

**S-310 A (BASE COMPOUND)**

SEIKO SERVICE CENTER CO.,LTD.

Chemwatch: 4859-04

Version No: 2.1.1.1

Safety Data Sheet

Print Date: 02/09/2013

Issue Date: 28/08/2013

S.GHS.CHN.EN

**SECTION 1 Identification of the substance / mixture and of the company / undertaking**

**Product Identifier**

**Product name:** S-310 A (BASE COMPOUND)

**Chemical Name:** Not Applicable

**Proper shipping name:** ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S. (contains bisphenol A type epoxy resin, liquid)

**Chemical formula:** Not Applicable

**Other means of identification:** Not Available

**CAS number:** Not Applicable

**Relevant identified uses of the substance or mixture and uses advised against**

**Relevant identified uses:** Used according to manufacturer's directions.  
 Adhesive and sealant

**Details of the supplier of the safety data sheet**

**Registered company name:** SEIKO SERVICE CENTER CO.,LTD.

**Address:** 1-12-13 Shinohashi, KOTO-KU Tokyo Japan

**Telephone:** +81-50-3160-2100

**Fax:** Not Available

**Website:** Not Available

**Email:** Not Available

**Emergency telephone number**

**Association / Organisation:** Not Available

**Emergency telephone numbers:** +81-50-3160-2100

**Other emergency telephone numbers:** +81-50-3160-2100

**SECTION 2 Hazards identification**

**Classification of the substance or mixture**

**GHS Classification<sup>[1]</sup>:**

Acute Toxicity (Inhalation) Category 4, Germ Cell Mutagen Category 2, Carcinogen Category 2, STOT - RE Category 1, Acute Aquatic Hazard Category 2, Chronic Aquatic Hazard Category 2, Flammable Liquid Category 4, Acute Toxicity (Dermal) Category 4, Skin Corrosion/Irritation Category 2, Skin Sensitizer Category

## 1, Eye Irritation Category 2A

**Legend:** 1. Classified by Chemwatch; 2. Classification drawn from EC Directive 67/548/EEC - Annex I; 3. Classification drawn from EC Directive 1272/2008 - Annex VI

### Label elements

#### GHS label elements



Signal word:

**DANGER**

#### Hazard statement(s):

H227	Combustible liquid
H312	Harmful in contact with skin
H315	Causes skin irritation
H317	May cause an allergic skin reaction
H319	Causes serious eye irritation
H332	Harmful if inhaled
H341	Suspected of causing genetic defects
H351	Suspected of causing cancer
H372	Causes damage to organs through prolonged or repeated exposure
H401	Toxic to aquatic life
H411	Toxic to aquatic life with long lasting effects

#### Precautionary statement(s): Prevention

P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P210	Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
P260	Do not breathe dust/fume/gas/mist/vapours/spray.
P261	Avoid breathing dust/fume/gas/mist/vapours/spray.
P264	Wash ... thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P271	Use only outdoors or in a well-ventilated area.
P272	Contaminated work clothing should not be allowed out of the workplace.
P273	Avoid release to the environment.
P280	Wear protective gloves/protective clothing/eye protection/face protection.
P281	Use personal protective equipment as required.

#### Precautionary statement(s): Response

P302+P352	IF ON SKIN: Wash with plenty of soap and water.
P304+P340	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.

P305+P351+P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P308+P313	IF exposed or concerned: Get medical advice/attention.
P312	Call a POISON CENTER/doctor/.../if you feel unwell.
P314	Get medical advice/attention if you feel unwell.
P321	Specific treatment (see ... on this label).
P322	Specific measures (see ... on this label).
P332+P313	If skin irritation occurs: Get medical advice/attention.
P333+P313	If skin irritation or rash occurs: Get medical advice/attention.
P337+P313	If eye irritation persists: Get medical advice/attention.
P362	Take off contaminated clothing.
P363	Wash contaminated clothing before reuse.
P370+P378	In case of fire: Use ... for extinction.
P391	Collect spillage.

#### Precautionary statement(s): Storage

P403+P235	Store in a well-ventilated place. Keep cool.
P405	Store locked up.

#### Precautionary statement(s): Disposal

P501	Dispose of contents/container to ...
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### SECTION 3 Composition / information on ingredients

#### Substances

See section below for composition of Mixtures

#### Mixtures

CAS No	% [weight]	Name	Classification according to directive 67/548/EEC [DSD]
2426-08-6	11	N-BUTYL GLYCIDYL ETHER	R20/22, R36/37, R52/53, Chronic Aquatic Hazard R43, R10, R40(3), R68(3), Category 3 , Flammable Liquid Category 3 , Skin Sensitizer Category 1 , Eye Irritation Category 2A , Acute Toxicity (Oral) Category 4 [1]
75-85		bisphenol A type epoxy resin, liquid	
5-15		other epoxy resin	

## SECTION 4 First aid measures

### Description of first aid measures

#### Eye Contact:

If this product comes in contact with the eyes:

- Wash out immediately with fresh 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.
- Seek medical attention without delay; if pain persists or recurs seek medical attention. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

#### Skin Contact:

If skin contact occurs:

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

#### Inhalation:

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

#### Ingestion:

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

### Indication of any immediate medical attention and special treatment needed

Treat symptomatically.

## SECTION 5 Firefighting measures

### Extinguishing media

- Foam.
- Dry chemical powder.

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

### Special hazards arising from the substrate or mixture

#### Fire Incompatibility:

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

### Advice for firefighters

#### Fire Fighting:

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

#### Fire/Explosion Hazard:

- Combustible.
- Slight fire hazard when exposed to heat or flame.
- Heating may cause expansion or decomposition leading to violent rupture of containers.
- On combustion, may emit toxic fumes of carbon monoxide (CO).
- May emit acrid smoke.
- Mists containing combustible materials may be explosive.

## SECTION 6 Accidental release measures

### Personal precautions, protective equipment and emergency procedures

#### Minor Spills:

Environmental hazard - contain spillage.

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

#### Major Spills:

Environmental hazard - contain spillage.

Moderate hazard.

- Clear area of personnel and move upwind.
- Alert Fire Brigade and tell them location and nature of hazard.
- Wear breathing apparatus plus protective gloves.
- Prevent, by any means available, spillage from entering drains or water course.

- No smoking, naked lights or ignition sources.
- Increase ventilation.
- Stop leak if safe to do so.
- Contain spill with sand, earth or vermiculite.
- Collect recoverable product into labelled containers for recycling.
- Absorb remaining product with sand, earth or vermiculite.
- Collect solid residues and seal in labelled drums for disposal.
- Wash area and prevent runoff into drains.
- If contamination of drains or waterways occurs, advise emergency services.

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

## SECTION 7 Handling and storage

### Precautions for safe handling

#### Safe handling

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

#### Other information

- Store in original containers.
- Keep containers securely sealed.
- Store in a cool, dry, well-ventilated area.
- Store away from incompatible materials and foodstuff containers.
- Protect containers against physical damage and check regularly for leaks.
- Observe manufacturer's storage and handling recommendations contained within this MSDS.

### Conditions for safe storage, including any incompatibilities

#### Suitable container:

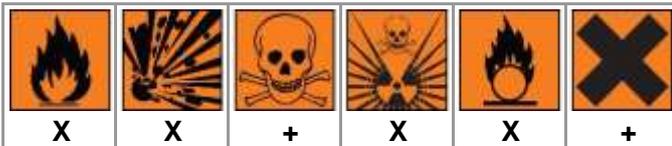
- Metal can or drum
- Packaging as recommended by manufacturer.

- Check all containers are clearly labelled and free from leaks.

#### Storage incompatibility:

#### Glycidyl ethers:

- may form unstable peroxides on storage in air, light, sunlight, UV light or other ionising radiation, trace metals - inhibitor should be maintained at adequate levels
- may polymerise in contact with heat, organic and inorganic free radical producing initiators
- may polymerise with evolution of heat in contact with oxidisers, strong acids, bases and amines
- react violently with strong oxidisers, permanganates, peroxides, acyl halides, alkalis, ammonium persulfate, bromine dioxide
- attack some forms of plastics, coatings, and rubber
- Avoid reaction with oxidising agents



X : Must not be stored together

0 : May be stored together with specific preventions

+: May be stored together

#### Package Material Incompatibilities:

## SECTION 8 Exposure controls / personal protection

### Control parameters

### Occupational Exposure Limits (OEL)

#### INGREDIENT DATA

Source	Ingredient	Material name	TWA	STEL	Peak	Notes
US ACGIH						
Threshold Limit Values (TLV)	n-butyl glycidyl ether	n-Butyl glycidyl ether (BGE)	3 (ppm)	Not Available	Not Available	TLV® Basis: Repro dam

#### Emergency Limits

Ingredient	TEEL-0	TEEL-1	TEEL-2	TEEL-3
n-butyl glycidyl ether	3(ppm)	3(ppm)	5.6(ppm)	250(ppm)
Ingredient	Original IDLH		Revised IDLH	
n-butyl glycidyl ether	3,500(ppm)		250(ppm)	

#### Exposure controls

#### Appropriate engineering controls

Engineering controls are used to remove a hazard or place a barrier between the worker and the hazard.

Well-designed engineering controls can be highly effective in protecting workers and will typically be independent of worker interactions to provide this high level of protection.

The basic types of engineering controls are:

Process controls which involve changing the way a job activity or process is done to reduce the risk.

Enclosure and/or isolation of emission source which keeps a selected hazard "physically" away from the worker and ventilation that strategically "adds" and "removes" air in the work environment.

Ventilation can remove or dilute an air contaminant if designed properly. The design of a ventilation system must match the particular process and chemical or contaminant in use.

Employers may need to use multiple types of controls to prevent employee overexposure.

General exhaust is adequate under normal operating conditions. Local exhaust ventilation may be required in specific circumstances. If risk of overexposure exists, wear 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	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 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.

### Personal protection



### Eye and face protection:

- Safety glasses with side shields.
- Chemical goggles.
- Contact lenses may pose a special hazard; soft contact lenses may absorb and concentrate irritants. A written policy document, describing the wearing of lens or restrictions on use, should be created for each

workplace or task. This should include a review of lens absorption and adsorption for the class of chemicals in use and an account of injury experience. Medical and first-aid personnel should be trained in their removal and suitable equipment should be readily available. In the event of chemical exposure, begin eye irrigation immediately and remove contact lens as soon as practicable. Lens should be removed at the first signs of eye redness or irritation - lens should be removed in a clean environment only after workers have washed hands thoroughly. [CDC NIOSH Current Intelligence Bulletin 59], [AS/NZS 1336 or national equivalent]

#### Skin protection:

See Hand protection below

#### Hand protection:

- Wear chemical protective gloves, e.g. PVC.
- Wear safety footwear or safety gumboots, e.g. Rubber

#### NOTE:

- The material may produce skin sensitisation in predisposed individuals. Care must be taken, when removing gloves and other protective equipment, to avoid all possible skin contact.
- Contaminated leather items, such as shoes, belts and watch-bands should be removed and destroyed.

The selection of the suitable gloves does not only depend on the material, but also on further marks of quality which vary from manufacturer to manufacturer. Where the chemical is a preparation of several substances, the resistance of the glove material can not be calculated in advance and has therefore to be checked prior to the application.

The exact break through time for substances has to be obtained from the manufacturer of the protective gloves and has to be observed when making a final choice.

Suitability and durability of glove type is dependent on usage. Important factors in the selection of gloves include:

- frequency and duration of contact,
- chemical resistance of glove material,
- glove thickness and
- dexterity

Select gloves tested to a relevant standard (e.g. Europe EN 374, US F739, AS/NZS 2161.1 or national equivalent).

- When prolonged or frequently repeated contact may occur, a glove with a protection class of 5 or higher (breakthrough time greater than 240 minutes according to EN 374, AS/NZS 2161.10.1 or national equivalent) is recommended.
- When only brief contact is expected, a glove with a protection class of 3 or higher (breakthrough time greater than 60 minutes according to EN 374, AS/NZS 2161.10.1 or national equivalent) is recommended.
- Contaminated gloves should be replaced.

Gloves must only be worn on clean hands. After using gloves, hands should be washed and dried thoroughly.

Application of a non-perfumed moisturiser is recommended.

#### Body protection:

See Other protection below

#### Other protection:

- Overalls.

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

Thermal hazards:

Recommended material(s):

Respiratory protection:

PVC chemical resistant type.

## SECTION 9 Physical and chemical properties

### Information on basic physical and chemical properties

Appearance

Transparent yellow liquid with a slight odour; slightly mixes with water.

<b>Physical state</b>	Liquid	<b>Relative density (Water = 1)</b>	1.13
<b>Odour</b>	Not Available	<b>Partition coefficient n-octanol / water</b>	Not Available
<b>Odour threshold</b>	Not Available	<b>Auto-ignition temperature (°C)</b>	Not Available
<b>pH (as supplied)</b>	Not Available	<b>Decomposition temperature</b>	Not Available
<b>Melting point / freezing point (°C)</b>	Not Available	<b>Viscosity (mPa s)</b>	900
<b>Initial boiling point and boiling range (°C)</b>	Not Available	<b>Molecular weight (g/mol)</b>	Not Applicable
<b>Flash point (°C)</b>	78	<b>Taste</b>	Not Available
<b>Evaporation rate</b>	Not Available	<b>Explosive properties</b>	Not Available
<b>Flammability</b>	Not Available	<b>Oxidising properties</b>	Not Available
<b>Upper Explosive Limit (%)</b>	Not Available	<b>Surface Tension (dyn/cm or mN/m)</b>	Not Available
<b>Lower Explosive Limit (%)</b>	Not Available	<b>Volatile Component (%vol)</b>	Not Available
<b>Vapour pressure (kPa)</b>	Not Available	<b>Gas group</b>	Not Available
<b>Solubility in water (g/L)</b>	Partly Immiscible	<b>pH as a solution(1%)</b>	Not Available
<b>Vapour density (Air = 1)</b>	Not Available		

## SECTION 10 Stability and reactivity

Reactivity:

See section 7

Chemical stability:

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

Possibility of hazardous reactions:

See section 7

**Conditions to avoid:**

See section 7

**Incompatible materials:**

See section 7

**Hazardous decomposition products:**

See section 5

**SECTION 11 Toxicological information****Information on toxicological effects****Inhaled:**

Inhalation of vapours or aerosols (mists, fumes), generated by the material during the course of normal handling, may be harmful. Not normally a hazard due to non-volatile nature of product

**Ingestion:**

The material is not thought to produce adverse health effects following ingestion (as classified by EC Directives using animal models). Nevertheless, adverse systemic effects have been produced following exposure of animals by at least one other route and good hygiene practice requires that exposure be kept to a minimum.

**Skin Contact:**

Skin contact with the material may be harmful; systemic effects may result following absorption.

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

The material may accentuate any pre-existing dermatitis condition. Open cuts, abraded or irritated skin should not be exposed to this material

**Eye:**

Evidence exists, or practical experience predicts, that the material may cause eye irritation in a substantial number of individuals and/or may produce significant ocular lesions which are present twenty-four hours or more after instillation into the eye(s) of experimental animals.

Repeated or prolonged eye contact may cause inflammation characterised by temporary redness (similar to windburn) of the conjunctiva (conjunctivitis); temporary impairment of vision and/or other transient eye damage/ulceration may occur.

**Chronic:**

On the basis, primarily, of animal experiments, concern has been expressed that the material may produce carcinogenic or mutagenic effects; in respect of the available information, however, there presently exists inadequate data for making a satisfactory assessment.

Practical experience shows that skin contact with the material is capable either of inducing a sensitisation reaction in a substantial number of individuals, and/or of producing a positive response in experimental animals.

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

Exposure to the material may result in a possible risk of irreversible effects. The material may produce mutagenic effects in man. This concern is raised, generally, on the basis of appropriate studies using mammalian somatic cells in vivo. Such findings are often supported by positive results from in vitro mutagenicity studies.

All glycidyl ethers show genotoxic potential due their alkylating properties. Those glycidyl ethers that have been investigated in long term studies exhibit more or less marked carcinogenic potential.

Alkylating agents may damage the stem cell which acts as the precursor to components of the blood. Loss of the stem cell may result in pancytopenia (a reduction in the number of red and white blood cells and platelets) with a latency period corresponding to the lifetime of the individual blood cells. Granulocytopenia (a reduction in granular leukocytes) develops within days and thrombocytopenia (a disorder involving platelets), within 1-2 weeks, whilst loss of erythrocytes (red blood cells) need months to become clinically manifest. Aplastic anaemia develops due to complete destruction of the stem cells.

Glycidyl ethers have been shown to cause allergic contact dermatitis in humans. Glycidyl ethers generally cause skin sensitization in experimental animals. Necrosis of the mucous membranes of the nasal cavities was induced in mice exposed to allyl glycidyl ether.

A study of workers with mixed exposures was inconclusive with regard to the effects of specific glycidyl ethers. Phenyl glycidyl ether, but not n-butyl glycidyl ether, induced morphological transformation in mammalian cells in vitro. n-Butyl glycidyl ether induced micronuclei in mice in vivo following intraperitoneal but not oral administration. Phenyl glycidyl ether did not induce micronuclei or chromosomal aberrations in vivo or chromosomal aberrations in animal cells in vitro. Alkyl C12 or C14 glycidyl ether did not induce DNA damage in cultured human cells or mutation in cultured animal cells. Allyl glycidyl ether induced mutation in Drosophila. The glycidyl ethers were generally mutagenic to bacteria Repeated administration of n-butyl glycidyl ether (BGE) to rats as three daily intramuscular injections of 400 mg/kg/day produced increased leukocyte counts in the blood. BGE produced skin sensitisation upon repeated applications in guinea pigs. Repeated inhalation of 300 ppm for 7 hours/day produced slight atrophy of the testes in rats

TOXICITY	IRRITATION
<b>S-310 A (BASE COMPOUND)</b>	
Not Available	Not Available
<b>n-butyl glycidyl ether</b>	
Dermal (rabbit) LD50: 2520 mg/kg	* ACGIH Documentation
Inhalation (mouse) LC50: >3500 ppm/4h *	Eye (rabbit): 0.75 mg/24h-SEVERE
Inhalation (rat) LC50: 670 ppm/8h *	Eye (rabbit): 91 mg - mild
Oral (rat) LD50: 2050 mg/kg	Skin (rabbit): 20 mg/24h - mild
	Skin (rabbit): 454 mg/3d - mild

Refer to individual constituents.

**N-BUTYL GLYCIDYL ETHER**

The following information refers to contact allergens as a group and may not be specific to this product. Contact allergies quickly manifest themselves as contact eczema, more rarely as urticaria or Quincke's oedema. The pathogenesis of contact eczema involves a cell-mediated (T lymphocytes) immune reaction of the delayed type. Other allergic skin reactions, e.g. contact urticaria, involve antibody-mediated immune reactions. The significance of the contact allergen is not simply determined by its 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.

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

Oxiranes (including glycidyl ethers and alkyl oxides, and epoxides) exhibit many common characteristics with respect to animal toxicology. One such oxirane is ethyloxirane; data presented here may be taken as representative.

for 1,2-butylene oxide (ethyloxirane):

Ethyloxirane increased the incidence of tumours of the respiratory system in male and female rats exposed via inhalation. Significant increases in nasal papillary adenomas and combined alveolar/bronchiolar adenomas and carcinomas were observed in male rats exposed to 1200 mg/m<sup>3</sup> ethyloxirane via inhalation for 103 weeks. There was also a significant positive trend in the incidence of combined alveolar/bronchiolar adenomas and carcinomas. Nasal papillary adenomas were also observed in 2/50 high-dose female rats with none occurring in control or low-dose animals. In mice exposed chronically via inhalation, one male mouse developed a squamous cell papilloma in the nasal cavity (300 mg/m<sup>3</sup>) but other tumours were not observed. Tumours were not observed in mice exposed chronically via dermal exposure. When trichloroethylene containing 0.8% ethyloxirane was administered orally to mice for up to 35 weeks, followed by 0.4% from weeks 40 to 69, squamous-cell carcinomas of the forestomach occurred in 3/49 males (p=0.029, age-adjusted) and 1/48 females at week 106.

Trichloroethylene administered alone did not induce these tumours and they were not observed in control animals. Two structurally related substances, oxirane (ethylene oxide) and methyloxirane (propylene oxide), which are also direct-acting alkylating agents, have been classified as carcinogenic

for n-butyl glycidyl ether (BGE):

Short-term exposure to BGE can cause irritation to the nose and throat. Long-term exposure can be detrimental to the blood and central nervous system (CNS) and may lead to loss of consciousness. BGE was rapidly absorbed and metabolized in rats and rabbits. The major urinary metabolites were 3-butoxy-2-acetylaminopropionic acid, 3-butoxy-2-hydroxypropionic acid, and butoxyacetic acid. Acute toxic

effects in mice and rats included incoordination, delirium, ataxia, depressed motor activity, agitation, excitement, and eventually CNS depression. Pathological findings included irritation of the lungs, pneumonitis, hyperemia of the adrenal glands, adhesions of the stomach to adjacent tissues, and focal inflammation and moderate congestion of central zones in the liver. Toxic effects in subchronic inhalation studies in rats included growth retardation, increased mortality, emaciation, liver necrosis, significant increases in kidney-to-body and lung-to-body weight ratios, increased aspartate transferase levels in serum (males only), and respiratory tract damage. Atrophy of the testes was also seen at high doses. BGE has been reported to cause genetic damage in vitro in bacteria, rodent cells, and human peripheral blood lymphocytes. In vivo, BGE given via intraperitoneal injection but not gavage produced a dose-related increase in micronuclei in mice. Limited evidence also suggested BGE may cause dominant lethal effects in mice, but the results were inconclusive. Chromosomal aberrations were observed in bone marrow cells of rats treated with BGE.

**Immunotoxicity:** BGE is reported to be a skin sensitizer, based on the murine local lymph node assay (LLNA), guinea pig maximization tests, and human studies. In a study of 20 patients with contact allergy to epoxy resins, three reacted to BGE (0.25%). In another study, BGE produced allergic reactions in only two of 140 patients tested. In more recent years, surveys regarding allergic and irritant reactions to plastic and glue allergens have been conducted. Patch testing of BGE (0.25% w/w in petroleum) with a two-day occlusion in 310 patients during a six-year period resulted in only two cases of allergic reaction (0.6%) and one case of irritant reaction. In another investigation, 839 patients were patch tested with a series of plastic and glue allergens over a period of seven years; no reactions (0 out of 343) to BGE (0.25%) were reported. In a bisphenol A-based epoxy resin manufacturing plant in which 26 of 228 workers had work-related skin eruptions during a ten-year period, 19 were patch tested. One subject showed a positive reaction to BGE, as well as epichlorohydrin. At 48 hours, erythema and mild edema were seen; at 72 hours, erythema, edema, and papules were seen.

**Cytotoxicity:** BGE (4.1-1000 g/mL) was toxic in human peripheral blood lymphocytes (HPBL); viability ranged from 85.9% (at 10 ug/mL [77 uM]) to 68.1% (at 1000 ug/mL).

**Genotoxicity:** BGE was found to be positive in a number of in vitro genetic toxicity assays. In *Salmonella typhimurium* strains TA100 and TA1535, BGE (up to 2000 ug/plate [15.36 umol/plate]) produced base-pair type mutations, both with and without metabolic activation (S9). It was positive for mutagenicity in the SOS chromotest, as well as in mouse lymphoma cells and Chinese hamster V79 cells. Furthermore, BGE induced DNA repair in human blood lymphocytes, WI38 cells, and human peripheral blood lymphocytes.

**Reproductive and Teratological Effects:** Inhalation of BGE (38, 75, 150, or 300 ppm [0.20, 0.40, 0.799, or 1.60 g/m<sup>3</sup>]) for seven hours per day, five days per week for ten weeks produced atrophic testes in four of five surviving rats at 300 ppm, very small testes in one of ten rats at 150 ppm, and slight patchy atrophy of the testes in one of ten rats at 75 ppm in reviews]). [EPA commented that "in the absence of data to the contrary, it should be assumed that the testicular atrophy is the result of direct action of BGE" Chemical Disposition, Metabolism, and Toxicokinetics: Oral administration of 14C-BGE (20 mg/kg [0.15 mmol/kg]) to male Wistar rats and New Zealand white rabbits resulted in rapid absorption and metabolism. Within 24 hours, 87 and 78%, respectively, were eliminated in the urine. After 96 hours, 91.5 and 80%, respectively, of the administered dose were excreted in the urine.

The following urinary metabolites were identified (compound; % in rats and % in rabbits): I (not identified; 22 and 4%), II (3-butoxy-2-acetylaminopropionic acid; 26 and 2%), III (3-butoxy-2-hydroxypropionic acid; 10 and 45%), and IV (butoxyacetic acid; 11 and 7%). A major route of biotransformation was via the hydrolytic opening of the epoxide ring, producing a diol that was then oxidized to 3-butoxy-2-hydroxypropionic acid, followed by oxidative

decarboxylation to yield butoxyacetic acid

<b>Acute Toxicity:</b>	Acute Toxicity (Inhalation) Category 4 Acute Toxicity (Dermal) Category 4	<b>Carcinogenicity:</b>	Carcinogen Category 2
<b>Skin Irritation/Corrosion:</b>	Skin Corrosion/Irritation Category 2	<b>Reproductivity:</b>	Not Applicable
<b>Serious Eye Damage/Irritation:</b>	Eye Irritation Category 2A	<b>STOT - Single Exposure:</b>	Not Applicable
<b>Respiratory or Skin sensitisation:</b>	Skin Sensitizer Category 1	<b>STOT - Repeated Exposure:</b>	STOT - RE Category 1
<b>Mutagenicity:</b>	Germ Cell Mutagen Category 2	<b>Aspiration Hazard:</b>	Not Applicable
<b>CMR STATUS</b>			

## SECTION 12 Ecological information

### Toxicity

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

Toxic to aquatic organisms.

May cause long-term adverse effects in the aquatic environment.

### Persistence and degradability

Ingredient	Persistence: Water/Soil	Persistence: Air
Not Available	Not Available	Not Available

### Bioaccumulative potential

Ingredient	Bioaccumulation
Not Available	Not Available

### Mobility in soil

Ingredient	Mobility
Not Available	Not Available

## SECTION 13 Disposal considerations

### Waste treatment methods

#### Product / Packaging disposal:

Legislation addressing waste disposal requirements may differ by country, state and/ or territory. Each user must refer to laws operating in their area. In some areas, certain wastes must be tracked.

A Hierarchy of Controls seems to be common - the user should investigate:

- Reduction
- Reuse
- Recycling

Disposal (if all else fails)

This material may be recycled if unused, or if it has not been contaminated so as to make it unsuitable for its intended use. If it has been contaminated, it may be possible to reclaim the product by filtration, distillation or

some other means. Shelf life considerations should also be applied in making decisions of this type. Note that properties of a material may change in use, and recycling or reuse may not always be appropriate.

- **DO NOT allow wash water from cleaning or process equipment to enter drains.**
- It may be necessary to collect all wash water for treatment before disposal.
- In all cases disposal to sewer may be subject to local laws and regulations and these should be considered first.
- Where in doubt contact the responsible authority.
- Recycle wherever possible or consult manufacturer for recycling options.
- Consult State Land Waste Authority for disposal.
- Bury or incinerate residue at an approved site.
- Recycle containers if possible, or dispose of in an authorised landfill.

**SECTION 14 Transport information**

**Labels Required:**



**Marine Pollutant**



**Land transport (UN)**



<b>UN number</b>	<b>3082</b>	<b>Packing group</b>	<b>III</b>
UN proper shipping name	ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S.	Environmental hazard	No relevant data
<b>Transport hazard class(es)</b>	<b>Class: 9</b> <b>Subrisk:</b>	<b>Special precautions for user</b>	<b>Special provisions</b> 274; 331; 335 <b>limited quantity</b> 5 L

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



<b>UN number</b>	<b>3082</b>	<b>Packing group</b>	<b>III</b>
UN proper shipping name	ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S.	Environmental hazard	No relevant data
<b>Transport hazard class(es)</b>	<b>ICAO/IATA Class: 9</b>	<b>Special precautions for user</b>	<b>Special provisions</b> A97 A158 <b>Cargo Only Packing Instructions:</b> 964

ICAO / IATA

Subrisk:

ERG Code: 9L

Cargo Only Maximum Qty / Pack: 450 L

Passenger and Cargo Packing Instructions: 964

Passenger and Cargo Maximum Qty / Pack: 450 L

Passenger and Cargo Limited Quantity Y964

Packing Instructions: Passenger and Cargo Maximum Qty / Pack: 30 kg G

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



<b>UN number</b>	<b>3082</b>	<b>Packing group</b>	<b>III</b>
UN proper shipping name	ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S.	Environmental hazard	No relevant data
<b>Transport hazard class(es)</b>	<b>Class: 9</b>	<b>Special precautions for user</b>	<b>EMS Number: F-A,S-F</b>
<b>Subrisk:</b>		<b>Special provisions:</b>	<b>274 335</b>
		<b>Limited Quantities:</b>	<b>5 L</b>

#### SECTION 15 Regulatory information

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

**n-butyl glycidyl ether(2426-08-6) is found on the following regulatory lists**

- "China Inventory of Existing Chemical Substances",
- "OECD List of High Production Volume (HPV) Chemicals",
- "China Occupational Exposure Limits for Hazardous Agents in the Workplace",
- "International Maritime Dangerous Goods Requirements (IMDG Code) - Substance Index",
- "Regulations concerning the International Carriage of Dangerous Goods by Rail - Table A: Dangerous Goods List - RID 2013 (English)",
- "International Air Transport Association (IATA) Dangerous Goods Regulations",
- "International Maritime Dangerous Goods Requirements (IMDG Code)",
- "China List of Dangerous Goods (GB 12268-2005) (Chinese)"

#### SECTION 16 Other information

##### Other information

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

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

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

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

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**S-310 B (HARDENING AGENT)**

SEIKO SERVICE CENTER CO.,LTD.

Chemwatch: 4859-05

Version No: 2.1.1.1

Safety Data Sheet

Print Date: 02/09/2013

Issue Date: 27/08/2013

S.GHS.CHN.EN

**SECTION 1 Identification of the substance / mixture and of the company / undertaking**

**Product Identifier**

**Product name:** S-310 B (HARDENING AGENT)

**Chemical Name:** Not Applicable

**Proper shipping name:** AMINES, LIQUID, CORROSIVE, N.O.S. or POLYAMINES, LIQUID, CORROSIVE, N.O.S.(contains benzene-1,3-dimethanamine)

**Chemical formula:** Not Applicable

**Other means of identification:** Not Available

**CAS number:** Not Applicable

**Relevant identified uses of the substance or mixture and uses advised against**

**Relevant identified uses:** Used according to manufacturer's directions.  
Adhesive and sealant

**Details of the supplier of the safety data sheet**

**Registered company name:** SEIKO SERVICE CENTER CO.,LTD.

**Address:** 1-12-13 Shinohashi, KOTO-KU Tokyo Japan

**Telephone:** +81-50-3160-2100

**Fax:** Not Available

**Website:** Not Available

**Email:** Not Available

**Emergency telephone number**

**Association / Organisation:** Not Available

**Emergency telephone numbers:** +81-50-3160-2100

**Other emergency telephone numbers:** +81-50-3160-2100

**SECTION 2 Hazards identification**

**Classification of the substance or mixture**

**GHS Classification<sup>[1]</sup>:**

Respiratory Sensitizer Category 1, Skin Corrosion/Irritation Category 1C, Skin Sensitizer Category 1, Metal Corrosion Category 1, Serious Eye Damage Category 1, Acute Toxicity (Oral) Category 4

**Legend:**1. Classified by Chemwatch; 2. Classification drawn from EC Directive 67/548/EEC - Annex I; 3. Classification drawn from EC Directive

## Label elements

## GHS label elements



Signal word: **DANGER**

## Hazard statement(s):

H290	May be corrosive to metals
H302	Harmful if swallowed
H314	Causes severe skin burns and eye damage
H317	May cause an allergic skin reaction
H318	Causes serious eye damage
H334	May cause allergy or asthma symptoms or breathing difficulties if inhaled

## Precautionary statement(s): Prevention

P234	Keep only in original container.
P260	Do not breathe dust/fume/gas/mist/vapours/spray.
P261	Avoid breathing dust/fume/gas/mist/vapours/spray.
P264	Wash ... thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P272	Contaminated work clothing should not be allowed out of the workplace.
P280	Wear protective gloves/protective clothing/eye protection/face protection.
P285	In case of inadequate ventilation wear respiratory protection.

## Precautionary statement(s): Response

P301+P312	IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell.
P301+P330+P331	IF SWALLOWED: rinse mouth. Do NOT induce vomiting.
P302+P352	IF ON SKIN: Wash with plenty of soap and water.
P303+P361+P353	IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.
P304+P340	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
P304+P341	IF INHALED: If breathing is difficult, remove victim to fresh air and keep at rest in a position comfortable for breathing.
P305+P351+P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P310	Immediately call a POISON CENTER/doctor/physician/first aider
P311	Call a POISON CENTER/doctor/...
P321	Specific treatment (see ... on this label).
P330	Rinse mouth.

P333+P313	If skin irritation or rash occurs: Get medical advice/attention.
P342+P311	If experiencing respiratory symptoms: Call a POISON CENTER/doctor/...
P363	Wash contaminated clothing before reuse.
P390	Absorb spillage to prevent material damage.

#### Precautionary statement(s): Storage

P405	Store locked up.
P406	Store in corrosive resistant/... container with a resistant inner liner.

#### Precautionary statement(s): Disposal

P501	Dispose of contents/container to ...
------	--------------------------------------

### SECTION 3 Composition / information on ingredients

#### Substances

See section below for composition of Mixtures

#### Mixtures

CAS No	% [weight]	Name	Classification according to directive 67/548/EEC [DSD]
1477-55-0	2.3	BENZENE-1,3-DIMETHANAMINE	R20/21/22, R42/43, R51/53, R41, R34 [1]
NotSpec. modified amine			

Acute Toxicity (Inhalation) Category 4 , Respiratory Sensitizer Category 1 , Acute Aquatic Hazard Category 2 , Chronic Aquatic Hazard Category 2 , Acute Toxicity (Dermal) Category 4 , Skin Corrosion/Irritation Category 1B , Skin Sensitizer Category 1 , Metal Corrosion Category 1 , Serious Eye Damage Category 1 , Acute Toxicity (Oral) Category 4 [1]

**Legend:** 1. Classified by Chemwatch; 2. Classification drawn from EC Directive 67/548/EEC - Annex I; 3. Classification drawn from EC Directive 1272/2008 - Annex VI

### SECTION 4 First aid measures

#### Description of first aid measures

## Eye Contact:

If this product comes in contact with the eyes:

- Wash out immediately with fresh 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.
- Seek medical attention without delay; if pain persists or recurs seek medical attention. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

## Skin Contact:

If skin contact occurs:

- Immediately flush body and clothes with large amounts of water, using safety shower if available.
- Quickly remove all contaminated clothing, including footwear.
- Wash skin and hair with running water. Continue flushing with water until advised to stop by the Poisons Information Centre.
- Transport to hospital, or doctor.

For amines:

- . In case of major exposure to liquid amine, promptly remove any contaminated clothing, including rings, watches, and shoe, preferably under a safety shower.
- Wash skin for 15 to 30 minutes with plenty of water and soap. Call a physician immediately.
- Remove and dry-clean or launder clothing soaked or soiled with this material before reuse. Dry cleaning of contaminated clothing may be more effective than normal laundering.
- Inform individuals responsible for cleaning of potential hazards associated with handling contaminated clothing.
- Discard contaminated leather articles such as shoes, belts, and watchbands.
- Note to Physician: Treat any skin burns as thermal burns. After decontamination, consider the use of cold packs and topical antibiotics.

## Inhalation:

- If fumes or combustion products are inhaled remove from contaminated area.
- Lay patient down. Keep warm and rested.
- Prosthesis 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.

For amines:

- All employees working in areas where contact with amine catalysts is possible should be thoroughly trained in the administration of appropriate first aid procedures.
- Experience has demonstrated that prompt administration of such aid can minimize the effects of accidental exposure.
- Promptly move the affected person away from the contaminated area to an area of fresh air.
- Keep the affected person calm and warm, but not hot.
- If breathing is difficult, oxygen may be administered by a qualified person.
- If breathing stops, give artificial respiration. Call a physician at once.

## Ingestion:

- 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.

## For amines:

- If liquid amine are ingested, have the affected person drink several glasses of water or milk.
- Do not induce vomiting.
- Immediately transport to a medical facility and inform medical personnel about the nature of the exposure. The decision of whether to induce vomiting should be made by an attending physician.

## Indication of any immediate medical attention and special treatment needed

### For acute or short-term repeated exposures to highly alkaline materials:

- Respiratory stress is uncommon but present occasionally because of soft tissue edema.
- Unless endotracheal intubation can be accomplished under direct vision, cricothyroidotomy or tracheotomy may be necessary.
- Oxygen is given as indicated.
- The presence of shock suggests perforation and mandates an intravenous line and fluid administration.
- Damage due to alkaline corrosives occurs by liquefaction necrosis whereby the saponification of fats and solubilisation of proteins allow deep penetration into the tissue.

Alkalis continue to cause damage after exposure.

### INGESTION:

- Milk and water are the preferred diluents

No more than 2 glasses of water should be given to an adult.

- Neutralising agents should never be given since exothermic heat reaction may compound injury.

\* Catharsis and emesis are absolutely contra-indicated.

\* Activated charcoal does not absorb alkali.

\* Gastric lavage should not be used.

Supportive care involves the following:

- Withhold oral feedings initially.
- If endoscopy confirms transmucosal injury start steroids only within the first 48 hours.
- Carefully evaluate the amount of tissue necrosis before assessing the need for surgical intervention.
- Patients should be instructed to seek medical attention whenever they develop difficulty in swallowing (dysphagia).

### SKIN AND EYE:

- Injury should be irrigated for 20-30 minutes.

Eye injuries require saline. [Ellenhorn & Barceloux: Medical Toxicology]

For amines:

- Certain amines may cause injury to the respiratory tract and lungs if aspirated. Also, such products may cause tissue destruction leading to stricture. If lavage is performed, endotracheal and/or esophagosopic control is suggested.
- No specific antidote is known.
- Care should be supportive and treatment based on the judgment of the physician in response to the reaction of the patient.

Laboratory animal studies have shown that a few amines are suspected of causing depletion of certain white blood cells and their precursors in lymphoid tissue. These effects may be due to an immunosuppressive mechanism.

Some persons with hyperreactive airways (e.g., asthmatic persons) may experience wheezing attacks (bronchospasm) when exposed to airway irritants.

Lung injury may result following a single massive overexposure to high vapour concentrations or multiple exposures to lower concentrations of any pulmonary irritant material.

Health effects of amines, such as skin irritation and transient corneal edema (blue haze, halo effect, glaucopsia), are best prevented by means of formal worker education, industrial hygiene monitoring, and exposure control methods. Persons who are highly sensitive to the triggering effect of non-specific irritants should not be assigned to jobs in which such agents are used, handled, or manufactured.

Medical surveillance programs should consist of a pre-placement evaluation to determine if workers or applicants have any impairments (e.g., hyperreactive airways or bronchial asthma) that would limit their fitness for work in jobs with potential for exposure to amines. A clinical baseline can be established at the time of this evaluation. Periodic medical evaluations can have significant value in the early detection of disease and in providing an opportunity for health counseling.

Medical personnel conducting medical surveillance of individuals potentially exposed to polyurethane amine catalysts should consider the following:

- Health history, with emphasis on the respiratory system and history of infections
- Physical examination, with emphasis on the respiratory system and the lymphoreticular organs (lymph nodes, spleen, etc.)
- Lung function tests, pre- and post-bronchodilator if indicated
- Total and differential white blood cell count
- Serum protein electrophoresis

Persons who are concurrently exposed to isocyanates also should be kept under medical surveillance.

Pre-existing medical conditions generally aggravated by exposure include skin disorders and allergies, chronic respiratory disease (e.g. bronchitis, asthma, emphysema), liver disorders, kidney disease, and eye disease.

Broadly speaking, exposure to amines, as characterised by amine catalysts, may cause effects similar to those caused by exposure to ammonia. As such, amines should be considered potentially injurious to any tissue that is directly contacted.

Inhalation of aerosol mists or vapors, especially of heated product, can result in chemical pneumonitis, pulmonary edema, laryngeal edema, and delayed scarring of the airway or other affected organs. There is no specific treatment.

Clinical management is based upon supportive treatment, similar to that for thermal burns.

Persons with major skin contact should be maintained under medical observation for at least 24 hours due to the possibility of delayed reactions.

Polyurethane Amine Catalysts: Guidelines for Safe Handling and Disposal Technical Bulletin June 2000 Alliance for Polyurethanes Industry

## SECTION 5 Firefighting measures

### Extinguishing media

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

### Special hazards arising from the substrate or mixture

#### Fire Incompatibility:

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

### Advice for firefighters

#### Fire Fighting:

- Alert Fire Brigade and tell them location and nature of hazard.
- Wear full body protective clothing with breathing apparatus.
- Prevent, by any means available, spillage from entering drains or water course.
- Use fire fighting procedures suitable for surrounding area.
- **Do not approach containers suspected to be hot.**
- Cool fire exposed containers with water spray from a protected location.
- If safe to do so, remove containers from path of fire.
- Equipment should be thoroughly decontaminated after use.

#### For amines:

- For firefighting, cleaning up large spills, and other emergency operations, workers must wear a self-contained breathing apparatus with full face-piece, operated in a pressure-demand mode.
- Airline and air purifying respirators should not be worn for firefighting or other emergency or upset conditions.
- Respirators should be used in conjunction with a respiratory protection program, which would include suitable fit testing and medical evaluation of the user.

#### Fire/Explosion Hazard:

- Combustible.
- Slight fire hazard when exposed to heat or flame.
- Heating may cause expansion or decomposition leading to violent rupture of containers.
- On combustion, may emit toxic fumes of carbon monoxide (CO).
- May emit acrid smoke.
- Mists containing combustible materials may be explosive.

## SECTION 6 Accidental release measures

## Personal precautions, protective equipment and emergency procedures

### Minor Spills:

- Drains for storage or use areas should have retention basins for pH adjustments and dilution of spills before discharge or disposal of material.
- Check regularly for spills and leaks.
- Clean up all spills immediately.
- Avoid breathing vapours and contact with skin and eyes.
- Control personal contact with the substance, by using protective equipment.
- Contain and absorb spill with sand, earth, inert material or vermiculite.
- Wipe up.
- Place in a suitable, labelled container for waste disposal.

for amines:

- If possible (i.e., without risk of contact or exposure), stop the leak.
- Contain the spilled material by diking, then neutralize.
- Next, absorb the neutralized product with clay, sawdust, vermiculite, or other inert absorbent and shovel into containers.
- Store the containers outdoors.
- Brooms and mops should be disposed of, along with any remaining absorbent, in accordance with all applicable federal, state, and local regulations and requirements.
- Decontamination of floors and other hard surfaces after the spilled material has been removed may be accomplished by using a 5% solution of acetic acid, followed by very hot water
- Dispose of the material in full accordance with all federal, state, and local laws and regulations governing the disposal of chemical wastes.
- Waste materials from an amine catalyst spill or leak may be hazardous wastes that are regulated under various laws.

### Major Spills:

- Clear area of personnel and move upwind.
- Alert Fire Brigade and tell them location and nature of hazard.
- Wear full body protective clothing with breathing apparatus.
- Prevent, by any means available, spillage from entering drains or water course.
- Consider evacuation (or protect in place).
- Stop leak if safe to do so.
- Contain spill with sand, earth or vermiculite.
- Collect recoverable product into labelled containers for recycling.
- Neutralise/decontaminate residue (see Section 13 for specific agent).
- Collect solid residues and seal in labelled drums for disposal.
- Wash area and prevent runoff into drains.
- After clean up operations, decontaminate and launder all protective clothing and equipment before storing and re-using.
- If contamination of drains or waterways occurs, advise emergency services.

For amines:

- First remove all ignition sources from the spill area.

- Have firefighting equipment nearby, and have firefighting personnel fully trained in the proper use of the equipment and in the procedures used in fighting a chemical fire.
- Spills and leaks of polyurethane amine catalysts should be contained by diking, if necessary, and cleaned up only by properly trained and equipped personnel. All others should promptly leave the contaminated area and stay upwind.
- Protective equipment for cleanup crews should include appropriate respiratory protective devices and impervious clothing, footwear, and gloves.
- All work areas should be equipped with safety showers and eyewash fountains in good working order.
- Any material spilled or splashed onto the skin should be quickly washed off.
- Spills or releases may need to be reported to federal, state, and local authorities. This reporting contingency should be a part of a site's emergency response plan.
- Protective equipment should be used during emergency situations whenever there is a likelihood of exposure to liquid amines or to excessive concentrations of amine vapor. 'Emergency' may be defined as any occurrence, such as, but not limited to, equipment failure, rupture of containers, or failure of control equipment that results in an uncontrolled release of amine liquid or vapor.
- Emergency protective equipment should include:
  - Self-contained breathing apparatus, with full face-piece, operated in positive pressure or pressure-demand mode.
  - Rubber gloves
  - Long-sleeve coveralls or impervious full body suit
  - Head protection, such as a hood, made of material(s) providing protection against amine catalysts
  - Firefighting personnel and other on-site Emergency Responders should be fully trained in Chemical Emergency Procedures. However back-up from local authorities should be sought

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

## SECTION 7 Handling and storage

### Precautions for safe handling

#### Safe handling

- **DO NOT allow clothing wet with material to stay in contact with skin**
- Avoid all personal contact, including inhalation.
- Wear protective clothing when risk of exposure occurs.
- Use in a well-ventilated area.
- Avoid contact with moisture.
- Avoid contact with incompatible materials.
- **When handling, DO NOT eat, drink or smoke.**
- Keep containers securely sealed when not in use.
- Avoid physical damage to containers.
- Always wash hands with soap and water after handling.
- Work clothes should be laundered separately. Launder contaminated clothing before re-use.
- Use good occupational work practice.
- Observe manufacturer's storage and handling recommendations contained within this MSDS.
- Atmosphere should be regularly checked against established exposure standards to ensure safe

working conditions are maintained.

#### Other information

- Store in original containers.
- Keep containers securely sealed.
- Store in a cool, dry, well-ventilated area.
- Store away from incompatible materials and foodstuff containers.
- Protect containers against physical damage and check regularly for leaks.
- Observe manufacturer's storage and handling recommendations contained within this MSDS.
- **DO NOT store near acids, or oxidising agents**
- No smoking, naked lights, heat or ignition sources.

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

##### Suitable container:

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

For low viscosity materials

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

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

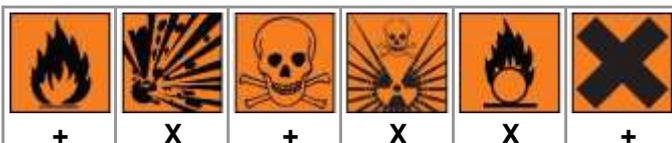
- Removable head packaging;
- Cans with friction closures and
- low pressure tubes and cartridges

may be used.

Where combination packages are used, and the inner packages are of glass, porcelain or stoneware, there must be sufficient inert cushioning material in contact with inner and outer packages unless the outer packaging is a close fitting moulded plastic box and the substances are not incompatible with the plastic.

##### Storage incompatibility:

- Avoid strong acids, acid chlorides, acid anhydrides and chloroformates.
- Avoid contact with copper, aluminium and their alloys.
- Avoid reaction with oxidising agents



X : Must not be stored together

0 : May be stored together with specific preventions

+: May be stored together

##### Package Material Incompatibilities:

## SECTION 8 Exposure controls / personal protection

### Control parameters

#### Occupational Exposure Limits (OEL)

#### INGREDIENT DATA

Source	Ingredient	Material name	TWA	STEL	Peak	Notes
US ACGIH Threshold Limit Values (TLV)	benzene-1,3-dimethanamine	m-Xylene a,a'-diamine	Not Available	Not Available	0.1 (mgm3)	TLV® Basis: Eye, skin, & GI irr

#### Emergency Limits

Ingredient	TEEL-0	TEEL-1	TEEL-2	TEEL-3
S-310 B (HARDENING AGENT)	Not Available	Not Available	Not Available	Not Available

Ingredient	Original IDLH	Revised IDLH
S-310 B (HARDENING AGENT)	Not Available	Not Available

### Exposure controls

#### Appropriate engineering controls

Engineering controls are used to remove a hazard or place a barrier between the worker and the hazard.

Well-designed engineering controls can be highly effective in protecting workers and will typically be independent of worker interactions to provide this high level of protection.

The basic types of engineering controls are:

Process controls which involve changing the way a job activity or process is done to reduce the risk.

Enclosure and/or isolation of emission source which keeps a selected hazard "physically" away from the worker and ventilation that strategically "adds" and "removes" air in the work environment.

Ventilation can remove or dilute an air contaminant if designed properly. The design of a ventilation system must match the particular process and chemical or contaminant in use.

Employers may need to use multiple types of controls to prevent employee overexposure.

Local exhaust ventilation usually required. If risk of overexposure exists, wear approved respirator. Correct fit is essential to obtain adequate protection. Supplied-air type respirator may be required in special circumstances. Correct fit is essential to ensure adequate protection.

An approved self contained breathing apparatus (SCBA) may be required in some situations.

Provide adequate ventilation in warehouse or closed storage area. 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	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 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.

### Personal protection



### Eye and face protection:

- Chemical goggles.
- Full face shield may be required for supplementary but never for primary protection of eyes
- Contact lenses may pose a special hazard; soft contact lenses may absorb and concentrate irritants. A written policy document, describing the wearing of lens or restrictions on use, should be created for each workplace or task. This should include a review of lens absorption and adsorption for the class of chemicals in use and an account of injury experience. Medical and first-aid personnel should be trained in their removal and suitable equipment should be readily available. In the event of chemical exposure, begin eye irrigation immediately and remove contact lens as soon as practicable. Lens should be removed at the first signs of eye redness or irritation - lens should be removed in a clean environment only after workers have washed hands thoroughly. [CDC NIOSH Current Intelligence Bulletin 59], [AS/NZS 1336 or national equivalent]

For amines: SPECIAL PRECAUTION:

- Because amines are alkaline materials that can cause rapid and severe tissue damage, wearing of contact lenses while working with amines is strongly discouraged. Wearing such lenses can prolong contact of the eye tissue with the amine, thereby causing more severe damage.
- Appropriate eye protection should be worn whenever amines are handled or whenever there is any possibility of direct contact with liquid products, vapors, or aerosol mists.

CAUTION:

- Ordinary safety glasses or face-shields will not prevent eye irritation from high concentrations of vapour.
- In operations where positive-pressure, air-supplied breathing apparatus is not required, all persons handling liquid amine catalysts or other polyurethane components in open containers should wear chemical workers safety goggles.
- Eyewash fountains should be installed, and kept in good working order, wherever amines are used.

Skin protection:

See Hand protection below

Hand protection:

- Wear chemical protective gloves, e.g. PVC.
- Wear safety footwear or safety gumboots, e.g. Rubber
- When handling corrosive liquids, wear trousers or overalls outside of boots, to avoid spills entering boots.

NOTE:

- The material may produce skin sensitisation in predisposed individuals. Care must be taken, when removing gloves and other protective equipment, to avoid all possible skin contact.
- Contaminated leather items, such as shoes, belts and watch-bands should be removed and destroyed.

The selection of suitable gloves does not only depend on the material, but also on further marks of quality which vary from manufacturer to manufacturer. Where the chemical is a preparation of several substances, the resistance of the glove material can not be calculated in advance and has therefore to be checked prior to the application.

The exact break through time for substances has to be obtained from the manufacturer of the protective gloves and has to be observed when making a final choice.

Suitability and durability of glove type is dependent on usage. Important factors in the selection of gloves include:

- frequency and duration of contact,
- chemical resistance of glove material,
- glove thickness and
- dexterity

Select gloves tested to a relevant standard (e.g. Europe EN 374, US F739, AS/NZS 2161.1 or national equivalent).

- When prolonged or frequently repeated contact may occur, a glove with a protection class of 5 or higher (breakthrough time greater than 240 minutes according to EN 374, AS/NZS 2161.10.1 or national equivalent) is recommended.
- When only brief contact is expected, a glove with a protection class of 3 or higher (breakthrough time greater than 60 minutes according to EN 374, AS/NZS 2161.10.1 or national equivalent) is recommended.
- Contaminated gloves should be replaced.

Gloves must only be worn on clean hands. After using gloves, hands should be washed and dried thoroughly.

Application of a non-perfumed moisturiser is recommended.

- Leather wear not recommended: Contaminated leather footwear, watch bands, should be destroyed, i.e. burnt, as they cannot be adequately decontaminated

For amines:

- Gloves must only be worn on clean hands. After using gloves, hands should be washed and dried thoroughly.
- Application of a non-perfumed moisturiser is recommended
- Where there is a possibility of exposure to liquid amines skin protection should include: rubber gloves, (neoprene, nitrile, or butyl).
- DO NOT USE latex.

Body protection:

See Other protection below

Other protection:

- Overalls.
- PVC Apron.
- PVC protective suit may be required if exposure severe.
- Eyewash unit.
- Ensure there is ready access to a safety shower.

Thermal hazards:

Recommended material(s):

Respiratory protection:

PVC chemical resistant type.

## SECTION 9 Physical and chemical properties

### Information on basic physical and chemical properties

Appearance

Transparent yellow liquid with a slight odour; slightly mixes with water.

<b>Physical state</b>	Liquid	<b>Relative density (Water = 1)</b>	1.055
<b>Odour</b>	Not Available	<b>Partition coefficient n-octanol / water</b>	Not Available
<b>Odour threshold</b>	Not Available	<b>Auto-ignition temperature (°C)</b>	Not Available
<b>pH (as supplied)</b>	Not Available	<b>Decomposition temperature</b>	Not Available
<b>Melting point / freezing point (°C)</b>	Not Available	<b>Viscosity (cSt)</b>	Not Available
<b>Initial boiling point and boiling range (°C)</b>	Not Available	<b>Molecular weight (g/mol)</b>	Not Applicable
<b>Flash point (°C)</b>	198 (CO)	<b>Taste</b>	Not Available
<b>Evaporation rate</b>	Not Available	<b>Explosive properties</b>	Not Available
<b>Flammability</b>	Not Available	<b>Oxidising properties</b>	Not Available
<b>Upper Explosive Limit (%)</b>	Not Available	<b>Surface Tension (dyn/cm or mN/m)</b>	Not Available
<b>Lower Explosive Limit (%)</b>	Not Available	<b>Volatile Component (%vol)</b>	Not Available
<b>Vapour pressure (kPa)</b>	Not Available	<b>Gas group</b>	Not Available
<b>Solubility in water (g/L)</b>	Immiscible	<b>pH as a solution(1%)</b>	Not Available
<b>Vapour density (Air = 1)</b>	Not Available		

## SECTION 10 Stability and reactivity

### Reactivity:

See section 7

### Chemical stability:

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

### Possibility of hazardous reactions:

See section 7

### Conditions to avoid:

See section 7

### Incompatible materials:

See section 7

### Hazardous decomposition products:

See section 5

## SECTION 11 Toxicological information

### Information on toxicological effects

#### Inhaled:

Inhalation of vapours or aerosols (mists, fumes), generated by the material during the course of normal handling, may be damaging to the health of the individual.

Inhalation of amine vapours may cause irritation of the mucous membranes of the nose and throat and lung irritation with respiratory distress and cough. Single exposures to near lethal concentrations and repeated exposures to sublethal concentrations produces tracheitis, bronchitis, pneumonitis and pulmonary oedema. Aliphatic and alicyclic amines are generally well absorbed from the respiratory tract. Systemic effects include headache, nausea, faintness and anxiety. These effects are thought to be transient and are probably related to the pharmacodynamic action of the amines. Histamine release by aliphatic amines may produce bronchoconstriction and wheezing.

Inhalation of epoxy resin amine hardener vapours (including polyamines and amine adducts) may produce bronchospasm and coughing episodes lasting days after cessation of the exposure. Even faint traces of these vapours may trigger an intense reaction in individuals showing "amine asthma". The literature records several instances of systemic intoxications following the use of amines in epoxy resin systems.

Excessive exposure to the vapours of epoxy amine curing agents may cause both respiratory irritation and central nervous system depression. Signs and symptoms of central nervous system depression, in order of increasing exposure, are headache, dizziness, drowsiness, and incoordination. In short, a single prolonged (measured in hours) or excessive inhalation exposure may cause serious adverse effects, including death.

#### Ingestion:

Accidental ingestion of the material may be harmful; animal experiments indicate that ingestion of less than 150 gram may be fatal or may produce serious damage to the health of the individual.

The material can produce chemical burns within the oral cavity and gastrointestinal tract following ingestion. Aliphatic and alicyclic amines are generally well absorbed from the gut. Corrosive action may cause tissue

damage throughout the gastrointestinal tract. Detoxification is thought to occur in the liver, kidney and intestinal mucosa with the enzymes, monoamine oxidase and diamine oxidase (histaminase) having a significant role.

### **Skin Contact:**

The material can produce chemical burns following direct contact with the skin.

Volatile amine vapours produce primary skin irritation and dermatitis. Direct local contact, with the lower molecular weight liquids, may produce skin burns. Percutaneous absorption of simple aliphatic amines is known to produce lethal effects often the same as that for oral administration. Cutaneous sensitisation has been recorded chiefly due to ethyleneamines. Histamine release following exposure to many aliphatic amines may result in "triple response" (white vasoconstriction, red flare and wheal) in human skin.

Open cuts, abraded or irritated skin should not be exposed to this material. Entry into the blood-stream through, for example, cuts, abrasions, puncture wounds or lesions, may produce systemic injury with harmful effects.

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

Amine epoxy-curing agents (hardeners) may produce primary skin irritation and sensitisation dermatitis in predisposed individuals. Cutaneous reactions include erythema, intolerable itching and severe facial swelling.

Blistering, with weeping of serious fluid, and crusting and scaling may also occur.

Virtually all of the liquid amine curing agents can cause sensitisation or allergic skin reactions.

Individuals exhibiting "amine dermatitis" may experience a dramatic reaction upon re-exposure to minute quantities. Highly sensitive persons may even react to cured resins containing trace amounts of unreacted amine hardener. Minute quantities of air-borne amine may precipitate intense dermatological symptoms in sensitive individuals. Prolonged or repeated exposure may produce tissue necrosis.

NOTE: Susceptibility to this sensitisation will vary from person to person. Also, allergic dermatitis may not appear until after several days or weeks of contact. However, once sensitisation has occurred, exposure of the skin to even very small amounts of the material may cause erythema (redness) and oedema (swelling) at the site. Thus, all skin contact with any epoxy curing agent should be avoided.

### **Eye:**

The material can produce chemical burns to the eye following direct contact. Vapours or mists may be extremely irritating.

When applied to the eye(s) of animals, the material produces severe ocular lesions which are present twenty-four hours or more after instillation.

Vapours of volatile amines cause eye irritation with lachrymation, conjunctivitis and minor transient corneal oedema which results in "halos" around lights (glauropsia, "blue haze", or "blue-grey haze"). Vision may become misty and halos may appear several hours after workers are exposed to the substance. This effect generally disappears spontaneously within a few hours of the end of exposure, and does not produce physiological after-effects. However oedema of the corneal epithelium, which is primarily responsible for vision disturbances, may take more than one or more days to clear, depending on the severity of exposure. Photophobia and discomfort from the roughness of the corneal surface also may occur after greater exposures.

Although no detriment to the eye occurs as such, glauropsia predisposes an affected individual to physical accidents and reduces the ability to undertake skilled tasks such as driving a vehicle.

Direct local contact with the liquid may produce eye damage which may be permanent in the case of the lower molecular weight species.

### **Chronic:**

Repeated or prolonged exposure to corrosives may result in the erosion of teeth, inflammatory and ulcerative

changes in the mouth and necrosis (rarely) of the jaw. Bronchial irritation, with cough, and frequent attacks of bronchial pneumonia may ensue. Gastrointestinal disturbances may also occur. Chronic exposures may result in dermatitis and/or conjunctivitis.

Practical evidence shows that inhalation of the material is capable of inducing a sensitisation reaction in a substantial number of individuals at a greater frequency than would be expected from the response of a normal population.

Pulmonary sensitisation, resulting in hyperactive airway dysfunction and pulmonary allergy may be accompanied by fatigue, malaise and aching. Significant symptoms of exposure may persist for extended periods, even after exposure ceases. Symptoms can be activated by a variety of nonspecific environmental stimuli such as automobile exhaust, perfumes and passive smoking.

Practical experience shows that skin contact with the material is capable either of inducing a sensitisation reaction in a substantial number of individuals, and/or of producing a positive response in experimental animals.

TOXICITY	IRRITATION
<b>S-310 B (HARDENING AGENT)</b>	
Not Available	Not Available
<b>benzene-1,3-dimethanamine</b>	
Dermal (rabbit) LD50: 2000 mg/kg	Eye (rabbit): 0.05 mg/24h SEVERE
Inhalation (rat) LC50: 700 ppm/1h	Skin (rabbit): 0.75 mg/24h SEVERE
Oral (rat) LD50: 930 mg/kg	

Refer to individual constituents.

### **BENZENE-1,3-DIMETHANAMINE**

The following information refers to contact allergens as a group and may not be specific to this product.

Contact allergies quickly manifest themselves as contact eczema, more rarely as urticaria or Quincke's oedema. The pathogenesis of contact eczema involves a cell-mediated (T lymphocytes) immune reaction of the delayed type. Other allergic skin reactions, e.g. contact urticaria, involve antibody-mediated immune reactions. The significance of the contact allergen is not simply determined by its 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.

For benzene-1,3-dimethanamine (m-xylene-alpha,alpha'-diamine) The toxicity via oral administration and inhalation was tissue damage in the digestive and respiratory organs, respectively, which are the first contact sites. The chemical is corrosive to rat and mouse skin and a sensitiser in the guinea pig maximisation test. In the 28-day repeated dose toxicity study [OECD TG 407], the chemical was given to rats by gavage at doses of 0, 10, 40, 150 and 600 mg/kg b.w/day. One male and four females died, and salivation, low locomotor activity and piloerection were noted in the 600 mg/kg group. Furthermore, ulceration, acanthosis with hyperkeratosis and submucosal inflammation were observed in the forestomach.

No adverse effects were observed in the 150 mg/kg and the lower dose groups.

A reproductive /developmental toxicity screening test [OECD TG 421] of rats by gavage at 50, 150 and 450 mg/kg b.w/day for at least 41 days resulted in death in one male in the 150 mg/kg group, and three males and one female in the 450 mg/kg group. In almost all 450 mg/kg animals, the same histopathological changes as the above 28-day study were observed in the forestomach. No adverse effects were found at 50 mg/kg b.w/day. Based on this information, the NOAEL for repeated dose toxicity is considered to be 50 mg/kg b.w/day.

In the above reproductive/developmental toxicity screening test [OECD TG 421] the substance was administered from 14 days before mating to 20 days after mating in males and to day 3 of lactation in females. No adverse effects were observed in terms of copulation, fertility, delivery and nursing of parents, and the viability, body weight and morphology of offspring. The NOAEL for reproductive/developmental toxicity (F1 offspring) was 450 mg/kg b.w/day.

The chemical was not mutagenic in bacteria [OECD TG 471 & 472]. It induced neither chromosomal aberrations in mammalian cells in vitro [OECD TG 473] nor micronuclei in mouse bone marrow in vivo [OECD TG 474].

In clinical observation of workers during the manufacturing process, the chemical appears to act as a gastrointestinal irritant. It has also been shown to cause contact sensitisation reactions in workers at concentrations equal to and below 0.1 mg/m<sup>3</sup>. The material may produce severe irritation to the eye causing pronounced inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.

The material may produce severe skin irritation after prolonged or repeated exposure, and may produce a contact dermatitis (nonallergic). This form of dermatitis is often characterised by skin redness (erythema) thickening of the epidermis.

Histologically there may be intercellular oedema of the spongy layer (spongiosis) and intracellular oedema of the epidermis. Prolonged contact is unlikely, given the severity of response, but repeated exposures may produce severe ulceration.

<b>Acute Toxicity:</b>	Acute Toxicity (Oral) Category 4	<b>Carcinogenicity:</b>	Not Applicable
<b>Skin Irritation/Corrosion:</b>	Skin Corrosion/Irritation Category 1C	<b>Reproductivity:</b>	Not Applicable
<b>Serious Eye Damage/Irritation:</b>	Serious Eye Damage Category 1	<b>STOT - Single Exposure:</b>	Not Applicable
<b>Respiratory or Skin sensitisation:</b>	Respiratory Sensitizer Category 1 Skin Sensitizer Category 1	<b>STOT - Repeated Exposure:</b>	Not Applicable
<b>Mutagenicity:</b>	Not Applicable	<b>Aspiration Hazard:</b>	Not Applicable
<b>CMR STATUS</b>			

## SECTION 12 Ecological information

### Toxicity

Prevent, by any means available, spillage from entering drains or water courses.

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

### Persistence and degradability

Ingredient	Persistence: Water/Soil	Persistence: Air
Not Available	Not Available	Not Available

### Bioaccumulative potential

Ingredient	Bioaccumulation
Not Available	Not Available

### Mobility in soil

Ingredient	Mobility
Not Available	Not Available

## SECTION 13 Disposal considerations

### Waste treatment methods

#### Product / Packaging disposal:

Legislation addressing waste disposal requirements may differ by country, state and/ or territory. Each user must refer to laws operating in their area. In some areas, certain wastes must be tracked.

A Hierarchy of Controls seems to be common - the user should investigate:

- Reduction
- Reuse
- Recycling
- Disposal (if all else fails)

This material may be recycled if unused, or if it has not been contaminated so as to make it unsuitable for its intended use. If it has been contaminated, it may be possible to reclaim the product by filtration, distillation or some other means. Shelf life considerations should also be applied in making decisions of this type. Note that

properties of a material may change in use, and recycling or reuse may not always be appropriate.

- **DO NOT allow wash water from cleaning or process equipment to enter drains.**
- It may be necessary to collect all wash water for treatment before disposal.
- In all cases disposal to sewer may be subject to local laws and regulations and these should be considered first.
- Where in doubt contact the responsible authority.
- Recycle wherever possible.
- Consult manufacturer for recycling options or consult local or regional waste management authority for disposal if no suitable treatment or disposal facility can be identified.
- Treat and neutralise at an approved treatment plant.
- Treatment should involve: Neutralisation with suitable dilute acid followed by: burial in a land-fill specifically licenced to accept chemical and / or pharmaceutical wastes or Incineration in a licenced apparatus (after admixture with suitable combustible material).
- Decontaminate empty containers. Observe all label safeguards until containers are cleaned and destroyed.

**SECTION 14 Transport information**

**Labels Required:**



**Marine Pollutant: NO**

**Land transport (UN)**



<b>UN number</b>	<b>2735</b>	<b>Packing group</b>	<b>III</b>
UN proper shipping name	AMINES, LIQUID, CORROSIVE, N.O.S. or POLYAMINES, LIQUID, CORROSIVE, N.O.S.	Environmental hazard	No relevant data
<b>Transport hazard class(es)</b>	<b>Class: 8</b>	<b>Special precautions for user</b>	<b>Special provisions 223; 274</b>
	<b>Subrisk:</b>		<b>limited quantity 5 L</b>

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



<b>UN number</b>	<b>2735</b>	<b>Packing group</b>	<b>III</b>
UN proper shipping name	AMINES, LIQUID, CORROSIVE, N.O.S. or POLYAMINES, LIQUID, CORROSIVE, N.O.S.	Environmental hazard	No relevant data

ICAO/IATA Class:	8	Special provisions	A3A803
ICAO / IATA Subrisk:		Cargo Only Packing Instructions:	856
Transport hazard class(es)		Cargo Only Maximum Qty / Pack:	60 L
	Special precautions for user	Passenger and Cargo Packing Instructions:	852
		Passenger and Cargo Maximum Qty / Pack:	5 L
ERG Code:	8L	Passenger and Cargo Limited Quantity	Y841
		Packing Instructions:	
		Passenger and Cargo Maximum Qty / Pack:	1 L
<b>Sea transport (IMDG-Code / GGVSee)</b>			



<b>UN number</b>	<b>2735</b>	<b>Packing group</b>	<b>III</b>
UN proper shipping name	AMINES, LIQUID, CORROSIVE, N.O.S. or POLYAMINES, LIQUID, CORROSIVE, N.O.S.	Environmental hazard	No relevant data

<b>Transport hazard class(es)</b>	<b>Class:</b> 8	<b>Special precautions for user</b>	<b>EMS Number:</b> F-A,S-B
<b>Subrisk:</b>			<b>Special provisions:</b> 223 274
			<b>Limited Quantities:</b> 5 L

<b>Transport in bulk according to Annex II of MARPOL 73 / 78 and the IBC code</b>			
<b>Source</b>	<b>Ingredient</b>	<b>Pollution Category</b>	<b>Residual Concentration – Residual Outside Special Concentration Area (% w/w)</b>

IMO MARPOL 73/78 (Annex II) -  
List of Noxious Liquid Substances Carried in Bulk  
benzene-1,3-dimethanamine (C)

## SECTION 15 Regulatory information

Safety, health and environmental regulations / legislation specific for the substance or mixture  
**benzene-1,3-dimethanamine(1477-55-0) is found on the following regulatory lists**

- "China Inventory of Existing Chemical Substances",
- "FisherTransport Information", "Sigma-AldrichTransport Information",
- "OECD List of High Production Volume (HPV) Chemicals", "International Council of Chemical Associations (ICCA) - High Production Volume List",

"International Maritime Dangerous Goods Requirements (IMDG Code) - Substance Index",  
"Regulations concerning the International Carriage of Dangerous Goods by Rail - Table A: Dangerous Goods List - RID 2013 (English)",  
"International Air Transport Association (IATA) Dangerous Goods Regulations",  
"IMO MARPOL 73/78 (Annex II) - List of Noxious Liquid Substances Carried in Bulk",  
"International Maritime Dangerous Goods Requirements (IMDG Code)",  
"China List of Dangerous Goods (GB 12268-2005) (Chinese)"

## **SECTION 16 Other information**

### **Other information**

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

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

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

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

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