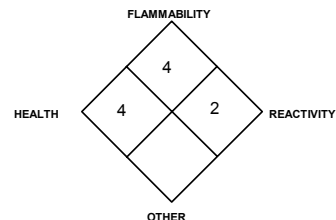


**NFPA RATING****MATERIAL SAFETY DATA SHEET**

Prepared to U.S. OSHA, CMA, ANSI and Canadian WHMIS Standards

PART I *What is the material and what do I need to know in an emergency?***1. PRODUCT IDENTIFICATION**

CHEMICAL NAME; CLASS: **ARSINE - AsH₃**
PRODUCT USE: Document Number: 001069
 For general analytical/synthetic chemical uses.
SUPPLIER/MANUFACTURER'S NAME: AIRGAS INC.
ADDRESS: 259 North Radnor-Chester Road
 Suite 100
 Radnor, PA 19087-5283
BUSINESS PHONE: 1-610-687-5253
EMERGENCY PHONE: 1-800-949-7937
 International: 423-479-0293
DATE OF PREPARATION: May 17, 1998
DATE OF REVISION: October 24, 2002

2. COMPOSITION and INFORMATION ON INGREDIENTS

CHEMICAL NAME	CAS #	mole %	EXPOSURE LIMITS IN AIR					
			ACGIH-TLV		OSHA-PEL		NIOSH IDLH ppm	OTHER ppm
			TWA ppm	STEL ppm	TWA ppm	STEL ppm		
Arsine	7784-42-1	> 99%	0.05	NE	0.05	NE	3	NIOSH REL: TWA = 0.002 mg/m ³ /15 minutes Carcinogen: NIOSH-Ca
Maximum Impurities		< 1%	None of the trace impurities of this gas contribute significantly to the hazards associated with the product. All hazard information pertinent to this product has been provided in this Material Safety Data Sheet, per the requirements of the Federal Occupational Safety and Health Administration Standard (29 CFR 1910.1200), U.S. State equivalent Standards and Canadian Workplace Hazardous Materials Identification System Standards (CPR 4).					

NE = Not Established.

See Section 16 for Definitions of Terms Used.

NOTE (1): ALL WHMIS required information is included in appropriate sections based on the ANSI Z400.1-1998 format. This gas has been classified in accordance with the hazard criteria of the CPR and the MSDS contains all the information required by the CPR.

3. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW: Arsine is a colorless, extremely toxic and flammable, liquefied gas at room temperature and atmospheric pressure, with a slight, garlic-like odor. The odor threshold of Arsine is 0.26-0.62 ppm. The odor should not be used as a method to detect the presence of Arsine as it is above the TLV. The health effects associated with Arsine over-exposures are primarily related to the destruction of red blood cells. Exposure to even very small quantities can result in severe health effects and death. Arsine is a potential human carcinogen. Arsine can form flammable mixtures in air and presents an extreme fire hazard when accidentally released. Arsine is a strong reducing agent and can react vigorously with mild to strong oxidizing agents. Arsine is heavier than air and may travel a considerable distance to a distant source of ignition and flash-back to a leak. Emergency responders must wear adequate personal protective equipment and provide suitable fire protection during response situations.

3. HAZARD IDENTIFICATION (Continued)

SYMPTOMS OF OVEREXPOSURE BY ROUTE OF EXPOSURE:

Arsine is very toxic by inhalation. The following paragraphs describe the symptoms of overexposure.

INHALATION: Arsine is an extremely toxic gas and is one of the most potent hemolytic agents in current industrial use. Both chronic and acute over-exposures to this gas are dangerous. Development of symptoms may be delayed for up to 24 hours. Effects of an acute over-exposure are related hemolysis (destruction of red blood cells), due to the reaction of the Arsine molecule with hemoglobin within red blood cells. Symptoms of such over-exposure may include the following: orange-colored sclera and skin, blood in urine, malaise, dizziness, headache, nausea, vomiting, abdominal pain, pain in the lower back (as a result of kidneys effects), liver dysfunction, heart damage, diarrhea, collapse, and coma. Hemolysis can continue for 96 hours after the over-exposure ends. In severe over-exposures, the mucous membrane, the rear side of the lips, and the flesh under the finger nails, may have a bluish discoloration. Pulmonary edema may occur following over-exposure. Arsine is moderately irritating to contaminated skin and eyes. Effects of chronic over-exposures can result in peripheral neuropathy (i.e. tingling and pain in the extremities), changes in pigmentation, cardiovascular problems, anemia, jaundice, and kidney damage. There is evidence that Arsine is potentially carcinogenic to humans. Specific effects, based on the concentration of Arsine, are presented below for use by qualified medical personnel: in treating Arsine exposure cases

ARSINE CONCENTRATION

3 ppm

6.25-15.5 ppm

250 - 500 ppm

500 ppm or higher

HEALTH EFFECT

The maximum concentration tolerated for several hours without serious symptoms.

Lethal within 30 -60 minutes.

Lethal within 30 minutes.

Lethal within a few minutes.



OTHER POTENTIAL HEALTH EFFECTS: Contact with liquid or rapidly expanding gases (which are released under high pressure) may cause frostbite. Symptoms of frostbite include change in skin color to white or grayish-yellow. The pain after such contact can quickly subside.

HEALTH EFFECTS OR RISKS FROM EXPOSURE: **An Explanation in Lay Terms.** Over-exposure to Arsine may cause the following health effects:

ACUTE: Arsine is an extremely toxic gas; even brief over-exposures can result in severe health problems and may be fatal. Effects of an acute inhalation over-exposure include related hemolysis (destruction of red blood cells). Symptoms of such over-exposure may include the following: orange colored-sclera and skin, blood in urine, fatigue, dizziness, headache, nausea, vomiting, abdominal pain, pain in the lower pack, diarrhea, and collapse. Pulmonary edema may also occur following over-exposure. Symptoms of hemolysis and edema can be delayed for several to 24 hours. Overexposure can be fatal.

CHRONIC: Effects of chronic over-exposures can result in peripheral neuropathy (i.e. tingling and pain in the extremities), changes in pigmentation, cardiovascular problems, anemia, jaundice, and kidney damage. There is evidence that Arsine is potentially carcinogenic to humans. Refer to Section 11 (Toxicology Information) for additional data.

TARGET ORGANS: ACUTE: Red blood cells and the blood system, circulatory system. CHRONIC: Nervous system, kidneys, liver.

HAZARDOUS MATERIAL IDENTIFICATION SYSTEM			
HEALTH HAZARD		(BLUE)	4
FLAMMABILITY HAZARD		(RED)	4
PHYSICAL HAZARD		(YELLOW)	2
PROTECTIVE EQUIPMENT			X
EYES	RESPIRATORY	HANDS	BODY
	See Section 8		See Section 8
For Routine Industrial Use and Handling Applications			

See Section 16 for Definition of Ratings

PART II

What should I do if a hazardous situation occurs?

4. FIRST-AID MEASURES

RESCUERS SHOULD NOT ATTEMPT TO RETRIEVE VICTIMS OF EXPOSURE TO THIS PRODUCT WITHOUT ADEQUATE PERSONAL PROTECTIVE EQUIPMENT. At a minimum, Self-Contained Breathing Apparatus and Chemically-Resistant and Fire-Retardant Personal Protective equipment should be worn. Adequate fire protection must be provided during rescue situations. Remove victim(s) to fresh air, as quickly as possible. Treatment for Arsine poisoning must be prompt. All over-exposed individuals must receive medical evaluation, because the development of symptoms to potentially life-threatening conditions may be delayed. Keep victims warm and comfortable. Only trained personnel should administer supplemental oxygen and/or cardio-pulmonary resuscitation, if necessary. Rescuers should be taken for medical attention, if necessary. Take copy of label and MSDS to physician or other health professional with victim(s).

4. FIRST-AID MEASURES (Continued)

SKIN EXPOSURE: In the event of frostbite after exposure to liquefied gas, remove any clothing that may restrict circulation to any frozen area. Do not rub frozen parts as tissue damage may occur. As soon as practicable, place any affected area in warm water bath which has a temperature that does not exceed 105°F (40°C). NEVER USE HOT WATER. NEVER USE DRY HEAT. If area of frostbite is extensive, and if possible, remove clothing while showering with warm water. If warm water is not available, or is impractical to use, wrap the affected parts gently in blankets. Alternatively, if the fingers or hands are frostbitten, place the affected area of the body in the armpit. Encourage victim to gently exercise the affected part while being warmed. Seek immediate medical attention.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Acute or chronic respiratory conditions may be aggravated by over-exposure to this product. Additionally, blood, kidney, liver and cardiovascular conditions may also be aggravated (depending on the severity and duration of the over-exposure).

RECOMMENDATIONS TO PHYSICIANS: The health effects of Arsine over-exposure are related to the destruction of the blood's red cells. The oxygen transport capability will be diminished and there is a risk of kidney failure. Administer oxygen. Be observant for pulmonary edema. Exchange transfusion through heparinized femoral catheters is the standard treatment for severe Arsine over-exposures. Such transfusions may require 10-15 exchanges of whole blood. The plasma hemoglobin treatment is used as a guideline; attempts should be made to lower the concentration by 75-85% of the plasma hemoglobin and also return the hematocrit level to normal. Preservation of renal function is essential. Early intravenous Mannitol (25-50 g) is given if the patient is oliguric, and bicarbonate is used to alkalinize the urine. Dialysis is a recommended treatment if renal failure supervenes. There is no specific treatment for Arsine poisoning; treatment with BAL (British Anti-Lewisite; Dimercaprol) is a suggested treatment (though its efficacy has been questioned). BAL will not prevent arsine-induced hemolysis, BAL may bind with circulating oxidation products of arsine after the red cells lyse, thus preventing acute and chronic toxicity to other organ systems. The dosage of BAL is 2.5 mg/kg body weight; this dosage should be repeated four to six times the first two days and reduced to twice daily for up to ten days.

5. FIRE-FIGHTING MEASURES

FLASH POINT: -62°C (-79°F)

AUTOIGNITION TEMPERATURE: Not applicable; extremely flammable gas.

FLAMMABLE LIMITS (in air by volume, %):

Lower (LEL): 4.5%

Upper (UEL): 64%

FIRE EXTINGUISHING MATERIALS: Extinguish Arsine fires by shutting-off the source of the gas. Use a fine water spray or fog to reduce combustion products formed in air. Cool fire-exposed cylinders with water spray, from the maximum distance possible. Alcohol foam, carbon dioxide or dry chemical forms of fire extinguishing agents can be used against Arsine fires.

UNUSUAL FIRE AND EXPLOSION HAZARDS: Arsine is an extremely toxic gas. Arsine is heavier than air and can travel considerable distances to a distant source of ignition and flash-back to the leak. Arsine ignites to form a variety of arsenic compounds (predominately arsenic trioxide).

Arsenic can be generated from Arsine when the gas is exposed to light or heated above 300°C (572°F). This gas is a strong reducing agent and can react vigorously with mild to strong oxidizing agents.

DANGER! Fires impinging (direct flame) on the outside surface of unprotected cylinders of this product can be very dangerous. Direct flame exposure on the cylinder wall can cause an explosion. This is a catastrophic failure of the cylinder releasing the contents into a massive fireball and explosion. The resulting fire and explosion can result in severe equipment damage and personnel injury or death over a large area around the cylinder. For massive fires in large areas, use unmanned hose holder or monitor nozzles; if this is not possible, withdraw from area and allow fire to burn.

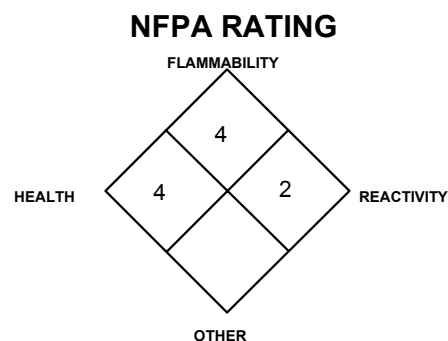
Explosion Sensitivity to Mechanical Impact: Not sensitive.

Explosion Sensitivity to Static Discharge: Sensitive. Static charge can build-up due to the low conductivity of liquid Arsine and may cause this product to ignite explosively if released.

SPECIAL FIRE-FIGHTING PROCEDURES: Structural fire-fighters must wear Self-Contained Breathing Apparatus and full protective equipment. Appropriate chemically-protective clothing may be necessary. Keep away from low-lying areas. Stay upwind. Because of the potential for a BLEVE, evacuation of non-emergency personnel is essential. If water is not available for cooling or protection of vessel exposures, evacuate the area. Follow the guidelines of the North American Emergency Response Guidebook (Guide #119).

6. ACCIDENTAL RELEASE MEASURES

SPILL AND LEAK RESPONSE: If a leak occurs of a sufficient quantity to cause a dangerous level of Arsine, evacuate the immediate area of all personnel. Uncontrolled releases should be responded to by trained personnel using pre-planned procedures. (continued on following page)



**See Section 16 for
Definition of Ratings**

6. ACCIDENTAL RELEASE MEASURES (Continued)

SPILL AND LEAK RESPONSE (continued): Proper protective equipment must be used. In case of a release, clear the affected area, protect people, and respond with trained personnel. Eliminate any possible sources of ignition, and provide maximum explosion-proof ventilation. If the gas is leaking from cylinder or valve, contact the supplier. Adequate fire protection must be provided. Use only non-sparking tools and equipment during the response. Minimum Personal Protective Equipment should be **Level A: fully encapsulating suit, triple-layer of gloves, chemically-resistant boots, hard-hat, and Self-Contained Breathing Apparatus**. Level A protection must be worn during emergency response situations in all areas in which the level of exposure to Arsine is above 50% of the TLV (0.05 ppm). Fire retardant gear must be worn under Level A protection when Arsine levels exceed 10% of the LEL (4.5%). Locate and seal the source of the leaking gas. Protect personnel attempting the shut-off with water-spray. Allow the gas to dissipate, if it can be done to an area in which there are no personnel. Combustible gas concentration must be below 10% of the LEL (4.5%) prior to entry. Monitor the surrounding area for toxic Arsine levels as well as combustible gas levels and oxygen level. The atmosphere must be below 50% of the TLV (0.05 ppm) of Arsine and must have at least 19.5 percent oxygen before personnel can be allowed in the area without Self-Contained Breathing Apparatus. Attempt to close the main source valve prior to entering the area. If this does not stop the release (or if 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.

THIS IS AN EXTREMELY TOXIC, FLAMMABLE GAS. Protection of all personnel and the area must be maintained.

PART III *How can I prevent hazardous situations from occurring?*

7. HANDLING and STORAGE

WORK PRACTICES AND HYGIENE PRACTICES: All areas where Arsine is used should be monitored with very sensitive gas detection instruments. Detection of concentrations below 50% of the TLV level of 0.05 ppm should trigger immediate response and corrective action. Detection of higher levels should initiate an alarm calling for evacuation of all personnel with the potential to be exposed. Due to the extreme toxicity of Arsine, all contaminated clothing should be removed and placed in a sealed container for proper disposal.

STORAGE AND HANDLING PRACTICES: Cylinders should be stored in dry, well-ventilated areas away from sources of heat. Compressed gases can present significant safety hazards. Store containers away from heavily trafficked areas and emergency exits. Post "No Smoking or Open Flames" signs in storage or use areas. Cylinders should be separated from oxygen cylinders, or other oxidizers, by a minimum distance of 20 ft., or by a barrier of non-combustible material at least 5 ft. high, having a fire-resistance rating of at least 0.5 hours. Isolate from other incompatible chemicals (refer to Section 10, Stability and Reactivity). Storage areas must meet national electrical codes for Class 1 Hazardous Areas. Post "No Smoking or Open Flames" signs in storage or use areas. Consider installation of leak detection and alarm for storage and use areas. Have appropriate extinguishing equipment in the storage area (i.e. sprinkler system, portable fire extinguishers). Keep the smallest amount on-site as is necessary. Full and empty cylinders should be segregated. Use a first-in, first-out inventory system to prevent full containers from being stored for long periods of time. 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-sparking or explosion proof. Use a check valve in the discharge line to prevent hazardous backflow.

SPECIAL PRECAUTIONS FOR HANDLING GAS CYLINDERS: Protect cylinders against physical damage. Store in cool, dry, well-ventilated, fireproof area, away from flammable materials and corrosive atmospheres. Store away from heat and ignition sources and out of direct sunlight. Do not store near elevators, corridors or loading docks. Do not allow area where cylinders are stored to exceed 52°C (125°F). Avoid storing products by incompatible chemicals. Do not store containers where they can come into contact with moisture. 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. Never tamper with pressure relief devices in valves and cylinders. The following rules are applicable to 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 in-place until cylinder is ready for use.

During Use: Use designated CGA fittings and other support equipment. Do not use adapters. Do not heat cylinder by any means to increase the discharge rate of the product from the cylinder. Use check valve or trap in discharge line to prevent hazardous backflow into the cylinder. Do not use oils or grease on gas-handling fittings or equipment.

After Use: Close main cylinder valve. Replace valve protection cap. Mark empty cylinders "EMPTY".

NOTE: Use only DOT or ASME Code containers. Earth-ground and bond all lines and equipment associated with this product. Close valve after each use and when empty. Cylinders must not be recharged except by or with the consent of owner. For additional information refer to the Compressed Gas Association Pamphlet P-1, *Safe Handling of Compressed Gases in Containers*. Additionally, refer to CGA Bulletin SB-2 "Oxygen Deficient Atmospheres".

PROTECTIVE PRACTICES DURING MAINTENANCE OF CONTAMINATED EQUIPMENT: Follow practices indicated in Section 6 (Accidental Release Measures). Make certain application equipment is locked and tagged-out safely. Always use product in areas where adequate ventilation is provided.

8. EXPOSURE CONTROLS - PERSONAL PROTECTION

VENTILATION AND ENGINEERING CONTROLS: Install automatic monitoring equipment to detect the level of Arsine. Provide explosion-proof ventilation adequate to ensure Arsine does not reach its lower flammability limit of 4.5%. Due to the extreme toxicity of Arsine, cylinders of this product should always be placed in a properly designed and constructed gas cabinet. Double wall piping should be used to deliver gas to the point of use. Exhaust from the cabinet and from the annular space of the tubing should be monitored.

RESPIRATORY PROTECTION: Maintain Arsine levels below 50% of the TLV (0.05 ppm) and oxygen levels above 19.5% in the workplace. The use of supplied air respiratory protection is recommended when changing Arsine cylinders or working on Arsine systems. Use supplied air respiratory protection when Arsine levels exceed 50% of the TLV (0.05 ppm), oxygen levels are below 19.5%, or during emergency response to a release of this product. During an emergency situation, before entering the area, check the concentration of Arsine and oxygen. If respiratory protection is needed, use only protection authorized in the U.S. Federal OSHA Standard (29 CFR 1910.134), applicable U.S. State regulations, or the Canadian CSA Standard Z94.4-93 and applicable standards of Canadian Provinces. 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 NIOSH guidelines for respirator selection are provided for additional information:

CONCENTRATION	RESPIRATORY EQUIPMENT
----------------------	------------------------------

At Concentrations Above the NIOSH REL or At Any Detectable Concentration: Positive pressure, full-facepiece Self-Contained Breathing Apparatus (SCBA); or positive pressure, full-facepiece Supplied Air Respirator (SAR) with an auxiliary positive pressure SCBA.

Escape: Gas mask with canister to protect against arsine; or escape-type SCBA.

EYE PROTECTION: Splash goggles, face-shields or safety glasses. If necessary, refer to U.S. OSHA 29 CFR 1910.133, or Canadian Standards.

HAND PROTECTION: Wear mechanically-resistant gloves when handling cylinders of this product. Wear chemically-resistant gloves when using this gas mixture. Neoprene gloves are recommended. If necessary, refer to U.S. OSHA 29 CFR 1910.138 or appropriate Standards of Canada.

BODY PROTECTION: Use body protection appropriate for task. For emergency response operations, clothing resistant to the toxic effects of Arsine is required (i.e., Level A Protection). Cotton clothing should be worn

9. PHYSICAL and CHEMICAL PROPERTIES

VAPOR DENSITY: 3.24 kg/m³ (0.2025 lb./ft³)

SPECIFIC GRAVITY (air = 1) @ 21.1°C (70°F) & 1 atm: 2.69

SOLUBILITY IN WATER: 0.23 in³/1 in³

VAPOR PRESSURE @ 21.1°C (70°F) psig: 205

COEFFICIENT WATER/OIL DISTRIBUTION: Not applicable.

SPECIFIC VOLUME (ft³/lb): 5.0

ODOR THRESHOLD: 0.26-0.62 ppm (detection or recognition unspecified)

LIQUID DENSITY @ 21.1°C (70°F): 1336 kg/m³ (83.55 lb./ft³)

APPEARANCE AND COLOR: Colorless gas with a mild, garlic odor

HOW TO DETECT THIS SUBSTANCE (warning properties): The odor cannot be considered a good warning property as extreme toxic properties of the gas will be in effect before the odor threshold is reached. Monitoring systems must be used for detection of this gas.

EVAPORATION RATE (nBuAc = 1): Not applicable.

FREEZING POINT: -116.9°C (-178.4°F)

BOILING POINT @ 1 atm: -62.5°C (-80.5°F)

pH: Not applicable.

EXPANSION RATIO: Not applicable.

10. STABILITY and REACTIVITY

STABILITY: Arsine is stable at room temperature, but begins to decompose at 446-464°F (230-240°C).

DECOMPOSITION PRODUCTS: Arsenic can be generated from Arsine when the gas is exposed to light or it is heated above 300°C (572°F). Arsenic trioxide is a combustion product of arsine.

MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: Arsine reacts readily with bromine, potassium permanganate, sodium hypochlorite to form arsenic compounds. Arsine is a strong reducing agent and will react with mild to strong oxidizers.

HAZARDOUS POLYMERIZATION: Will not occur.

CONDITIONS TO AVOID: Avoid exposing cylinders to extremely high temperatures, which could cause the cylinders to rupture. Avoiding exposing this product to incompatible chemicals.

PART IV *Is there any other useful information about this material?*

11. TOXICOLOGICAL INFORMATION

TOXICITY DATA: The following data are currently available for Arsine:

TCLo (Inhalation-Human) 3 ppm: Blood: pigmented or nucleated red blood cells, other hemolysis with or without anemia	LD ₅₀ (Intraperitoneal-Rabbit) 2500 µg/kg	TCLo (Inhalation-Rat) 500 ppm/6 hours/28 days-intermittent: Endocrine: changes in spleen weight; Blood: other changes; Biochemical: Enzyme inhibition, induction, or change in blood or tissue levels: other Enzymes
TCLo (Inhalation-Man) 325 µg/m ³ : Gastrointestinal: other changes; Kidney, Ureter, Bladder: hematuria	LD ₅₀ (Intraperitoneal-Domestic) 3 mg/kg	TCLo (Inhalation-Rat) 500 ppm/6 hours/90 days-intermittent: Endocrine: changes in spleen weight; Blood: pigmented or nucleated red blood cells, changes in erythrocyte (RBC) count
LCLo (Inhalation-Human) 25 ppm/30 minutes: Blood: other hemolysis with or without anemia; Endocrine: changes in growth hormone	LCLo (Inhalation-Monkey) 600 mg/m ³ /1 hour	TCLo (Inhalation-Mouse) 5 ppm/6 hours/14 days-intermittent: Liver: changes in liver weight; Endocrine: changes in spleen weight; Blood: changes in other cell count (unspecified)
LCLo (Inhalation-Human) 300 ppm/5 minutes	LCLo (Inhalation-Cat) 150 mg/m ³ /20 minutes	TCLo (Inhalation-Mouse) 500 ppb/12 weeks-intermittent: Endocrine: changes in spleen weight; Blood: changes in spleen, changes in leukocyte (WBC) count
TDLo (Inhalation-Man) 338 ppt: Gastrointestinal tract effects, systemic effects, central nervous system effects	LCLo (Inhalation-Frog) 4500 mg/m ³ /3 hours: Peripheral Nerve and Sensation: spastic paralysis with or without sensory change; Behavioral: altered sleep time (including change in righting reflex); Cardiac: other changes	
LC ₅₀ (Inhalation-Rat) 390 mg/m ³ /10 minutes	TDLo (Intraperitoneal-Rabbit) 5500 µg/kg/11 days-intermittent: Related to Chronic Data: death	
LC ₅₀ (Inhalation-Mouse) 250 mg/m ³ /10 minutes	TCLo (Inhalation-Hamster) 2500 ppm/6 hours/28 days-intermittent: Liver: changes in liver weight; Endocrine: changes in spleen weight; Blood: other changes	
LC ₅₀ (Inhalation-Dog) 350 mg/m ³ /30 minutes	TDLo (Intraperitoneal-Mouse) 12 mg/kg/10 days-intermittent: Related to Chronic Data: death	
LC ₅₀ (Inhalation-Rabbit) 650 mg/m ³ /10 minutes	TCLo (Inhalation-Rat) 2500 ppm/6 hours/14 days-intermittent: Liver: changes in liver weight; Endocrine: changes in spleen weight; Blood: other changes	
LC ₅₀ (Inhalation-Domestic) 1 gm/m ³ /10 minutes		
LD ₅₀ (Intraperitoneal-Mouse) 3 mg/kg		
LD ₅₀ (Intraperitoneal-Cat) 2 mg/kg		

SUSPECTED CANCER AGENT: Arsine is listed by agencies tracking the carcinogenic potential of chemical compounds, as follows:

NIOSH-Ca (Potential Occupational Carcinogen)

The EPA has listed Inorganic Arsenic compounds a classification of EPA-A, based on sufficient evidence from human data. An increased lung cancer mortality was observed in multiple human populations exposed primarily through inhalation. Also increased mortality from multiple internal organ cancers (liver, kidney, lung, and bladder).

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

IRRITANCY OF PRODUCT: Arsine is moderately irritating to contaminated skin and eyes.

SENSITIZATION OF PRODUCT: Arsine is not known to cause skin or respiratory sensitization in humans.

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

Mutagenicity: No mutagenicity effects have been described for Arsine.

Embryotoxicity: No embryotoxic effects have been described for Arsine.

Teratogenicity: No teratogenicity effects have been described for Arsine.

Reproductive Toxicity: No reproductive toxicity effects have been described for Arsine.

A *mutagen* is a chemical which causes permanent changes to genetic material (DNA) such that the changes will propagate through generation lines. An *embryotoxin* is a chemical which causes damage to a developing embryo (i.e. within the first eight weeks of pregnancy in humans), but the damage does not propagate across generational lines. A *teratogen* is a chemical which causes damage to a developing fetus, but the damage does not propagate across generational lines. A *reproductive toxin* is any substance which interferes in any way with the reproductive process.

ACGIH BIOLOGICAL EXPOSURE INDICES (BEIs): Currently, ACGIH Biological Exposure Indices (BEIs) have been determined for Arsine, as follows:

CHEMICAL DETERMINANT	SAMPLING TIME	BEI
Arsenic Elemental And Soluble Inorganic Compounds Including Arsine: • Inorganic Arsenic Plus Methylated Metabolites In Urine	• End of workweek	• 35 µg/g creatinine

12. ECOLOGICAL INFORMATION

ENVIRONMENTAL STABILITY: This gas will be dissipated rapidly in well-ventilated areas. The gas is a strong reducing agent and will react with a wide variety of oxidizing materials. Arsenic can be generated from Arsine when the gas is exposed to light.

EFFECT OF MATERIAL ON PLANTS or ANIMALS: Arsine is an extremely toxic gas which can be harmful or fatal to over-exposed plant or animal life.

EFFECT OF CHEMICAL ON AQUATIC LIFE: Arsine is an extremely toxic gas which is soluble in water; therefore, this gas can be harmful or fatal to aquatic life in contaminated bodies of water.

13. DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL: Product removed from the cylinder must be disposed of in accordance with appropriate U.S. Federal, State, and local regulations or with regulations of Canada and its Provinces. Return cylinders with residual product to Airgas, Inc. Do not dispose of locally.

14. TRANSPORTATION INFORMATION

ARSINE IS HAZARDOUS AS DEFINED BY 49 CFR 172.101 BY THE U.S. DEPARTMENT OF TRANSPORTATION.

PROPER SHIPPING NAME: Arsine
HAZARD CLASS NUMBER and DESCRIPTION: 2.3 (Toxic Gas), 2.1 (Flammable Gas)
UN IDENTIFICATION NUMBER: UN 2188
PACKING GROUP: Not Applicable
DOT LABEL(S) REQUIRED: Class 2.3 (Toxic Gas), Class 2.1 (Flammable Gas)
NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (2000): 119
SPECIAL PROVISION: This material must be described "Poison-Inhalation Hazard Zone A" on shipping papers and containers must be marked per the requirements of 49 CFR 172.313.
MARINE POLLUTANT: Arsine is not classified by the DOT as a Marine Pollutant (as defined by 49 CFR 172.101, Appendix B).

TRANSPORT CANADA TRANSPORTATION OF DANGEROUS GOODS REGULATIONS: Arsine is considered as Dangerous Goods, per regulations of Transport Canada. The use of the above U.S. DOT information from the U.S. 49 CFR regulations is allowed for shipments that originate in the U.S. For shipments via ground vehicle or rail that originate in Canada, the following information is applicable.

PROPER SHIPPING NAME: Arsine
HAZARD CLASS NUMBER and DESCRIPTION: 2.3 (Toxic Gas), 2.1 (Flammable Gas)
UN IDENTIFICATION NUMBER: UN 2188
PACKING GROUP: Not Applicable
HAZARD LABEL(S) REQUIRED: Class 2.3 (Toxic Gas); Class 2.1 (Flammable Gas)
SPECIAL PROVISIONS: 38
EXPLOSIVE LIMIT & LIMITED QUANTITY INDEX: 0
ERAP INDEX: 0
PASSENGER CARRYING SHIP INDEX: Forbidden
PASSENGER CARRYING ROAD OR RAIL VEHICLE INDEX: Forbidden
MARINE POLLUTANT: Potential Marine Pollutant.

15. REGULATORY INFORMATION

ADDITIONAL U.S. REGULATIONS:

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

CHEMICAL NAME	SARA 302 (40 CFR 355, Appendix A)	SARA 304 (40 CFR Table 302.4)	SARA 313 (40 CFR 372.65)
Arsine	Yes	Yes	Yes

U.S. SARA THRESHOLD PLANNING QUANTITY: 100 lb (45.4 kg)

U.S. CERCLA REPORTABLE QUANTITY (RQ): Arsine has a 100 lb (45.4 kg) Reportable Quantity as an Extremely Hazardous Substance. Releases of Arsine are subject to the release reporting requirements of CERCLA section 103, codified at 40 CFR part 302, in addition to the requirements of 40 CFR part 355. Arsine is an Extremely Hazardous Substance (EHS) subject to reporting requirements when stored in excess of its threshold planning quantity (TPQ) of 100 lbs (45.4 kg). Persons in charge of vessels or facilities are required to notify the National Response Center (NRC) immediately, when there is a release of Arsine, in an amount equal to or greater than its reportable quantity of 100 lb or (45.4 kg). The toll free number of the NRC is (800) 424-8802; In the Washington D.C. metropolitan area (202) 426-2675. The rule for determining when notification is required is stated in 40 CFR 302.4 (Section IV. D.3.b).

U.S. TSCA INVENTORY STATUS: Arsine is listed on the TSCA Inventory.

OTHER U.S. FEDERAL REGULATIONS: Arsine, as an Inorganic Arsenic compound is subject to the reporting requirements of Section 112(r) of the Clean Air Act. The Threshold Quantity for this gas is 1,000 Lb (454 kg). Arsine does not contain any Class I or Class II ozone depleting chemicals (40 CFR part 82). Arsine is subject to requirements of CFR 29 1910.1000. Arsine is listed in Table Z.1. Arsine is listed in 40 CFR, Part 68 (Risk Management for Chemical Release Prevention), Table 1, as an extremely hazardous and flammable substance. The threshold quantity for Arsine under this regulation is 1,000 lb (454 kg). Arsine is not regulated under the Inorganic Arsenic Standard (29 CFR 1910.1018). Depending on specific operations involving the use of this product, the regulations of the Process Safety Management of Highly Hazardous Chemicals may be applicable (29 CFR 1910.119). Under this regulation Arsine is listed in Appendix A. The threshold quantity for Arsine, under this regulation is 100 lb (45.4 kg).

15. REGULATORY INFORMATION (Continued)

ADDITIONAL U.S. REGULATIONS (continued):

U.S. STATE REGULATORY INFORMATION: Arsine is covered under specific State regulations, as denoted below:

Alaska - Designated Toxic and Hazardous Substances: Arsine

California - Permissible Exposure Limits for Chemical Contaminants: Arsine.

Florida - Substance List: Arsine

Illinois - Toxic Substance List: Arsine.

Kansas - Section 302/313 List: Arsine.

Massachusetts - Substance List: Arsine.

Michigan - Critical Materials Register: Arsine.

Minnesota - List of Hazardous Substances: Arsine.

Missouri - Employer Information/Toxic Substance List: Arsine.

New Jersey - Right to Know Hazardous Substance List: Arsine.

North Dakota - List of Hazardous Chemicals, Reportable Quantities: No.

Pennsylvania - Hazardous Substance List: Arsine.

Rhode Island - Hazardous Substance List: Arsine.

Texas - Hazardous Substance List: Arsine.

West Virginia - Hazardous Substance List: Arsine.

Wisconsin - Toxic and Hazardous Substances: Arsine.

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

CGA LABELING (For Compressed Gas):

DANGER:

CANCER SUSPECT AGENT
POISONOUS, FLAMMABLE LIQUID AND GAS UNDER PRESSURE.
MAY BE FATAL IF INHALED
CAUSES SEVERE BLOOD, LIVER, KIDNEY AND OTHER ORGAN DAMAGE.
SYMPTOMS MAY BE DELAYED.

ODOR:

MAY FORM EXPLOSIVE MIXTURES WITH AIR.
Garlic-like.
Do not breathe gas.
Store and use with adequate ventilation, and use in closed systems.
Keep away from heat, flames, and sparks.
Cylinder temperature should not exceed 52°C (125°F).
Do not get liquid in eyes, on skin, or clothing.
Close valve after each use and when empty.
WHEN RETURNING CYLINDER, INSTALL VALVE OUTLET CAP OR PLUG, LEAK-TIGHT.
Use in accordance with the Material Safety Data Sheet.

POISON

CALL A PHYSICIAN



FIRST-AID:

IF INHALED, or suspicion of any exposure, remove to fresh air. If not breathing, give artificial respiration and supplemental oxygen. If breathing, give oxygen. Call a physician even if no symptoms are present. Symptoms may be delayed. Consider any exposure as a potentially toxic doses.
DO NOT REMOVE THIS PRODUCT LABEL.

ADDITIONAL CANADIAN REGULATIONS:

CANADIAN DSL/NDL INVENTORY: Arsine is listed on the DSL Inventory.

OTHER CANADIAN REGULATIONS: Not Applicable.

CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) PRIORITIES SUBSTANCES LISTS: Arsine is on the CEPA First Priorities Substances Lists, "Toxic", (as an Inorganic Arsenic Compound)..

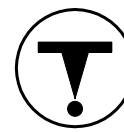
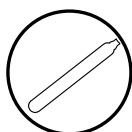
CANADIAN WHMIS SYMBOLS:

Class A: Compressed Gas

Class B1: Flammable Gas

Class D1A: Material Causing Serious and Immediate Effects.

Class D2A: Other Toxic Effects.



16. OTHER INFORMATION

PREPARED BY:

CHEMICAL SAFETY ASSOCIATES, Inc.
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619/670-0609

The information contained herein is based on data considered accurate. However, no warranty is expressed or implied regarding the accuracy of these data or the results to be obtained from the use thereof. Airgas, Inc. assumes no responsibility for injury to the vendee or third persons proximately caused by the material if reasonable safety procedures are not adhered to as stipulated in the data sheet. Additionally, Airgas, Inc. assumes no responsibility for injury to vendee or third persons proximately caused by abnormal use of the material even if reasonable safety procedures are followed. Furthermore, vendee assumes the risk in his use of the material.

DEFINITIONS OF TERMS

A large number of abbreviations and acronyms appear on a MSDS. Some of these which are commonly used include the following:

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.

LOQ: Limit of Quantitation.

MAK: Federal Republic of Germany Maximum Concentration Values in the workplace.

NE: Not Established. When no exposure guidelines are established, an entry of NE is made for reference.

NIC: Notice of Intended Change.

NIOSH CEILING: The exposure that shall not be exceeded during any part of the workday. If instantaneous monitoring is not feasible, the ceiling shall be assumed as a 15-minute TWA exposure (unless otherwise specified) that shall not be exceeded at any time during a workday.

NIOSH RELS: NIOSH's Recommended Exposure Limits.

PEL-Permissible Exposure Limit: OSHA's Permissible Exposure Limits. This exposure value means exactly the same as a TLV, except that it is enforceable by OSHA. The OSHA Permissible Exposure Limits are based in the 1989 PELs and the June, 1993 Air Contaminants Rule (Federal Register: 58: 35338-35351 and 58: 40191). Both the current PELs and the vacated PELs are indicated. The phrase, "Vacated 1989 PEL," is placed next to the PEL that was vacated by Court Order.

SKIN: Used when there is a danger of cutaneous absorption.

STEL-Short Term Exposure Limit: Short Term Exposure Limit, usually a 15-minute time-weighted average (TWA) exposure that should not be exceeded at any time during a workday, even if the 8-hr TWA is within the TLV-TWA, PEL-TWA or REL-TWA.

TLV-Threshold Limit Value: An airborne concentration of a substance that represents conditions under which it is generally believed that nearly all workers may be repeatedly exposed without adverse effect. The duration must be considered, including the 8-hour.

TWA-Time Weighted Average: Time Weighted Average exposure concentration for a conventional 8-hr (TLV, PEL) or up to a 10-hr (REL) workday and a 40-hr workweek.

IDLH-Immediately Dangerous to Life and Health: This level represents a concentration from which one can escape within 30-minutes without suffering escape-preventing or permanent injury.

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): No significant health risk, irritation of skin or eyes not anticipated. *Skin Irritation:* Essentially non-irritating. PII or Draize = "0". *Eye Irritation:* Essentially non-irritating, or minimal effects which clear in < 24 hours [e.g. mechanical irritation]. Draize = "0". *Oral Toxicity LD₅₀ Rat:* < 5000 mg/kg. *Dermal Toxicity LD₅₀Rat or Rabbit:* < 2000 mg/kg. *Inhalation Toxicity 4-hrs LC₅₀ Rat:* < 20 mg/L.; **1 (Slight Hazard):** Minor reversible injury may occur; slightly or mildly irritating. *Skin Irritation:* Slightly or mildly irritating. *Eye Irritation:* Slightly or mildly irritating. *Oral Toxicity LD₅₀ Rat:* > 500-5000 mg/kg. *Dermal Toxicity LD₅₀Rat or Rabbit:* > 1000-2000 mg/kg. *Inhalation Toxicity LC₅₀ 4-hrs Rat:* > 2-20 mg/L);

HAZARDOUS MATERIALS IDENTIFICATION SYSTEM

HAZARD RATINGS (continued):

HEALTH HAZARD (continued):

2 (Moderate Hazard): Temporary or transitory injury may occur. *Skin Irritation:* Moderately irritating; primary irritant; sensitizer. PII or Draize > 0, < 5. *Eye Irritation:* Moderately to severely irritating and/or corrosive; reversible corneal opacity; corneal involvement or irritation clearing in 8-21 days. Draize > 0, ≤ 25. *Oral Toxicity LD₅₀ Rat:* > 50-500 mg/kg. *Dermal Toxicity LD₅₀Rat or Rabbit:* > 200-1000 mg/kg. *Inhalation Toxicity LC₅₀ 4-hrs Rat:* > 0.5-2 mg/L.; **3 (Serious Hazard):** Major injury likely unless prompt action is taken and medical treatment is given; high level of toxicity; corrosive. *Skin Irritation:* Severely irritating and/or corrosive; may destroy dermal tissue, cause skin burns, dermal necrosis. PII or Draize > 5-8 with destruction of tissue. *Eye Irritation:* Corrosive, irreversible destruction of ocular tissue; corneal involvement or irritation persisting for more than 21 days. Draize > 80 with effects irreversible in 21 days. *Oral Toxicity LD₅₀ Rat:* > 1-50 mg/kg. *Dermal Toxicity LD₅₀Rat or Rabbit:* > 20-200 mg/kg. *Inhalation Toxicity LC₅₀ 4-hrs Rat:* > 0.05-0.5 mg/L.; **4 (Severe Hazard):** Life-threatening; major or permanent damage may result from single or repeated exposure. *Skin Irritation:* Not appropriate. Do not rate as a "4", based on skin irritation alone. *Eye Irritation:* Not appropriate. Do not rate as a "4", based on eye irritation alone. *Oral Toxicity LD₅₀ Rat:* ≤ 1 mg/kg. *Dermal Toxicity LD₅₀Rat or Rabbit:* ≤ 20 mg/kg. *Inhalation Toxicity LC₅₀ 4-hrs Rat:* ≤ 0.05 mg/L). **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; Liquids, solids and semisolids having a flash point at or above 93.3°C [200°F] (e.g. OSHA Class IIIB, or; Most ordinary combustible materials [e.g. wood, paper, etc.]; **2 (Moderate Hazard-Materials)** that must be moderately heated or exposed to relatively high ambient temperatures 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.); **3 (Serious Hazard- Liquids and solids)** that can be ignited under almost all ambient temperature conditions. Materials in this degree produce hazardous atmospheres with air under almost all ambient temperatures, or, unaffected by ambient temperature, are readily ignited under almost all conditions, including: Liquids having a flash point below 22.8°C [73°F] and having a boiling point at or above 38°C [100°F] and below 37.8°C [100°F] [e.g. OSHA Class IB and IC]; Materials that on account of their physical form or environmental conditions can form explosive mixtures with air and are readily dispersed in air [e.g., dusts of combustible solids, mists or droplets of flammable liquids]; Materials that burn extremely rapidly, usually by reason of self-contained oxygen [e.g. dry nitrocellulose and many organic peroxides]);

DEFINITIONS OF TERMS (Continued)

HAZARDOUS MATERIALS IDENTIFICATION SYSTEM HAZARD RATINGS (continued):

FLAMMABILITY HAZARD (continued):

4 (Severe Hazard-Materials that will rapidly or completely vaporize at atmospheric pressure and normal ambient temperature or that are readily dispersed in air, and which will burn readily, including: Flammable gases; Flammable cryogenic materials; Any liquid or gaseous material that is liquid while under pressure and has a flash point below 22.8°C [73°F] and a boiling point below 37.8°C [100°F] [e.g. OSHA Class IA; Material that ignite spontaneously when exposed to air at a temperature of 54.4°C [130°F] or below [e.g. pyrophoric]).

PHYSICAL HAZARD:

0 (*Water Reactivity*: Materials that do not react with water. *Organic Peroxides*: Materials that are normally stable, even under fire conditions and will not react with water. *Explosives*: Substances that are Non-Explosive. *Unstable Compressed Gases*: No Rating. *Pyrophorics*: No Rating. *Oxidizers*: No "0" rating allowed. *Unstable Reactives*: Substances that will not polymerize, decompose, condense or self-react.); **1** (*Water Reactivity*: Materials that change or decompose upon exposure to moisture. *Organic Peroxides*: Materials that are normally stable, but can become unstable at high temperatures and pressures. These materials may react with water, but will not release energy. *Explosives*: Division 1.5 & 1.6 substances that are very insensitive explosives or that do not have a mass explosion hazard. *Compressed Gases*: Pressure below OSHA definition. *Pyrophorics*: No Rating. *Oxidizers*: Packaging Group III; *Solids*: any material that in either concentration tested, exhibits a mean burning time less than or equal to the mean burning time of a 3:7 potassium bromate/cellulose mixture and the criteria for Packing Group I and II are not met. *Liquids*: any material that exhibits a mean pressure rise time less than or equal to the pressure rise time of a 1:1 nitric acid (65%)/cellulose mixture and the criteria for Packing Group I and II are not met. *Unstable Reactives*: Substances that may decompose, condense or self-react, but only under conditions of high temperature and/or pressure and have little or no potential to cause significant heat generation or explosive hazard. Substances that readily undergo hazardous polymerization in the absence of inhibitors.); **2** (*Water Reactivity*: Materials that may react violently with water. *Organic Peroxides*: Materials that, in themselves, are normally unstable and will readily undergo violent chemical change, but will not detonate. These materials may also react violently with water. *Explosives*: Division 1.4 – Explosive substances where the explosive effect are largely confined to the package and no projection of fragments of appreciable size or range are expected. An external fire must not cause virtually instantaneous explosion of almost the entire contents of the package. *Compressed Gases*: Pressurized and meet OSHA definition but < 514.7 psi absolute at 21.1°C (70°F) [500 psig]. *Pyrophorics*: No Rating. *Oxidizers*: Packaging 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 criteria 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 Packing Group I are not met. *Unstable Reactives*: Substances that may polymerize, decompose, condense, or self-react at ambient temperature and/or pressure, but have a low potential for significant heat generation or explosion. Substances that readily form peroxides upon exposure to air or oxygen at room temperature); **3** (*Water Reactivity*: Materials that may form explosive reactions with water. *Organic Peroxides*: Materials that are capable of detonation or explosive reaction, but require a strong initiating source, or must be heated under confinement before initiation; or materials that react explosively with water. *Explosives*: Division 1.2 – Explosive substances that have a fire hazard and either a minor blast hazard or a minor projection hazard or both, but do not have a mass explosion hazard. *Compressed Gases*: Pressure ≥ 514.7 psi absolute at 21.1°C (70°F) [500 psig]. *Pyrophorics*: No Rating. *Oxidizers*: Packaging Group I *Solids*: any material that, in either concentration tested, exhibits a mean burning time less than 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 perchloric acid (50%)/cellulose mixture. (continued in next column)

HAZARDOUS MATERIALS IDENTIFICATION SYSTEM HAZARD RATINGS (continued):

PHYSICAL HAZARD (continued):

3 (continued): *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.); **4** (*Water Reactivity*: Materials that react explosively with water without requiring heat or confinement. *Organic Peroxides*: Materials that are readily capable of detonation or explosive decomposition at normal temperature and pressures. *Explosives*: Division 1.1 & 1.2-explosive substances that have a mass explosion hazard or have a projection hazard. A mass explosion is one that affects almost the entire load instantaneously. *Compressed Gases*: No Rating. *Pyrophorics*: Add to 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.). PPE Rating B: Hand and eye protection is required for routine chemical use. PPE Rating C: Hand, eye, and body protection may be required for routine chemical use.

HMS PERSONAL PROTECTION EQUIPMENT CODES:

A = Safety Glasses; B= Safety Glasses, Gloves; C = Safety Glasses, Gloves, Apron; D = ace Shield (w/ safety glasses), Gloves, Apron; E = Safety Glasses, Gloves, Dust Respirator; F = Safety Glasses, Gloves, Apron, Dust Respirator Safety Glasses, Gloves, Apron, Dust Respirator; G = Safety Glasses, Gloves, Chemical Vapor Respirator; H = Safety Glasses, Gloves, Apron, Chemical Vapor Respirator; I = Safety Glasses, Gloves, Combination Dust and Chemical Vapor Respirator; J= Safety Glasses, Gloves, Apron, Combination Dust and Chemical Vapor Respirator; K = Airline Hood or Mask, Gloves, Full Protective Suit, Boots; X = Situations Requiring Specialized Attention to PPE

NATIONAL FIRE PROTECTION ASSOCIATION HAZARD RATINGS:

HEALTH HAZARD: **0** (material that on exposure under fire conditions would offer no hazard beyond that of ordinary combustible materials); **1** (materials that on exposure under fire conditions could cause irritation or minor residual injury); **2** (materials that on intense or continued exposure under fire conditions could cause temporary incapacitation or possible residual injury); **3** (materials that can on short exposure could cause serious temporary or residual injury); **4** (materials that under very short exposure could cause death or major residual injury).

FLAMMABILITY HAZARD AND REACTIVITY HAZARD: Refer to definitions for "Hazardous Materials Identification System".

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.

TOXICOLOGICAL INFORMATION:

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: **LD₅₀** - Lethal Dose (solids & liquids) which kills 50% of the exposed animals; **LC₅₀** - 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/m³** concentration expressed in weight of substance per volume of air; **mg/kg** quantity of material, by weight, administered to a test subject, based on their body weight in kg. Other measures of toxicity include **TDLo**, the lowest dose to cause a symptom and **TCLo** the lowest concentration to cause a symptom; **TDo**, **LDLo**, and **LDo**, or **TC**, **TCo**, **LCLo**, and **LCo**, the lowest dose (or concentration) to cause lethal or toxic effects (continued on following page)

DEFINITIONS OF TERMS (Continued)

TOXICOLOGICAL INFORMATION (continued):

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:

EC is the effect concentration in water. **BCF** = Bioconcentration Factor, which is used to determine if a substance will concentrate in lifeforms which consume contaminated plant or animal matter. **TL_m** = median threshold limit; Coefficient of Oil/Water Distribution is represented by **log K_{ow}** or **log K_{oc}** and is used to assess a substance's behavior in the environment.

REGULATORY INFORMATION:

U.S. and CANADA:

This section explains the impact of various laws and regulations on the material. **ACGIH:** American Conference of Governmental Industrial Hygienists, a professional association which establishes exposure limits. **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/NDL**); 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.