mole for PnB. Fugacity modeling indicates that most propylene glycol ethers are likely to partition roughly equally into the soil and water compartments in the environment with small to negligible amounts remaining in other environmental compartments (air, sediment, and aquatic biota). Propylene glycol ethers are unlikely to persist in the environment. Once in air, the half-life of the category members due to direct reactions with photochemically generated hydroxyl radicals, range from 2.0 hours for TPM to 4.6 hours for PnB. In water, most this family are "readily biodegradable" under aerobic conditions. (DPMA degraded within 28 days (and within the specified 10-day window) but only using pre-adapted or "acclimated" inoculum.). In soil, biodegradation is rapid for PM and PMA.

Ecotoxicity:

Acute aquatic toxicity testing indicates low toxicity for both ethers and acetates. For ethers, effect concentrations are > 500 mg/L. For acetates, effect concentrations are > 151 mg/L.

■ DO NOT discharge into sewer or waterways.

Ecotoxicity

Ingredient	Persistence: Water/Soil	Persistence: Air	Bioaccumulation	Mobility
Flexane High Performance Brushable Hardener #692- 889		No data		
propylene glycol monomethyl ether acetate, alpha- isomer	HIGH	No data	LOW	HIGH

Section 13 - DISPOSAL CONSIDERATIONS

- Consult manufacturer for recycling options and recycle where possible .
- Consult State Land Waste Management Authority for disposal.
- Incinerate residue at an approved site.
- Recycle containers if possible, or dispose of in an authorised landfill.

Section 14 - TRANSPORTATION INFORMATION



Labels Required: FLAMMABLE LIQUID

HAZCHEM: 3[Y]E (ADG6)

Land Transport UNDG:

Class or division: 3 Subsidiary risk: None

UN No.: 1139 UN packing group: III

Shipping Name: COATING SOLUTION (includes surface treatments or coatings used for industrial or other purposes such as vehicle undercoating, drum or barrel lining)

continued...

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Section 14 - TRANSPORTATION INFORMATION

Air Transport IATA:

ICAO/IATA Class:	3	ICAO/IATA Subrisk:	None
UN/ID Number:	1139	Packing Group:	III
Special provisions:	A3		
Shipping Name:	COATING SOLUTION		

Maritime Transport IMDG:

IMDG Class:	3	IMDG Subrisk:	None
UN Number:	1139	Packing Group:	III
EMS Number:	F- E, S- E	Special provisions:	944
Limited Quantities:	5 L	Marine Pollutant:	Not Determined
Shipping Name:	COATING SOLUTION (includes surface treatments or coatings used for industrial purposes such as vehicle under-coating, drum or barrel lining)		

Section 15 - REGULATORY INFORMATION

POISONS SCHEDULE: None

REGULATIONS

Regulations for ingredients

propylene glycol monomethyl ether acetate, alpha-isomer (CAS: 108-65-6,84540-57-8) is found on the following regulatory lists;

"Australia Exposure Standards", "Australia Hazardous Substances", "Australia High Volume Industrial Chemical List (HVICL)", "Australia Inventory of Chemical Substances (AICS)", "GESAMP/EHS Composite List of Hazard Profiles - Hazard evaluation of substances transported by ships", "IMO IBC Code Chapter 17: Summary of minimum requirements", "International Council of Chemical Associations (ICCA) - High Production Volume List", "OECD Representative List of High Production Volume (HPV) Chemicals"

No data for Flexane High Performance Brushable Hardener #692-889 (CW: 4523-69)

Section 16 - OTHER INFORMATION

INGREDIENTS WITH MULTIPLE CAS NUMBERS

Ingredient Name	CAS
propylene glycol monomethyl ether acetate, alpha- isomer	108- 65- 6, 84540- 57- 8

■ 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.

■ 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.

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FLEXANE HIGH PERFORMANCE BRUSHABLE HARDENER #692-889

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Section 16 - OTHER INFORMATION

This is the end of the MSDS.