1. PRODUCT IDENTIFICATION

**CHEMICAL NAME; CLASS:** Deuterated Ammonia

**CHEMICAL FAMILY:** Nitrogen Deuterated

**PRODUCT USE:** Semi-Conductor Gas

**MANUFACTURER**

MATHESON TRI-GAS, INC.

150 ALLEN ROAD

BASKING RIDGE, NJ 07920

USA

Phone: 908/991-9200

**EMERGENCY PHONE:**

CHEMTREC DOMESTIC U.S.: 1-800-424-9300

CHEMTREC INTERNATIONAL: 1-703-527-3887

CANUTEC (CANADA): 1-613-996-6666

2. COMPOSITION and INFORMATION ON INGREDIENTS

(10,000 ppm = 1%)

<table>
<thead>
<tr>
<th>CHEMICAL NAME</th>
<th>CAS #</th>
<th>mole %</th>
<th>EXPOSURE LIMITS IN AIR</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>ppm</td>
<td>ACGIH-TLV TWA ppm</td>
</tr>
<tr>
<td>Deuterated Ammonia</td>
<td>13550-49-7</td>
<td>99.998%</td>
<td>25</td>
</tr>
</tbody>
</table>

| MAK, 15 min., average value, 1-hr-interval |

| DFG MAK Pregnancy Risk Classification: C |

3. HAZARD IDENTIFICATION

**EMERGENCY OVERVIEW:** Product Description: This gas is colorless and has a strong and suffocating odor characteristic of Ammonia. Health Hazards: This gas can burn and damage eyes, skin, mucous membranes, and any other exposed tissue. Inhalation can cause coughing and breathing difficulty. Overexposure to this gas may be fatal. Delayed pulmonary damage and breathing difficulty may occur. Severe overexposures can be fatal. Flammability Hazards: Deuterated Ammonia is not readily ignited, but explosions of Ammonia in confined spaces have been reported. Vapor clouds of the gas may be controlled using a water fog. Reactivity Hazards: This gas is not reactive. Environmental Hazards: This gas is toxic and can cause harm to plants and animals if released to the environment. All accidental releases must be minimized. Emergency Response Considerations: Extreme caution must be used when responding to releases; persons who respond to releases of this product must protect themselves from inhalation of the gas, especially in areas which are downwind of the release. Emergency responders must wear appropriate personal protective equipment for the situation to which they are responding.
3. HAZARD IDENTIFICATION (Continued)

SYMPTOMS OF OVER-EXPOSURE BY ROUTE OF EXPOSURE: The most significant route of over-exposure for this product is by inhalation.

INHALATION: This gas can be extremely irritating or corrosive, depending on concentration and duration of exposure. Low levels of Deuterated Ammonia may irritate the lungs and throat. At higher levels, inhalation exposure may result in severe irritation and burns of mucous membranes, throat and lungs. Delayed pulmonary damage, chemical pneumonitis and breathing difficulty may also occur. Severe inhalation over-exposures can be fatal. As a result of severe exposures to this gas, permanent lung injury may occur. Prolonged or repeated over-exposures to low levels of this gas may cause impaired lung function, bronchitis, or emphysema.

Note: Symptoms can develop after over-exposure to concentrations of Deuterated Ammonia are described below. The onset of the symptoms of pulmonary edema can be delayed for hours or days after the exposure.

<table>
<thead>
<tr>
<th>CONCENTRATION OF AMMONIA</th>
<th>OBSERVED EFFECT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.6 - 53 ppm</td>
<td>Odor Threshold</td>
</tr>
<tr>
<td>25 - 50 ppm</td>
<td>Irritation of the eyes and mucous membranes, which can be tolerated for several hours.</td>
</tr>
<tr>
<td>100 - 150 ppm</td>
<td>Immediate irritation of the throat, which may be tolerated for an hour.</td>
</tr>
<tr>
<td>400 - 700 ppm</td>
<td>Immediate, severe irritation of the respiratory system and eyes occurs. This concentration of Ammonia is intolerable for even brief exposure.</td>
</tr>
<tr>
<td>&gt; 5000 ppm</td>
<td>This level of exposure may result in rapid death due to suffocation or fluid in the lungs. Exposure to concentrations in excess of 5000 ppm may cause laryngeal spasms, resulting in death.</td>
</tr>
</tbody>
</table>

In addition, high concentrations of Deuterated Ammonia gas may cause an oxygen deficient atmosphere. Exposure to high concentrations may cause unconsciousness, and under some circumstances, death.

CONTACT WITH SKIN or EYES: When Deuterated Ammonia levels are low, this gas may be irritating to the skin. When Deuterated Ammonia levels are higher, severe irritation of the skin may occur. Repeated, low level skin contact may result in dermatitis (dry, red,itchy skin). Low levels of Deuterated Ammonia (less than 1%) in contact with the eyes, will cause watering, pain and irritation. Higher levels of Deuterated Ammonia may cause severe injury and swelling of the eye tissue. Temporary vision impairment or permanent damage or blindness may occur. Contact with rapidly expanding gases (which are released under high pressure) may cause frostbite.

SKIN ABSORPTION: Skin absorption is a significant route of exposure for Deuterated Ammonia following prolonged low-level exposure.

HEALTH EFFECTS OR RISKS FROM EXPOSURE: Over-exposure to this gas mixture may cause the following health effects:

ACUTE: At lower levels, exposure to this gas mixture will irritate the skin, eyes and respiratory system. Higher levels may result in severe irritation and burns of eyes, skin, mucous membranes, and any other exposed tissue. If high concentrations of this gas are inhaled, delayed pulmonary damage and breathing difficulty may occur. Severe inhalation over-exposures can be fatal, as a result of lung damage.

CHRONIC: Prolonged or repeated inhalation over-exposures to this gas may cause impaired lung function and emphysema. Repeated skin contact with low levels may cause dermatitis. Refer to Section 11 (Toxicology Information) for additional data.

TARGET ORGANS: ACUTE: Respiratory system, skin, eyes. CHRONIC: Skin, respiratory system.

HMIS RATING: HEALTH HAZARD = 3 FLAMMABILITY HAZARD = 1 INSTABILITY HAZARD = 0

Hazard Scale: 0 = Minimal 1 = Slight 2 = Moderate 3 = Serious 4 = Severe

4. FIRST-AID MEASURES

GENERAL INFORMATION: In cases of over exposure, delayed onset of life-threatening symptoms may occur. Remove to fresh air, as quickly as possible. Only trained personnel should administer supplemental oxygen and/or cardio-pulmonary resuscitation, if necessary. Seek medical attention immediately.
4. FIRST-AID MEASURES (Continued)

SKIN EXPOSURE: If this gas has contaminated the skin, immediately begin decontamination with running water. Minimum flushing is for 15 minutes. Remove exposed or contaminated clothing, taking care not to contaminate eyes. Seek immediate medical attention.

EYE EXPOSURE: If this gas enters the eyes, open exposed eyes while under gentle running water. Use sufficient force to open eyelids. "Roll" eyes. Minimum flushing is for 15 minutes.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Acute or chronic respiratory conditions, skin conditions, or eye disorders may be aggravated by over-exposure to the components of this gas mixture.

5. FIRE-FIGHTING MEASURES

FLASH POINT: Not available. Deuterated Ammonia can be ignited.

AUTOIGNITION TEMPERATURE: 651°C (1204°F)

FLAMMABLE LIMITS (in air by volume, %):

- Lower (LEL): 15.0%
- Upper (UEL): 28.0%

FIRE EXTINGUISHING MATERIALS:

- Water Spray: YES
- Carbon Dioxide: YES
- Foam: YES
- Dry Chemical: YES
- Halon: YES
- Other: Any "ABC" Class.

Water spray should be used to cool fire-exposed containers.

UNUSUAL FIRE AND EXPLOSION HAZARD: Deuterated Ammonia is a toxic, corrosive gas and presents an extreme hazard to firefighters. In the event of fire, cool containers of this gas with water to prevent failure. Use a water spray or fog to reduce or direct vapors. Do not direct a water spray at the source of a release. This gas may ignite explosively, if released near an active fire. Deuterated Ammonia is lighter than air, but conditions associated with a release can cause it to accumulate in low-lying areas. Exposure to high heat, as in a fire situation, can cause the cylinder to rupture.

EXPLOSION SENSITIVITY TO MECHANICAL IMPACT: Not sensitive.

EXPLOSION SENSITIVITY TO STATIC DISCHARGE: There is insufficient information to classify Deuterated Ammonia as to its sensitivity to static discharge.

SPECIAL FIRE-FIGHTING PROCEDURES: Incipient fire responders should wear eye protection. Structural firefighters must wear Self-Contained Breathing Apparatus and full protective equipment. Move fire-exposed cylinders if it can be done without risk to firefighters. Otherwise, cool containers with hose stream and protect personnel. Withdraw immediately in case of rising sounds from venting safety device or any discoloration of tanks due to the fire. If Deuterated Ammonia is involved in a fire, fire runoff water should be contained to prevent possible environmental damage.

6. ACCIDENTAL RELEASE MEASURES

LEAK RESPONSE: Uncontrolled releases should be responded to by trained personnel using pre-planned procedures. Proper protective equipment should be used in the event of a significant release from a single cylinder. Call CHEMTREC (1-800-424-9300) for emergency assistance. Or if in Canada, call CANUTEC (613-996-6666).

Minimum Personal Protective Equipment should be Level A: triple-gloves (neoprene rubber gloves and nitrile gloves, over latex or N-Dex™ gloves), fully-encapsulating chemical resistant suit and boots, hard-hat, and Self Contained Breathing Apparatus. Large releases of Deuterated Ammonia will be evident by the cloud of ammonia hydroxide mist which is formed. Small releases of Deuterated Ammonia can be detected by means of an atomizer or squeeze bottle filled with concentrated hydrochloric acid or with wet pH paper, which will turn blue. A white cloud will show the location of the leak. Attempt to close the main source valve prior to entering the area. If this does not stop the release (or it is not possible to reach the valve), allow the gas to release in place or remove it to a safe area and allow the gas to be released there. Monitor the surrounding area for Ammonia gas and oxygen levels. The Ammonia level must be below 25 ppm AND the atmosphere must have at least 19.5 percent oxygen before personnel can be allowed in the area without Self-Contained Breathing Apparatus. If possible stop the gas flow at the source. A water fog or mist can be used to control the vapor cloud resulting from the release.
7. HANDLING and USE

WORK PRACTICES AND HYGIENE PRACTICES:

Do not eat or drink while handling chemicals.

Be aware of all potential exposure symptoms; exposures to fatal concentrations of this product could occur without any significant warning symptoms.

All work operations should be monitored in such a way that emergency personnel can be immediately contacted in the event of a release.

Workers who handle this gas mixture should wear protective clothing, as listed in Section 8 (Exposure Controls and Personal Protection).

Instant-acting showers should be available in the event of an emergency.

Eye-wash fountains or similar equipment should be available for eye irrigation.

If ventilation controls are not adequate to control exposure to this gas mixture, proper respiratory protection equipment should be provided and workers using such equipment should be carefully trained in its operation and limitations.

Precautions must always be taken to prevent suck-back of foreign materials into the cylinder by using a check-valve, or vacuum break, since suck-back may cause dangerous pressure changes within the cylinder.

STORAGE AND HANDLING PRACTICES: Cylinders should be stored upright and be firmly secured to prevent falling or being knocked-over. Cylinders can be stored in the open, but in such cases, should be protected against extremes of weather and from the dampness of the ground to prevent rusting. Cylinders should be stored in dry, well-ventilated areas away from sources of heat or ignition. Do not allow area where cylinders are stored to exceed 52°C (125°F). This gas can be dangerous and should only be handled by trained personnel. Wearing contact lenses is not recommended when handling this gas. It is strongly recommended that this gas only be handled in areas with extensive venting capabilities, preferably a gas handling cabinet. Monitoring may be considered for areas in which this gas is used. Detection of Deuterated Ammonia should trigger immediate response and corrective action. Contaminated clothing should be removed and laundered separately before reuse.

Most common metals are not affected by dry Deuterated Ammonia. However, when combined with water vapor, ammonia will attack copper, zinc or alloys containing copper as a major alloying element, and therefore, these materials should not be used in construction of Deuterated Ammonia handling equipment. DOT regulations prohibit the use of copper, zinc, silver or alloys of these materials in the construction of containers for Deuterated Ammonia that are used in its shipment. Use non-sparking ventilation systems, approved explosion-proof equipment, and appropriate electrical systems. Electrical equipment used in gas-handling operations, or located in storage areas, should be non-spark or explosion-proof. If leaks develop in Deuterated Ammonia lines, they must be given prompt attention because they will become progressively worse.

Before using this gas, meticulous leak checking using inert gas is strongly recommended, particularly after new connections are made. Cylinder valves should be inspected regularly for physical damage or corrosion (apparent by discoloration or rust). Care should be taken to inspect the following valve locations for corrosion: neck (where valve inserts into cylinder); bonnet nut (where handle attaches to valve body). Close valve after each use and when empty. The failure of a valve can result in violent release of the pressurized gas, creating a severe mechanical injury hazard.

SPECIAL PRECAUTIONS FOR HANDLING GAS CYLINDERS: Compressed gases can present significant safety hazards. The following rules are applicable to work situations in which cylinders are being used.

Before Use: Move cylinders with a suitable hand-truck. Do not drag, slide or roll cylinders. Do not drop cylinders or permit them to strike each other. Secure cylinders firmly. Leave the valve protection cap (where provided) in-place until cylinder is ready for use.

During Use: Use designated CGA fittings and other support equipment. Do not use adapters. Do not use oils or grease on gas-handling fittings or equipment. Immediately contact the supplier if there are any difficulties associated with operating the cylinder valve. Never insert an object (e.g. wrench, screwdriver, pry bar, etc.) into valve cap openings. Doing so may damage the valve, causing a leak to occur. Use an adjustable strap wrench to remove over-tight or rusted caps. Never strike an arc, on a compressed gas cylinder or make a cylinder part of and electric circuit.

Use: Close main cylinder valve. Replace valve protection cap. Close valve after each use and when empty. Mark empty cylinders "EMPTY".
7. HANDLING and USE (Continued)

PROTECTIVE PRACTICES DURING MAINTENANCE OF CONTAMINATED EQUIPMENT: Refer to current CGA Guidelines for information on protective practices during maintenance of contaminated equipment.

8. EXPOSURE CONTROLS - PERSONAL PROTECTION

VENTILATION AND ENGINEERING CONTROLS: Use with adequate ventilation to ensure compliance with exposure limits described in Section 2 (Composition and Information on Ingredients). Local exhaust ventilation is preferred, because it prevents dispersion of this gas mixture into the work place by eliminating it at its source. If appropriate, install automatic monitoring equipment to detect the level of Ammonia, and Oxygen. Eye wash stations/safety showers should be near areas where this product is used or stored.

RESPIRATORY PROTECTION: Maintain the level of Deuterated Ammonia below those listed in Section 2 (Composition and Information on Ingredients) and oxygen levels above 19.5% in the workplace. If necessary, use only respiratory protection authorized in the U.S. Federal OSHA Respiratory Protection Standard (29 CFR 1910.134), or equivalent U.S. State standards and Canadian CSA Standard Z94.4-93. Oxygen levels below 19.5% are considered IDLH by OSHA. In such atmospheres, use of a full-facepiece pressure/demand SCBA or a full facepiece, supplied air respirator with auxiliary self-contained air supply is required under OSHA’s Respiratory Protection Standard (1910.134-1998). The following are NIOSH respiratory guidelines for Ammonia.

AMMONIA

<table>
<thead>
<tr>
<th>CONCENTRATION</th>
<th>RESPIRATORY PROTECTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 250 ppm:</td>
<td>Any Chemical Cartridge Respirator with cartridge(s), or any Supplied-Air Respirator (SAR).</td>
</tr>
<tr>
<td>Up to 300 ppm:</td>
<td>Any SAR operated in a continuous-flow mode, or any Powered, Air-Purifying Respirator with cartridge(s), or any Chemical Cartridge Respirator with a full facepiece and cartridge(s), or any Air-Purifying, Full-Facepiece Respirator (gas mask) with a chin-style, front- or back-mounted canister, or any Self-Contained Breathing Apparatus (SCBA) with a full facepiece, or any SAR with a full facepiece.</td>
</tr>
<tr>
<td>Emergency or Planned Entry into Unknown Concentrations or IDLH Conditions:</td>
<td>Any SCBA that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode, or any SAR that has a full facepiece and is used in a pressure-demand or other positive-pressure mode in combination with an auxiliary SCBA operated in pressure-demand or other positive-pressure mode.</td>
</tr>
<tr>
<td>Escape:</td>
<td>Any Air-Purifying, Full-Facepiece Respirator (gas mask) with a chin-style, front- or back-mounted canister, or any appropriate escape-type, SCBA.</td>
</tr>
</tbody>
</table>

EYE PROTECTION: Splash goggles or safety glasses. Face-shields should be worn if operations will generate mists or sprays. If necessary, refer to U.S. OSHA 29 CFR 1910.133 or Canadian CSA Standard Z94.3-02.

HAND PROTECTION: Chemically resistant gloves should be worn when using this gas. Wear mechanically-resistant gloves when handling cylinders containing this gas. If necessary, refer to U.S. OSHA 29 CFR 1910.138, or appropriate Standards of Canada.

BODY PROTECTION: Use body protection appropriate for task. Transfer of large quantities under pressure may require protective equipment appropriate to the task. If necessary, refer to the OSHA Technical Manual (Section VII: Personal Protective Equipment) or appropriate Standards of Canada. If a hazard of injury to the feet exists due to falling objects, rolling objects, where objects may pierce the soles of the feet or where employee’s feet may be exposed to electrical hazards, use foot protection, as described in U.S. OSHA 29 CFR 1910.136 and the Canadian CSA Standard Z195-02, Protective Footwear.

9. PHYSICAL and CHEMICAL PROPERTIES

SPECIFIC VOLUME @ 0°C: 22.6 lb/ft³ (1.452 kg/ m³)
SOLUBILITY IN WATER vol/liq @ 15.5°C: Soluble.
GAS DENSITY @ 21.1°C: 0.0519 lb/ft³ (0.831 kg/m³) CRITICAL PRESSURE: 113 bar
MOLECULAR WEIGHT: 20.054
SPECIFIC GRAVITY (air = 1) @ 25°C: 0.5970
BOILING POINT @ 1 atm: -30.9°C (-23.62°F) FREEZING/MELTING POINT @ 1 atm: -78°C (-108°F)

DEUTERATED AMMONIA MSDS

EFFECTIVE DATE: FEBRUARY 3, 2007
PAGE 5 OF 12
MATH0098
9. PHYSICAL and CHEMICAL PROPERTIES (Continued)

COEFFICIENT WATER/OIL DISTRIBUTION: Not applicable.

ODOR THRESHOLD: 0.6 - 53 ppm (detection) [for Ammonia, Anhydrous]

VAPOR PRESSURE @ 21.1°C (70°F): 114.1 psig (786.7 kPa) [for Ammonia, Anhydrous]

APPEARANCE, ODOR AND STATE: Deuterated Ammonia is a suffocating, pungent-smelling, toxic, corrosive, liquefied gas. This gas is lighter than air and fumes strongly in moist air, producing a cloud of ammonium hydroxide mist.

WARNING PROPERTIES FOR THIS GAS: The odor of Deuterated Ammonia cannot be relied upon for detection of this gas, as olfactory fatigue can occur. This gas mixture may be lighter than air and fumes could fume strongly in moist air, producing a cloud of ammonium hydroxide mist. The dense appearance of this gas may act as a warning property when released. Area monitoring should be performed using appropriate equipment.

10. STABILITY and REACTIVITY

STABILITY: Stable at standard temperatures and pressures.

DECOMPOSITION PRODUCTS: Will react with water or moist air to ammonium hydroxide mist.

MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: Deuterated Ammonia is not compatible with most metals, acids, oxidizers. Deuterated Ammonia can form explosive compounds with mercury, gold or silver compounds or the elements. Deuterated Ammonia reacts violently with telluriumtetra bromide and tetrachloride, chlorine, bromine, fluorine, or the interhalogen compounds, and with acid halides, ethylene oxide, and hypochlorites (including household bleach). Poisoning or death can occur if Deuterated Ammonia (or ammonia-containing products) are mixed with household bleach.

HAZARDOUS POLYMERIZATION: Will not occur.

CONDITIONS TO AVOID: Contact with incompatible materials and exposure to moisture. Cylinders exposed to high temperatures or direct flame can rupture or burst.

11. TOXICOLOGICAL INFORMATION

TOXICITY DATA: The following are human toxicity data, LD50 oral-rat data, mutation data and select LCLo and TCLo data for Ammonia Anhydrous. Additional animal data are available for the components, but are not being presented in this MSDS.

**AMMONIA:**
- LCLo (inhalation, human) = 30,000 ppm/ 5 minutes
- TCLo (inhalation, human) = 20 ppm; irritation

**AMMONIA (continued):**
- LDLo (unknown, man) = 132 mg/kg
- LD50 (oral, rat) = 350 mg/kg

**SUSPECTED CANCER AGENT:** Deuterated Ammonia is not found on the following lists: FEDERAL OSHA Z LIST, IARC, NTP, CAL/OSHA, and therefore is not considered to be, nor suspected to be a cancer-causing agent by these agencies.

**IRRITANCY OF PRODUCT:** This gas is severely irritating to contaminated tissue.

**SENSITIZATION TO THE PRODUCT:** Deuterated Ammonia is not known to be a human skin or respiratory sensitizer.

**REPRODUCTIVE TOXICITY INFORMATION:** Listed below is information concerning the effects of this gas on the human reproductive system.

- **Mutagenicity:** Deuterated Ammonia is not reported to cause mutagenic effects in humans. Ammonia, Anhydrous has been reported to cause mutagenic effects in microorganisms during experimental studies with exposures at relatively high doses.
- **Embryotoxicity:** Deuterated Ammonia is not reported to cause embryotoxic effects in humans.
- **Teratogenicity:** Deuterated Ammonia is not reported to cause teratogenic effects in humans.
- **Reproductive Toxicity:** Deuterated Ammonia is not reported to cause adverse reproductive effects in humans.

**BIOLOGICAL EXPOSURE INDICES (BEIs):** There are no Biological Exposure Indices (BEIs) determined for this gas.

12. ECOLOGICAL INFORMATION

ENVIRONMENTAL STABILITY: This gas will be dissipated rapidly in well-ventilated areas. As an ammonium compound, Deuterated Ammonia is strongly absorbed on soil, on sediment particles and colloids in water.
ENVIRONMENTAL STABILITY (continued): This absorption results in high concentrations of sorbed ammonia in oxidized sediments. Under anoxic conditions, the absorptive capacity of sediments is less, resulting in the release of Deuterated Ammonia to either the water column or to an oxidized sediment layer above. Persistence: In the atmosphere, it is theorized that Ammonia compounds combine with sulfate ion in the atmosphere or in washout by rainfall, resulting in a rapid return of Ammonia to the soil. In the soil and water, Deuterated Ammonia will biodegrade and not persist. Biodegradation: As an ammonia compound, Deuterated Ammonia rapidly converts to nitrate by nitrification, in an aquatic environment. Bacteria convert the ammonia to nitrate, creating an oxygen demand (BOD) several days after introduction of Deuterated Ammonia to the environment. Temperature, oxygen supply and pH of the water are factors in determining the rate of biodegradation. All work practices should be aimed at eliminating environmental contamination.

EFFECT OF MATERIAL ON PLANTS or ANIMALS: Due to the potentially corrosive nature of this gas, animals exposed to this product may experience tissue damage, burns, and may be killed. Plants contaminated with this product may be adversely affected. Plants have a high affinity for gaseous Ammonia when leaf stomata are open in daylight. No data are currently available on this gas related to bioaccumulation in animals.

EFFECT OF CHEMICAL ON AQUATIC LIFE: Deuterated Ammonia will hydrolyze and form ammonium hydroxide mist when in contact with water. In the unlikely event that a release of this product occurs near a river or other body of water, fish and other aquatic life may be harmed. The following aquatic toxicity data are available for Anhydrous Ammonia.

**LC** (goldfish, yellow perch) = 2.0-2.5 ppm/1-4 days

**LC100** (crayfish) = 60-80 ppm/3 days

**TL** (fathead minnow) = 8.2 ppm/96 hours

**LC50** (coho salmon) = 0.45 mg/L/12 hours

**LC100** (crayfish) = 60-80 ppm/3 days

**LC50** (guppy fry) = 1.2-7.4 mg/L/96 hours

**LC50** (cutthroat trout fry, _Salam clarki_) = 0.5-0.8 mg/L/96 hours

**LC50** (rainbow trout: fertilized egg, alevins (0-50 days old), fry (85 days old), adults) = >3.58, >3.58, 0.068, 0.097 mg/L/24 hours

**LC50** (walking catfish) = 0.28 mg/L/48 hours

**LC50** (Salmo trutta) = >0.15 mg/L, 0.6-0.9 mg/L / 18 hours, 96 hours

**LC50** (Salvelinus fontinalis) = 0.96-1.05 mg/L, 96 hours

**LC50** (Catostomus platyrhynchos) = 0.67-0.82 mg/L, 96 hours

**LC50** (Oimephales promelas) = 0.73-3.4 mg/L, 96 hours

**LC50** (Notropis lutrensis) = 0.9-1.1 mg/L, 96 hours

**LC50** (Magli cephalus) = 1.2-2.4 mg/L, 96 hours

**LC50** (Morone americana) = 0.52-2.13 mg/L, 96 hours

**LC50** (Notropis spilopterus) = 1.2-1.35 mg/L, 96 hours

**LC50** (Lepomis cyanellus) = 0.6-2.1 mg/L, 96 hours

**LC50** (Lepomis macrolepis) = 0.14-0.86 mg/L, 96 hours

**LC50** (Lepomis gibbosus) = 0.26-4.6 mg/L, 96 hours

**LC50** (Micropterus salmoides) = >0.21-1.7 mg/L, 96 hours

**LC50** (Catostomus commersoni) = 0.79-1.4 mg/L, 96 hours

**LC50** (Notropis spilopterus) = 0.9-1.1 mg/L, 96 hours

**LC50** (Lepomis cyanellus) = 0.6-2.1 mg/L, 96 hours

**LC50** (Lepomis cyanellus) = 0.14-0.86 mg/L, 96 hours

**LC50** (Lepomis cyanellus) = 0.024-2.3 mg/L, 48 hours

**LC50** (Micropterus salmoides) = >0.21-1.7 mg/L, 96 hours

**LC50** (Notropis spilopterus) = 0.9-1.1 mg/L, 96 hours

**LC50** (Lepomis cyanellus) = 0.6-2.1 mg/L, 96 hours

**LC50** (Lepomis cyanellus) = 0.14-0.86 mg/L, 96 hours

**LC50** (Lepomis cyanellus) = 0.6-2.1 mg/L, 96 hours

**LC50** (Lepomis cyanellus) = 0.14-0.86 mg/L, 96 hours

**LC50** (Lepomis cyanellus) = 0.6-2.1 mg/L, 96 hours

**LC50** (Lepomis cyanellus) = 0.14-0.86 mg/L, 96 hours

13. DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL: Waste disposal must be in accordance with appropriate Federal, State, and local regulations. Return cylinders with any residual product to Matheson Tri-Gas. Do not dispose of locally.

14. TRANSPORTATION INFORMATION

THIS GAS IS HAZARDOUS AS DEFINED BY 49 CFR 172.101 BY THE U.S. DEPARTMENT OF TRANSPORTATION. The following information is for U.S. domestic shipments only!

PROPER SHIPPING NAME: Ammonia, anhydrous (Deuterated Ammonia)

HAZARD CLASS NUMBER and DESCRIPTION: 2.2 (Non-Flammable Gas)

UN IDENTIFICATION NUMBER: UN 1005

PACKING GROUP: Class 2.2 (Non-Flammable Gas)

CAUTION: Compressed gas cylinders shall not be refilled except by qualified producers of compressed gases. Shipment of a compressed gas cylinder which has not been filled by the owner or with the owner’s written consent is a violation of Federal law (49 CFR, Part 173.301 (b).

NAERG (NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK) #: 125

MARINE POLLUTANT: Deuterated Ammonia is not classified by the DOT as a Marine Pollutant (as defined by 49 CFR 172.101, Appendix B).

SPECIAL SHIPPING INFORMATION: Cylinders should be transported in a secure position, in a well-ventilated vehicle. The transportation of compressed gas cylinders in automobiles or in closed-body vehicles present serious safety hazards and should be discouraged.
14. TRANSPORTATION INFORMATION (Continued)

TRANSPORT CANADA TRANSPORTATION OF DANGEROUS GOODS REGULATIONS: This gas is classified as dangerous goods, per regulations of Transport Canada.

PROPER SHIPPING NAME: Ammonia, anhydrous (Deuterated Ammonia)

HAZARD CLASS NUMBER and DESCRIPTION: 2.2 (Non-Flammable Gas), 8 (Corrosive)

UN IDENTIFICATION NUMBER: UN 1005

PACKING GROUP: Not Applicable

HAZARD LABEL: Class 2.2 (Non-Flammable Gas), Class 8 (Corrosive)

SPECIAL PROVISIONS: None

EXPLOSIVE LIMIT AND LIMITED QUANTITY INDEX: 0

ERAP INDEX: 3000

PASSENGER CARRYING SHIP INDEX: Forbidden

PASSENGER CARRYING ROAD VEHICLE OR PASSENGER CARRYING RAILWAY VEHICLE INDEX: Forbidden

NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (2004): 125

NOTE: Shipment of compressed gas cylinders via Public Passenger Road Vehicle is a violation of Canadian law (Transport Canada Transportation of Dangerous Goods Act, 1992).

SPECIAL SHIPPING INFORMATION: Cylinders should be transported in a secure position, in a well-ventilated vehicle. The transportation of compressed gas cylinders in automobiles or in closed-body vehicles present serious safety hazards and should be discouraged.

15. REGULATORY INFORMATION

ADDITIONAL U.S. REGULATIONS:

U.S. SARA REPORTING REQUIREMENTS: Deuterated Ammonia is subject to the reporting requirements of Sections 302, 304 and 313 of Title III of the Superfund Amendments and Reauthorization Act., as follows:

<table>
<thead>
<tr>
<th>COMPOUND</th>
<th>SARA 302 (40 CFR 355, Appendix A)</th>
<th>SARA 304 (40 CFR Table 302.4)</th>
<th>SARA 313 (40 CFR 372.65)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ammonia</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
</tbody>
</table>

U.S. SARA 302 EXTREMELY HAZARDOUS SUBSTANCE (EHS) THRESHOLD PLANNING QUANTITY (TPQ): Ammonia Anhydrous = 500 lb (227 kg)

U.S. SARA 304 EXTREMELY HAZARDOUS SUBSTANCE (EHS) REPORTABLE QUANTITY (RQ): Ammonia Anhydrous = 500 lb (227 kg)

U.S. SARA 313 THRESHOLD PLANNING QUANTITY (RQ): Ammonia = 500 lb (227 kg)

U.S. CERCLA REPORTABLE QUANTITY (RQ): Ammonia = 100 lb (454 kg)

U.S. SARA HAZARD CATEGORIES (SECTION 311/312, 40 CFR 370-21): ACUTE: Yes; CHRONIC: Yes; FIRE: No; REACTIVE: No; SUDDEN RELEASE: Yes

U.S. TSCA INVENTORY STATUS: Deuterated Ammonia listed on the TSCA Inventory.

OTHER U.S. FEDERAL REGULATIONS: Ammonia is subject to the reporting requirements of CFR 29 1910.1000. Ammonia is listed on Table Z.1. Ammonia is subject to the reporting requirements of Section 112(r) of the Clean Air Act. The Threshold Quantity of Ammonia is 10,000 lbs. Ammonia is regulated under the Process Safety Management of Highly Hazardous Chemicals (29 CFR 1910.119). Depending on specific operations involving the use of this product, the threshold quantity for Ammonia is 10,000 lbs. Ammonia is listed as a Regulated Substance in quantities of 10,000 lbs (4,553 kg) or greater, per 40 CFR, Part 68, of the Risk Management for Chemical Accidental Release Prevention. However, Ammonia when used as an agricultural nutrient, and when held by farmers, is exempt from all provisions of this regulation.

CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT (PROPOSITION 65): Deuterated Ammonia is not on the California Proposition 65 lists.

LABELING: If cylinders of this gas mixture should be labeled for precautionary information per the guidelines of the CGA. Refer to the CGA for further information.
15. REGULATORY INFORMATION (Continued)

ADDITIONAL CANADIAN REGULATIONS:
CANADIAN DSL/NDDSL INVENTORY STATUS: Ammonia Anhydrous is listed on the DSL Inventory.
OTHER CANADIAN REGULATIONS: Not applicable.
CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) PRIORITIES SUBSTANCES LISTS: Ammonia Anhydrous is on the CEPA Priority 2 Substances List.
CANADIAN WHMIS CLASSIFICATION and SYMBOLS: This gas mixture would be categorized as a Controlled Product, Hazard Classes: A (compressed gas), B1 (flammable gas), and D1A (very toxic), E (corrosive), as per the Controlled Product Regulations. The following symbols are required for WHMIS compliance for this gas mixture.

16. OTHER INFORMATION

CREATION DATE: February 3, 2007    REVISION DATE: New

MIXTURES: When two or more gases or liquefied gases are mixed, their hazardous properties may combine to create additional, unexpected hazards. Obtain and evaluate the safety information for each component before you use the mixture. Consult an Industrial Hygienist or other trained person when you make your safety evaluation of the end product. Remember, gases and liquids have properties which can cause serious injury or death.

Further information can be found in the following pamphlets published by: Compressed Gas Association Inc. (CGA), 1725 Jefferson Davis Highway, Suite 1004, Arlington, VA 22202-4102. Telephone: (703) 412-0900.

“Safe Handling of Compressed Gases in Containers” (P-1, 1999)
“Safe Handling and Storage of Compressed Gases” (AV-1, 1999)
“Handbook of Compressed Gases” (1992)

PREPARED BY:
CHEMICAL SAFETY ASSOCIATES, Inc.
PO Box 3519, La Mesa, CA 91944-3519
800/441-3365

DEFINITIONS OF TERMS

A large number of abbreviations and acronyms appear on a MSDS. CAS #: This is the Chemical Abstract Service Number that uniquely identifies each constituent.

EXPOSURE LIMITS IN AIR:
CEILING LEVEL: The concentration that shall not be exceeded during any part of the working exposure.

DFG MAK Germ Cell Mutagen Categories: 1: Germ cell mutagens which have been shown to increase the mutant frequency in the progeny of exposed humans. 2: Germ cell mutagens which have been shown to increase the mutant frequency in the progeny of exposed mammals. 3A: Substances which have been shown to induce genetic damage in germ cells of human of animals, or which produce mutagenic effects in somatic cells of mammals in vivo and have been shown to reach the germ cells in an active form. 3B: Substances which are suspected of being germ cell mutagens because of their genotoxic effects in mammalian somatic cell in vivo; in exceptional cases, substances for which there are no in vivo data, but which are clearly mutagenic in vitro and structurally related to known in vivo mutagens. 4: Not applicable (Category 4 carcinogenic substances are those with non-genotoxic mechanisms of action. By definition, germ cell mutagens are genotoxic. Therefore, a Category 4 for germ cell mutagens cannot apply. At some time in the future, it is conceivable that a Category 4 could be established for genotoxic substances with primary targets other than DNA [e.g. purely aneugenic substances] if research results make this seem sensible). 5: Germ cell mutagens, the potency of which is considered to be so low that, provided the MAK value is observed, their contribution to genetic risk for humans is expected not to be significant.

DFG MAK Pregnancy Risk Group Classification: Group A: A risk of damage to the developing embryo or fetus has been unequivocally demonstrated. Exposure of pregnant women can lead to damage of the developing organism, even when MAK and BAT values are observed. Group B: Currently available information indicates a risk of damage to the developing embryo or fetus must be considered to be probable. Damage to the developing organism cannot be excluded when pregnant women are exposed, even when MAK and BAT values are observed.

EXPOSURE LIMITS IN AIR (continued):
DFG MAK Germ Cell Mutagen Categories (continued): Group C: Substances which have been shown to increase the frequency of mutations in mammalian somatic cells in vivo; in exceptional cases, substances for which there are no in vivo data, but which are clearly mutagenic in vitro and structurally related to known in vivo mutagens. 4: Not applicable (Category 4 carcinogenic substances are those with non-genotoxic mechanisms of action. By definition, germ cell mutagens are genotoxic. Therefore, a Category 4 for germ cell mutagens cannot apply. At some time in the future, it is conceivable that a Category 4 could be established for genotoxic substances with primary targets other than DNA [e.g. purely aneugenic substances] if research results make this seem sensible). 5: Germ cell mutagens, the potency of which is considered to be so low that, provided the MAK value is observed, their contribution to genetic risk for humans is expected not to be significant.

EFFECTIVE DATE: FEBRUARY 3, 2007
PAGE 9 OF 12 MATH0098
DEFINITIONS OF TERMS (continued)

HAZARDOUS MATERIALS IDENTIFICATION SYSTEM

HAZARD RATINGS: This rating system was developed by the National Paint and Coating Association and has been adopted by industry to identify the degree of chemical hazards.

HEALTH HAZARD:
0 (Minimal Hazard-Materials that will not burn in air when exposure to a temperature of 815.5 °C [1500 °F] for a period of 5 minutes.); 1 (Slight Hazard-Materials that must be pre-heated before ignition can occur. Material require considerable pre-heating, under all ambient temperature conditions before ignition and combustion can occur, Including: Materials that will burn in air when exposed to a temperature of 815.5 °C [1500 °F] for a period of 5 minutes or less); 2 (Moderate Hazard-Materials that may burn rapidly and create flash fire hazards (e.g. cotton, sisal, hemp); 3 (Serious Hazard- Liquids and solids that can be ignited under almost all ambient temperature conditions before ignition can occur. Materials in this degree would not, under normal conditions, form hazardous atmospheres in air, but under high ambient temperatures or moderate heating may release vapor in sufficient quantities to produce hazardous atmospheres in air, Including: Liquids having a flash-point at or above 37.8 °C [100 °F]; Solid materials in the form of course dusts that may burn rapidly but that generally do not form explosive atmospheres; Solid materials in a fibrous or shredded form that may burn rapidly and create flash fire hazards (e.g. cotton, sisal, hemp); Solids and semisolids that readily give off flammable vapors); 4 (Severe Hazard-Materials that will rapidly or completely vaporize at normal air pressure and not polymerize, decompose, condense or self-react; (1 Water Reactivity: Materials that change or decompose upon exposure to moisture. Organic Peroxides: Oxidizers: Packing Group II Solids: any material that, either in concentration tested, exhibits a mean burning time of less than or equal to the mean burning time of a 2.3 potassium bromate/cellulose mixture and the time of ignition for Packing Group I are not met. Liquids: any material that exhibits a mean pressure rise time less than or equal to the pressure rise of a 1:1 aqueous sodium chlorate solution (40%)/cellulose mixture and the criteria for Organic Peroxides: Materials that are capable of detonation or explosive reaction, but require a strong initiating source, or must be heated under confinement before ignition, and for explosives that react explosively with water. Explosives: Division 1.2 – Explosive substances that form a fire hazard and either a minor blast hazard or a minor projection hazard, but do not have a mass explosion hazard. Compressed Gases: Pressure > 51.47 psi absolute at 21.1 °C (70°F) [500 psig]. Pyrophorics: No Rating. Oxidizers: Packing Group I Solids: any material that, either concentration tested, exhibits a mean burning time of less than or equal to the mean burning time of a 3.2 potassium bromate/cellulose mixture. Liquids: Any material that spontaneously ignites when mixed with cellulose in a 1:1 ratio, or which exhibits a mean pressure rise time less than the pressure rise time of a 1.1 perichloric acid (50%)/cellulose mixture. Unstable Reactives: Substances that may polymerize, decompose, condense or self-react at ambient temperature and/or pressure and have a moderate potential to cause significant heat generation or explosion.); (2 Water Reactivity: Materials that are capable of detonation or explosive decomposition at normal ambient temperature and pressures. Explosives: Division 1.1 & 1.2-explosive substances that have a mass explosion hazard or have a detonation hazard. A mass explosion hazard is one that affects almost the entire load instantaneously. Compressed Gases: No Rating. Pyrophorics: Add the definition of Flammability “4". Oxidizers: No “4” rating. Unstable Reactives: Substances that may polymerize, decompose, condense or self-react at ambient temperature and/or pressure and have a high potential to cause significant heat generation or explosion.);

FLAMMABILITY HAZARD:
0 (Minimal Hazard-Materials that will not burn in air when exposure to a temperature of 815.5 °C [1500 °F] for a period of 5 minutes.); 1 (Slight Hazard-Materials that must be pre-heated before ignition can occur. Material require considerable pre-heating, under all ambient temperature conditions before ignition and combustion can occur, Including: Materials that will burn in air when exposed to a temperature of 815.5 °C [1500 °F] for a period of 5 minutes or less); 2 (Moderate Hazard-Materials that may burn rapidly and create flash fire hazards (e.g. cotton, sisal, hemp); 3 (Serious Hazard- Liquids and solids that can be ignited under almost all ambient temperature conditions before ignition can occur. Materials in this degree would not, under normal conditions, form hazardous atmospheres in air, but under high ambient temperatures or moderate heating may release vapor in sufficient quantities to produce hazardous atmospheres in air, Including: Liquids having a flash-point at or above 37.8 °C [100 °F]; Solid materials in the form of course dusts that may burn rapidly but that generally do not form explosive atmospheres; Solid materials in a fibrous or shredded form that may burn rapidly and create flash fire hazards (e.g. cotton, sisal, hemp); Solids and semisolids that readily give off flammable vapors;)

16. OTHER INFORMATION (Continued)
DEUTERATED AMMONIA MSDS EFFECTIVE DATE: FEBRUARY 3, 2007 MATH0098
16. OTHER INFORMATION (Continued)

DEFINITIONS OF TERMS (continued):

NATIONAL FIRE PROTECTION ASSOCIATION HAZARD RATINGS (continued):

HEALTH HAZARD (continued): 2 (materials that, under emergency conditions, can cause temporary incapacitation or residual injury): Gases and vapors whose LC50 for acute inhalation toxicity is greater than 3,000 ppm but less than or equal to 5,000 ppm. Dusts and mists whose LC50 for acute inhalation toxicity is greater than 2 mg/L but less than or equal to 10 mg/L. Materials whose LC50 for acute dermal toxicity is greater than 200 mg/kg but less than or equal to 1,000 mg/kg. Materials whose LC50 for acute oral toxicity is greater than 50 mg/kg but less than or equal to 500 mg/kg. Any liquid whose saturated vapor concentration at 20°C (68°F) is equal to or greater than one-fifth its LC50 for acute inhalation toxicity, if its LC50 is less than or equal to 5,000 ppm and that does not meet the criteria for either degree of hazard 3 or degree of hazard 4. Compressed liquefied gases with boiling points between -30°C (-22°F) and -55°C (-67.5°F) that cause severe tissue damage, depending on duration of exposure. Materials that are respiratory irritants. Materials that cause severe, but reversible irritation to the eyes or are lacrimators. Materials that are primary skin irritants or sensizers. 3 (materials that, under emergency conditions, can cause serious or permanent injury): Gases and vapors whose LC50 for acute inhalation toxicity is greater than 1,000 ppm but less than or equal to 3,000 ppm. Dusts and mists whose LC50 for acute inhalation toxicity is greater than 0.5 mg/L but less than or equal to 2 mg/L. Materials whose LC50 for acute dermal toxicity is greater than 40 mg/kg but less than or equal to 200 mg/kg. Materials whose LC50 for acute oral toxicity is greater than 5 mg/kg but less than or equal to 50 mg/kg. Any liquid whose saturated vapor concentration at 20°C (68°F) is equal to or greater than one-fifth its LC50 for acute inhalation toxicity, if its LC50 is less than or equal to 3000 ppm and that does not meet the criteria for degree of hazard 4. Compressed liquefied gases with boiling points between -30°C (-22°F) and -55°C (-67.5°F) that cause frostbite and irreversible tissue damage. Materials that are respiratory irritants. Cryogenic gases that cause frostbite and irreversible tissue damage. Materials that are corrosive to the respiratory tract. Materials that are corrosive to the eyes or cause irreversible corneal opacity. Materials that are corrosive to the skin. 4 (materials that, under emergency conditions, can be lethal): Gases and vapors whose LC50 for acute inhalation toxicity less than or equal to 1,000 ppm. Dusts and mists whose LC50 for acute inhalation toxicity is less than or equal to 0.5 mg/L. Materials whose LC50 for acute dermal toxicity is less than or equal to 0.5 mg/kg. Materials whose LC50 for acute oral toxicity is less than or equal to 5 mg/kg. Any liquid whose saturated vapor concentration at 20°C (68°F) is equal to or greater than one-fifth its LC50 for acute inhalation toxicity, if its LC50 is less than or equal to 1000 ppm. FLAMMABILITY HAZARD: 0 (materials that will not burn in air under typical local conditions, including intrinsically noncombustible materials such as concrete, stone, and sand: Materials that will not burn in air when exposed to a temperature of 816°C (1500°F) for a period of 5 minutes in accordance with Annex D. Materials that must be preheated before ignition can occur: Materials that require this degree of heating or that can become unstable at elevated temperatures and pressures: Materials that have an estimated instantaneous power density (product of heat of reaction and reaction rate) at 250°C (482°F) above 0.01 W/mL. Materials that do not exhibit an exotherm at temperatures less than or equal to 500°C (932°F) when tested by differential scanning calorimetry. Materials that in themselves are normally stable, but that can become unstable at elevated temperatures and pressures: Materials that have an estimated instantaneous power density (product of heat of reaction and reaction rate) at 250°C (482°F) at or above 0.01 W/mL and below 10 W/mL. Materials that readily undergo violent chemical change at elevated temperatures and pressures: Materials that have an estimated instantaneous power density (product of heat of reaction and reaction rate) at 250°C (482°F) at or above 10 W/mL and below 100 W/mL. Materials that in themselves are capable of detonation or explosive decomposition or explosive reaction, but that require a strong initiating event (e.g., shock or friction) to be ignited: Materials that have an estimated instantaneous power density (product of heat of reaction and reaction rate) at 250°C (482°F) at or above 100 W/mL and below 1000 W/mL. Materials that are sensitive to thermal or mechanical shock at elevated temperatures and pressures.

FLAMMABILITY LIMITS IN AIR:

Much of the information related to fire and explosion is derived from the National Fire Protection Association (NFPA). Flash Point - Minimum temperature at which a liquid gives off sufficient vapors to form an ignitable mixture with air. Autoignition Temperature: The minimum temperature required to initiate combustion in air with no other source of ignition. LEL - the lowest percent of vapor in air, by volume, that will explode or ignite in the presence of an ignition source. UEL - the highest percent of vapor in air, by volume, that will explode or ignite in the presence of an ignition source.

GASEOUS HAZARDS:

Human and Animal Toxicology: Possible health hazards as derived from human data, animal studies, or from the results of studies with similar compounds are presented. Definitions of some terms used in this section are: LDo5 - Lethal Dose (solids & liquids) which kills 50% of the exposed animals; LDo10 - Lethal Concentration (gases) which kills 50% of the exposed animals; ppm - concentration expressed in parts of material per million parts of air or water; mg/kg - concentration expressed in weight of substance per volume of air; mg/kg - quantity of material, by weight, administered to a test subject, with no additional measures of toxicity include TLDo and TLC which are the lowest dose to cause a symptom and the lowest concentration to cause a symptom.
16. OTHER INFORMATION (Continued)

DEFINITIONS OF TERMS (Continued):

TOXICOLOGICAL INFORMATION (continued):
TDo, LDLo, and LDo, or TC, TCo, LCLo, and LCo, the lowest dose (or concentration) to cause lethal or toxic effects. Cancer Information: The sources are: IARC - the International Agency for Research on Cancer; NTP - the National Toxicology Program; RTECS - the Registry of Toxic Effects of Chemical Substances; OSHA and CAL/OSHA. IARC and NTP rate chemicals on a scale of decreasing potential to cause human cancer with rankings from 1 to 4. Subrankings (2A, 2B, etc.) are also used. Other Information: BEI - ACGIH Biological Exposure Indices, represent the levels of determinants which are most likely to be observed in specimens collected from a healthy worker who has been exposed to chemicals to the same extent as a worker with inhalation exposure to the TLV.

ECOLOGICAL INFORMATION:

BCF = Bioconcentration Factor, which is used to determine if a substance will concentrate in lifeforms which consume contaminated plant or animal matter;
EC is the Effect Concentration in water; EC50 is the Effect Concentration for 50% of the organisms exposed; NOEC is the No Observed Effect Concentration; MATC is the Maximum Acceptable Toxicant Concentration; NOLC is the No Observed Lethal Concentration; TLm is the median threshold limit; Coefficient of Oil/Water Distribution is represented by log Kow or log Koc and is used to assess a substance's behavior in the environment.

REGULATORY INFORMATION:

U.S. and CANADA:
ACGIH: American Conference of Governmental Industrial Hygienists, a professional association which establishes exposure limits. This section explains the impact of various laws and regulations on the material. EPA is the U.S. Environmental Protection Agency. NIOSH is the National Institute of Occupational Safety and Health, which is the research arm of the U.S. Occupational Safety and Health Administration (OSHA). WHMIS is the Canadian Workplace Hazardous Materials Information System. DOT and TC are the U.S. Department of Transportation and the Transport Canada, respectively. Superfund Amendments and Reauthorization Act (SARA); the Canadian Domestic/Non-Domestic Substances List (DSL/NDSL); the U.S. Toxic Substance Control Act (TSCA); Marine Pollutant status according to the DOT; the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or Superfund); and various state regulations. This section also includes information on the precautionary warnings which appear on the material's package label.

OSHA - U.S. Occupational Safety and Health Administration.