# KOSTherm HD Inhibitor

## KOST USA

Chemwatch Hazard Alert Code: **4**

Version No: **1.2**
Safety Data Sheet according to OSHA HazCom Standard (2012) requirements

Issue Date: **14/10/2022**
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L.GHS.USA.EN

## SECTION 1 Identification

### Product Identifier

| | |
|---|---|
| **Product name** | KOSTherm HD Inhibitor |
| **Synonyms** | Not Available |
| **Other means of identification** | Not Available |

### Recommended use of the chemical and restrictions on use

| | |
|---|---|
| **Relevant identified uses** | Use according to manufacturer's directions. |

### Name, address, and telephone number of the chemical manufacturer, importer, or other responsible party

| | |
|---|---|
| **Registered company name** | **KOST USA** |
| **Address** | 1000 Tennessee Ave, Cincinnati, OH 45229 Ohio United States |
| **Telephone** | Not Available |
| **Fax** | Not Available |
| **Website** | www.KOSTUSA.com |
| **Email** | sales@kostusa.com |

### Emergency phone number

| | |
|---|---|
| **Association / Organisation** | **POISON CONTROL** |
| **Emergency telephone numbers** | 1-800-222-1222 |
| **Other emergency telephone numbers** | Not Available |

## SECTION 2 Hazard(s) identification

### Classification of the substance or mixture

**NFPA 704 diamond**

Note: The hazard category numbers found in GHS classification in section 2 of this SDSs are NOT to be used to fill in the NFPA 704 diamond. Blue = Health Red = Fire Yellow = Reactivity White = Special (Oxidizer or water reactive substances)

| | |
|---|---|
| **Classification** | Skin Corrosion/Irritation Category 1B, Serious Eye Damage/Eye Irritation Category 1, Sensitisation (Skin) Category 1, Carcinogenicity Category 2 |

### Label elements

| | |
|---|---|
| **Hazard pictogram(s)** |  |
| **Signal word** | **Danger** |

### Hazard statement(s)

| | |
|---|---|
| **H314** | Causes severe skin burns and eye damage. |
| **H317** | May cause an allergic skin reaction. |
| **H351** | Suspected of causing cancer. |

### Hazard(s) not otherwise classified

Not Applicable

### Precautionary statement(s) Prevention

| | |
|---|---|
| **P201** | Obtain special instructions before use. |
| **P260** | Do not breathe mist/vapours/spray. |
| **P264** | Wash all exposed external body areas thoroughly after handling. |
| **P280** | Wear protective gloves, protective clothing, eye protection and face protection. |
| **P261** | Avoid breathing mist/vapours/spray. |
| **P202** | Do not handle until all safety precautions have been read and understood. |
| **P272** | Contaminated work clothing must not be allowed out of the workplace. |

### Precautionary statement(s) Response

| | |
|---|---|
| **P301+P330+P331** | IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. |
| **P303+P361+P353** | IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower. |
| **P305+P351+P338** | IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. |
| **P308+P313** | IF exposed or concerned: Get medical advice/ attention. |
| **P310** | Immediately call a POISON CENTER/doctor/physician/first aider. |
| **P302+P352** | IF ON SKIN: Wash with plenty of water. |
| **P363** | Wash contaminated clothing before reuse. |
| **P333+P313** | If skin irritation or rash occurs: Get medical advice/attention. |
| **P362+P364** | Take off contaminated clothing and wash it before reuse. |
| **P304+P340** | IF INHALED: Remove person to fresh air and keep comfortable for breathing. |

### Precautionary statement(s) Storage

| | |
|---|---|
| **P405** | Store locked up. |

### Precautionary statement(s) Disposal

| | |
|---|---|
| **P501** | Dispose of contents/container to authorised hazardous or special waste collection point in accordance with any local regulation. |

## SECTION 3 Composition / information on ingredients

### Substances

See section below for composition of Mixtures

### Mixtures

| CAS No | %[weight] | Name |
|---|---|---|
| 102-71-6 | 19.9 | triethanolamine |
| 141-43-5 | 19.9 | monoethanolamine |

## SECTION 4 First-aid measures

### Description of first aid measures

| | |
|---|---|
| **Eye Contact** | If this product comes in contact with the eyes:<br>‣ Immediately hold eyelids apart and flush the eye continuously with running water.<br>‣ 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.<br>‣ Continue flushing until advised to stop by the Poisons Information Centre or a doctor, or for at least 15 minutes.<br>‣ Transport to hospital or doctor without delay.<br>‣ Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.<br>For amines:<br>‣ If liquid amines come in contact with the eyes, irrigate immediately and continuously with low pressure flowing water, preferably from an eye wash fountain, for 15 to 30 minutes.<br>‣ For more effective flushing of the eyes, use the fingers to spread apart and hold open the eyelids. The eyes should then be “rolled” or moved in all directions.<br>‣ Seek immediate medical attention, preferably from an ophthalmologist. |
| **Skin Contact** | If skin or hair contact occurs:<br>‣ Immediately flush body and clothes with large amounts of water, using safety shower if available.<br>‣ Quickly remove all contaminated clothing, including footwear.<br>‣ Wash skin and hair with running water. Continue flushing with water until advised to stop by the Poisons Information Centre.<br>‣ Transport to hospital, or doctor.<br>For amines:<br>‣ In case of major exposure to liquid amine, promptly remove any contaminated clothing, including rings, watches, and shoe, preferably under a safety shower.<br>‣ Wash skin for 15 to 30 minutes with plenty of water and soap. Call a physician immediately.<br>‣ 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.<br>‣ Inform individuals responsible for cleaning of potential hazards associated with handling contaminated clothing.<br>‣ Discard contaminated leather articles such as shoes, belts, and watchbands. |

**Continued...**

| | |
|---|---|
| | 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.<br>‣ Lay patient down. Keep warm and rested.<br>‣ Prostheses such as false teeth, which may block airway, should be removed, where possible, prior to initiating first aid procedures.<br>‣ 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.<br>‣ Transport to hospital, or doctor, without delay.<br>For amines:<br>‣ All employees working in areas where contact with amine catalysts is possible should be thoroughly trained in the administration of appropriate first aid procedures.<br>‣ Experience has demonstrated that prompt administration of such aid can minimize the effects of accidental exposure.<br>‣ Promptly move the affected person away from the contaminated area to an area of fresh air.<br>‣ Keep the affected person calm and warm, but not hot.<br>‣ If breathing is difficult, oxygen may be administered by a qualified person.<br>‣ If breathing stops, give artificial respiration. Call a physician at once. |
| **Ingestion** | ‣ For advice, contact a Poisons Information Centre or a doctor at once.<br>‣ Urgent hospital treatment is likely to be needed.<br>‣ If swallowed do **NOT** induce vomiting.<br>‣ If vomiting occurs, lean patient forward or place on left side (head-down position, if possible) to maintain open airway and prevent aspiration.<br>‣ Observe the patient carefully.<br>‣ Never give liquid to a person showing signs of being sleepy or with reduced awareness; i.e. becoming unconscious.<br>‣ Give water to rinse out mouth, then provide liquid slowly and as much as casualty can comfortably drink.<br>‣ Transport to hospital or doctor without delay.<br>For amines:<br>‣ If liquid amine are ingested, have the affected person drink several glasses of water or milk.<br>‣ Do not induce vomiting.<br>‣ 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. |

### Most important symptoms and effects, both acute and delayed

See Section 11

### 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 esophagoscopic 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.

**Continued...**

Persons with major skin contact should be maintained under medical observation for at least 24 hours due to the possibility of delayed reactions.
**Polyurethene Amine Catalysts: Guidelines for Safe Handling and Disposal Technical Bulletin June 2000**
**Alliance for Polyurethanes Industry**

## SECTION 5 Fire-fighting measures

### Extinguishing media

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

### 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 |

### Special protective equipment and precautions for fire-fighters

| | |
|---|---|
| **Fire Fighting** | For amines:<br>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.<br>Airline and air purifying respirators should not be worn for firefighting or other emergency or upset conditions.<br>Respirators should be used in conjunction with a respiratory protection program, which would include suitable fit testing and medical evaluation of the user.<br>Alert Fire Brigade and tell them location and nature of hazard.<br>Wear full body protective clothing with breathing apparatus.<br>Prevent, by any means available, spillage from entering drains or water course.<br>Use water delivered as a fine spray to control fire and cool adjacent area.<br>Avoid spraying water onto liquid pools.<br>**DO NOT** approach containers suspected to be hot.<br>Cool fire exposed containers with water spray from a protected location.<br>If safe to do so, remove containers from path of fire. |
| **Fire/Explosion Hazard** | Combustible.<br>Slight fire hazard when exposed to heat or flame.<br>Heating may cause expansion or decomposition leading to violent rupture of containers.<br>On combustion, may emit toxic fumes of carbon monoxide (CO).<br>May emit acrid smoke.<br>Mists containing combustible materials may be explosive.<br>Combustion products include:<br>carbon dioxide ($CO_2$)<br>nitrogen oxides (NOx)<br>other pyrolysis products typical of burning organic material.<br>May emit poisonous fumes.<br>May emit corrosive fumes. |

## SECTION 6 Accidental release measures

### Personal precautions, protective equipment and emergency procedures

See section 8

### Environmental precautions

See section 12

### Methods and material for containment and cleaning up

| | |
|---|---|
| **Minor Spills** | for amines:<br>If possible (i.e., without risk of contact or exposure), stop the leak.<br>Contain the spilled material by diking, then neutralize.<br>Next, absorb the neutralized product with clay, sawdust, vermiculite, or other inert absorbent and shovel into containers.<br>Store the containers outdoors.<br>Brooms and mops should be disposed of, along with any remaining absorbent, in accordance with all applicable federal, state, and local regulations and requirements.<br>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<br>Dispose of the material in full accordance with all federal, state, and local laws and regulations governing the disposal of chemical wastes.<br>Waste materials from an amine catalyst spill or leak may be “hazardous wastes” that are regulated under various laws.<br>Remove all ignition sources.<br>Clean up all spills immediately.<br>Avoid breathing vapours and contact with skin and eyes.<br>Control personal contact with the substance, by using protective equipment.<br>Contain and absorb spill with sand, earth, inert material or vermiculite.<br>Wipe up.<br>Place in a suitable, labelled container for waste disposal. |
| **Major Spills** | Chemical Class: bases<br>For release onto land: recommended sorbents listed in order of priority.<br>SORBENT TYPE \| RANK \| APPLICATION \| COLLECTION \| LIMITATIONS |

**Continued...**

LAND SPILL - SMALL

| | | | | |
|---|---|---|---|---|
| cross-linked polymer - particulate | 1 | shovel | shovel | R,W,SS |
| cross-linked polymer - pillow | 1 | throw | pitchfork | R, DGC, RT |
| sorbent clay - particulate | 2 | shovel | shovel | R, I, P |
| foamed glass - pillow | 2 | throw | pitchfork | R, P, DGC, RT |
| expanded minerals - particulate | 3 | shovel | shovel | R, I, W, P, DGC |
| foamed glass - particulate | 4 | shovel | shovel | R, W, P, DGC, |

LAND SPILL - MEDIUM

| | | | | |
|---|---|---|---|---|
| cross-linked polymer -particulate | 1 | blower | skiploader | R,W, SS |
| sorbent clay - particulate | 2 | blower | skiploader | R, I, P |
| expanded mineral - particulate | 3 | blower | skiploader | R, I,W, P, DGC |
| cross-linked polymer - pillow | 3 | throw | skiploader | R, DGC, RT |
| foamed glass - particulate | 4 | blower | skiploader | R, W, P, DGC |
| foamed glass - pillow | 4 | throw | skiploader | R, P, DGC., RT |

Legend
DGC: Not effective where ground cover is dense
R; Not reusable
I: Not incinerable
P: Effectiveness reduced when rainy
RT:Not effective where terrain is rugged
SS: Not for use within environmentally sensitive sites
W: Effectiveness reduced when windy
Reference: Sorbents for Liquid Hazardous Substance Cleanup and Control;
R.W Melvold et al: Pollution Technology Review No. 150: Noyes Data Corporation 1988
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

Moderate hazard.

- Clear area of personnel and move upwind.
- Alert Fire Brigade and tell them location and nature of hazard.
- Wear breathing apparatus plus protective gloves.
- Prevent, by any means available, spillage from entering drains or water course.
- No smoking, naked lights or ignition sources.
- Increase ventilation.
- Stop leak if safe to do so.
- Contain spill with sand, earth or vermiculite.
- Collect recoverable product into labelled containers for recycling.
- Absorb remaining product with sand, earth or vermiculite.
- Collect solid residues and seal in labelled drums for disposal.
- Wash area and prevent runoff into drains.
- If contamination of drains or waterways occurs, advise emergency services.

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

## SECTION 7 Handling and storage

### Precautions for safe handling

**Safe handling**

Alkanolamines and iron may produced unstable complexes. Monoethanolamine (MEA) and iron form a trisethanolamino-iron complex. This material may spontaneously decompose at temperatures between 130 and 160 degrees C. and is suspected of causing a fire in a nearly empty storage tank containing a "heel" of MEA in contact with carbon steel coils. If steam coil heating is used, low pressure steam in stainless steel coils should be considered. Drum heating should also be reviewed and, where possible, temperatures should be maintained below 130 degrees C.

- 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.<br>‣ When handling, **DO NOT** eat, drink or smoke.<br>‣ Keep containers securely sealed when not in use.<br>‣ Avoid physical damage to containers.<br>‣ Always wash hands with soap and water after handling.<br>‣ Work clothes should be laundered separately.<br>‣ Use good occupational work practice.<br>‣ Observe manufacturer's storage and handling recommendations contained within this SDS.<br>‣ Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions.<br>‣ **DO NOT** allow clothing wet with material to stay in contact with skin |
| **Other information** | ‣ Store in original containers.<br>‣ Keep containers securely sealed.<br>‣ No smoking, naked lights or ignition sources.<br>‣ Store in a cool, dry, well-ventilated area.<br>‣ Store away from incompatible materials and foodstuff containers.<br>‣ Protect containers against physical damage and check regularly for leaks.<br>‣ Observe manufacturer's storage and handling recommendations contained within this SDS. |

### Conditions for safe storage, including any incompatibilities

| | |
|---|---|
| **Suitable container** | ‣ Metal can or drum<br>‣ Packaging as recommended by manufacturer.<br>‣ Check all containers are clearly labelled and free from leaks. |
| **Storage incompatibility** | ‣ Avoid strong acids, acid chlorides, acid anhydrides and chloroformates.<br>‣ Violent reaction and fire may result when amine catalysts are exposed to, or mixed with, oxidizing agents such as perchlorates, nitrates, permanganates, chromates, nitric acid, halogens, peroxides, and some cleaning solutions containing acids.<br>‣ The large amount of heat generated by the reaction of the catalyst with the oxidizing agent may be sufficient to cause vigorous boiling, which can cause the hot material to splash or splatter.<br><br>Triethanolamine:<br>· is an organic base<br>· reacts violently with strong oxidisers, permanganates, peroxides, ammonium persulfate, bromine dioxide, sulfuric acid, nitric acid<br>· is incompatible with organic anhydrides, acrylates, alcohols, aldehydes, alkylene oxides, substituted allyls, cellulose nitrate, cresols, caprolactam solution, epichlorohydrin, ethylene dichloride, isocyanates, ketones, glycols, mercury, nitrates, phenols, vinyl acetate<br>· decomposes exothermically with maleic anhydride<br>· increase the explosive sensitivity of nitromethane<br>· corrodes, aluminium, copper, its alloys, tin, zinc<br>Diethanolamine:<br>‣ reacts vigorously with strong oxidisers<br>‣ reacts with aldehydes, ketones, acrylates, formates, oxalates, nitrites, non-oxidising mineral acids, strong acids, organic acids, organic anhydrides, isocyanates, vinyl acetate, acrylates, substituted allyls, alkylene oxides, epichlorohydrin,<br>‣ may undergo self-sustaining thermal decomposition at temperatures above 250 C<br>‣ attacks aluminium, copper, zinc and their alloys, and galvanised iron<br>Monoethanolamine<br>‣ is a strong organic base<br>‣ reacts violently with strong oxidisers, strong acids (with spattering)<br>‣ is incompatible with acetic acid, acetic anhydride, acrolein, acrylates, acrylic acid, acrylonitrile, alcohols, aldehydes, alkali metals, alkylene oxides, substituted allyls, caprolactam solution, cellulose nitrate, chlorosulfonic acid, cresols, epichlorohydrin, glycols, halogenated hydrocarbons, isocyanates, ketones, mesityl oxide, oleum, organic anhydrides, phenols, beta-propiolactone, vinyl acetate<br>‣ forms explosive mixture with sodium perchlorate<br>‣ reacts with iron forming tris-ethanolamineiron<br>‣ may undergo a self-sustaining thermal decomposition when heated in excess of 250 degrees C<br>‣ attacks aluminium, copper, lead, tin, zinc, and their alloys<br>‣ attacks plastics, coatings an rubber<br><br>‣ Avoid contact with copper, aluminium and their alloys.<br>‣ Avoid reaction with oxidising agents |

## SECTION 8 Exposure controls / personal protection

### Control parameters

#### Occupational Exposure Limits (OEL)

#### INGREDIENT DATA

| Source | Ingredient | Material name | TWA | STEL | Peak | Notes |
|---|---|---|---|---|---|---|
| US OSHA Permissible Exposure Limits (PELs) Table Z-1 | monoethanolamine | Ethanolamine | 3 ppm / 6 mg/m3 | Not Available | Not Available | Not Available |
| US NIOSH Recommended Exposure Limits (RELs) | monoethanolamine | Ethanolamine | 3 ppm / 8 mg/m3 | 15 mg/m3 / 6 ppm | Not Available | Not Available |

#### Emergency Limits

| Ingredient | TEEL-1 | TEEL-2 | TEEL-3 |
|---|---|---|---|
| triethanolamine | 15 mg/m3 | 240 mg/m3 | 1,500 mg/m3 |
| monoethanolamine | 6 ppm | 170 ppm | 1,000 ppm |

| Ingredient | Original IDLH | Revised IDLH |
|---|---|---|
| triethanolamine | Not Available | Not Available |
| monoethanolamine | 30 ppm | Not Available |

**Continued...**

### Occupational Exposure Banding

| Ingredient | Occupational Exposure Band Rating | Occupational Exposure Band Limit |
|---|---|---|
| triethanolamine | E | ≤ 0.1 ppm |
| ***Notes:*** | *Occupational exposure banding is a process of assigning chemicals into specific categories or bands based on a chemical's potency and the adverse health outcomes associated with exposure. The output of this process is an occupational exposure band (OEB), which corresponds to a range of exposure concentrations that are expected to protect worker health.* | |

### MATERIAL DATA

Exposed individuals are **NOT** reasonably expected to be warned, by smell, that the Exposure Standard is being exceeded.

Odour Safety Factor (OSF) is determined to fall into either Class C, D or E.

The Odour Safety Factor (OSF) is defined as:

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

Classification into classes follows:

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

for triethanolamine:
Exposure at or below the TLV-TWA is thought to minimise the potential for skin and eye irritation, and acute effects (including liver, kidney and nerve damage) and chronic effects (including cancer and allergic contact dermatitis).
Odour Safety Factor (OSF)
OSF=0.77 (triethanolamine)

for monoethanolamine:
Odour threshold: 3-4 ppm.
Continuous exposure at 5 ppm produced only slight systemic effects. Intermittent exposure produces a lesser degree of toxicity in laboratory animals. This decreased toxicity is related to the rate of elimination;
the longer retained, the greater the toxicity,. The TLV-TWA is thought to be protective against the risk of irritation and neuropathic effects.
Odour Safety Factor (OSF)
OSF=0.77 (ETHANOL AMINE)

## 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.

**Continued...**

| | |
|---|---|
| **Personal protection** | |
| **Eye and face protection** | - Safety glasses with unperforated side shields may be used where continuous eye protection is desirable, as in laboratories; spectacles are not sufficient where complete eye protection is needed such as when handling bulk-quantities, where there is a danger of splashing, or if the material may be under pressure.<br>- Chemical goggles.whenever there is a danger of the material coming in contact with the eyes; goggles must be properly fitted.<br>- Full face shield (20 cm, 8 in minimum) may be required for supplementary but never for primary protection of eyes; these afford face protection.<br>- Alternatively a gas mask may replace splash goggles and face shields.<br>- Contact lenses may pose a special hazard; soft contact lenses may absorb and concentrate irritants. A written policy document, describing the wearing of lenses or restrictions on use, should be created for each workplace or task. This should include a review of lens absorption and adsorption for the class of chemicals in use and an account of injury experience. Medical and first-aid personnel should be trained in their removal and suitable equipment should be readily available. In the event of chemical exposure, begin eye irrigation immediately and remove contact lens as soon as practicable. Lens should be removed at the first signs of eye redness or irritation - lens should be removed in a clean environment only after workers have washed hands thoroughly. [CDC NIOSH Current Intelligence Bulletin 59], [AS/NZS 1336 or national equivalent]<br>For amines:<br>SPECIAL PRECAUTION:<br>- 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.<br>- 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.<br>CAUTION:<br>- Ordinary safety glasses or face-shields will not prevent eye irritation from high concentrations of vapour.<br>- 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.<br>- Eyewash fountains should be installed, and kept in good working order, wherever amines are used. |
| **Skin protection** | See Hand protection below |
| **Hands/feet protection** | - Elbow length PVC gloves<br>- When handling corrosive liquids, wear trousers or overalls outside of boots, to avoid spills entering boots.<br>**NOTE:**<br>- 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.<br>- Contaminated leather items, such as shoes, belts and watch-bands should be removed and destroyed.<br>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.<br>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.<br>Personal hygiene is a key element of effective hand care. 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.<br>Suitability and durability of glove type is dependent on usage. Important factors in the selection of gloves include:<br>· frequency and duration of contact,<br>· chemical resistance of glove material,<br>· glove thickness and<br>· dexterity<br>Select gloves tested to a relevant standard (e.g. Europe EN 374, US F739, AS/NZS 2161.1 or national equivalent).<br>· 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.<br>· 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.<br>· Some glove polymer types are less affected by movement and this should be taken into account when considering gloves for long-term use.<br>· Contaminated gloves should be replaced.<br>As defined in ASTM F-739-96 in any application, gloves are rated as:<br>· Excellent when breakthrough time > 480 min<br>· Good when breakthrough time > 20 min<br>· Fair when breakthrough time < 20 min<br>· Poor when glove material degrades<br>For general applications, gloves with a thickness typically greater than 0.35 mm, are recommended.<br>It should be emphasised that glove thickness is not necessarily a good predictor of glove resistance to a specific chemical, as the permeation efficiency of the glove will be dependent on the exact composition of the glove material. Therefore, glove selection should also be based on consideration of the task requirements and knowledge of breakthrough times.<br>Glove thickness may also vary depending on the glove manufacturer, the glove type and the glove model. Therefore, the manufacturers technical data should always be taken into account to ensure selection of the most appropriate glove for the task.<br>Note: Depending on the activity being conducted, gloves of varying thickness may be required for specific tasks. For example:<br>· Thinner gloves (down to 0.1 mm or less) may be required where a high degree of manual dexterity is needed. However, these gloves are only likely to give short duration protection and would normally be just for single use applications, then disposed of.<br>· Thicker gloves (up to 3 mm or more) may be required where there is a mechanical (as well as a chemical) risk i.e. where there is abrasion or puncture potential<br>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.<br>For amines:<br>- Gloves must only be worn on clean hands. After using gloves, hands should be washed and dried thoroughly.<br>- Application of a non-perfumed moisturiser is recommended<br>- Where there is a possibility of exposure to liquid amines skin protection should include: rubber gloves, (neoprene, nitrile, or butyl).<br>- DO NOT USE latex. |
| **Body protection** | See Other protection below |

Continued...

| | |
|---|---|
| **Other protection** | - Overalls.<br>- P.V.C apron.<br>- Barrier cream.<br>- Skin cleansing cream.<br>- Eye wash unit. |

### Recommended material(s)

**GLOVE SELECTION INDEX**

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

| Material | CPI |
|---|---|
| BUTYL | A |
| NATURAL+NEOPRENE | A |
| NEOPRENE | A |
| NEOPRENE/NATURAL | A |
| NITRILE | A |
| PVA | A |
| NATURAL RUBBER | B |
| PVC | B |
| BUTYL/NEOPRENE | C |
| HYPALON | C |
| NITRILE+PVC | C |
| VITON | C |

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

### Respiratory protection

Type AK-P Filter of sufficient capacity. (AS/NZS 1716 & 1715, EN 143:2000 & 149:2001, ANSI Z88 or national equivalent)

Where the concentration of gas/particulates in the breathing zone, approaches or exceeds the "Exposure Standard" (or ES), respiratory protection is required.
Degree of protection varies with both face-piece and Class of filter; the nature of protection varies with Type of filter.

| Required Minimum Protection Factor | Half-Face Respirator | Full-Face Respirator | Powered Air Respirator |
|---|---|---|---|
| up to 10 x ES | AK-AUS P2 | - | AK-PAPR-AUS / Class 1 P2 |
| up to 50 x ES | - | AK-AUS / Class 1 P2 | - |
| up to 100 x ES | - | AK-2 P2 | AK-PAPR-2 P2 ^ |

^ - Full-face
A(All classes) = Organic vapours, B AUS or B1 = Acid gasses, B2 = Acid gas or hydrogen cyanide(HCN), B3 = Acid gas or hydrogen cyanide(HCN), E = Sulfur dioxide(SO2), G = Agricultural chemicals, K = Ammonia(NH3), Hg = Mercury, NO = Oxides of nitrogen, MB = Methyl bromide, AX = Low boiling point organic compounds(below 65 degC)

- Cartridge respirators should never be used for emergency ingress or in areas of unknown vapour concentrations or oxygen content.
- The wearer must be warned to leave the contaminated area immediately on detecting any odours through the respirator. The odour may indicate that the mask is not functioning properly, that the vapour concentration is too high, or that the mask is not properly fitted. Because of these limitations, only restricted use of cartridge respirators is considered appropriate.
- Cartridge performance is affected by humidity. Cartridges should be changed after 2 hr of continuous use unless it is determined that the humidity is less than 75%, in which case, cartridges can be used for 4 hr. Used cartridges should be discarded daily, regardless of the length of time used

Where engineering controls are not feasible and work practices do not reduce airborne amine concentrations below recommended exposure limits, appropriate respiratory protection should be used. In such cases, air-purifying respirators equipped with cartridges designed to protect against amines are recommended.

## SECTION 9 Physical and chemical properties

### Information on basic physical and chemical properties

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|---|---|
| **Appearance** | Yellow |

| | | | |
|---|---|---|---|
| **Physical state** | Liquid | **Relative density (Water = 1)** | Not Available |
| **Odour** | Not Available | **Partition coefficient n-octanol / water** | Not Available |
| **Odour threshold** | Not Available | **Auto-ignition temperature (°C)** | Not Available |
| **pH (as supplied)** | 11.60 | **Decomposition temperature (°C)** | Not Available |
| **Melting point / freezing point (°C)** | Not Available | **Viscosity (cSt)** | 700.00 |
| **Initial boiling point and boiling range (°C)** | Not Available | **Molecular weight (g/mol)** | Not Available |
| **Flash point (°C)** | Not Available | **Taste** | Not Available |
| **Evaporation rate** | Not Available | **Explosive properties** | Not Available |
| **Flammability** | Not Available | **Oxidising properties** | Not Available |
| **Upper Explosive Limit (%)** | Not Available | **Surface Tension (dyn/cm or mN/m)** | Not Available |
| **Lower Explosive Limit (%)** | Not Available | **Volatile Component (%vol)** | Not Available |
| **Vapour pressure (kPa)** | Not Available | **Gas group** | Not Available |
| **Solubility in water** | Miscible | **pH as a solution (Not Available%)** | 9.6 |

**Continued...**

| | | | |
|---|---|---|---|
| **Vapour density (Air = 1)** | Not Available | **VOC g/L** | Not Available |

## SECTION 10 Stability and reactivity

| | |
|---|---|
| **Reactivity** | See section 7 |
| **Chemical stability** | - Unstable in the presence of incompatible materials.<br>- Product is considered stable.<br>- 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** | Evidence shows, or practical experience predicts, that the material produces irritation of the respiratory system, in a substantial number of individuals, following inhalation. In contrast to most organs, the lung is able to respond to a chemical insult by first removing or neutralising the irritant and then repairing the damage. The repair process, which initially evolved to protect mammalian lungs from foreign matter and antigens, may however, produce further lung damage resulting in the impairment of gas exchange, the primary function of the lungs. Respiratory tract irritation often results in an inflammatory response involving the recruitment and activation of many cell types, mainly derived from the vascular system.<br>Inhalation of alkaline corrosives may produce irritation of the respiratory tract with coughing, choking, pain and mucous membrane damage. Pulmonary oedema may develop in more severe cases; this may be immediate or in most cases following a latent period of 5-72 hours. Symptoms may include a tightness in the chest, dyspnoea, frothy sputum, cyanosis and dizziness. Findings may include hypotension, a weak and rapid pulse and moist rales.<br>When rats (both sexes) were exposed to statically generated triethanolamine (25 deg. C) for six hours, there were no major signs nor was there any gross pathology (kill rate 0/6).<br>Monoethanolamine vapours, mists and liquid are corrosive to the mouth and throat. When rats where exposed for 8 hours to a highly enriched and/ or saturated atmosphere at ambient temperatures, there were no fatalities |
| **Ingestion** | Ingestion of alkaline corrosives may produce immediate pain, and circumoral burns. Mucous membrane corrosive damage is characterised by a white appearance and soapy feel; this may then become brown, oedematous and ulcerated. Profuse salivation with an inability to swallow or speak may also result. Even where there is limited or no evidence of chemical burns, both the oesophagus and stomach may experience a burning pain; vomiting and diarrhoea may follow. The vomitus may be thick and may be slimy (mucous) and may eventually contain blood and shreds of mucosa. Epiglottal oedema may result in respiratory distress and asphyxia. Marked hypotension is symptomatic of shock; a weak and rapid pulse, shallow respiration and clammy skin may also be evident. Circulatory collapse may occur and, if uncorrected, may produce renal failure. Severe exposures may result in oesophageal or gastric perforation accompanied by mediastinitis, substernal pain, peritonitis, abdominal rigidity and fever. Although oesophageal, gastric or pyloric stricture may be evident initially, these may occur after weeks or even months and years. Death may be quick and results from asphyxia, circulatory collapse or aspiration of even minute amounts. Death may also be delayed as a result of perforation, pneumonia or the<br>effects of stricture formation.<br>The material has **NOT** been classified by EC Directives or other classification systems as "harmful by ingestion". This is because of the lack of corroborating animal or human evidence. The material may still be damaging to the health of the individual, following ingestion, especially where pre-existing organ (e.g liver, kidney) damage is evident. Present definitions of harmful or toxic substances are generally based on doses producing mortality rather than those producing morbidity (disease, ill-health). Gastrointestinal tract discomfort may produce nausea and vomiting. In an occupational setting however, ingestion of insignificant quantities is not thought to be cause for concern.<br>Ingestion of triethanolamine may cause gastro-intestinal irritation with haemorrhage and congestion of intestines. May be fatal if swallowed. Calculated median lethal dose in 70 kg man is 560 gms. [ICI]<br>Triethanolamine may cause burning or painful sensations in the mouth, throat, chest and abdomen, vomiting and diarrhoea.<br>In rats where triethanolamine was administered orally, major toxic signs included sluggishness, lachrymation, piloerection, unsteady gait, diarrhoea and red or brown discharge on perinasal and perigenital hair. Gross pathological investigations revealed discoloured lungs, stomach, intestines and a dark red liquid in the stomach and intestine<br>Ethanolamine is a normal intermediate in the metabolism of certain animal species producing phospholipids and choline. Major signs in rats poisoned by monoethanolamine included lachrymation,<br>piloerection, kyphosis, unsteady gait, emaciation, pallor, red or brown discharge on perianal, periocular and perigenital fur. Gross pathological changes included discolouration of lungs, stomach, intestines and kidneys, liver to stomach adhesions, and liquid or gas-filled stomachs. |
| **Skin Contact** | The material can produce severe chemical burns following direct contact with the skin.<br>Skin contact with the material may damage the health of the individual; systemic effects may result following absorption.<br>Open cuts, abraded or irritated skin should not be exposed to this material<br>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.<br>Brief contact with triethanolamine may cause slight irritation with itching and local redness. Prolonged contact may produce more severe irritation with discomfort, or pain, localised redness and swelling (oedema) and possible tissue destruction. Skin contact may produce sensitisation in a small proportion of individuals. Covered patch testing resulted in a small percentage of subjects who displayed signs of allergic contact dermatitis (BIBRA Toxicology Profile, 1990). Triethanolamine has also been identified as the cause of erythematous vesicular lesions, eczema, non-allergic contact dermatitis and irritation amongst workers.<br>Rabbits exposed percutaneously to toxic levels of triethanolamine showed sluggishness, unsteady gait and emaciation. Gross pathology consisted of discoloured lungs, thymus, spleen, kidneys, stomach and, gas and/ or liquid-filled intestines.<br>Guinea pigs exposed dermally to triethanolamine (8 g/kg/day, 5 days/week applied to shaved and subsequently bandaged skin), died between the second and seventeenth application. Necrosis of the epithelium was observed. Kidneys and liver showed cloudy swelling and congestion; fatty changes were seen in the central ascini of the liver, and lung and adrenal congestion were observed.<br>When applied to the skin ethanolamine is considerably more toxic than when administered orally. A single prolonged skin exposure may result in the absorption of harmful amounts. Rats poisoned after topical application showed sluggishness, abdominal distension, prostration and emaciation. Gross pathological changes included discoloured lungs, trachea, intestines, thymus and kidneys and liquid or gas-filled stomach and intestines. |

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| | |
|---|---|
| | The undiluted liquid causes swelling and redness on rabbit skin, comparable to a first-degree burn. The necrosis produced is not related to its alkalinity.<br>Following a 4-hour occluded application to rabbit skin, there was severe erythema, oedema and necrosis with subsequent ulceration and scabbing. |
| **Eye** | When applied to the eye(s) of animals, the material produces severe ocular lesions which are present twenty-four hours or more after instillation.<br>Direct contact with alkaline corrosives may produce pain and burns. Oedema, destruction of the epithelium, corneal opacification and iritis may occur. In less severe cases these symptoms tend to resolve. In severe injuries the full extent of the damage may not be immediately apparent with late complications comprising a persistent oedema, vascularisation and corneal scarring, permanent opacity, staphyloma, cataract, symblepharon and loss of sight.<br>A drop of ethanolamine in the eye causes injury slightly less than that produced by ammonia (grade 9, on a scale 1 to 10). Following instillation to rabbit eyes (0.005 ml), there was severe corneal injury with vascularisation and corneal deformation, severe iritis, and severe conjunctival irritation with necrosis |
| **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.<br>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.<br>Long-term exposure to respiratory irritants may result in disease of the airways involving difficult breathing and related systemic problems.<br>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.<br>Substances that can cause occupational asthma (also known as asthmagens and respiratory sensitisers) can induce a state of specific airway hyper-responsiveness via an immunological, irritant or other mechanism. Once the airways have become hyper-responsive, further exposure to the substance, sometimes even to tiny quantities, may cause respiratory symptoms. These symptoms can range in severity from a runny nose to asthma. Not all workers who are exposed to a sensitiser will become hyper-responsive and it is impossible to identify in advance who are likely to become hyper-responsive.<br>Substances than can cuase occupational asthma should be distinguished from substances which may trigger the symptoms of asthma in people with pre-existing air-way hyper-responsiveness. The latter substances are not classified as asthmagens or respiratory sensitisers<br>Wherever it is reasonably practicable, exposure to substances that can cuase occupational asthma should be prevented. Where this is not possible the primary aim is to apply adequate standards of control to prevent workers from becoming hyper-responsive.<br>Activities giving rise to short-term peak concentrations should receive particular attention when risk management is being considered. Health surveillance is appropriate for all employees exposed or liable to be exposed to a substance which may cause occupational asthma and there should be appropriate consultation with an occupational health professional over the degree of risk and level of surveillance.<br>Toxic: danger of serious damage to health by prolonged exposure through inhalation, in contact with skin and if swallowed.<br>Serious damage (clear functional disturbance or morphological change which may have toxicological significance) is likely to be caused by repeated or prolonged exposure. As a rule the material produces, or contains a substance which produces severe lesions. Such damage may become apparent following direct application in subchronic (90 day) toxicity studies or following sub-acute (28 day) or chronic (two-year) toxicity tests.<br>Limited evidence suggests that repeated or long-term occupational exposure may produce cumulative health effects involving organs or biochemical systems.<br><br>Prolonged or chronic exposure to alkanolamines may result in liver, kidney or nervous system injury. Repeated inhalation may aggravate asthma and inflammatory or fibrotic pulmonary disease.<br><br>Results of repeated exposure tests with diethanolamine (DEA) in laboratory animals include anaemia (rats) and effects on the kidneys (rats and mice) and liver (mice). DEA produces nervous system injury in dogs and rats. Heart and salivary gland lesions have also been seen in mice treated cutaneously with DEA and in mice receiving DEA in drinking water. Rats given high doses of DEA developed anaemia and testicular lesions.<br><br>Exaggerated doses of DEA produced heart and nervous system effects in other animals. Changes in other organs were judged to be secondary due to the poor health of animals subjected to extremely high doses of DEA. Rats, rabbits and guinea pigs exposed to high vapour concentrations of volatile monoethanolamine (MEA) (up to 1250 ppm) for periods of up to 5 weeks developed pulmonary, hepatic and renal lesions. Dogs, rats and guinea pigs exposed to 100 ppm MEA for 30 days, became apathetic and developed poor appetites. Animal tests also indicate that inhalation exposure to MEA may result in nervous system injury. All species exposed to airborne MEA experienced dermal effects, varying from ulceration to hair loss probably resulting from contact with the cage.<br><br>An increased incidence of skeletal variations, suggestive of a slight developmental delay was seen in the foetuses of rats given 1500 mg/kg/day DEA cutaneously; this also produced significant maternal toxicity. No foetal malformations, however, were seen in rats nor in rabbits receiving identical treatment. The foetus of rats given high doses of MEA by gavage, showed an increased rate of embryofoetal death, growth retardation, and some malformations including hydronephrosis and hydroureter. The high doses required to produce these effects bring into question the relevance of this finding to humans. There is some evidence that embryofoetotoxicity and teratogenicity does not occur in rats when MEA is administered by dermal application to the mother.<br><br>The National Toxicology Program (NTP) concluded that there is clear evidence of liver tumours and some evidence of kidney tumours in mice exposed dermally to DEA over their lifetime. Chronic skin painting studies in mice of both sexes produced liver tumours and an increased incidence of kidney tumours in male mice. The significance of these findings to humans is unclear as DEA is neither genotoxic, mutagenic nor clastogenic, and did not induce tumours in rats or transgenic mice similarly treated. Alkanolamines (especially those containing a secondary amine moiety) may react with nitrites or other nitrosating agents to form carcinogenic N-nitrosamines. Alkanolamines are metabolised by biosynthetic routes to ethanolamine and choline and incorporated into phospholipids. They are excreted predominantly unchanged with a half-life of approximately one week. In the absence of sodium nitrite, no conversion to carcinogenic N-nitrosamines was observed.<br><br>Diethanolamine competitively inhibits the cellular uptake of choline, in vitro, and hepatic changes in choline homeostasis, consistent with choline deficiency, are observed in vivo.<br><br>Many amines are potent skin and respiratory sensitisers and certain individuals especially those described as "atopic" (i.e. those predisposed to asthma and other allergic responses) may show allergic reactions when chronically exposed to alkanolamines.<br><br>In a study with coconut diethanolamide, the National Toxicology Program (Technical Report Series 479), showed clear evidence of carcinogenic activity in male B6C3F1 mice based on increased incidences of hepatic and renal tubule neoplasms and in female B6C3F1 mice based on increased incidences of hepatic neoplasms. There was equivocal evidence of carcinogenic activity in female F344/N rats based on a marginal increase in the incidence of renal tube neoplasms. These increases were associated with the concentration of free diethanolamine present as a contaminant in the diethanolamine condensate. Exposure to rats to coconut oil diethanolamine condensate by dermal application in ethanol for 2 years resulted in epidermal hyperplasia, sebaceous gland hyperplasia, hyperkeratosis and parakeratosis in males and females and ulcer in females at the site of application. There were increases in the incidences of chronic inflammation, epithelial hyperplasia, and epithelial ulcer in the forestomach of female rats. The severity of nephropathy in dosed female rats were increased. Exposure of mice to coconut oil diethanolamine condensate by dermal application for 2 years resulted in increased incidences of eosinophilic foci of the liver in males. Increased incidences of |

**Continued...**

epidermal hyperplasia, sebaceous gland hyperplasia, and hyperkeratosis in males and females, ulcer in males, and parakeratosis and inflammation in females at the site of application and of follicular cell hyperplasia in the thyroid gland of males and females, were chemical related.
Reversible liver and kidney damage has been demonstrated in animals from chronic exposure to triethanolamine.
Although the product is not, in itself, carcinogenic, reaction under strong acid conditions, with nitrites and nitrous acids results in the formation of a potent carcinogen, N-nitrosodiethanolamine.
This situation might be encountered in certain metal-treatment operations, for example.
A cohort study, in which cancer morbidity and mortality were investigated in workers exposed to cutting fluids with nitrates and amines (amongst them triethanolamine), had negative results. The effects on workers industrially exposed to metal-working coolants containing sodium nitrite and triethanolamine solutions were investigated in a Russian study. Observed vascular effecs were attributed to sodium nitrite; no effects were attributed to triethanolamine.
Screening studies in mice suggest that the material does not effect foetal development.
In the European Union, trialkylamines, trialkanolamines, and their salts (ingredients containing TEA) may only be used up to 2.5%, must be at least 99% pure, are not to be used with nitrosating systems, must have a maximum secondary amine content of 0.5%, must have a maximum nitrosamine content of 50 ug/kg, and must be kept in nitrite-free containers

| | TOXICITY | IRRITATION |
|---|---|---|
| **KOSTherm HD Inhibitor** | Not Available | Not Available |

| | TOXICITY | IRRITATION |
|---|---|---|
| **triethanolamine** | dermal (rat) LD50: >16000 mg/kg[2] | Eye (rabbit): 0.1 ml - |
| | Oral (Rabbit) LD50; 2200 mg/kg[2] | Eye (rabbit): 10 mg - mild |
| | | Eye (rabbit): 5.62 mg - SEVERE |
| | | minor conjunctival irritation |
| | | no irritation * |
| | | Skin (human): 15 mg/3d (int)-mild |
| | | Skin (rabbit): 4 h occluded |
| | | Skin (rabbit): 560 mg/24 hr- mild |

| | TOXICITY | IRRITATION |
|---|---|---|
| **monoethanolamine** | Dermal (rabbit) LD50: 1000 mg/kg[2] | Eye (rabbit): 0.76 mg - SEVERE |
| | Inhalation(Guinea) LC50; ~0.145 mg/l4h[2] | Skin (rabbit):505 mg open-moderate |
| | Oral (Guinea) LD50; 620 mg/kg[2] | |

***Legend:*** *1. Value obtained from Europe ECHA Registered Substances - Acute toxicity 2. Value obtained from manufacturer's SDS. Unless otherwise specified data extracted from RTECS - Register of Toxic Effect of chemical Substances*

**TRIETHANOLAMINE**

Lachrymation, diarrhoea, convulsions, urinary tract changes, changes in bladder weight, changes in testicular weight, changes in thymus weight, changes in liver weight, dermatitis after systemic exposure, kidney, ureter, bladder tumours recorded. Equivocal tumourigen by RTECS criteria.
Dermal rabbit value quoted above is for occluded patch in male or female animals * Union Carbide

The material may produce severe irritation to the eye causing pronounced inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.
The material may cause skin irritation after prolonged or repeated exposure and may produce a contact dermatitis (nonallergic). This form of dermatitis is often characterised by skin redness (erythema) and swelling epidermis. Histologically there may be intercellular oedema of the spongy layer (spongiosis) and intracellular oedema of the epidermis.
For triethanolamine (and its salts):
**Acute toxicity:** Triethanolamine is of low toxicity by the oral, dermal and inhalation routes of exposure. Oral LD50 values have been shown to range from approximately 5-10 g/kg. The dermal LD50 is greater than 2 g/kg . The inhalation LC50 is greater than a saturated atmosphere
**Repeat Dose Toxicity:** The studies to determine toxicity of triethanolamine from repeated exposure were conducted for a duration of 91 days or 2 years. In both studies the NOAEL was at least 1000 mg/kg. There was no evidence of gross or histopathological change that could be attributed to treatment. Also, triethanolamine was shown to be non-carcinogenic.
**Genetic Toxicity:** Mutation (bacterial);This endpoint has been satisfied by two studies using 4 strains (TA 98, TA 100, TA 1535 and TA 1537) of *Salmonella typhimurium.* Triethanolamine was not mutagenic in any of the tester strains.
Chromosomal aberration (mammalian, *in vitro*) – This endpoint was satisfied by a cytogenetic assay using Chinese hamster lung cells. Triethanolamine did not induce chromosome aberrations in this test system.
**Reproductive Toxicity:** No studies have been conducted to specifically evaluate the effect of triethanolamine on reproductive performance. However, based on consideration of the repeat dose toxicity studies of at least 90 days duration, there were no abnormalities noted in the histopathological examination of reproductive organs. This fact, and the lack of effects on foetal development, allow the conclusion that triethanolamine would not be expected to produce adverse effects to reproductive performance and fertility.
**Developmental Toxicity:** This endpoint was satisfied using a developmental toxicity screening study according to the Chernoff-Kavlock method . Based on the results from this test, triethanolamine does not impair development of the fetus.
A Cosmetic Ingredient Review (CIR) expert panel conducted a review of triethanolamine-containing personal care products
The panel was concerned with the levels of free diethanolamine that could be present as an impurity in TEA or TEA-containing ingredients. The panel stated that the amount of free diethanolamine available must be limited to the present practices of use and concentration of diethanolamine.
The Panel concluded that TEA and 31 related TEA-containing ingredients, are safe when formulated to be nonirritating and when the levels of free diethanolamine do not exceed the prescribed levels. These ingredients should not be used in cosmetic products in which N-nitroso compounds can be formed.
Dermal carcinogenicity studies performed by the NTP on TEA reported equivocal evidence of carcinogenic activity in male mice based on the occurrence of liver hemangiosarcoma, some evidence of carcinogenic activity in female mice based on increased incidences of hepatocellular adenoma, and equivocal evidence of carcinogenic activity in male rats based on a marginal increase in the incidence of renal tubule cell adenoma. It has been hypothesized that TEA may cause liver tumours in mice via a choline-depletion mode of action. Humans are much less sensitive to this deficiency, and these hepatic findings are considered to have little relevance to humans regarding the safety of the use of TEA in personal care products.
The panel was concerned that the potential exists for dermal irritation with the use of products formulated using TEA or TEA-related ingredients. The panel specified that products containing these ingredients must be formulated to be nonirritating.
Tertiary alkyl amines such as TEA do not react with N-nitrosating agents to directly form nitrosamines. However, tertiary amines can act as

Continued...

| | |
|---|---|
| | precursors in nitrosamine formation by undergoing nitrosative cleavage.he resultant secondary amine (ie, diethanolamine) can then be N-nitrosated to products that may be carcinogenic. Because of the potential for this process to occur, TEA and TEA-containing ingredients should not be used in cosmetic products in which N-nitroso compounds can be formed.<br>Safety Assessment of Triethanolamine and Triethanolamine-Containing Ingredients as Used in Cosmetics: International Journal of Toxicology (supplement 1) 59S-83S. 2013<br>http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.901.4174&rep=rep1&type=pdf<br>The substance is classified by IARC as Group 3:<br>**NOT** classifiable as to its carcinogenicity to humans.<br>Evidence of carcinogenicity may be inadequate or limited in animal testing.<br>**NOTE:** Substance has been shown to be mutagenic in at least one assay, or belongs to a family of chemicals producing damage or change to cellular DNA. |
| **MONOETHANOLAMINE** | * Bayer<br>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. |
| **KOSTherm HD Inhibitor & TRIETHANOLAMINE & MONOETHANOLAMINE** | Asthma-like symptoms may continue for months or even years after exposure to the material ends. This may be due to a non-allergic condition known as reactive airways dysfunction syndrome (RADS) which can occur after exposure to high levels of highly irritating compound. Main criteria for diagnosing RADS include the absence of previous airways disease in a non-atopic individual, with sudden onset of persistent asthma-like symptoms within minutes to hours of a documented exposure to the irritant. Other criteria for diagnosis of RADS include a reversible airflow pattern on lung function tests, moderate to severe bronchial hyperreactivity on methacholine challenge testing, and the lack of minimal lymphocytic inflammation, without eosinophilia. 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. On the other hand, industrial bronchitis is a disorder that occurs as a result of exposure due to high concentrations of irritating substance (often particles) and is completely reversible after exposure ceases. The disorder is characterized by difficulty breathing, cough and mucus production.<br>While it is difficult to generalise about the full range of potential health effects posed by exposure to the many different amine compounds, characterised by those used in the manufacture of polyurethane and polyisocyanurate foams, it is agreed that overexposure to the majority of these materials may cause adverse health effects.<br>‣ Many amine-based compounds can induce histamine liberation, which, in turn, can trigger allergic and other physiological effects, including bronchoconstriction or bronchial asthma and rhinitis.<br>‣ Systemic symptoms include headache, nausea, faintness, anxiety, a decrease in blood pressure, tachycardia (rapid heartbeat), itching, erythema (reddening of the skin), urticaria (hives), and facial edema (swelling). Systemic effects (those affecting the body) that are related to the pharmacological action of amines are usually transient.<br>Typically, there are four routes of possible or potential exposure: inhalation, skin contact, eye contact, and ingestion.<br>**Inhalation:**<br>Inhalation of vapors may, depending upon the physical and chemical properties of the specific product and the degree and length of exposure, result in moderate to severe irritation of the tissues of the nose and throat and can irritate the lungs.<br>Products with higher vapour pressures have a greater potential for higher airborne concentrations. This increases the probability of worker exposure.<br>Higher concentrations of certain amines can produce severe respiratory irritation, characterised by nasal discharge, coughing, difficulty in breathing, and chest pains.<br>Chronic exposure via inhalation may cause headache, nausea, vomiting, drowsiness, sore throat, bronchopneumonia, and possible lung damage. Also, repeated and/or prolonged exposure to some amines may result in liver disorders, jaundice, and liver enlargement. Some amines have been shown to cause kidney, blood, and central nervous system disorders in laboratory animal studies.<br>While most polyurethane amine catalysts are not sensitisers, some certain individuals may also become sensitized to amines and may experience respiratory distress, including asthma-like attacks, whenever they are subsequently exposed to even very small amounts of vapor. Once sensitised, these individuals must avoid any further exposure to amines. Although chronic or repeated inhalation of vapor concentrations below hazardous or recommended exposure limits should not ordinarily affect healthy individuals, chronic overexposure may lead to permanent pulmonary injury, including a reduction in lung function, breathlessness, chronic bronchitis, and immunologic lung disease.<br>Inhalation hazards are increased when exposure to amine catalysts occurs in situations that produce aerosols, mists, or heated vapors. Such situations include leaks in fitting or transfer lines. Medical conditions generally aggravated by inhalation exposure include asthma, bronchitis, and emphysema.<br>**Skin Contact:**<br>Skin contact with amine catalysts poses a number of concerns. Direct skin contact can cause moderate to severe irritation and injury-i.e., from simple redness and swelling to painful blistering, ulceration, and chemical burns. Repeated or prolonged exposure may also result in severe cumulative dermatitis.<br>Skin contact with some amines may result in allergic sensitisation. Sensitised persons should avoid all contact with amine catalysts. Systemic effects resulting from the absorption of the amines through skin exposure may include headaches, nausea, faintness, anxiety, decrease in blood pressure, reddening of the skin, hives, and facial swelling. These symptoms may be related to the pharmacological action of the amines, and they are usually transient.<br>**Eye Contact:**<br>Amine catalysts are alkaline in nature and their vapours are irritating to the eyes, even at low concentrations.<br>Direct contact with the liquid amine may cause severe irritation and tissue injury, and the “burning” may lead to blindness. (Contact with solid products may result in mechanical irritation, pain, and corneal injury.)<br>Exposed persons may experience excessive tearing, burning, conjunctivitis, and corneal swelling.<br>The corneal swelling may manifest itself in visual disturbances such as blurred or “foggy” vision with a blue tint (“blue haze”) and sometimes a halo phenomenon around lights. These symptoms are transient and usually disappear when exposure ceases.<br>Some individuals may experience this effect even when exposed to concentrations below doses that ordinarily cause respiratory irritation.<br>**Ingestion:**<br>The oral toxicity of amine catalysts varies from moderately to very toxic.<br>Some amines can cause severe irritation, ulceration, or burns of the mouth, throat, esophagus,and gastrointestinal tract.<br>Material aspirated (due to vomiting) can damage the bronchial tubes and the lungs.<br>Affected persons also may experience pain in the chest or abdomen, nausea, bleeding of the throat and the gastrointestinal tract, diarrhea, dizziness, drowsiness, thirst, circulatory collapse, coma, and even death.<br>**Polyurethane Amine Catalysts: Guidelines for Safe Handling and Disposal; Technical Bulletin June 2000**<br>**Alliance for Polyurethanes Industry** |
| **KOSTherm HD Inhibitor & TRIETHANOLAMINE** | The following information refers to contact allergens as a group and may not be specific to this product.<br>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. |

| | | | |
|---|---|---|---|
| **Acute Toxicity** | ✗ | **Carcinogenicity** | ✓ |
| **Skin Irritation/Corrosion** | ✓ | **Reproductivity** | ✗ |

**Continued...**

| | | | |
|---|---|---|---|
| **Serious Eye Damage/Irritation** | ✓ | **STOT - Single Exposure** | ✗ |
| **Respiratory or Skin sensitisation** | ✓ | **STOT - Repeated Exposure** | ✗ |
| **Mutagenicity** | ✗ | **Aspiration Hazard** | ✗ |

***Legend:*** ✗ *– Data either not available or does not fill the criteria for classification*
✓ *– Data available to make classification*

## SECTION 12 Ecological information

### Toxicity

**KOSTherm HD Inhibitor**

| Endpoint | Test Duration (hr) | Species | Value | Source |
|---|---|---|---|---|
| Not Available | Not Available | Not Available | Not Available | Not Available |

**triethanolamine**

| Endpoint | Test Duration (hr) | Species | Value | Source |
|---|---|---|---|---|
| EC50 | 72h | Algae or other aquatic plants | >107<260mg/l | 2 |
| BCF | 1008h | Fish | <0.4 | 7 |
| EC50 | 48h | Crustacea | 565.2-658.3mg/l | 4 |
| EC10(ECx) | 96h | Algae or other aquatic plants | 7.1mg/l | 1 |
| LC50 | 96h | Fish | 11800mg/l | 2 |
| EC50 | 96h | Algae or other aquatic plants | 169mg/l | 1 |

**monoethanolamine**

| Endpoint | Test Duration (hr) | Species | Value | Source |
|---|---|---|---|---|
| EC50 | 72h | Algae or other aquatic plants | 15mg/l | 1 |
| EC50 | 48h | Crustacea | 65mg/l | 1 |
| NOEC(ECx) | 72h | Algae or other aquatic plants | 4mg/l | 1 |
| LC50 | 96h | Fish | 75mg/l | 1 |
| EC50 | 96h | Algae or other aquatic plants | 80mg/l | 2 |

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

Harmful to aquatic organisms.
for monoethanolamine:
log Kow : -1.31
Koc : 5
Half-life (hr) air : 11
Henry's atm m3 /mol: 4.00E-08
BOD 5: 0.8-1.1,0%
Biodegradability:
BOD5: 800 mg/g
>70%: BOD of the ThOD (OECD 301F)
>90%: DOC reduction (OECD 301A)
COD : 1.27-1.28
ThOD : 2.49
BCF : <1
**Environmental fate:**
Monoethanolamine will leach into soil. It is expected to exist solely as a vapor in the ambient atmosphere. Models estimate that this material will preferentially partition to water versus air or
soil.. Vapour-phase is degraded in the atmosphere by reaction with photochemically produced hydroxyl radicals
The potential for mobility in the soil is high (Koc between 0 and 50).
Log soil organic carbon partition coefficient (log Koc) is estimated to be 0.70.
**Degradation and Persistence:**
The material is biodegradable, passing the OECD tests for ready biodegradability.
Biodegradation reached in CO2 evolution test after 28 days: 97%* (modified Sturm Test, OECD 301B)
Biodegradation reached in modified OECD Screening Test after 28 days: 94%* (OECD 301E)
Biodegradation reached in manometric Respirometer Test after 28 days:>70%* (OECD 301F)
Biodegradation under aerobic static laboratory conditions is high (BOD20 or BOD28/ThOD >40%)
BOD20 (Biochemical Oxygen Demand after 20 days): 1.5 p/p
ThOD (Theoretical Oxygen Demand)): 2.36 p/p (calc).
IC50 (Inhibitory Concentration): >1000 mg/l
**Biodegradation:** Test method: OECD 301F; ISO 9408; 92/69/EEC, C.4-D (aerobic), activated sludge, domestic
Degree of elimination: 90 - 100 % (28 d)
Evaluation: Readily biodegradable (according to OECD criteria).
This material will biodegrade relatively rapidly in both soil and water, and will not persist in the environment.
Monoethanolamine is biodegraded or transformed into other compounds under both aerobic and anaerobic conditions even at concentrations greater than 1500 mg/kg. Ammonium, acetate, and nitrogen gas are the dominant by-products . The generation of nitrogen gas suggests that simultaneous nitrification and denitrification occurs because of the existence of anoxic zones resulting from diffusion limited oxygen transport into the soils.Low temperatures (5 C) reduced the biodegradation rates significantly compared to rates at room temperature.
**Bioaccumulation:** Because of the n-octanol/water distribution coefficient (log Pow) accumulation in organisms is not to be expected.
Bioconcentration potential is low (BCF less than 100 or log Kow less than 3).
Bioaccumulation: Because of this material's high solubility and rapid biodegradability, it is unlikely that bioaccumulation will
occur in aquatic or terrestrial systems.
**Biochemical oxygen demand (BOD):** Incubation period 5 d: 800 mg/g
Due to the pH-value of the product, neutralization is generally required before discharging sewage into treatment plants.
**Ecotoxicity:**
This material is highly soluble in water. Laboratory toxicity tests indicate that is not significantly toxic to fish and aquatic invertebrates, although amphibians may be more sensitive.

**Continued...**

Wildlife species may be more susceptible since mammals and birds do not readily metabolise this material. The odor and flavor of this material may attract some wildlife and cause them to consume spilled material
BASF date:
Fish LC50 (96 h): goldfish 170 mg/l (APHA 1971 static)
Daphnia magna EC50 (48 h): 65 mg/l (Directive 84/449/EEC); (24 h): 120-140 mg/l
Aquatic plants EC50 (72 h): green algae 22 mg/l (Guideline 92/69/EEC)
Algae NOEC (192 h): 0.75-0.97 mg/l
Activated sludge EC50 (0.5 h): >1000 mg/l (DIV/EN/ISO 8192-OECD 209-88/302/EEC)
Bacteria EC50 (17 h): 100 mg/l
Dow Chemicals data
The material is practically non-toxic to aquatic organisms on an acute basis (LC50/ EC50 >100 mg/l in most sensitive species).
Daphnia LC50 (-) 114 mg/l *
Fish LC50 (-): Oncorhyncus mykiss 150 mg/l, gold fish 170 mg/l, bluegill 300-1000 mg/l, fathead minnow 635 mg/l, mosquito fish 337.5, golden orfe 224-525 mg/l
* (Dow Chemical)
BOD5: 60%; BOD19: 75%; BOD20: 100% **
Toxicity to microorganisms: IC50 700 mg/l
Daphnia LC50 (48 h): 33 mg/l; 93 mg/l **
Fish LC50 (96 h): fathead minnow 125 mg/l, 206 mg/l **
ThOD: 1.54 mg/mg (measured); 1.31 mg/mg (calculated) **
Monoethanolamine may be toxic to aquatic life at relatively low concentrations in water.
Editors note: there is clear contradiction between the conclusion reached by Dow Chemical and other manufacturers relating to aquatic toxicity. Under present EC Directives the material is not toxic to aquatic life.
** (Dow Chemical)
for triethanolamine:
Koc : 3
Half-life (hr) air : 4
Henry's atm m3 /mol: 3.38E-19
BOD 5 if unstated: nil-0.17
COD : 1.5
ThOD : 2.04; 1.61 p/p
ThOD (measured) 1.52 mg/mg (Union Carbide)
ThOD (calculated) 1.61 mg/mg (Union Carbide)
BCF : <1
Biodegradability: 96% DOC reduction (OECD Method 301E)
BOD; Day 5: 8%, Day 10: 9%, Day 20: 66%
Passes Sturm, AFNOR tests for biodegradability.
Reaches more than 70% mineralisation in OECD test for inherent biodegradability (Zahn-Wellens test)
Theoretical oxygen demand ThOD) is calculated at 1.61 p/p. Degradation is expected in the atmospheric environment within minutes to hours.
Log octanol/ water partition coefficient (log Kow) is estimated using the Pomona-Medchem structural fragment to be -1.746.
Potential for the mobility in soil is very high (Koc betweeen 0 and 50).
Henry's Law Constant (H) is estimated to be 3.38E-19 atm.m3/mol (25 C)
Log soil organic carbon partition coefficient (log Koc) is estimated to be 0.48.
When released into soil the material is expected to degrade without significant evaporation. A half-life of between 1 to 10 days is expected.
Material has shown a potential to biodegrade. Attains >99% degradation in activated sludge in 24 hours. Attains >99% degradation in soil is 1-14 days.
Bioconcentration potential is low (BCF less than 100 or log Kow less than 3).
When released into water, the material is expected to degrade with a half-life of about 1 to 10 days. Because the material has a log octanol-water coefficient of less than 3 it is not expected to bioaccumulate.
Release to air is expected to produce photolytic degradation resulting in hydroxyl radicals. The material is expected to be removed from the atmosphere by dry and wet deposition (half-life between 1 and 10 days).
**Environmental fate:**
Transport: Due to the high water solubility and low vapour pressure of triethanolamine, it is likely to partition preferentially into the water phase from which volatilisation to the atmosphere is likely to be only a minor removal process. The low log Kow value indicates that bioaccumulation and adsorption onto soils/sediments is unlikely to occur.
**Water:** If released to water, triethanolamine should biodegrade. The half-life of this compound is expected to range from a few days to a few weeks depending on the degree of acclimation of the system. Bioconcentration in aquatic organisms, adsorption to suspended solids and sediments, and volatilization are not expected to be important fate processes in water. Triethanolamine does not decompose or hydrolyze in contact with water and there is no abiotic degradation
**Biodegradation:** Triethanolamine is readily biodegradable, possibly after a short acclimation period . The data indicate that triethanolamine is inherently biodegradable. Extensive removal due to biodegradation is to be expected in sewage treatment plants . In the ready biodegradation tests, triethanolamine was readily biodegradable in the AFNOR (97% degradation based on DOC removal), STURM (91% degradation based on CO2 evolution) and OECD Screening test (96% degradation based on DOC removal, but little degradation was observed in the MITI (14 day test; 2% removal based on BOD and Closed Bottle (0-9% removal based on BOD).
**Ecotoxicity:**
Material is practically non-toxic to aquatic organisms on an acute basis (LC50 >100 mg/l in most sensitive species)
Fish LC50 (96 h): fathead minnow (Pimephales promelas) 1800-11800 mg/l; fathead minnow 5600 mg/l (Union Carbide);bluegill (Leuciscus idus) 7930 mg/l; goldfish (Carassius auratus) 5000 mg/l
Daphnia magna LC50 (24 h): 1390 - 2038 mg/l
Daphnia magna LC50 (48 h): 947 mg/l (Union Carbide)
Algae LC50 (48 h): 750 mg/l
Brine shrimp LC50: (Artemia salina) 5600 mg/l
Maximum acceptable toxicant concentration (MATC): 22 mg/l
Algal growth inhibition (Scenedesmus subspicatus) EC50: 470-750 mg/l
Inhibition of bacteria in effluent: 50% inhibition: >10000 mg/l
Inhibitory concentration (IC50) is OECD "Activated Sludge, Respiration Inhibition Test" (Guideline 209) is >1000 mg/l.
**DO NOT** discharge into sewer or waterways.

### Persistence and degradability

| Ingredient | Persistence: Water/Soil | Persistence: Air |
|---|---|---|
| triethanolamine | LOW | LOW |
| monoethanolamine | LOW | LOW |

### Bioaccumulative potential

| Ingredient | Bioaccumulation |
|---|---|
| triethanolamine | LOW (BCF = 3.9) |
| monoethanolamine | LOW (LogKOW = -1.31) |

### Mobility in soil

Continued...

| Ingredient | Mobility |
|---|---|
| triethanolamine | LOW (KOC = 10) |
| monoethanolamine | HIGH (KOC = 1) |

## SECTION 13 Disposal considerations

### Waste treatment methods

**Product / Packaging disposal**

- Containers may still present a chemical hazard/ danger when empty.
- Return to supplier for reuse/ recycling if possible.

Otherwise:

- If container can not be cleaned sufficiently well to ensure that residuals do not remain or if the container cannot be used to store the same product, then puncture containers, to prevent re-use, and bury at an authorised landfill.
- Where possible retain label warnings and SDS and observe all notices pertaining to the product.
- 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 licensed to accept chemical and / or pharmaceutical wastes or Incineration in a licensed apparatus (after admixture with suitable combustible material).
- Decontaminate empty containers. Observe all label safeguards until containers are cleaned and destroyed.
- Most polyurethane amine catalysts and their byproducts can be chemically or biologically degraded.
- Incineration is the preferred method of disposal; however, nitrogen oxide emission control may be required to meet current environmental regulations.
- Landfill disposal of amine-containing wastes is acceptable only where landfill sites are governmentally approved to receive this type of waste.
- A suitable industrial or municipal waste treatment system also can be used, depending upon the quality and quantity of waste to be treated, the treatment plant capability, and discharge water quality standards.
- Finally, all relevant local, state, and federal regulations and requirements governing the disposal of amine-containing wastes must be adhered to strictly.

Drum Disposal

- While the many laws, regulations, and ordinances governing the disposal of empty containers are varied and complex, one principle is common to all: the responsibility for the proper disposal of empty containers lies with the waste generator.
- Moreover, the waste generator is also responsible for any injury to health or environment caused by improper disposal.
- It is imperative, therefore, that all persons responsible for the disposal of chemical wastes (including “empty” drums) be familiar with the requirements of the legislation governing such 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.

## SECTION 14 Transport information

### Labels Required

| | |
|---|---|
| **Marine Pollutant** | NO |

### Land transport (DOT): NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS

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

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

### Transport in bulk according to Annex II of MARPOL and the IBC code

Not Applicable

### Transport in bulk in accordance with MARPOL Annex V and the IMSBC Code

| Product name | Group |
|---|---|
| triethanolamine | Not Available |
| monoethanolamine | Not Available |

### Transport in bulk in accordance with the ICG Code

| Product name | Ship Type |
|---|---|
| triethanolamine | Not Available |
| monoethanolamine | Not Available |

## SECTION 15 Regulatory information

Continued...

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

**triethanolamine is found on the following regulatory lists**

- International Agency for Research on Cancer (IARC) - Agents Classified by the IARC Monographs
- US - Massachusetts - Right To Know Listed Chemicals
- US Department of Homeland Security (DHS) - Chemical Facility Anti-Terrorism Standards (CFATS) - Chemicals of Interest
- US DOE Temporary Emergency Exposure Limits (TEELs)
- US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory
- US TSCA Chemical Substance Inventory - Interim List of Active Substances

**monoethanolamine is found on the following regulatory lists**

- US - Massachusetts - Right To Know Listed Chemicals
- US DOE Temporary Emergency Exposure Limits (TEELs)
- US NIOSH Recommended Exposure Limits (RELs)
- US OSHA Permissible Exposure Limits (PELs) Table Z-1
- US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory
- US TSCA Chemical Substance Inventory - Interim List of Active Substances

### Federal Regulations

### Superfund Amendments and Reauthorization Act of 1986 (SARA)

**Section 311/312 hazard categories**

| | |
|---|---|
| Flammable (Gases, Aerosols, Liquids, or Solids) | No |
| Gas under pressure | No |
| Explosive | No |
| Self-heating | No |
| Pyrophoric (Liquid or Solid) | No |
| Pyrophoric Gas | No |
| Corrosive to metal | No |
| Oxidizer (Liquid, Solid or Gas) | No |
| Organic Peroxide | No |
| Self-reactive | No |
| In contact with water emits flammable gas | No |
| Combustible Dust | No |
| Carcinogenicity | Yes |
| Acute toxicity (any route of exposure) | No |
| Reproductive toxicity | No |
| Skin Corrosion or Irritation | Yes |
| Respiratory or Skin Sensitization | Yes |
| Serious eye damage or eye irritation | Yes |
| Specific target organ toxicity (single or repeated exposure) | No |
| Aspiration Hazard | No |
| Germ cell mutagenicity | No |
| Simple Asphyxiant | No |
| Hazards Not Otherwise Classified | No |

**US. EPA CERCLA Hazardous Substances and Reportable Quantities (40 CFR 302.4)**

None Reported

### State Regulations

**US. California Proposition 65**

None Reported

### National Inventory Status

| National Inventory | Status |
|---|---|
| Australia - AIIC / Australia Non-Industrial Use | Yes |
| Canada - DSL | Yes |
| Canada - NDSL | No (triethanolamine; monoethanolamine) |
| China - IECSC | Yes |
| Europe - EINEC / ELINCS / NLP | Yes |
| Japan - ENCS | Yes |
| Korea - KECI | Yes |
| New Zealand - NZIoC | Yes |
| Philippines - PICCS | Yes |
| USA - TSCA | Yes |
| Taiwan - TCSI | Yes |
| Mexico - INSQ | Yes |
| Vietnam - NCI | Yes |

Continued...

| National Inventory | Status |
|---|---|
| Russia - FBEPH | Yes |
| ***Legend:*** | *Yes = All CAS declared ingredients are on the inventory*<br>*No = One or more of the CAS listed ingredients are not on the inventory. These ingredients may be exempt or will require registration.* |

## SECTION 16 Other information

| | |
|---|---|
| **Revision Date** | 14/10/2022 |
| **Initial Date** | 13/10/2022 |

### CONTACT POINT

IMMEDIATELY contact the local POISON CONTROL center for your area (24 hours): Alberta 1-800-332-1414 British Columbia 1-800-567-8911 Manitoba 1-855-776-4766 New Brunswick 911 Newfoundland and Labrador 1-866-727-1110 Northwest Territories 1-800-332-1414 Nova Scotia and Prince Edward Island 1-800-565-8161, 1-800-332-1414 or 911 Nunavut 1-800-268-9017 Ontario 1-800-268-9017 Quebec 1-800-463-5060 Saskatchewan 1-866-454-1212 Yukon Territory 867-393-8700 United States 1-800-222-1222 Contactez IMMÉDIATEMENT le centre ANTIPOISON de votre région (24 heures): Alberta 1-800-332-1414 Colombie-Britannique 1-800-567-8911 Manitoba 1-855-776-4766 Nouveau-Brunswick 911 Terre-Neuve-et-Labrador 1-866-727-1110 Territoires du Nord-Ouest 1-800-332-1414 Nouvelle-Écosse et Île-du-Prince-Édouard 1-800-565-8161, 1-800-332-1414 ou 911 Nunavut 1-800-268-9017 Ontario 1-800-268-9017 Québec 1-800-463-5060 Saskatchewan 1-866-454-1212 Territoire du Yukon 867-393-8700 États-Unis: 1-800-222-1222

### SDS Version Summary

| Version | Date of Update | Sections Updated |
|---|---|---|
| 0.2 | 14/10/2022 | Name |

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

### Definitions and abbreviations

PC－TWA: Permissible Concentration-Time Weighted Average
PC－STEL: Permissible Concentration-Short Term Exposure Limit
IARC: International Agency for Research on Cancer
ACGIH: American Conference of Governmental Industrial Hygienists
STEL: Short Term Exposure Limit
TEEL: Temporary Emergency Exposure Limit。
IDLH: Immediately Dangerous to Life or Health Concentrations
ES: Exposure Standard
OSF: Odour Safety Factor
NOAEL :No Observed Adverse Effect Level
LOAEL: Lowest Observed Adverse Effect Level
TLV: Threshold Limit Value
LOD: Limit Of Detection
OTV: Odour Threshold Value
BCF: BioConcentration Factors
BEI: Biological Exposure Index
AIIC: Australian Inventory of Industrial Chemicals
DSL: Domestic Substances List
NDSL: Non-Domestic Substances List
IECSC: Inventory of Existing Chemical Substance in China
EINECS: European INventory of Existing Commercial chemical Substances
ELINCS: European List of Notified Chemical Substances
NLP: No-Longer Polymers
ENCS: Existing and New Chemical Substances Inventory
KECI: Korea Existing Chemicals Inventory
NZIoC: New Zealand Inventory of Chemicals
PICCS: Philippine Inventory of Chemicals and Chemical Substances
TSCA: Toxic Substances Control Act
TCSI: Taiwan Chemical Substance Inventory
INSQ: Inventario Nacional de Sustancias Químicas
NCI: National Chemical Inventory
FBEPH: Russian Register of Potentially Hazardous Chemical and Biological Substances

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