ETHANOLAMINE

Section 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME
ETHANOLAMINE

OTHER NAMES
C2-H7-N-O, C2-H7-N-O, HOCH2CH2NH2, "beta-aminoethyl alcohol", beta-ethanolamine, ethylolamine, glycinol, beta-hydroxyethylamine, 2-hydroxyethylamine, 2-hydroxyethylamine, MEA, Colamine, Olamine, "Thiofaco M-50", "Thiofaco M-50",Monoethanolamine

PROPER SHIPPING NAME
MONOETHANOLAMINE or ETHANOLAMINE

PRODUCT USE
Scrubbing acid gases (H2S, CO2), from gas streams; especially in ammonia synthesis. Used in pharmaceutical preparations. Base of non-ionic detergents for drycleaning, wool treatment, water paints, polishes, agricultural sprays; chemical intermediates. corrosion inhibitors, rubber accelerators.
Regeant

SUPPLIER
Company: S D FINE - CHEM LIMITED
Address:
315- 317, T.V.IND.ESTATE,
248 WORLI ROAD,
MUMBAI- 400 030, INDIA
technical@sdfine.com
Telephone: 91- 22 24959898
Telephone: 91- 22 24959899
Fax: 91- 22 24937232

Section 2 - HAZARDS IDENTIFICATION

HAZARD RATINGS

GHS Classification

Acute Aquatic Hazard Category 3
Acute Toxicity (Dermal) Category 4
Acute Toxicity (Inhalation) Category 4

continued...

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

EMERGENCY OVERVIEW

HAZARD
DANGER
Determined by using GHS criteria:
H302 H312 H332 H290 H314 H318 H402
Harmful if swallowed
Harmful in contact with skin
Harmful if inhaled
May be corrosive to metals
Causes severe skin burns and eye damage
Causes serious eye damage
Harmful to aquatic life

PRECAUTIONARY STATEMENTS

Prevention
Keep only in original container.
Do not breathe dust/fume/gas/mist/vapours/spray.
Avoid breathing dust/fume/gas/mist/vapours/spray.
Wash thoroughly after handling.
Do not eat, drink or smoke when using this product.
Use only outdoors or in a well-ventilated area.
Avoid release to the environment.
Wear protective gloves/protective clothing/eye protection/face protection.

Response
IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell.
IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
IF ON SKIN: Wash with plenty of soap and water.
IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.
IF INHALED: Remove to fresh air and keep at rest in a position comfortable for breathing.
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
Immediately call a POISON CENTER or doctor/physician.
Call a POISON CENTER or doctor/physician if you feel unwell.
Rinse mouth.
Wash contaminated clothing before reuse.
Absorb spillage to prevent material damage.

Storage
Store locked up.
Store in corrosive resistant container or with a resistant inner liner.

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Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

NAME	CAS RN	%
ethanolamine	141-43-5	>97

Section 4 - FIRST AID MEASURES

SWALLOWED
- For advice, contact a Poisons Information Centre or a doctor at once.
- Urgent hospital treatment is likely to be needed.
- If swallowed do NOT induce vomiting.
- If vomiting occurs, lean patient forward or place on left side (head-down position, if possible) to maintain open airway and prevent aspiration.
- Observe the patient carefully.
- Never give liquid to a person showing signs of being sleepy or with reduced awareness; i.e. becoming unconscious.
- Give water to rinse out mouth, then provide liquid slowly and as much as casualty can comfortably drink.
- Transport to hospital or doctor without delay.

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

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

INHALED
- If fumes or combustion products are inhaled remove from contaminated area.
- Lay patient down. Keep warm and rested.
- Prostheses such as false teeth, which may block airway, should be removed, where possible, prior to initiating first aid procedures.
- Apply artificial respiration if not breathing, preferably with a demand valve resuscitator, bag-valve mask device, or pocket mask as trained. Perform CPR if necessary.
- Transport to hospital, or doctor.
- Inhalation of vapours or aerosols (mists, fumes) may cause lung oedema.
- Corrosive substances may cause lung damage (e.g. lung oedema, fluid in the lungs).
- As this reaction may be delayed up to 24 hours after exposure, affected individuals need complete rest (preferably in semi-recumbent posture) and must be kept under medical observation even if no symptoms are (yet) manifested.
- Before any such manifestation, the administration of a spray containing a dexamethasone derivative or beclomethasone derivative may be considered.

This must definitely be left to a doctor or person authorised by him/her.
(ICSC13719).

continued...

NOTES TO PHYSICIAN
■ 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].

Section 5 - FIRE FIGHTING MEASURES

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

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

FIRE/EXPLOSION HAZARD
• Combustible.
• Slight fire hazard when exposed to heat or flame.
• Heating may cause expansion or decomposition leading to violent rupture of containers.
• On combustion, may emit toxic fumes of carbon monoxide (CO).
• May emit acrid smoke.
• Mists containing combustible materials may be explosive.
Combustion products include: carbon dioxide (CO_2), nitrogen oxides (NOx), other pyrolysis products typical of burning organic material.
May emit corrosive fumes.

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

Personal Protective Equipment
Gas tight chemical resistant suit.

Section 6 - ACCIDENTAL RELEASE MEASURES

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

MAJOR SPILLS
■ Chemical Class: bases
For release onto land: recommended sorbents listed in order of priority.

SORBENT TYPE	RANK	APPLICATION	COLLECTION	LIMITATIONS
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

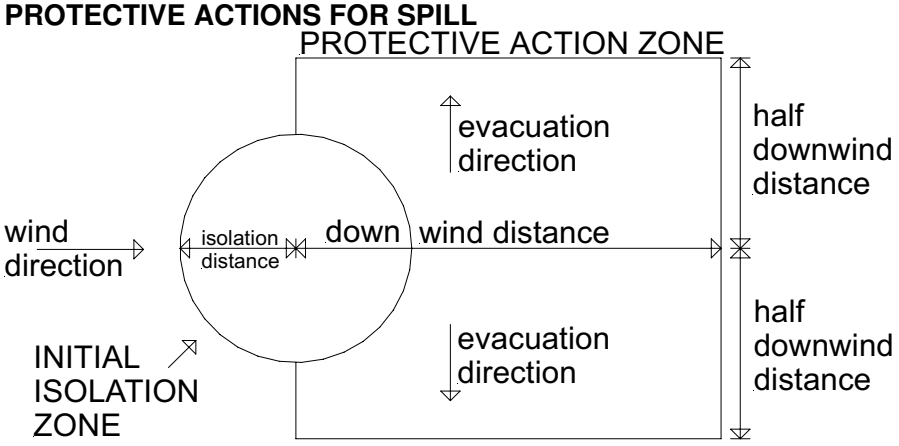
continued...

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.

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

PROTECTIVE ACTIONS FOR SPILL



From IERG (Canada/Australia)

Isolation Distance	25 metres
Downwind Protection Distance	250 metres
IERG Number	36

FOOTNOTES
1 PROTECTIVE ACTION ZONE is defined as the area in which people are at risk of harmful exposure. This zone assumes that random changes in wind direction confines the vapour plume to an area within 30 degrees on either side of the predominant wind direction, resulting in a crosswind protective action distance equal to the downwind protective action distance.
2 PROTECTIVE ACTIONS should be initiated to the extent possible, beginning with those closest to the spill and working away from the site in the downwind direction. Within the protective action zone a level of vapour

continued...

concentration may exist resulting in nearly all unprotected persons becoming incapacitated and unable to take protective action and/or incurring serious or irreversible health effects.
3 INITIAL ISOLATION ZONE is determined as an area, including upwind of the incident, within which a high probability of localised wind reversal may expose nearly all persons without appropriate protection to life-threatening concentrations of the material.
4 SMALL SPILLS involve a leaking package of 200 litres (55 US gallons) or less, such as a drum (jerrican or box with inner containers). Larger packages leaking less than 200 litres and compressed gas leaking from a small cylinder are also considered "small spills".

LARGE SPILLS involve many small leaking packages or a leaking package of greater than 200 litres, such as a cargo tank, portable tank or a "one-tonne" compressed gas cylinder.
5 Guide 153 is taken from the US DOT emergency response guide book.
6 IERG information is derived from CANUTEC - Transport Canada.

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

Section 7 - HANDLING AND STORAGE

PROCEDURE FOR HANDLING

• DO NOT allow clothing wet with material to stay in contact with skin.

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.

• DO NOT USE brass or copper containers / stirrers.
• Avoid all personal contact, including inhalation.
• Wear protective clothing when risk of exposure occurs.
• Use in a well-ventilated area.
• Avoid contact with moisture.
• Avoid contact with incompatible materials.
• When handling, DO NOT eat, drink or smoke.
• Keep containers securely sealed when not in use.
• Avoid physical damage to containers.
• Always wash hands with soap and water after handling.
• Work clothes should be laundered separately. Launder contaminated clothing before re-use.
• Use good occupational work practice.
• Observe manufacturer's storing and handling recommendations.
• Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions are maintained.

SUITABLE CONTAINER

• Glass container is suitable for laboratory quantities.
• DO NOT use aluminium, galvanised or tin-plated containers.
• Lined metal can, lined metal pail/ can.
• Plastic pail.
• Polyliner drum.
• Packing as recommended by manufacturer.
• Check all containers are clearly labelled and free from leaks.

For low viscosity materials

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

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

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

may be used.

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

STORAGE INCOMPATIBILITY
• Avoid strong acids, acid chlorides, acid anhydrides and chloroformates.
• Avoid contact with copper, aluminium and their alloys.
• Avoid reaction with oxidising agents.
Monoethanolamine
• is a strong organic base
• reacts violently with strong oxidisers, strong acids (with spattering)
• 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
• forms explosive mixture with sodium perchlorate
• reacts with iron forming tris-ethanolamineiron
• may undergo a self-sustaining thermal decomposition when heated in excess of 250 degrees C
• attacks aluminium, copper, lead, tin, zinc, and their alloys
• attacks plastics, coatings an rubber.
Reacts with carbon dioxide in the air

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

SAFE STORAGE WITH OTHER CLASSIFIED CHEMICALS

+	+	+	+	X	+

+: May be stored together
O: May be stored together with specific preventions
X: Must not be stored together

Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE CONTROLS

Source	Material	TWA ppm	TWA mg/m³	STEL ppm	STEL mg/m³
Australia Exposure Standards	ethanolamine (Ethanolamine)	3	7.5	6	15

EMERGENCY EXPOSURE LIMITS

Material	Revised IDLH Value (mg/m3)	Revised IDLH Value (ppm)

continued...

ethanolamine	30

MATERIAL DATA

ETHANOLAMINE:

■ for monoethanolamine:

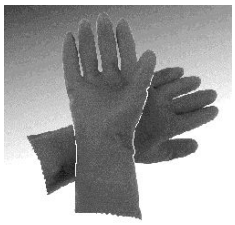
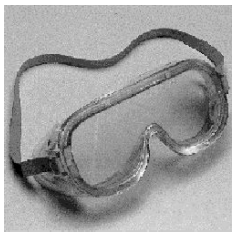
Odour threshold: 3-4 ppm.

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).

PERSONAL PROTECTION

EYE

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

HANDS/FEET

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

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

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

Select gloves tested to a relevant standard (e.g. Europe EN 374, US F739).

- 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) is recommended.
- When only brief contact is expected, a glove with a protection class of 3 or higher (breakthrough time greater than 60 minutes according to EN 374) is recommended.
- Contaminated gloves should be replaced.

Gloves must only be worn on clean hands. After using gloves, hands should be washed and dried thoroughly. Application of a non-perfumed moisturiser is recommended.

OTHER

- Overalls.
- PVC Apron.

continued...

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

The local concentration of material, quantity and conditions of use determine the type of personal protective equipment required. For further information consult your Occupational Health and Safety Advisor.

ENGINEERING CONTROLS

■ General exhaust is adequate under normal operating conditions. Local exhaust ventilation may be required in special circumstances. If risk of overexposure exists, wear approved respirator. Supplied-air type respirator may be required in special circumstances. Correct fit is essential to ensure adequate protection. Provide adequate ventilation in warehouses and enclosed storage areas. Air contaminants generated in the workplace possess varying "escape" velocities which, in turn, determine the "capture velocities" of fresh circulating air required to effectively remove the contaminant.

Type of Contaminant:	Air Speed:
solvent, vapours, degreasing etc., evaporating from tank (in still air).	0.25- 0.5 m/s (50- 100 f/min)
aerosols, fumes from pouring operations, intermittent container filling, low speed conveyer transfers, welding, spray drift, plating acid fumes, pickling (released at low velocity into zone of active generation)	0.5- 1 m/s (100- 200 f/min.)
direct spray, spray painting in shallow booths, drum filling, conveyer loading, crusher dusts, gas discharge (active generation into zone of rapid air motion)	1- 2.5 m/s (200- 500 f/min.)
grinding, abrasive blasting, tumbling, high speed wheel generated dusts (released at high initial velocity into zone of very high rapid air motion)	2.5- 10 m/s (500- 2000 f/min.)

Within each range the appropriate value depends on:

Lower end of the range	Upper end of the range
1: Room air currents minimal or favourable to capture	1: Disturbing room air currents
2: Contaminants of low toxicity or of nuisance value only.	2: Contaminants of high toxicity
3: Intermittent, low production.	3: High production, heavy use
4: Large hood or large air mass in motion	4: Small hood- local control only

Simple theory shows that air velocity falls rapidly with distance away from the opening of a simple extraction pipe. Velocity generally decreases with the square of distance from the extraction point (in simple cases). Therefore the air speed at the extraction point should be adjusted, accordingly, after reference to distance from the contaminating source. The air velocity at the extraction fan, for example, should be a minimum of 1-2 m/s (200-400 f/min) for extraction of solvents generated in a tank 2 meters distant from the extraction point. Other mechanical considerations, producing performance deficits within the extraction apparatus, make it essential that theoretical air velocities are multiplied by factors of 10 or more when extraction systems are installed or used.

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Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE
Clear, colourless, hygroscopic, viscous liquid. Mild ammoniacal odour. Strong base. Miscible with water, methanol and acetone.

PHYSICAL PROPERTIES
Liquid.
Mixes with water.
Corrosive.
Alkaline.

State	Liquid	Molecular Weight	61.10
Melting Range (°C)	10.5	Viscosity	20 cSt@40°C
Boiling Range (°C)	170.5	Solubility in water (g/L)	Miscible
Flash Point (°C)	94.5(DIN 51758)	pH (1% solution)	12.1
Decomposition Temp (°C)	Not Available	pH (as supplied)	Not available
Autoignition Temp (°C)	410	Vapour Pressure (kPa)	0.79 @ 60 C
Upper Explosive Limit (%)	27 (133.8 C)	Specific Gravity (water=1)	1.02
Lower Explosive Limit (%)	3.4 (88.3 C)	Relative Vapour Density (air=1)	2.11
Volatile Component (%vol)	100	Evaporation Rate	0.1 BuAc=1
Gas group	IIA		

Material	Value
ETHANOLAMINE:	
log Kow	- 1.31

Section 10 - CHEMICAL STABILITY AND REACTIVITY INFORMATION

CONDITIONS CONTRIBUTING TO INSTABILITY
• Presence of incompatible materials.
• Product is considered stable.
• Hazardous polymerisation will not occur.
For incompatible materials - refer to Section 7 - Handling and Storage.

Section 11 - TOXICOLOGICAL INFORMATION

POTENTIAL HEALTH EFFECTS

ACUTE HEALTH EFFECTS

SWALLOWED
■ Accidental ingestion of the material may be harmful; animal experiments indicate that ingestion of less than 150 gram may be fatal or may produce serious damage to the health of the individual.
■ The material can produce chemical burns within the oral cavity and gastrointestinal tract following ingestion.
■ 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, 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.

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EYE
■ The material can produce chemical burns to the eye following direct contact. Vapours or mists may be extremely irritating.
■ If applied to the eyes, this material causes severe eye damage.
■ 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.

SKIN
■ Skin contact with the material may be harmful; systemic effects may result following absorption.
■ The material can produce chemical burns following direct contactwith the skin.
■ There is some evidence to suggest that the material may cause moderate inflammation of the skin either following direct contact or after a delay of some time. Repeated exposure can cause contact dermatitis which is characterised by redness, swelling and blistering.
■ 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.
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.
Following a 4-hour occluded application to rabbit skin, there was severe erythema, oedema and necrosis with subsequent ulceration and scabbing.
■ Open cuts, abraded or irritated skin should not be exposed to this material.
■ Entry into the blood-stream, through, for example, cuts, abrasions 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.

INHALED
■ If inhaled, this material can irritate the throat andlungs of some persons.
■ Inhalation of vapours or aerosols (mists, fumes), generated by the material during the course of normal handling, may be harmful.
■ 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.

CHRONIC HEALTH EFFECTS
■ 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.
Substance accumulation, in the human body, may occur and may cause some concern following repeated or long-term occupational exposure.
Prolonged or chronic exposure to alkanolamines may result in liver, kidney or nervous system injury. Repeated inhalation may aggravate asthma and lung disease involving inflammation or scarring.
Results of animal testing with diethanolamine (DEA) and monoethanolamine (MEA) has shown a wide range of possible effects, including induction of tumours, developmental abnormalities and injury to the foetus and mother.
Many amines greatly sensitise the skin and respiratory system, and certain individuals, especially those predisposed to asthma and other allergic responses, may show allergic reactions when chronically exposed to alkanolamines.
In vitro and animal mutagenicity studies were negative.

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

TOXICITY	IRRITATION
Oral (rat) LD50: 2050 mg/kg	Skin (rabbit):505 mg open- Moderate

continued...

Oral (rat) LD50: 1510 mg/kg * Eye (rabbit): 0.76 mg - SEVERE
Dermal (rabbit) LD50: 1000 mg/kg
■ 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 on contact skin redness, swelling, the production of vesicles, scaling and thickening of the skin.
Asthma-like symptoms may continue for months or even years after exposure to the material ceases. This may be due to a non-allergenic condition known as reactive airways dysfunction syndrome (RADS) which can occur following exposure to high levels of highly irritating compound. Key criteria for the diagnosis of RADS include the absence of preceding respiratory disease, in a non-atopic individual, with abrupt onset of persistent asthma-like symptoms within minutes to hours of a documented exposure to the irritant. A reversible airflow pattern, on spirometry, with the presence of moderate to severe bronchial hyperreactivity on methacholine challenge testing and the lack of minimal lymphocytic inflammation, without eosinophilia, have also been included in the criteria for diagnosis of RADS. RADS (or asthma) following an irritating inhalation is an infrequent disorder with rates related to the concentration of and duration of exposure to the irritating substance. Industrial bronchitis, on the other hand, is a disorder that occurs as result of exposure due to high concentrations of irritating substance (often particulate in nature) and is completely reversible after exposure ceases. The disorder is characterised by dyspnea, cough and mucus production.
* Bayer

Section 12 - ECOLOGICAL INFORMATION

ethanolamine 48 hr EC50 (100) mg/L Common shrimp, sand shrimp Crustacea Source: Experimental

Refer to data for ingredients, which follows:

ETHANOLAMINE:

■ Fish LC50 (96hr.) (mg/l):	170
■ Algae IC50 (72hr.) (mg/l):	0.75- 1.6
■ log Kow (Sangster 1997):	- 1.31
■ log Pow (Verschueren 1983):	- 1.31
■ BOD5:	0.93
■ COD:	1.27
■ ThOD:	2.49

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

continued...

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. 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).
■ DO NOT discharge into sewer or waterways.

continued...

Section 12 - ECOLOGICAL INFORMATION

Ecotoxicity

Ingredient	Persistence: Water/Soil	Persistence: Air	Bioaccumulation	Mobility
ethanolamine	LOW		LOW	HIGH

GESAMP/EHS COMPOSITE LIST - GESAMP Hazard Profiles

Name / Cas No / RTECS No	EHS	TRN	A1a	A1b	A1	A2	B1	B2	C1	C2	C3	D1	D2	D3	E1	E2	E3
-	733	311	0	NI	0	R	2	0	1	1	3	3A	3			D	3
CAS:141-43- 5 / KJ5775000																	

Legend:
EHS=EHS Number (EHS=GESAMP Working Group on the Evaluation of the Hazards of Harmful Substances Carried by Ships) NRT=Net Register Tonnage, A1a=Bioaccumulation log Pow, A1b=Bioaccumulation BCF, A1=Bioaccumulation, A2=Biodegradation, B1=Acuteaquatic toxicity LC/ECIC50 (mg/l), B2=Chronic aquatic toxicity NOEC (mg/l), C1=Acute mammalian oral toxicity LD50 (mg/kg), C2=Acutemammalian dermal toxicity LD50 (mg/kg), C3=Acute mammalian inhalation toxicity LC50 (mg/kg), D1=Skin irritation & corrosion, D2=Eye irritation& corrosion, D3=Long-term health effects, E1=Tainting, E2=Physical effects on wildlife & benthic habitats, E3=Interference with coastal amenities,
For column A2: R=Readily biodegradable, NR=Not readily biodegradable.
For column D3: C=Carcinogen, M=Mutagenic, R=Reprotoxic, S=Sensitising, A=Aspiration hazard, T=Target organ systemic toxicity, L=Lunginjury, N=Neurotoxic, I=Immunotoxic.
For column E1: NT=Not tainting (tested), T=Tainting test positive.
For column E2: Fp=Persistent floater, F=Floater, S=Sinking substances.
The numerical scales start from 0 (no hazard), while higher numbers reflect increasing hazard.
(GESAMP/EHS Composite List of Hazard Profiles - Hazard evaluation of substances transported by ships)

Section 13 - DISPOSAL CONSIDERATIONS

- 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 MSDS and observe all notices pertaining to the product.

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

continued...

first.
- Where in doubt contact the responsible authority.
- Recycle wherever possible.
- Consult manufacturer for recycling options or consult local or regional waste management authority for disposal if no suitable treatment or disposal facility can be identified.
- Treat and neutralise at an approved treatment plant.
- Treatment should involve: Neutralisation with suitable dilute acid followed by: burial in a land-fill specifically licenced to accept chemical and / or pharmaceutical wastes or Incineration in a licenced apparatus (after admixture with suitable combustible material).
- Decontaminate empty containers. Observe all label safeguards until containers are cleaned and destroyed.

Section 14 - TRANSPORTATION INFORMATION

Labels Required: CORROSIVE

HAZCHEM:
2X

Land Transport UNDG:

Class or division:	8	Subsidiary risk:	None
UN No.:	2491	UN packing group:	III

Shipping Name:ETHANOLAMINE or ETHANOLAMINE SOLUTION

Air Transport IATA:

ICAO/IATA Class:	8	ICAO/IATA Subrisk:	None
UN/ID Number:	2491	Packing Group:	III
Special provisions:	A3		

Shipping Name: ETHANOLAMINE

Maritime Transport IMDG:

IMDG Class:	8	IMDG Subrisk:	None
UN Number:	2491	Packing Group:	III
EMS Number:	F- A, S- B	Special provisions:	223
Limited Quantities:	5 L		

Shipping Name: ETHANOLAMINE or ETHANOLAMINE SOLUTION

GESAMP hazard profiles for this material can be found in section 12 of the MSDS.

Section 15 - REGULATORY INFORMATION

REGULATIONS

ethanolamine (CAS: 141-43-5) is found on the following regulatory lists;

"Australia Exposure Standards","Australia Hazardous Substances","Australia High Volume Industrial Chemical List (HVICL)","Australia Inventory of Chemical Substances (AICS)","Australia Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP) - Appendix F (Part 3)","Australia Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP) - Schedule 5","Australia Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP) - Schedule 6","GESAMP/EHS Composite List - GESAMP Hazard Profiles","IMO IBC Code Chapter 17: Summary of minimum requirements","IMO MARPOL 73/78 (Annex II) - List of Noxious Liquid

continued...

Substances Carried in Bulk","International Council of Chemical Associations (ICCA) - High Production Volume List","OECD Representative List of High Production Volume (HPV) Chemicals"

Section 16 - OTHER INFORMATION

MSDS SECTION CHANGES

The following table displays the version number of and date on which each section was last changed.

Section Name	Version	Date	Section Name	Version	Date	Section Name	Version	Date
Ingredients	7	8- Jan- 2009	Storage (storage incompatibility)	4	16- Aug- 2006	Acute Health (eye)	4	16- Aug- 2006
Advice to Doctor	4	16- Aug- 2006	Storage (storage requirement)	4	16- Aug- 2006	Acute Health (inhaled)	4	16- Aug- 2006
First Aid (swallowed)	4	16- Aug- 2006	Storage (suitable container)	4	16- Aug- 2006	Acute Health (skin)	4	16- Aug- 2006
Fire Fighter (fire fighting)	4	16- Aug- 2006	Engineering Control	4	16- Aug- 2006	Acute Health (swallowed)	4	16- Aug- 2006
Fire Fighter (fire incompatibility)	4	16- Aug- 2006	Personal Protection (eye)	4	16- Aug- 2006	Chronic Health	4	16- Aug- 2006
Fire Fighter (fire/explosion hazard)	4	16- Aug- 2006	Personal Protection (hands/feet)	4	16- Aug- 2006	Toxicity and Irritation (Other)	4	16- Aug- 2006
Spills (major)	4	16- Aug- 2006	Personal Protection (other)	4	16- Aug- 2006	Environmental	4	16- Aug- 2006
Spills (minor)	4	16- Aug- 2006	Appearance	4	16- Aug- 2006	Disposal	4	16- Aug- 2006
Handling Procedure	4	16- Aug- 2006	Physical Properties	4	16- Aug- 2006			

The above information is believed to be accurate and represent the best information currently available to us, but does not represent any warranty expressed or implied of the properties of the product. User should make their own investigation to determine the suitability of the information for their particular purpose.

Issue Date: 25-Aug-2017