



# SAFETY DATA SHEET

THE DOW CHEMICAL COMPANY

**Product name:** Amine EA Highers

**Issue Date:** 02/27/2018

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THE DOW CHEMICAL COMPANY encourages and expects you to read and understand the entire (M)SDS, as there is important information throughout the document. We expect you to follow the precautions identified in this document unless your use conditions would necessitate other appropriate methods or actions.

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## 1. IDENTIFICATION

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**Product name:** Amine EA Highers

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

**Identified uses:** Industrial uses: Chemical intermediate. Others.

**COMPANY IDENTIFICATION**

THE DOW CHEMICAL COMPANY  
2030 WILLARD H DOW CENTER  
MIDLAND MI 48674-0000  
UNITED STATES

**Customer Information Number:**

800-258-2436  
SDSQuestion@dow.com

**EMERGENCY TELEPHONE NUMBER**

**24-Hour Emergency Contact:** CHEMTREC +1 800-424-9300

**Local Emergency Contact:** 800-424-9300

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## 2. HAZARDS IDENTIFICATION

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**Hazard classification**

This material is hazardous under the criteria of the Federal OSHA Hazard Communication Standard 29CFR 1910.1200.

Acute toxicity - Category 4 - Oral

Acute toxicity - Category 4 - Inhalation

Skin corrosion - Category 1B

Serious eye damage - Category 1

Skin sensitisation - Category 1

Reproductive toxicity - Category 1B

Effects on or via lactation

Specific target organ toxicity - single exposure - Category 3

Specific target organ toxicity - repeated exposure - Category 1 - Inhalation

**Label elements**

**Hazard pictograms**



Signal word: **DANGER!**

### Hazards

Harmful if swallowed or if inhaled.  
Causes severe skin burns and eye damage.  
May cause an allergic skin reaction.  
May cause respiratory irritation.  
May damage fertility or the unborn child.  
May cause harm to breast-fed children.  
Causes damage to organs (Respiratory Tract) through prolonged or repeated exposure if inhaled.

### Precautionary statements

#### Prevention

Obtain special instructions before use.  
Do not handle until all safety precautions have been read and understood.  
Do not breathe dust/ fume/ gas/ mist/ vapours/ spray.  
Avoid contact during pregnancy/ while nursing.  
Wash skin thoroughly after handling.  
Do not eat, drink or smoke when using this product.  
Use only outdoors or in a well-ventilated area.  
Contaminated work clothing should not be allowed out of the workplace.  
Wear protective gloves/ protective clothing/ eye protection/ face protection.

#### Response

IF SWALLOWED: Call a POISON CENTER/doctor if you feel unwell. Rinse mouth.  
IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.  
IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.  
IF INHALED: Remove person to fresh air and keep comfortable for breathing. Immediately call a POISON CENTER/doctor.  
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/doctor.  
IF exposed or concerned: Get medical advice/ attention.  
If skin irritation or rash occurs: Get medical advice/ attention.  
Wash contaminated clothing before reuse.

#### Storage

Store in a well-ventilated place. Keep container tightly closed.  
Store locked up.

#### Disposal

Dispose of contents/ container to an approved waste disposal plant.

### Other hazards

No data available

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### 3. COMPOSITION/INFORMATION ON INGREDIENTS

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This product is a mixture.

Component	CASRN	Concentration
Aminoethylethanolamine	111-41-1	> 60.0 - < 95.0 %
Triethylenetetramine	112-24-3	> 1.0 - < 15.0 %
n-(2-Aminoethyl)piperazine	140-31-8	> 0.0 - < 8.0 %
2-Piperazinoethanol	103-76-4	> 0.0 - < 5.0 %
Diethylenetriamine	111-40-0	> 0.0 - < 5.0 %
Tetraethylenepentamine	112-57-2	> 0.0 - < 5.0 %
Pentaethylenehexamine mixture	4067-16-7	> 0.0 - < 5.0 %

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### 4. FIRST AID MEASURES

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#### Description of first aid measures

##### General advice:

First Aid responders should pay attention to self-protection and use the recommended protective clothing (chemical resistant gloves, splash protection). If potential for exposure exists refer to Section 8 for specific personal protective equipment.

**Inhalation:** Move person to fresh air. If not breathing, give artificial respiration; if by mouth to mouth use rescuer protection (pocket mask, etc). If breathing is difficult, oxygen should be administered by qualified personnel. Call a physician or transport to a medical facility.

**Skin contact:** Immediate continued and thorough washing in flowing water for at least 30 minutes is imperative while removing contaminated clothing. Prompt medical consultation is essential. Wash clothing before reuse. Properly dispose of leather items such as shoes, belts, and watchbands. Suitable emergency safety shower facility should be immediately available.

**Eye contact:** Wash immediately and continuously with flowing water for at least 30 minutes. Remove contact lenses after the first 5 minutes and continue washing. Obtain prompt medical consultation, preferably from an ophthalmologist. Suitable emergency eye wash facility should be immediately available.

**Ingestion:** Do not induce vomiting. Give one cup (8 ounces or 240 ml) of water or milk if available and transport to a medical facility. Do not give anything by mouth unless the person is fully conscious.

**Most important symptoms and effects, both acute and delayed:** Aside from the information found under Description of first aid measures (above) and Indication of immediate medical attention and special treatment needed (below), any additional important symptoms and effects are described in Section 11: Toxicology Information.

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

**Notes to physician:** Maintain adequate ventilation and oxygenation of the patient. May cause asthma-like (reactive airways) symptoms. Bronchodilators, expectorants, antitussives and corticosteroids may be of help. Respiratory symptoms, including pulmonary edema, may be delayed. Persons receiving significant exposure should be observed 24-48 hours for signs of respiratory distress. If burn is present, treat as any thermal burn, after decontamination. Due to irritant properties, swallowing may result in burns/ulceration of mouth, stomach and lower gastrointestinal tract with subsequent stricture. Aspiration of vomitus may cause lung injury. Suggest endotracheal/esophageal control if lavage is done. No specific antidote. Treatment of exposure should be directed at the control of symptoms and the clinical condition of the patient. Excessive exposure may aggravate preexisting asthma and other respiratory disorders (e.g. emphysema, bronchitis, reactive airways dysfunction syndrome).

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## 5. FIREFIGHTING MEASURES

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**Suitable extinguishing media:** Water fog or fine spray. Dry chemical fire extinguishers. Carbon dioxide fire extinguishers. Foam. Alcohol resistant foams (ATC type) are preferred. General purpose synthetic foams (including AFFF) or protein foams may function, but will be less effective.

**Unsuitable extinguishing media:** Do not use direct water stream. May spread fire.

**Special hazards arising from the substance or mixture**

**Hazardous combustion products:** During a fire, smoke may contain the original material in addition to combustion products of varying composition which may be toxic and/or irritating. Combustion products may include and are not limited to: Nitrogen oxides. Carbon monoxide. Carbon dioxide.

**Unusual Fire and Explosion Hazards:** Container may rupture from gas generation in a fire situation. Violent steam generation or eruption may occur upon application of direct water stream to hot liquids.

**Advice for firefighters**

**Fire Fighting Procedures:** Keep people away. Isolate fire and deny unnecessary entry. Use water spray to cool fire exposed containers and fire affected zone until fire is out and danger of reignition has passed. Fight fire from protected location or safe distance. Consider the use of unmanned hose holders or monitor nozzles. Immediately withdraw all personnel from the area in case of rising sound from venting safety device or discoloration of the container. Burning liquids may be extinguished by dilution with water. Do not use direct water stream. May spread fire. Move container from fire area if this is possible without hazard. Burning liquids may be moved by flushing with water to protect personnel and minimize property damage.

**Special protective equipment for firefighters:** Wear positive-pressure self-contained breathing apparatus (SCBA) and protective fire fighting clothing (includes fire fighting helmet, coat, trousers, boots, and gloves). Avoid contact with this material during fire fighting operations. If contact is likely, change to full chemical resistant fire fighting clothing with self-contained breathing apparatus. If this is

not available, wear full chemical resistant clothing with self-contained breathing apparatus and fight fire from a remote location. For protective equipment in post-fire or non-fire clean-up situations, refer to the relevant sections.

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## 6. ACCIDENTAL RELEASE MEASURES

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**Personal precautions, protective equipment and emergency procedures:** Evacuate area. Refer to section 7, Handling, for additional precautionary measures. Only trained and properly protected personnel must be involved in clean-up operations. Keep upwind of spill. Ventilate area of leak or spill. Use appropriate safety equipment. For additional information, refer to Section 8, Exposure Controls and Personal Protection.

**Environmental precautions:** Prevent from entering into soil, ditches, sewers, waterways and/or groundwater. See Section 12, Ecological Information.

**Methods and materials for containment and cleaning up:** Contain spilled material if possible. Small spills: Absorb with materials such as: Clay. Dirt. Milsorb®. Sand. Do NOT use absorbent materials such as: Cellulose. Sawdust. Collect in suitable and properly labeled containers. Large spills: Dike area to contain spill. Dilute with large quantities of water. Pump into suitable and properly labeled containers. See Section 13, Disposal Considerations, for additional information.

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## 7. HANDLING AND STORAGE

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**Precautions for safe handling:** Do not get in eyes, on skin, on clothing. Do not swallow. Avoid prolonged or repeated contact with skin. Wash thoroughly after handling. Keep container closed. Avoid breathing vapor. Use with adequate ventilation. See Section 8, EXPOSURE CONTROLS AND PERSONAL PROTECTION.

Spills of these organic materials on hot fibrous insulations may lead to lowering of the autoignition temperatures possibly resulting in spontaneous combustion.

**Conditions for safe storage:** Store in a dry place. Do not store in: Zinc. Copper. Galvanized containers. Copper alloys. Additional storage and handling information on this product may be obtained by calling your sales or customer service contact.

### Storage stability

**Shelf life: Use within, Steel drums.** 24 Month

**Bulk** 6 Month

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## 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

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### Control parameters

If exposure limits exist, they are listed below. If no exposure limits are displayed, then no values are applicable.

Component	Regulation	Type of listing	Value/Notation
Aminoethylethanolamine	Dow IHG	TWA	0.5 mg/m3
	Dow IHG	TWA	Skin Sensitizer
Triethylenetetramine	US WEEL	TWA	1 ppm
	US WEEL	TWA	SKIN

Diethylenetriamine	ACGIH	TWA	1 ppm
	ACGIH	TWA	SKIN
Tetraethylenepentamine	US WEEL	TWA	5 mg/m3
	US WEEL	TWA	SKIN, DSEN

**Exposure controls**

**Engineering controls:** Use engineering controls to maintain airborne level below exposure limit requirements or guidelines. If there are no applicable exposure limit requirements or guidelines, use only with adequate ventilation. Local exhaust ventilation may be necessary for some operations.

**Individual protection measures**

**Eye/face protection:** Use chemical goggles.

**Skin protection**

**Hand protection:** Use gloves chemically resistant to this material. Examples of preferred glove barrier materials include: Polyethylene. Ethyl vinyl alcohol laminate ("EVAL"). Examples of acceptable glove barrier materials include: Butyl rubber. Natural rubber ("latex"). Neoprene. Nitrile/butadiene rubber ("nitrile" or "NBR"). Polyvinyl alcohol ("PVA"). Polyvinyl chloride ("PVC" or "vinyl"). Viton. NOTICE: The selection of a specific glove for a particular application and duration of use in a workplace should also take into account all relevant workplace factors such as, but not limited to: Other chemicals which may be handled, physical requirements (cut/puncture protection, dexterity, thermal protection), potential body reactions to glove materials, as well as the instructions/specifications provided by the glove supplier.

**Other protection:** Use protective clothing chemically resistant to this material. Selection of specific items such as face shield, boots, apron, or full body suit will depend on the task.

**Respiratory protection:** Respiratory protection should be worn when there is a potential to exceed the exposure limit requirements or guidelines. If there are no applicable exposure limit requirements or guidelines, use an approved respirator. Selection of air-purifying or positive-pressure supplied-air will depend on the specific operation and the potential airborne concentration of the material. For emergency conditions, use an approved positive-pressure self-contained breathing apparatus.

The following should be effective types of air-purifying respirators: Organic vapor cartridge.

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## 9. PHYSICAL AND CHEMICAL PROPERTIES

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**Appearance**

<b>Physical state</b>	Liquid.
<b>Color</b>	Amber to Dark Brown
<b>Odor</b>	Slightly ammoniacal
<b>Odor Threshold</b>	No test data available
<b>pH</b>	No test data available
<b>Melting point/range</b>	Not applicable to liquids
<b>Freezing point</b>	-45 °C ( -49 °F) <i>Literature</i>
<b>Boiling point (760 mmHg)</b>	243 °C ( 469 °F) <i>Literature</i>

<b>Flash point</b>	<b>closed cup</b> 127 °C ( 261 °F) <i>ASTM D93-90</i> 127 °C ( 261 °F) <i>ASTM D93-90</i>
<b>Evaporation Rate (Butyl Acetate = 1)</b>	No test data available
<b>Flammability (solid, gas)</b>	Not applicable to liquids
<b>Lower explosion limit</b>	No test data available
<b>Upper explosion limit</b>	No test data available
<b>Vapor Pressure</b>	< 0.01 mmHg at 20 °C (68 °F) <i>Literature</i>
<b>Relative Vapor Density (air = 1)</b>	3.6 <i>Literature</i>
<b>Relative Density (water = 1)</b>	1.03 at 20 °C (68 °F) / 20 °C <i>Literature</i>
<b>Water solubility</b>	100 % at 20 °C (68 °F) <i>Literature</i>
<b>Partition coefficient: n-octanol/water</b>	No data available
<b>Auto-ignition temperature</b>	365 °C (689 °F) <i>Literature</i>
<b>Decomposition temperature</b>	No test data available No test data available
<b>Kinematic Viscosity</b>	98 mm <sup>2</sup> /s at 25 °C (77 °F) <i>Literature</i>
<b>Explosive properties</b>	No data available
<b>Oxidizing properties</b>	No data available
<b>Liquid Density</b>	1.035 g/cm <sup>3</sup> at -45 °C (-49 °F) <i>Literature</i> @ freezing pt.
<b>Softening point</b>	No data available
<b>Molecular weight</b>	No data available
<b>Pour point</b>	No data available

NOTE: The physical data presented above are typical values and should not be construed as a specification.

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## 10. STABILITY AND REACTIVITY

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**Reactivity:** No data available

**Chemical stability:** Stable under recommended storage conditions. See Storage, Section 7.  
Hygroscopic

**Possibility of hazardous reactions:** Polymerization will not occur.

**Conditions to avoid:** Exposure to elevated temperatures can cause product to decompose.  
Generation of gas during decomposition can cause pressure in closed systems. Avoid moisture.

**Incompatible materials:** Avoid contact with: Nitrites. Strong acids. Strong oxidizers. Product may potentially react with various halogenated organic solvents, resulting in temperature and/or pressure increases. Corrosive when wet. Heating above 60°C in the presence of aluminum can result in corrosion and generation of flammable hydrogen gas. Avoid unintended contact with: Halogenated hydrocarbons.

**Hazardous decomposition products:** Decomposition products depend upon temperature, air supply and the presence of other materials.

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## 11. TOXICOLOGICAL INFORMATION

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*Toxicological information appears in this section when such data is available.*

### Acute toxicity

#### Acute oral toxicity

Low toxicity if swallowed. Swallowing may result in gastrointestinal irritation or ulceration. Swallowing may result in burns of the mouth and throat.

As product: Single dose oral LD50 has not been determined.

Based on information for component(s):

LD50, Rat, > 1,700 mg/kg Estimated.

#### Acute dermal toxicity

Prolonged skin contact is unlikely to result in absorption of harmful amounts.

As product: The dermal LD50 has not been determined.

Based on information for component(s):

LD50, Rat, > 4,000 mg/kg

#### Acute inhalation toxicity

Prolonged excessive exposure may cause serious adverse effects, even death. Excessive exposure may cause severe irritation to upper respiratory tract (nose and throat) and lungs.

As product: The LC50 has not been determined.

### Skin corrosion/irritation

Brief contact may cause severe skin burns. Symptoms may include pain, severe local redness and tissue damage.

### Serious eye damage/eye irritation

May cause severe irritation with corneal injury which may result in permanent impairment of vision, even blindness. Chemical burns may occur.

### Sensitization

Based on information for component(s):

Has caused allergic skin reactions in humans.

Has caused allergic skin reactions when tested in guinea pigs.

Has demonstrated the potential for contact allergy in mice.

Individuals having an allergic skin reaction to this product may have an allergic skin reaction to similar material(s).

Tetraethylenepentamine (TEPA).

Triethylenetetramine (TETA).

Aminoethylethanolamine (AEEA).

Diethylenetriamine.

Piperazine.

Aminoethylpiperazine (AEP).  
Ethylenediamine (EDA).

For respiratory sensitization:  
No relevant data found.

**Specific Target Organ Systemic Toxicity (Single Exposure)**

Product test data not available. Refer to component data.

**Specific Target Organ Systemic Toxicity (Repeated Exposure)**

Contains component(s) which have been reported to cause effects on the following organs in animals:  
Kidney.  
Gastrointestinal tract.  
Lung.

**Carcinogenicity**

Contains component(s) which did not cause cancer in laboratory animals.

**Teratogenicity**

Contains component(s) which caused birth defects in laboratory animals. Contains component(s) which have been toxic to the fetus in lab animal tests.

**Reproductive toxicity**

Contains component(s) which have interfered with fertility in animal studies.

**Mutagenicity**

Contains component(s) which were negative in some in vitro genetic toxicity studies and positive in others.

**Aspiration Hazard**

Aspiration into the lungs may occur during ingestion or vomiting, causing tissue damage or lung injury.

**COMPONENTS INFLUENCING TOXICOLOGY:**

**Aminoethylethanolamine**

**Acute inhalation toxicity**

At room temperature, exposure to vapor is minimal due to low volatility; vapor from heated material may cause respiratory irritation. Based on the available data, narcotic effects were not observed.

The LC50 has not been determined.

**Specific Target Organ Systemic Toxicity (Single Exposure)**

May cause respiratory irritation.

Route of Exposure: Inhalation

Target Organs: Respiratory Tract

**Triethylenetetramine**

**Acute inhalation toxicity**

The LC50 has not been determined.

**Specific Target Organ Systemic Toxicity (Single Exposure)**

Material is corrosive. Material is not classified as a respiratory irritant; however, upper respiratory tract irritation or corrosivity may be expected.

**n-(2-Aminoethyl)piperazine**

**Acute inhalation toxicity**

The LC50 has not been determined. 8 Hour, vapour, No deaths occurred following exposure to a saturated atmosphere.

**Specific Target Organ Systemic Toxicity (Single Exposure)**

Evaluation of available data suggests that this material is not an STOT-SE toxicant.

**2-Piperazinoethanol**

**Acute inhalation toxicity**

At room temperature, exposure to vapor is minimal due to low volatility. Vapor from heated material may cause respiratory irritation and other effects.

As product: The LC50 has not been determined.

**Specific Target Organ Systemic Toxicity (Single Exposure)**

Available data are inadequate to determine single exposure specific target organ toxicity.

**Diethylenetriamine**

**Acute inhalation toxicity**

LC50, Rat, 4 Hour, dust/mist, > 0.07 - < 0.3 mg/l

**Specific Target Organ Systemic Toxicity (Single Exposure)**

May cause respiratory irritation.

Route of Exposure: Inhalation

Target Organs: Respiratory system

**Tetraethylenepentamine**

**Acute inhalation toxicity**

At room temperature, exposure to vapor is minimal due to low volatility. Excessive exposure may cause irritation to upper respiratory tract (nose and throat).

The LC50 has not been determined. Rat, 8 Hour, vapour, No deaths occurred following exposure to a saturated atmosphere.

**Specific Target Organ Systemic Toxicity (Single Exposure)**

Evaluation of available data suggests that this material is not an STOT-SE toxicant.

**Pentaethylenehexamine mixture**

**Acute inhalation toxicity**

At room temperature, exposure to vapor is minimal due to low volatility. Vapor from heated material may cause respiratory irritation and other effects.

As product: The LC50 has not been determined.

**Specific Target Organ Systemic Toxicity (Single Exposure)**

Evaluation of available data suggests that this material is not an STOT-SE toxicant.

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## 12. ECOLOGICAL INFORMATION

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*Ecotoxicological information appears in this section when such data is available.*

### Toxicity

#### Aminoethylethanolamine

##### **Acute toxicity to fish**

Material is slightly toxic to aquatic organisms on an acute basis (LC50/EC50 between 10 and 100 mg/L in the most sensitive species tested).

LC50, Pimephales promelas (fathead minnow), 96 Hour, 640 mg/l, OECD Test Guideline 203 or Equivalent

##### **Acute toxicity to aquatic invertebrates**

EC50, Daphnia magna (Water flea), static test, 48 Hour, 22 mg/l, OECD Test Guideline 202 or Equivalent

##### **Acute toxicity to algae/aquatic plants**

ErC50, Desmodesmus subspicatus (green algae), 72 Hour, Growth rate inhibition, 353.6 mg/l, OECD Test Guideline 201 or Equivalent

##### **Toxicity to bacteria**

EC50, Bacteria, 16 Hour, > 5,000 mg/l

EC50, Pseudomonas putida, 17 Hour, 135 mg/l

#### Triethylenetetramine

##### **Acute toxicity to fish**

Material is slightly toxic to aquatic organisms on an acute basis (LC50/EC50 between 10 and 100 mg/L in the most sensitive species tested).

May increase pH of aquatic systems to > pH 10 which may be toxic to aquatic organisms.

LC50, Pimephales promelas (fathead minnow), static test, 96 Hour, 330 mg/l, OECD Test Guideline 203 or Equivalent

##### **Acute toxicity to aquatic invertebrates**

EC50, Daphnia magna (Water flea), static test, 48 Hour, 31.1 mg/l, OECD Test Guideline 202 or Equivalent

##### **Acute toxicity to algae/aquatic plants**

EC50, Pseudokirchneriella subcapitata (green algae), semi-static test, 72 Hour, Growth rate inhibition, 20 mg/l, OECD Test Guideline 201 or Equivalent

##### **Toxicity to bacteria**

EC50, Bacteria, 16 Hour, 680 mg/l

##### **Chronic toxicity to aquatic invertebrates**

NOEC, Daphnia magna (Water flea), semi-static test, 21 d, number of offspring, 1.9 mg/l

#### n-(2-Aminoethyl)piperazine

##### **Acute toxicity to fish**

Material is slightly toxic to aquatic organisms on an acute basis (LC50/EC50 between 10 and 100 mg/L in the most sensitive species tested).

LC50, Pimephales promelas (fathead minnow), static test, 96 Hour, 2,190 mg/l, OECD Test Guideline 203 or Equivalent

**Acute toxicity to aquatic invertebrates**

EC50, Daphnia magna (Water flea), static test, 48 Hour, 58 mg/l, OECD Test Guideline 202 or Equivalent

**Acute toxicity to algae/aquatic plants**

ErC50, Pseudokirchneriella subcapitata (green algae), 72 Hour, Growth rate inhibition, > 1,000 mg/l, OECD Test Guideline 201 or Equivalent

**2-Piperazinoethanol**

**Acute toxicity to fish**

Material is practically non-toxic to fish on an acute basis (LC50 > 100 mg/L).

LC50, Pimephales promelas (fathead minnow), flow-through test, 96 Hour, 6,410 mg/l, OECD Test Guideline 203 or Equivalent

**Acute toxicity to aquatic invertebrates**

LC50, Daphnia magna (Water flea), 48 Hour, 384 mg/l, OECD Test Guideline 202 or Equivalent

**Toxicity to bacteria**

EC50, Bacteria, 16 Hour, > 5,000 mg/l, hUCC

**Diethylenetriamine**

**Acute toxicity to fish**

Material is slightly toxic to aquatic organisms on an acute basis (LC50/EC50 between 10 and 100 mg/L in the most sensitive species tested).

LC50, Poecilia reticulata (guppy), semi-static test, 96 Hour, 430 mg/l

**Acute toxicity to aquatic invertebrates**

EC50, Daphnia magna (Water flea), static test, 48 Hour, 16 mg/l, DIN 38412

**Acute toxicity to algae/aquatic plants**

ErC50, Pseudokirchneriella subcapitata (green algae), static test, 72 Hour, Growth rate inhibition, 1,164 mg/l, OECD Test Guideline 201 or Equivalent

**Toxicity to bacteria**

EC50, Bacteria, static test, 16 Hour, > 5,000 mg/l

**Chronic toxicity to fish**

NOEC, Fish, semi-static test, 28 d, growth, > 10 mg/l

**Chronic toxicity to aquatic invertebrates**

NOEC, Daphnia magna (Water flea), semi-static test, 21 d, number of offspring, 5.6 mg/l  
MATC (Maximum Acceptable Toxicant Level), Daphnia magna (Water flea), semi-static test, 21 d, number of offspring, 7.95 mg/l

**Toxicity to soil-dwelling organisms**

EC50, Eisenia fetida (earthworms), 28 d, 797 mg/kg

**Tetraethylenepentamine**

**Acute toxicity to fish**

Material is moderately toxic to aquatic organisms on an acute basis (LC50/EC50 between 1 and 10 mg/L in the most sensitive species tested).

May increase pH of aquatic systems to > pH 10 which may be toxic to aquatic organisms.

LC50, Poecilia reticulata (guppy), semi-static test, 96 Hour, 420 mg/l, OECD Test Guideline 203 or Equivalent

**Acute toxicity to aquatic invertebrates**

EC50, Daphnia magna (Water flea), static test, 48 Hour, 24.1 mg/l, OECD Test Guideline 202 or Equivalent

**Acute toxicity to algae/aquatic plants**

ErC50, Pseudokirchneriella subcapitata (green algae), static test, 72 Hour, Growth rate inhibition, 6.8 mg/l, OECD Test Guideline 201 or Equivalent

**Toxicity to bacteria**

EC50, activated sludge, static test, 1 Hour, 1,600 mg/l

**Pentaethylenehexamine mixture**

**Acute toxicity to fish**

Material is moderately toxic to aquatic organisms on an acute basis (LC50/EC50 between 1 and 10 mg/L in the most sensitive species tested).

LC50, Pimephales promelas (fathead minnow), static test, 96 Hour, 133 mg/l

LC50, Poecilia reticulata (guppy), semi-static test, 96 Hour, 180 mg/l

**Acute toxicity to aquatic invertebrates**

EC50, Daphnia magna (Water flea), Static, 48 Hour, 17.5 mg/l

**Acute toxicity to algae/aquatic plants**

ErC50, Pseudokirchneriella subcapitata (green algae), Static, 72 Hour, Growth rate inhibition, 1.7 mg/l, OECD Test Guideline 201

EbC50, Pseudokirchneriella subcapitata (green algae), Biomass, 0.7 mg/l

**Persistence and degradability**

**Aminoethylethanolamine**

**Biodegradability:** Material is readily biodegradable. Passes OECD test(s) for ready biodegradability.

10-day Window: Pass

**Biodegradation:** > 97 %

**Exposure time:** 28 d

**Method:** OECD Test Guideline 301F or Equivalent

**Theoretical Oxygen Demand:** 2.77 mg/mg

**Chemical Oxygen Demand:** 1,070 mg/g

**Triethylenetetramine**

**Biodegradability:** Biodegradation under aerobic static laboratory conditions is moderate (BOD20 or BOD28/ThOD between 10 and 40%).

10-day Window: Fail

**Biodegradation:** 0 %

**Exposure time:** 20 d

**Method:** OECD Test Guideline 301D or Equivalent

**Theoretical Oxygen Demand:** 3.40 mg/mg

**Chemical Oxygen Demand:** 1.94 mg/mg

**Biological oxygen demand (BOD)**

Incubation Time	BOD
5 d	5.000 %
20 d	2.5 - 11 %

#### n-(2-Aminoethyl)piperazine

**Biodegradability:** Material is not readily biodegradable according to OECD/EEC guidelines.

10-day Window: Fail

**Biodegradation:** 0 %

**Exposure time:** 28 d

**Method:** OECD Test Guideline 301F or Equivalent

**Theoretical Oxygen Demand:** 3.34 mg/mg

**Chemical Oxygen Demand:** 1.84 mg/mg

**Photodegradation**

**Atmospheric half-life:** 0.05 d

**Method:** Estimated.

#### 2-Piperazinoethanol

**Biodegradability:** Biodegradation under aerobic static laboratory conditions is moderate (BOD20 or BOD28/ThOD between 10 and 40%).

**Theoretical Oxygen Demand:** 2.83 mg/mg Calculated.

**Chemical Oxygen Demand:** 1.81 mg/mg Dichromate

**Biological oxygen demand (BOD)**

Incubation Time	BOD
5 d	3 - 5 %
10 d	3 - 6 %
20 d	6 - 13 %

**Photodegradation**

**Test Type:** Half-life (indirect photolysis)  
**Sensitization:** OH radicals  
**Atmospheric half-life:** 0.057 d  
**Method:** Estimated.

#### Diethylenetriamine

**Biodegradability:** Material is ultimately biodegradable (reaches > 70% mineralization in OECD test(s) for inherent biodegradability). Based on stringent OECD test guidelines, this material cannot be considered as readily biodegradable; however, these results do not necessarily mean that the material is not biodegradable under environmental conditions.  
**10-day Window:** Not applicable  
**Biodegradation:** > 80 %  
**Exposure time:** 30 d  
**Method:** OECD Test Guideline 302A or Equivalent

**Theoretical Oxygen Demand:** 3.42 mg/mg

#### **Biological oxygen demand (BOD)**

Incubation Time	BOD
5 d	23.000 %
10 d	46.000 %
20 d	70.000 %

#### **Photodegradation**

**Sensitization:** OH radicals  
**Atmospheric half-life:** 0.87 Hour  
**Method:** Estimated.

#### Tetraethylenepentamine

**Biodegradability:** Material is not readily biodegradable according to OECD/EEC guidelines.  
**10-day Window:** Fail  
**Biodegradation:** 0 %  
**Exposure time:** 28 d  
**Method:** OECD Test Guideline 301A or Equivalent  
**10-day Window:** Not applicable  
**Biodegradation:** 17 %  
**Exposure time:** 84 d  
**Method:** OECD Test Guideline 302A or Equivalent

**Theoretical Oxygen Demand:** 3.39 mg/mg

**Chemical Oxygen Demand:** 1.54 - 1.88 mg/mg

#### **Biological oxygen demand (BOD)**

Incubation Time	BOD
20 d	0 - 12 %

**Photodegradation****Atmospheric half-life:** 0.41 Hour**Method:** Estimated.**Pentaethylenehexamine mixture****Biodegradability:** Material is not readily biodegradable according to OECD/EEC guidelines.

10-day Window: Fail

**Biodegradation:** 0 %**Exposure time:** 162 d**Method:** OECD Test Guideline 301D**Biological oxygen demand (BOD)**

Incubation Time	BOD
5 d	2.000 %
10 d	4.000 %
20 d	8.000 %

**Bioaccumulative potential****Aminoethylethanolamine****Bioaccumulation:** Bioconcentration potential is low (BCF < 100 or Log Pow < 3).**Partition coefficient: n-octanol/water(log Pow):** -1.46 Measured**Bioconcentration factor (BCF):** < 3.7 Cyprinus carpio (Carp) 42 d Measured**Triethylenetetramine****Bioaccumulation:** Bioconcentration potential is low (BCF < 100 or Log Pow < 3).**Partition coefficient: n-octanol/water(log Pow):** -2.65 Estimated.**n-(2-Aminoethyl)piperazine****Bioaccumulation:** Bioconcentration potential is low (BCF < 100 or Log Pow < 3).**Partition coefficient: n-octanol/water(log Pow):** -1.48 Measured**2-Piperazinoethanol****Bioaccumulation:** Bioconcentration potential is low (BCF < 100 or Log Pow < 3).**Partition coefficient: n-octanol/water(log Pow):** -1.56 Estimated.**Diethylenetriamine****Bioaccumulation:** Bioconcentration potential is low (BCF < 100 or Log Pow < 3).**Partition coefficient: n-octanol/water(log Pow):** -1.58 at 20 °C Estimated.**Bioconcentration factor (BCF):** < 0.3 Fish Measured**Tetraethylenepentamine****Bioaccumulation:** No bioconcentration is expected because of the relatively high water solubility.**Partition coefficient: n-octanol/water(log Pow):** -3.16 Estimated.**Pentaethylenehexamine mixture**

**Partition coefficient: n-octanol/water(log Pow):** -3.67 Estimated.

#### Mobility in soil

##### Aminoethylethanolamine

Potential for mobility in soil is very high (Koc between 0 and 50).  
Given its very low Henry's constant, volatilization from natural bodies of water or moist soil is not expected to be an important fate process.

**Partition coefficient (Koc):** 3.5 Estimated.

##### Triethylenetetramine

Potential for mobility in soil is very high (Koc between 0 and 50).

**Partition coefficient (Koc):** 4.1 - 310 Estimated.

##### n-(2-Aminoethyl)piperazine

Expected to be relatively immobile in soil (Koc > 5000).

**Partition coefficient (Koc):** 37000 Estimated.

##### 2-Piperazinoethanol

Potential for mobility in soil is very high (Koc between 0 and 50).

**Partition coefficient (Koc):** 7 Estimated.

##### Diethylenetriamine

Expected to be relatively immobile in soil (Koc > 5000).

Given its very low Henry's constant, volatilization from natural bodies of water or moist soil is not expected to be an important fate process.

**Partition coefficient (Koc):** 19111 Estimated.

##### Tetraethylenepentamine

Potential for mobility in soil is very high (Koc between 0 and 50).

Given its very low Henry's constant, volatilization from natural bodies of water or moist soil is not expected to be an important fate process.

**Partition coefficient (Koc):** 3.6 - 1098 Estimated.

##### Pentaethylenehexamine mixture

Potential for mobility in soil is slight (Koc between 2000 and 5000).

**Partition coefficient (Koc):** 3887 Estimated.

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## 13. DISPOSAL CONSIDERATIONS

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**Disposal methods:** DO NOT DUMP INTO ANY SEWERS, ON THE GROUND, OR INTO ANY BODY OF WATER. All disposal practices must be in compliance with all Federal, State/Provincial and local laws and regulations. Regulations may vary in different locations. Waste characterizations and compliance with applicable laws are the responsibility solely of the waste generator. AS YOUR SUPPLIER, WE HAVE NO CONTROL OVER THE MANAGEMENT PRACTICES OR MANUFACTURING PROCESSES OF PARTIES HANDLING OR USING THIS MATERIAL. THE INFORMATION PRESENTED HERE PERTAINS ONLY TO THE PRODUCT AS SHIPPED IN ITS INTENDED CONDITION AS DESCRIBED IN MSDS SECTION: Composition Information. FOR UNUSED & UNCONTAMINATED PRODUCT, the preferred options include sending to a licensed, permitted: Recycler. Incinerator or other thermal destruction device.

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**14. TRANSPORT INFORMATION**

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**DOT**

<b>Proper shipping name</b>	Amines, liquid, corrosive, n.o.s.(Aminoethylethanolamine, Triethylenetetramine)
<b>UN number</b>	UN 2735
<b>Class</b>	8
<b>Packing group</b>	II

**Classification for SEA transport (IMO-IMDG):**

<b>Proper shipping name</b>	AMINES, LIQUID, CORROSIVE, N.O.S.(Aminoethylethanolamine, Triethylenetetramine)
<b>UN number</b>	UN 2735
<b>Class</b>	8
<b>Packing group</b>	II
<b>Marine pollutant</b>	No
<b>Transport in bulk according to Annex I or II of MARPOL 73/78 and the IBC or IGC Code</b>	Consult IMO regulations before transporting ocean bulk

**Classification for AIR transport (IATA/ICAO):**

<b>Proper shipping name</b>	Amines, liquid, corrosive, n.o.s.(Aminoethylethanolamine, Triethylenetetramine)
<b>UN number</b>	UN 2735
<b>Class</b>	8
<b>Packing group</b>	II

This information is not intended to convey all specific regulatory or operational requirements/information relating to this product. Transportation classifications may vary by container volume and may be influenced by regional or country variations in regulations. Additional transportation system information can be obtained through an authorized sales or customer service representative. It is the responsibility of the transporting organization to follow all applicable laws, regulations and rules relating to the transportation of the material.

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**15. REGULATORY INFORMATION**

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**Superfund Amendments and Reauthorization Act of 1986 Title III (Emergency Planning and Community Right-to-Know Act of 1986) Sections 311 and 312**

Acute toxicity (any route of exposure)  
Skin corrosion or irritation  
Serious eye damage or eye irritation  
Respiratory or skin sensitisation

Reproductive toxicity  
Specific target organ toxicity (single or repeated exposure)

**Superfund Amendments and Reauthorization Act of 1986 Title III (Emergency Planning and Community Right-to-Know Act of 1986) Section 313**

This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

**Pennsylvania Worker and Community Right-To-Know Act:**

The following chemicals are listed because of the additional requirements of Pennsylvania law:

Components	CASRN
Aminoethylethanolamine	111-41-1
Triethylenetetramine	112-24-3
n-(2-Aminoethyl)piperazine	140-31-8
Diethylenetriamine	111-40-0
Tetraethylenepentamine	112-57-2

**California Proposition 65 (Safe Drinking Water and Toxic Enforcement Act of 1986)**

This product contains no listed substances known to the State of California to cause cancer, birth defects or other reproductive harm, at levels which would require a warning under the statute.

**United States TSCA Inventory (TSCA)**

All components of this product are in compliance with the inventory listing requirements of the U.S. Toxic Substances Control Act (TSCA) Chemical Substance Inventory.

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## 16. OTHER INFORMATION

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**Hazard Rating System**

**NFPA**

Health	Flammability	Instability
3	1	0

**Revision**

Identification Number: 31000128 / A001 / Issue Date: 02/27/2018 / Version: 4.0

Most recent revision(s) are noted by the bold, double bars in left-hand margin throughout this document.

**Legend**

ACGIH	USA. ACGIH Threshold Limit Values (TLV)
Dow IHG	Dow Industrial Hygiene Guideline
SKIN	Absorbed via skin
SKIN, DSEN	Absorbed via Skin, Skin Sensitizer
TWA	Time weighted average
US WEEL	USA. Workplace Environmental Exposure Levels (WEEL)

**Full text of other abbreviations**

AICS - Australian Inventory of Chemical Substances; ASTM - American Society for the Testing of Materials; bw - Body weight; CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act; CMR - Carcinogen, Mutagen or Reproductive Toxicant; DIN - Standard of the German Institute for Standardisation; DOT - Department of Transportation; DSL - Domestic Substances List (Canada); ECx - Concentration associated with x% response; EHS - Extremely Hazardous Substance; ELx - Loading rate associated with x% response; EmS - Emergency Schedule; ENCS - Existing and New Chemical Substances (Japan); ErCx - Concentration associated with x% growth rate response; ERG - Emergency Response Guide; GHS - Globally Harmonized System; GLP - Good Laboratory Practice; HMIS - Hazardous Materials Identification System; IARC - International Agency for Research on Cancer; IATA - International Air Transport Association; IBC - International Code for the Construction and Equipment of Ships carrying Dangerous Chemicals in Bulk; IC50 - Half maximal inhibitory concentration; ICAO - International Civil Aviation Organization; IECSC - Inventory of Existing Chemical Substances in China; IMDG - International Maritime Dangerous Goods; IMO - International Maritime Organization; ISHL - Industrial Safety and Health Law (Japan); ISO - International Organisation for Standardization; KECI - Korea Existing Chemicals Inventory; LC50 - Lethal Concentration to 50 % of a test population; LD50 - Lethal Dose to 50% of a test population (Median Lethal Dose); MARPOL - International Convention for the Prevention of Pollution from Ships; MSHA - Mine Safety and Health Administration; n.o.s. - Not Otherwise Specified; NFPA - National Fire Protection Association; NO(A)EC - No Observed (Adverse) Effect Concentration; NO(A)EL - No Observed (Adverse) Effect Level; NOELR - No Observable Effect Loading Rate; NTP - National Toxicology Program; NZIoC - New Zealand Inventory of Chemicals; OECD - Organization for Economic Co-operation and Development; OPPTS - Office of Chemical Safety and Pollution Prevention; PBT - Persistent, Bioaccumulative and Toxic substance; PICCS - Philippines Inventory of Chemicals and Chemical Substances; (Q)SAR - (Quantitative) Structure Activity Relationship; RCRA - Resource Conservation and Recovery Act; REACH - Regulation (EC) No 1907/2006 of the European Parliament and of the Council concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals; RQ - Reportable Quantity; SADT - Self-Accelerating Decomposition Temperature; SARA - Superfund Amendments and Reauthorization Act; SDS - Safety Data Sheet; TCSI - Taiwan Chemical Substance Inventory; TSCA - Toxic Substances Control Act (United States); UN - United Nations; UNRTDG - United Nations Recommendations on the Transport of Dangerous Goods; vPvB - Very Persistent and Very Bioaccumulative

#### Information Source and References

This SDS is prepared by Product Regulatory Services and Hazard Communications Groups from information supplied by internal references within our company.

THE DOW CHEMICAL COMPANY urges each customer or recipient of this (M)SDS to study it carefully and consult appropriate expertise, as necessary or appropriate, to become aware of and understand the data contained in this (M)SDS and any hazards associated with the product. The information herein is provided in good faith and believed to be accurate as of the effective date shown above. However, no warranty, express or implied, is given. Regulatory requirements are subject to change and may differ between various locations. It is the buyer's/user's responsibility to ensure that his activities comply with all federal, state, provincial or local laws. The information presented here pertains only to the product as shipped. Since conditions for use of the product are not under the control of the manufacturer, it is the buyer's/user's duty to determine the conditions necessary for the safe use of this product. Due to the proliferation of sources for information such as manufacturer-specific (M)SDSs, we are not and cannot be responsible for (M)SDSs obtained from any source other than ourselves. If you have obtained an (M)SDS from another source or if you are not sure that the (M)SDS you have is current, please contact us for the most current version.

US

