

# ETHYLENEDIAMINE

GHS Safety Data Sheet

Version No:4

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## Section 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

### PRODUCT NAME

ETHYLENEDIAMINE

### OTHER NAMES

C2-H8-N2, NH<sub>2</sub>CH<sub>2</sub>CH<sub>2</sub>NH<sub>2</sub>, "1, 2-diaminoethane", "1, 2-diaminoethane", "1, 2-ethanediamine", "1, 2-ethanediamine", dimethylenediamine, EDA, diaminoethane, "1, 2-ethylenediamine", "1, 2-ethylenediamine", "ethylene diamine"

### PROPER SHIPPING NAME

ETHYLENEDIAMINE

### PRODUCT USE

Used in manufacture of chelating agents (EDTA), epoxy curing agents, dimethyloethylene-urea resins, emulsifying agents, textile lubricants, antifreeze inhibitor.

### SUPPLIER

Company: S D FINE- CHEM LIMITED

Address:

315- 317, T.V. INDUSTRIAL ESTATE,

248, WORLI,

MUMBAI- 400030.INDIA.

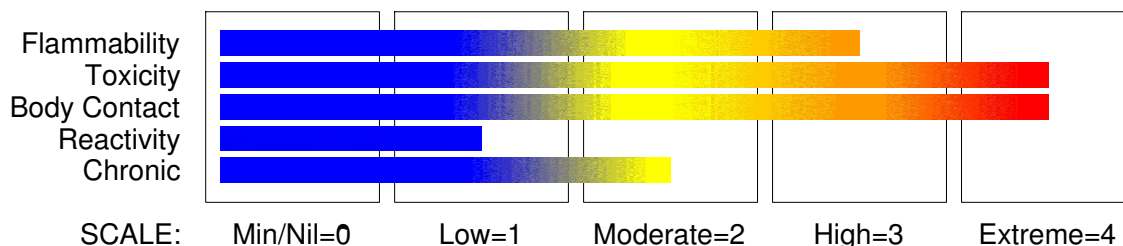
technical@sdfine.com

Telephone: 91- 22- 24959898

Telephone: 91- 22- 24959899

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### HAZARD RATINGS



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## Section 2 - HAZARDS IDENTIFICATION

### GHS Classification

Acute Toxicity (Dermal) Category 4  
Acute Toxicity (Inhalation) Category 3  
Acute Toxicity (Oral) Category 4  
Flammable Liquid Category 3  
Metal Corrosion Category 1  
Respiratory Sensitizer Category 1  
Skin Corrosion/Irritation Category 1B  
Skin Sensitizer Category 1



## EMERGENCY OVERVIEW

### HAZARD

DANGER

Determined by using GHS criteria:

H226 H331 H312 H302 H334 H317 H290 H314

Flammable liquid and vapour

Toxic if inhaled

Harmful in contact with skin

Harmful if swallowed

May cause allergic or asthmatic symptoms or breathing difficulties if inhaled

May cause allergic skin reaction

May be corrosive to metals

Causes severe skin burns and eye damage

### PRECAUTIONARY STATEMENTS

#### Prevention

Do not breathe dust/fume/gas/mist/vapours/spray.

Use only outdoors or in a well ventilated area.

Avoid breathing dust/fume/gas/mist/vapours/spray.

Do not eat, drink or smoke when using this product.

Wash hands thoroughly after handling.

Wear protective gloves/clothing

Do not breathe dust or mist.

In case of inadequate ventilation wear respiratory protection.

Contaminated clothing should not be allowed out of the workplace.

Wear protective gloves/clothing and eye/face protection.

Wash thoroughly after handling.

Ground/bond container and receiving equipment.

Use explosion-proof electrical/ventilating/lighting/equipment

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## Section 2 - HAZARDS IDENTIFICATION

Take precautionary measures against static discharge  
Use only non-sparking tools.  
Keep away from heat/sparks/open flame - No smoking.  
Keep container tightly closed.  
Wear protective gloves and eye/face protection.

### Response

In case of fire, use alcohol-type foam for extinction.  
Wash contaminated clothing before reuse.  
IF INHALED: Remove to fresh air and keep at rest in a position comfortable for breathing.  
If on skin or hair: remove/take off immediately all contaminated clothing. Rinse with water/shower.  
If experiencing respiratory symptoms call a POISON CENTER or doctor/physician.  
Absorb spillage to prevent material damage.  
If skin irritation or rash occurs, seek medical advice/attention.  
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.  
IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.  
IF INHALED: If breathing is difficult, remove to fresh air and keep at rest in a position comfortable for breathing.  
IF ON SKIN: Gently wash with plenty of soap and water.  
Immediately call a POISON CENTER or doctor/physician.  
Call a POISON CENTER or doctor/physician if you feel unwell.  
Specific treatment: refer to Label or MSDS.

### Storage

Store locked up.  
Store in a corrosive resistant container with a resistant liner.

### Disposal

Dispose of contents and container in accordance with relevant legislation.

## Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

| NAME            | CAS RN   | %    |
|-----------------|----------|------|
| ethylenediamine | 107-15-3 | > 99 |

## 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.

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## Section 4 - FIRST AID MEASURES

### EYE

If this product comes in contact with the eyes:

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

### SKIN

If skin 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, without delay.

### 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.

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## Section 4 - FIRST AID MEASURES

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- 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

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### EXTINGUISHING MEDIA

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

### FIRE FIGHTING

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

### FIRE/EXPLOSION HAZARD

- Liquid and vapour are highly flammable.
  - Severe fire hazard when exposed to heat, flame and/or oxidisers.
  - Vapour may travel a considerable distance to source of ignition.
  - Heating may cause expansion or decomposition leading to violent rupture of containers.
  - On combustion, may emit toxic fumes of carbon monoxide (CO).
- Combustion products include: carbon monoxide (CO), carbon dioxide (CO<sub>2</sub>), nitrogen oxides (NO<sub>x</sub>), other pyrolysis products typical of burning organic material.  
May emit corrosive fumes.

### FIRE INCOMPATIBILITY

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

### Personal Protective Equipment

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

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## Section 6 - ACCIDENTAL RELEASE MEASURES

### EMERGENCY PROCEDURES

#### MINOR SPILLS

- Remove all ignition sources.
- Clean up all spills immediately.
- Avoid breathing vapours and contact with skin and eyes.
- Control personal contact by using protective equipment.
- Contain and absorb small quantities with vermiculite or other absorbent material.
- Wipe up.
- Collect residues in a flammable waste container.

#### MAJOR SPILLS

Chemical Class: amines, alkyl

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         |
| wood fiber - pillow                 | 3    | throw       | pitchfork  | R, P, DGC, RT,  |
| treated wood fibre - pillow         | 3    | throw       | pitchfork  | DGC, RT         |
| foamed glass - pillow               | 4    | throw       | pitchfork  | R, P, DGC, RT   |
| LAND SPILL - MEDIUM                 |      |             |            |                 |
| cross- linked polymer - particulate | 1    | blower      | skiploader | R, W, SS        |
| cross- linked polymer - pillow      | 2    | throw       | skiploader | R, DGC, RT      |
| sorbent clay - particulate          | 3    | blower      | skiploader | R, I, P         |
| polypropylene - particulate         | 3    | blower      | skiploader | W, SS, DGC      |
| expanded mineral - particulate      | 4    | blower      | skiploader | R, I, W, P, DGC |
| polypropylene - mat                 | 4    | throw       | skiploader | DGC, RT         |

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## Section 6 - ACCIDENTAL RELEASE MEASURES

### 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.
- May be violently or explosively reactive.
- Wear full body protective clothing with breathing apparatus.
- Prevent, by any means available, spillage from entering drains or water course.
- No smoking, naked lights or ignition sources.
- Increase ventilation.
- Stop leak if safe to do so.
- Water spray or fog may be used to disperse vapour.
- Contain or absorb spill with sand, earth or vermiculite.
- Use only spark-free shovels and explosion proof equipment.
- Collect recoverable product into labelled containers for recycling.
- Collect solid residues and seal in labelled drums for disposal.
- Wash area and prevent runoff into drains.
- After clean up operations, decontaminate and launder all protective clothing and equipment before storing and re-using.
- If contamination of drains or waterways occurs, advise emergency services.

### EMERGENCY RESPONSE PLANNING GUIDELINES (ERPG)

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

life-threatening health effects is:

ethylenediamine 1000 ppm

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

ethylenediamine 20 ppm

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

ethylenediamine 10 ppm

The threshold concentration below which most people will experience no appreciable risk of health effects:

ethylenediamine 10 ppm

American Industrial Hygiene Association (AIHA)

Ingredients considered according to the following cutoffs

|                 |               |               |              |
|-----------------|---------------|---------------|--------------|
| Very Toxic (T+) | $\geq 0.1\%$  | Toxic (T)     | $\geq 3.0\%$ |
| R50             | $\geq 0.25\%$ | Corrosive (C) | $\geq 5.0\%$ |
| R51             | $\geq 2.5\%$  |               |              |

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## Section 6 - ACCIDENTAL RELEASE MEASURES

else  $\geq 10\%$   
where percentage is percentage of ingredient found in the mixture

### SAFE STORAGE WITH OTHER CLASSIFIED CHEMICALS



+: May be stored together

O: May be stored together with specific precautions

X: Must not be stored together

**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.

- Avoid all personal contact, including inhalation.
- Wear protective clothing when risk of exposure occurs.
- Use in a well-ventilated area.
- WARNING: To avoid violent reaction, ALWAYS add material to water and NEVER water to material.
- Avoid smoking, naked lights or ignition sources.
- Avoid contact with incompatible materials.
- When handling, DO NOT eat, drink or smoke.
- Keep containers securely sealed when not in use.
- Avoid physical damage to containers.
- Always wash hands with soap and water after handling.
- Work clothes should be laundered separately. 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.
- Containers, even those that have been emptied, may contain explosive vapours.
- Do NOT cut, drill, grind, weld or perform similar operations on or near containers.

### SUITABLE CONTAINER

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

### STORAGE INCOMPATIBILITY

Avoid strong acids.  
Avoid contact with copper, aluminium and their alloys.  
Avoid reaction with oxidising agents.

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## Section 7 - HANDLING AND STORAGE

### STORAGE REQUIREMENTS

- Store in approved flammable liquid storage area.
  - No smoking, naked lights/ignition sources.
  - Keep containers securely sealed.
  - Store away from incompatible materials in a cool, dry, well-ventilated area.
  - 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.

## Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

### EXPOSURE CONTROLS

The following materials had no OELs on our records

- ethylenediamine:

CAS:107- 15- 3 CAS:8030- 24- 8 CAS:85404- 18- 8

### EMERGENCY EXPOSURE LIMITS

| Material        | Revised IDLH Value (mg/m3) | Revised IDLH Value (ppm) |
|-----------------|----------------------------|--------------------------|
| ethylenediamine |                            | 1, 000                   |

### ODOUR SAFETY FACTOR (OSF)

OSF=10 (ETHYLENEDIAMINE)

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                                                                                                        |

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## Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

### MATERIAL DATA

Based on a dietary study with rats in which no adverse effects were observed at 23 mg/kg/day free base and the no observed effects in rats exposed by inhalation at 59 ppm, the recommended TLV-TWA is thought to provide sufficient margin of safety.

OSHA has determined that a skin notation is necessary for substances that have a median LD50 of less than 1000 mg/kg.

### 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

Suitability and durability of glove type is dependent on usage. Factors such as:

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

are important in the selection of gloves.

Elbow length PVC gloves.

When handling corrosive liquids, wear trousers or overalls outside of boots, to avoid spills entering boots.

NOTE: The material may produce skin sensitisation in predisposed individuals. Care must be taken, when removing gloves and other protective equipment, to avoid all possible skin contact.

#### OTHER

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

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## Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

### 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: ethylenediamine

Protective Material

|             |   |
|-------------|---|
| BUTYL       | A |
| SARANEX- 23 | A |
| TEFLON      | A |
| NEOPRENE    | C |
| PE          | C |
| PVC         | C |

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.

### RESPIRATOR

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

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

\* - Continuous Flow

\*\* - Continuous-flow or positive pressure demand.

The local concentration of material, quantity and conditions of use determine the type of personal protective equipment required.

For further information consult  
your

Occupational Health and Safety Advisor.

### ENGINEERING CONTROLS

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

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# ETHYLENEDIAMINE

## Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

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:<br>solvent, vapours, degreasing etc., evaporating from tank (in still air).<br>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)<br>direct spray, spray painting in shallow booths, drum filling, conveyer loading, crusher dusts, gas discharge (active generation into zone of rapid air motion)<br>grinding, abrasive blasting, tumbling, high speed wheel generated dusts (released at high initial velocity into zone of very high rapid air motion). | Air Speed:<br>0.25- 0.5 m/s (50- 100 f/min.)<br><br>0.5- 1 m/s (100- 200 f/min.)<br><br>1- 2.5 m/s (200- 500 f/min.)<br><br>2.5- 10 m/s (500- 2000 f/min.) |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|

Within each range the appropriate value depends on:

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

## Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

### APPEARANCE

Clear alkaline flammable liquid; dissolves in water.  
Strong ammonia-amine like odour.  
Soluble in alcohol, slightly soluble in ether, insoluble in benzene.  
Fumes in air. Hygroscopic, and absorbs carbon dioxide from air.

### PHYSICAL PROPERTIES

Liquid.

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## Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

Mixes with water.  
Corrosive.  
Alkaline.  
Toxic or noxious vapours/gas.

Molecular Weight: 60.0986  
Melting Range (°C): 8.5  
Solubility in water (g/L): Miscible  
pH (1% solution): 9.25 @ 25% Soln.  
Volatile Component (%vol): 100 approx.  
Relative Vapour Density (air=1): 2.07  
Lower Explosive Limit (%): 5.8  
Autoignition Temp (°C): 380  
State: Liquid

Boiling Range (°C): 117  
Specific Gravity (water=1): 0.90  
pH (as supplied): 9.1  
Vapour Pressure (kPa): 1.33 @ 20 C  
Evaporation Rate: Fast  
Flash Point (°C): 33.9  
Upper Explosive Limit (%): 11.1  
Decomposition Temp (°C): Not Available  
Viscosity: Not Available

log Kow (Sangster 1997): - 2.04

## Section 10 - CHEMICAL STABILITY AND REACTIVITY INFORMATION

### CONDITIONS CONTRIBUTING TO INSTABILITY

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

## Section 11 - TOXICOLOGICAL INFORMATION

### POTENTIAL HEALTH EFFECTS

#### ACUTE HEALTH EFFECTS

##### SWALLOWED

The material can produce chemical burns within the oral cavity and gastrointestinal tract following ingestion.

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

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

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# ETHYLENEDIAMINE

## Section 11 - TOXICOLOGICAL INFORMATION

minute amounts. Death may also be delayed as a result of perforation, pneumonia or the effects of stricture formation.

Aliphatic and alicyclic amines are generally well absorbed from the gut. Corrosive action may cause tissue damage throughout the gastrointestinal tract. Detoxification is thought to occur in the liver, kidney and intestinal mucosa with the enzymes, monoamine oxidase and diamine oxidase (histaminase) having a significant role.

### EYE

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

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

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.

Vapours of volatile amines cause eye irritation with lachrymation, conjunctivitis and minor transient corneal oedema which results in "halos" around lights (glauropsia). This effect disappears spontaneously within a few hours of the end of exposure, and does not produce physiological after-effects. Although no detriment to the eye occurs as such, glauropsia predisposes an affected individual to physical accidents and reduces the ability to undertake skilled tasks such as driving a vehicle.

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

### SKIN

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

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

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

The material produces severe skin irritation; evidence exists, or practical experience predicts, that the material either:

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

NOTE: Prolonged contact is unlikely, given the severity of response, but repeated exposures may produce severe ulceration.

Skin contact with alkaline corrosives may produce severe pain and burns; brownish stains may develop. The corroded area may be soft, gelatinous and necrotic; tissue destruction may be deep.

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.

Volatile amine vapours produce primary skin irritation and dermatitis. Direct local contact, with the lower molecular weight liquids, may produce skin burns. Percutaneous

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# ETHYLENEDIAMINE

## Section 11 - TOXICOLOGICAL INFORMATION

absorption of simple aliphatic amines is known to produce lethal effects often the same as that for oral administration. Cutaneous sensitisation has been recorded chiefly due to ethyleneamines. Histamine release following exposure to many aliphatic amines may result in "triple response" (white vasoconstriction, red flare and wheal) in human skin.

### INHALED

Inhalation of vapours or aerosols (mists, fumes), generated by the material during the course of normal handling, may produce severe damage to the health of the individual. Relatively small amounts absorbed through the lungs may prove fatal.

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.

Inhalation hazard is increased at higher temperatures.

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

### 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.

Limited evidence suggests that repeated or long-term occupational exposure may produce cumulative health effects involving organs or biochemical systems.

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

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

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

Respiratory sensitisation may result in allergic/asthma like responses; from coughing and

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## Section 11 - TOXICOLOGICAL INFORMATION

minor breathing difficulties to bronchitis with wheezing, gasping.  
Sensitisation may give severe responses to very low levels of exposure, in situations where exposure may occur.

### TOXICITY AND IRRITATION

#### TOXICITY

Oral (rat) LD50: 500 mg/kg  
Inhalation (human) TCLo: 200 ppm  
Inhalation (rat) LCLo: 4000 ppm/8h  
Dermal (rabbit) LD50: 750 mg/kg  
Inhalation (Human) TCLo: 200 ppm/4h  
Oral (Rat) LD50: 1200 mg/kg  
Intraperitoneal (Rat) LD50: 76 mg/kg  
Subcutaneous (Rat) LD50: 300 mg/kg  
Inhalation (Mouse) LC50: 300 mg/m<sup>3</sup>/4h  
Intraperitoneal (Mouse) LD50: 200 mg/kg  
Intravenous (Dog) LD: 100 mg/kg  
Subcutaneous (Rabbit) LD: 500 mg/kg  
Oral (Guinea) pig: LD50 470 mg/kg

#### IRRITATION

Skin(rabbit):450 mg Open Moderate  
Skin(rabbit):10 mg/24h Open SEVERE  
Eye (rabbit):0.67 mg SEVERE  
Eye (rabbit):0.75mg/24h SEVERE

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

Histologically there may be intercellular oedema of the spongy layer (spongiosis) and intracellular oedema of the epidermis. Prolonged contact is unlikely, given the severity of response, but repeated exposures may produce severe ulceration. Asthma-like symptoms may continue for months or even years after exposure to the material ceases. This may be due to a non-allergenic condition known as reactive airways dysfunction syndrome (RADS) which can occur following exposure to high levels of highly irritating compound. Key criteria for the diagnosis of RADS include the absence of preceding respiratory disease, in a non-atopic individual, with abrupt onset of persistent asthma-like symptoms within minutes to hours of a documented exposure to the irritant. A reversible airflow pattern, on spirometry, with the presence of moderate to severe bronchial hyperreactivity on methacholine challenge testing and the lack of minimal lymphocytic inflammation, without eosinophilia, have also been included in the criteria for diagnosis of RADS. RADS (or asthma) following an irritating inhalation is an infrequent disorder with rates related to the concentration of and duration of exposure to the irritating substance. Industrial bronchitis, on the other hand, is a disorder that occurs as result of exposure due to high concentrations of irritating substance (often particulate in nature) and is completely reversible after exposure ceases. The disorder is characterised by dyspnea, cough and mucus production. Allergic reactions which develop in the respiratory passages as bronchial asthma or rhinoconjunctivitis, are mostly the result of reactions of the allergen with specific

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antibodies of the IgE class and belong in their reaction rates to the manifestation of the immediate type. In addition to the allergen-specific potential for causing respiratory sensitisation, the amount of the allergen, the exposure period and the genetically determined disposition of the exposed person are likely to be decisive. Factors which increase the sensitivity of the mucosa may play a role in predisposing a person to allergy. They may be genetically determined or acquired, for example, during infections or exposure to irritant substances. Immunologically the low molecular weight substances become complete allergens in the organism either by binding to peptides or proteins (haptens) or after metabolism (prohaptens). Particular attention is drawn to so-called atopic diathesis which is characterised by an increased susceptibility to allergic rhinitis, allergic bronchial asthma and atopic eczema (neurodermatitis) which is associated with increased IgE synthesis. Exogenous allergic alveolitis is induced essentially by allergen specific immune-complexes of the IgG type; cell-mediated reactions (T lymphocytes) may be involved. Such allergy is of the delayed type with onset up to four hours following exposure.

## Section 12 - ECOLOGICAL INFORMATION

|                                    |            |
|------------------------------------|------------|
| Fish LC50 (96hr.) (mg/l):          | 230 (48hr) |
| Daphnia magna EC50 (48hr.) (mg/l): | 0.88       |
| Algae IC50 (72hr.) (mg/l):         | 0.08- 0.85 |
| log Kow (Sangster 1997):           | - 2.04     |
| BOD5:                              | 0.01       |
| COD:                               | 1.33       |
| ThOD:                              | 3.45       |

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

DO NOT discharge into sewer or waterways.

BOD 5 if unstated: 0.01

COD: 1.33

ThOD: 3.45

Toxicity Fish: LC50(48)18-230mg/L

Nitrif. inhib.: 43% inhib at 50mg/L

Degradation Biological: some

## Section 13 - DISPOSAL CONSIDERATIONS

- 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 licenced land-fill or Incineration in a licenced apparatus
  - Decontaminate empty containers. Observe all label safeguards until containers are cleaned and destroyed.
  - 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

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## Section 13 - DISPOSAL CONSIDERATIONS

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.

### WASTE DISPOSAL PROCEDURES

• Collect and package recoverable quantities of ethylenediamine for incineration. Wear protective clothing for the disposal of small quantities. Dissolve the ethylenediamine in 100mL of 3M sulfuric acid. Add 10g of potassium permanganate in small portions. Allow the mixture to stir overnight. Add solid sodium bisulfite until a colourless solution forms. Neutralise with 5% aqueous sodium hydroxide solution. Empty the liquid portion into the drain with water. Discard any recoverable solid with normal refuse [Armour 1996].

### SPILLAGE DISPOSAL

• Shut off all ignition sources. Clear area of personnel. Wear self contained breathing apparatus, nitrile rubber gloves and protective clothing to control personal contact from ethylenediamine. Cover and contain the spill with a 1:1:1 mixture by weight of sodium carbonate or calcium carbonate, bentonite and sand. Scoop the absorbed mixture into a container and place in a well ventilated area.  
Add water to dissolve the sodium carbonate. Add 3M sulfuric acid until a pH of 1 is obtained. Add 1mL of ethylenediamine for each 10g of potassium permanganate. Allow the mixture to be stirred and leave overnight. Add solid sodium bisulfite with stirring until the solution is colourless. Neutralise with 5% aqueous sodium hydroxide solution. Allow the solids to settle.

## Section 14 - TRANSPORTATION INFORMATION



Labels Required: CORROSIVE, FLAMMABLE LIQUID  
HAZCHEM: 2W

### UNDG:

Dangerous Goods Class: 8  
UN Number: 1604  
Shipping Name: ETHYLENEDIAMINE

Subrisk: 3  
Packing Group: II

### Air Transport IATA:

ICAO/IATA Class: 8  
UN/ID Number: 1604  
ERG Code: 8F  
Shipping name: ETHYLENEDIAMINE

ICAO/IATA Subrisk: 3  
Packing Group: II

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## Section 14 - TRANSPORTATION INFORMATION

### Maritime Transport IMDG:

|                               |            |                |    |
|-------------------------------|------------|----------------|----|
| IMDG Class:                   | 8          | IMDG Subrisk:  | 3  |
| UN Number:                    | 1604       | Packing Group: | II |
| EMS Number:                   | F- E, S- C |                |    |
| Shipping name:ETHYLENEDIAMINE |            |                |    |

## Section 15 - REGULATORY INFORMATION

### REGULATIONS

ethylenediamine (CAS: 107-15-3) is found on the following regulatory lists;  
IMO MARPOL 73/78 (Annex II) - List of Noxious Liquid Substances Carried in Bulk  
International Council of Chemical Associations (ICCA) - High Production Volume List  
OECD Representative List of High Production Volume (HPV) Chemicals

No data available for ethylenediamine as CAS: 8030-24-8, CAS: 85404-18-8.

## Section 16 - OTHER INFORMATION

### INGREDIENTS WITH MULTIPLE CAS NUMBERS

| Ingredient Name | CAS                                    |
|-----------------|----------------------------------------|
| ethylenediamine | 107- 15- 3, 8030- 24- 8, 85404 - 18- 8 |

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.

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