mercury (elemental)

Section 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME
mercury (elemental)

STATEMENT OF HAZARDOUS NATURE
CONSIDERED A HAZARDOUS SUBSTANCE ACCORDING TO OSHA 29 CFR 1910.1200.

NFPA

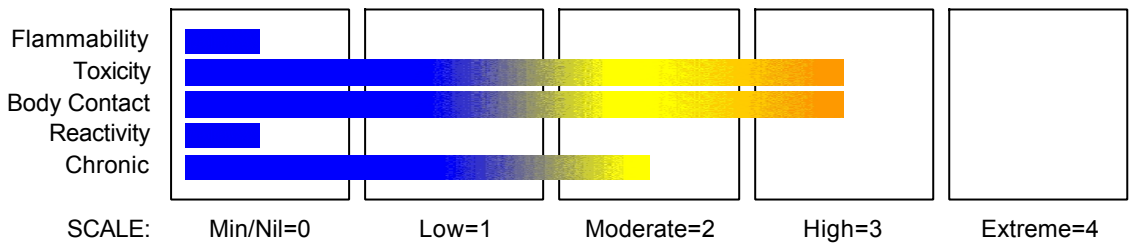
SUPPLIER
Chemwatch Pty Ltd
+61 3 9573 3112 or (where available) Toll Free +800 2436 2255
Email chemwatch@chemwatch.net

PRODUCT USE
Barometers; thermometers; hydrometers; pyrometers; mercury arc lamps; switches; manufacture of mirrors; amalgams, mercury boilers; gold and silver extraction; cathode in electrolysis.

SYNONYMS
Hg, hydrargyrum, "liquid silver", "quick silver", "colloidal mercury", "quicksilver mercury metal"

Section 2 - HAZARDS IDENTIFICATION

CHEMWATCH HAZARD RATINGS



CANADIAN WHMIS SYMBOLS

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EMERGENCY OVERVIEW

RISK
Toxic by inhalation.
Danger of cumulative effects.
Harmful in contact with skin and if swallowed.
Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

POTENTIAL HEALTH EFFECTS

ACUTE HEALTH EFFECTS

SWALLOWED
■ Accidental ingestion of the material may be harmful; animal experiments indicate that ingestion of less than 150 gram may be fatal or may produce serious damage to the health of the individual.
■ The material is not thought to produce adverse health effects following ingestion (as classified by EC Directives using animal models). Nevertheless, adverse systemic effects have been produced following exposure of animals by at least one other route and good hygiene practice requires that exposure be kept to a minimum.

EYE
■ Although the liquid is not thought to be an irritant (as classified by EC Directives), direct contact with the eye may produce transient discomfort characterised by tearing or conjunctival redness (as with windburn).

SKIN
■ The liquid may be miscible with fats or oils and may degrease the skin, producing a skin reaction described as non-allergic contact dermatitis. The material is unlikely to produce an irritant dermatitis as described in EC Directives .
■ Skin contact with the material may damage the health of the individual; systemic effects may result following absorption.
■ Open cuts, abraded or irritated skin should not be exposed to this material.
■ Entry into the blood-stream, through, for example, cuts, abrasions or lesions, may produce systemic injury with harmful effects. Examine the skin prior to the use of the material and ensure that any external damage is suitably protected.

INHALED
■ Inhalation of aerosols (mists, fumes), generated by the material during the course of normal handling, may produce toxic effects; these may be fatal.
■ The material is not thought to produce respiratory irritation (as classified by EC Directives using animal models). Nevertheless inhalation of vapours, fumes or aerosols, especially for prolonged periods, may produce respiratory discomfort and occasionally, distress.

CHRONIC HEALTH EFFECTS
■ Substance accumulation, in the human body, is likely and may cause some concern following repeated or long-term occupational exposure.
Mercury easily crosses the placenta and causes birth defects. Chronic exposure results in excess saliva

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production, loss of appetite, stomach upset, vague abdominal discomfort and mild diarrhoea. The kidneys are rarely involved. Chronic mercury poisoning usually shows itself mainly as effects on the nervous system, especially the central nervous system. There may be tremors involving the hands and fingers, eyelids, cheeks, legs and tongue. Motor control may be impaired, leading to slurred or scanning speech and inco-ordinated walking. Disturbance with seeing or hearing may occur. There may be behaviour changes such as depression, despondency and fearfulness, often accompanied by sleep disturbance, headache and fatigue. Advanced cases show memory loss, hallucinations and deterioration in mental function. Other symptoms include a constant metallic taste, and various levels of gum inflammation, leading to periodontal disease and loosening of teeth. A dark blue line may occur along the gum margins. Uncommonly, a syndrome known as acrodynia ("pink disease") may occur, of which the major symptom is itchy scaling of the hands and feet.
Dentists with moderate long term mercury exposures show subtle behavioural changes, tiredness, short term memory loss and impaired nerve conduction.
Tremor is regarded as indicator of long term, low level exposures. Fine tremor of fingers, hands, arms, occasionally eyelids, lips and whole body.
[CHEMINFO 322]

Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

NAME	CAS RN	%
mercury (elemental)	7439-97-6	>98

Section 4 - FIRST AID MEASURES

SWALLOWED
• Immediately give a glass of water.
• First aid is not generally required. If in doubt, contact a Poisons Information Centre or a doctor.

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

SKIN
■ If skin contact occurs:
• Immediately remove all contaminated clothing, including footwear.
• Flush skin and hair with running water (and soap if available).
• Seek medical attention in event of irritation.

INHALED
• If fumes or combustion products are inhaled remove from contaminated area.
• Lay patient down. Keep warm and rested.
• Prostheses such as false teeth, which may block airway, should be removed, where possible, prior to initiating first aid procedures.
• Apply artificial respiration if not breathing, preferably with a demand valve resuscitator, bag-valve mask

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device, or pocket mask as trained. Perform CPR if necessary.
• Transport to hospital, or doctor, without delay.
• Inhalation of vapours or aerosols (mists, fumes) may cause lung oedema.
• Corrosive substances may cause lung damage (e.g. lung oedema, fluid in the lungs).
• As this reaction may be delayed up to 24 hours after exposure, affected individuals need complete rest (preferably in semi-recumbent posture) and must be kept under medical observation even if no symptoms are (yet) manifested.
• Before any such manifestation, the administration of a spray containing a dexamethasone derivative or beclomethasone derivative may be considered.
This must definitely be left to a doctor or person authorised by him/her.
(ICSC13719).

NOTES TO PHYSICIAN
• Moderate adsorption of inorganic mercury compounds through the gastro-intestinal tract (7-15%) is the principal cause of poisoning. These compounds are highly concentrated (as the mercuric (Hg (2+) form) in the kidney; acute ingestion may lead to oliguric renal failure. Severe mucosal necrosis may also result from ingestion.
• Chronic effects range from proteinuria to nephrotic syndrome. Chronic presentation also involves dermatitis, gingivitis, stomatitis, tremor and neuropsychiatric symptoms of erethism.
• Absorbed inorganic mercury does not significantly cross the blood-brain barrier.
• Emesis and lavage should be initiated following acute ingestion.
• Activated charcoal interrupts absorption; cathartics should be administered when charcoal is given.
• The use of British Anti-Lewisite is indicated in severe inorganic poisoning. Newer derivatives of BAL (e.g. dimercaptosuccinic acid, [DMSA] and 2,3-dimercapto-1-propanesulfate [DMPS]) may prove more effective. [Ellenhorn and Barceloux: Medical Toxicology]

BIOLOGICAL EXPOSURE INDEX - BEI

These represent the determinants observed in specimens from a healthy worker exposed at the Exposure Standard (ES or TLV).

Determinant	Index	Sampling Time	Comments
1. Total inorganic mercury in urine	35 ug/gm creatinine	Preshift	B
2. Total inorganic mercury in blood	15 ug/L	End of shift at end of workweek	B

B: Background levels occur in specimens collected from subjects NOT exposed.
Within a group of workers there is a relatively good correlation between the level of exposure and the concentration of metal in the blood and urine. There is no specific antidote for chronic poisoning.

Section 5 - FIRE FIGHTING MEASURES

Vapor Pressure (mmHg): 0.002 @ 25 C.
Upper Explosive Limit (%): Not applicable
Specific Gravity (water=1): 13.534
Lower Explosive Limit (%): Not applicable

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

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FIRE FIGHTING
• Alert Fire Brigade and tell them location and nature of hazard.
• Wear full body protective clothing with breathing apparatus.
• Prevent, by any means available, spillage from entering drains or water course.
• Use fire fighting procedures suitable for surrounding area.
• Do not approach containers suspected to be hot.
• Cool fire exposed containers with water spray from a protected location.
• If safe to do so, remove containers from path of fire.
• Equipment should be thoroughly decontaminated after use.
When any large container (including road and rail tankers) is involved in a fire, consider evacuation by 500 metres in all directions.

GENERAL FIRE HAZARDS/HAZARDOUS COMBUSTIBLE PRODUCTS
• Non combustible.
• Not considered a significant fire risk, however containers may burn.
Decomposition may produce toxic fumes of: metal oxides.
May emit corrosive fumes.
In fire situation very toxic mercury vapour and mercury oxide is formed.

FIRE INCOMPATIBILITY
■ None known.

Section 6 - ACCIDENTAL RELEASE MEASURES

MINOR SPILLS
• Use suction bottle to collect small amounts of mercury.
• Calcium polysulfide with excess sulfur can be sprinkled into cracks or other inaccessible places to convert mercury globules into the sulfide.
• Collect solid residues and place in tightly sealed, clean, dry containers.

MAJOR SPILLS
• Avoid all personal contact and wear full protective equipment
• Environmental hazard: contain spillage. Stop leak if safe to do so
• Clean up bulk mercury spillage by mechanical means, suck up where practicable.
• Calcium polysulfide with excess sulfur can be sprinkled into cracks or other inaccessible places to convert mercury globules into the sulfide. (Proprietary products are available for this purpose)
• Collect solid residues and place in clean, dry, sealable plastic drums.
• Ensure that all residues are cleaned up.
• Do NOT wash spill area after clean up.
• Vacuum up residues.
• Clear area of personnel and move upwind.
• Alert Fire Brigade and tell them location and nature of hazard.
• Wear full body protective clothing with breathing apparatus.
• Prevent, by any means available, spillage from entering drains or water course.
• Consider evacuation (or protect in place).
• Stop leak if safe to do so.
• Contain spill with sand, earth or vermiculite.
• Collect recoverable product into labelled containers for recycling.
• Neutralise/decontaminate residue (see Section 13 for specific agent).
• Collect solid residues and seal in labelled drums for disposal.
• Wash area and prevent runoff into drains.
• After clean up operations, decontaminate and launder all protective clothing and equipment before storing

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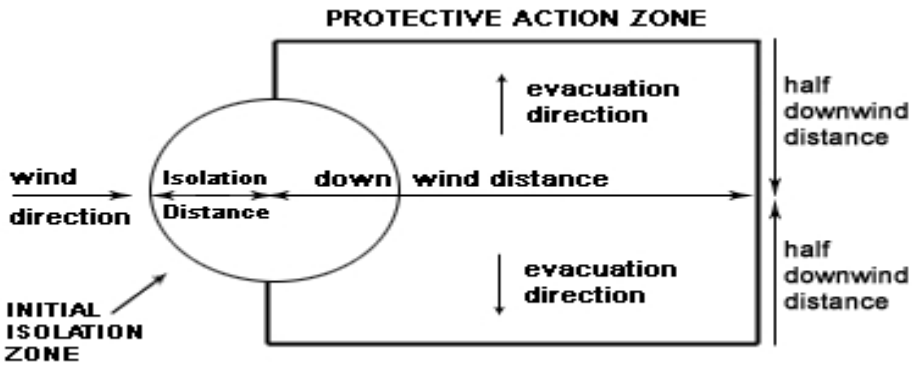
and re-using.
• If contamination of drains or waterways occurs, advise emergency services.

PROTECTIVE ACTIONS FOR SPILL



From IERG (Canada/Australia)

Isolation Distance	10 metres
Downwind Protection Distance	25 metres

FOOTNOTES
1 PROTECTIVE ACTION ZONE is defined as the area in which people are at risk of harmful exposure. This zone assumes that random changes in wind direction confines the vapor plume to an area within 30 degrees on either side of the predominant wind direction, resulting in a crosswind protective action distance equal to the downwind protective action distance.
2 PROTECTIVE ACTIONS should be initiated to the extent possible, beginning with those closest to the spill and working away from the site in the downwind direction. Within the protective action zone a level of vapor concentration may exist resulting in nearly all unprotected persons becoming incapacitated and unable to take protective action and/or incurring serious or irreversible health effects.
3 INITIAL ISOLATION ZONE is determined as an area, including upwind of the incident, within which a high probability of localized wind reversal may expose nearly all persons without appropriate protection to life-threatening concentrations of the material.
4 SMALL SPILLS involve a leaking package of 200 litres (55 US gallons) or less, such as a drum (jerrican or box with inner containers). Larger packages leaking less than 200 litres and compressed gas leaking from a small cylinder are also considered "small spills".
LARGE SPILLS involve many small leaking packages or a leaking package of greater than 200 litres, such as a cargo tank, portable tank or a "one-tonne" compressed gas cylinder.
5 Guide 172 is taken from the US DOT emergency response guide book.
6 IERG information is derived from CANUTEC - Transport Canada.

EMERGENCY RESPONSE PLANNING GUIDELINES (ERPG)
The maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to one hour WITHOUT experiencing or developing

life-threatening health effects is:
mercury (elemental) 0.5ppm

irreversible or other serious effects or symptoms which could impair an individual's ability to take protective action is:
mercury (elemental) 0.25ppm

continued...

other than mild, transient adverse effects without perceiving a clearly defined odour is:
mercury (elemental) N/A

American Industrial Hygiene Association (AIHA)

Ingredients considered according to the following cutoffs

Very Toxic (T+)	>= 0.1%	Toxic (T)	>= 3.0%
R50	>= 0.25%	Corrosive (C)	>= 5.0%
R51	>= 2.5%		
else	>= 10%		

where percentage is percentage of ingredient found in the mixture

Section 7 - HANDLING AND STORAGE

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

RECOMMENDED STORAGE METHODS
• DO NOT use aluminium, galvanised or tin-plated containers.
• Lined metal can, lined metal pail/ can.
• Plastic pail.
• Polyliner drum.
• Packing as recommended by manufacturer.
• Check all containers are clearly labelled and free from leaks.
For low viscosity materials
• Drums and jerricans must be of the non-removable head type.
• Where a can is to be used as an inner package, the can must have a screwed enclosure.
For materials with a viscosity of at least 2680 cSt. (23 deg. C) and solids (between 15 C deg. and 40 deg C.):
• Removable head packaging;
• Cans with friction closures and
• low pressure tubes and cartridges
may be used.
-
Where combination packages are used, and the inner packages are of glass, porcelain or stoneware, there must be sufficient inert cushioning material in contact with inner and outer packages unless the outer packaging is a close fitting moulded plastic box and the substances are not incompatible with the plastic.

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Mercury dissolves aluminium, aluminium alloys.
Packages for Air freight must be to IATA Packing Instruction 803, and manufactured articles containing mercury to Packing Instruction 805; i.e. Packing group I requirements.

STORAGE REQUIREMENTS

- Store in original containers.
- Keep containers securely sealed.
- Store in a cool, dry, well-ventilated area.
- Store away from incompatible materials and foodstuff containers.
- Protect containers against physical damage and check regularly for leaks.
- Observe manufacturer's storing and handling recommendations.

SAFE STORAGE WITH OTHER CLASSIFIED CHEMICALS

X	X	+	X	X	+

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

Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE CONTROLS

Source	Material	TWA ppm	TWA mg/m³	STEL ppm	STEL mg/m³	Peak ppm	Peak mg/m³	TWA F/CC	Notes
US - Minnesota Permissible Exposure Limits (PELs)	mercury (elemental) (Mercury (vapor) (as Hg))		0.05						
US ATSDR Minimal Risk Levels for Hazardous Substances (MRLs)	mercury (elemental) (MERCURY)		0.0002						
Canada - British Columbia Occupational Exposure Limits	mercury (elemental) (Mercury - Elemental, as Hg)		0.025						Skin; R
US OSHA Permissible Exposure Levels (PELs) - Table Z2	mercury (elemental) (Mercury (Z37.8–1971))						0.1		

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mercury (elemental)

Source	Material	TWA ppm	TWA mg/m³	STEL ppm	STEL mg/m³	Peak ppm	Peak mg/m³	TWA F/CC	Notes
US - Vermont Permissible Exposure Limits Table Z- 1- A Transitional Limits for Air Contaminants	mercury (elemental) (Mercury (vapor) (as Hg))		See Table Z- 2						
US - Vermont Permissible Exposure Limits Table Z- 1- A Final Rule Limits for Air Contaminants	mercury (elemental) (Mercury (vapor) (as Hg))		0.05						
US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants	mercury (elemental) (Mercury (vapor) (as Hg))		0.05						
US - Idaho - Limits for Air Contaminants	mercury (elemental) (Mercury (vapor) (as Hg))		[2]						
US - Idaho - Acceptable Maximum Peak Concentrations	mercury (elemental) (Mercury (Z37.8-1971))						1 mg/10M3		
US - Oregon Permissible Exposure Limits (Z- 2)	mercury (elemental) (Mercury (Z37.8-1971))		0.05			0.1			Bold print identifies substances for which the Oregon Permissible Exposure Limits (PELs) are different than the federal limits.

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mercury (elemental)

Source	Material	TWA ppm	TWA mg/m³	STEL ppm	STEL mg/m³	Peak ppm	Peak mg/m³	TWA F/CC	Notes
Canada - Nova Scotia Occupational Exposure Limits	mercury (elemental) (Mercury - Elemental (as Hg))		0.025						TLV Basis: central nervous system impairment; kidney damage
US - Michigan Exposure Limits for Air Contaminants	mercury (elemental) (Mercury Vapor (as Hg))		0.05						
US - Washington Permissible exposure limits of air contaminants	mercury (elemental) (Mercury (as Hg) - Vapor)		0.05		0.15				
US - Alaska Limits for Air Contaminants	mercury (elemental) (Mercury (vapor) (as Hg))		0.05						
Canada - Quebec Permissible Exposure Values for Airborne Contaminants (English)	mercury (elemental) (Mercury , mercury vapor (as Hg))		0.025						
US - Wyoming Toxic and Hazardous Substances Table Z- 2 Acceptable ceiling concentration, Acceptable maximum peak above the acceptable ceiling concentration for an 8- hr shift	mercury (elemental) (Mercury (Z37.8-1971))						0.1		
Canada - Ontario Occupational Exposure Limits	mercury (elemental) (Metal / Métal)		2						
Canada - Ontario Occupational Exposure Limits	mercury (elemental) (Metal / Métal)		1						

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Source	Material	TWA ppm	TWA mg/m³	STEL ppm	STEL mg/m³	Peak ppm	Peak mg/m³	TWA F/CC	Notes
US - Hawaii Air Contaminant Limits	mercury (elemental) (Mercury (vapor) (as Hg))		0.05						
US - California Permissible Exposure Limits for Chemical Contaminants	mercury (elemental) (Mercury, metallic and inorganic compounds as Hg)		0.025				0.1		
Canada - Saskatchewan Occupational Health and Safety Regulations - Contamination Limits	mercury (elemental) (Mercury, (as Hg): Inorganic forms, including metallic mercury)		0.025		0.075				Skin
Canada - Alberta Occupational Exposure Limits	mercury (elemental) (Mercury, as Hg in Inorganic compounds, including metallic mercury)		0.025						
Canada - Northwest Territories Occupational Exposure Limits (English)	mercury (elemental) (Mercury (Alkyl compounds) - Skin (as Hg))		0.01		0.03				
US NIOSH Recommended Exposure Limits (RELs)	mercury (elemental) (Mercury (organo) alkyl compounds (as Hg))		0.01		0.03				[skin]
US - Hawaii Air Contaminant Limits	mercury (elemental) (Mercury (organo) alkyl compounds (as Hg))		0.01		0.03				
Canada - Yukon Permissible Concentrations for Airborne Contaminant Substances	mercury (elemental) (Mercury (Alkyl compounds) - Skin (as Hg))	0.001	0.01	0.003	0.03				

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Source	Material	TWA ppm	TWA mg/m³	STEL ppm	STEL mg/m³	Peak ppm	Peak mg/m³	TWA F/CC	Notes
Canada - Saskatchewan Occupational Health and Safety Regulations - Contamination Limits	mercury (elemental) (Mercury, (as Hg): Alkyl compounds)		0.01		0.03				Skin
US NIOSH Recommended Exposure Limits (RELs)	mercury (elemental) (Mercury compounds [except (organo) alkyls] (as Hg))		0.05				0.1		[skin]; (TWA (Hg Vapor)); (Ceiling (Other))
Canada - Ontario Occupational Exposure Limits	mercury (elemental) (All forms of except alkyl, as Hg / Toutes les formes de mercure, sauf les composés alkylés, en Hg)		0.025						Skin / Peau
Canada - Yukon Permissible Concentrations for Airborne Contaminant Substances	mercury (elemental) (Mercury (all forms except Alkyl) (as Hg))	-	0.05	-	0.15				
Canada - Northwest Territories Occupational Exposure Limits (English)	mercury (elemental) (Mercury (all forms except Alkyl) (as Hg))		0.05		0.15				

EMERGENCY EXPOSURE LIMITS

Material	Revised IDLH Value (mg/m³)	Revised IDLH Value (ppm)
mercury (elemental)|2809	2	
mercury (elemental)|2809	10	

MATERIAL DATA

MERCURY (ELEMENTAL):
Metallic mercury may also be absorbed via the skin.
NOTE: Detector tubes for mercury vapour, measuring in excess of 0.1 mg/m3, are commercially available.

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PERSONAL PROTECTION




Consult your EHS staff for recommendations

EYE
- Safety glasses with side shields
- Chemical goggles.
- Contact lenses may pose a special hazard; soft contact lenses may absorb and concentrate irritants. A written policy document, describing the wearing of lens or restrictions on use, should be created for each workplace or task. This should include a review of lens absorption and adsorption for the class of chemicals in use and an account of injury experience. Medical and first-aid personnel should be trained in their removal and suitable equipment should be readily available. In the event of chemical exposure, begin eye irrigation immediately and remove contact lens as soon as practicable. Lens should be removed at the first signs of eye redness or irritation - lens should be removed in a clean environment only after workers have washed hands thoroughly. [CDC NIOSH Current Intelligence Bulletin 59], [AS/NZS 1336 or national equivalent].

HANDS/FEET
- Wear chemical protective gloves, eg. PVC.
- Wear safety footwear or safety gumboots, eg. Rubber.

Suitability and durability of glove type is dependent on usage. Important factors in the selection of gloves include:
- frequency and duration of contact,
- chemical resistance of glove material,
- glove thickness and
- dexterity

Select gloves tested to a relevant standard (e.g. Europe EN 374, US F739, AS/NZS 2161.1 or national equivalent).
- When prolonged or frequently repeated contact may occur, a glove with a protection class of 5 or higher (breakthrough time greater than 240 minutes according to EN 374, AS/NZS 2161.10.1 or national equivalent) is recommended.
- When only brief contact is expected, a glove with a protection class of 3 or higher (breakthrough time greater than 60 minutes according to EN 374, AS/NZS 2161.10.1 or national equivalent) is recommended.
- Contaminated gloves should be replaced.

Gloves must only be worn on clean hands. After using gloves, hands should be washed and dried thoroughly. Application of a non-perfumed moisturiser is recommended.
PVC boots. Beware of transferring mercury on soles of footwear.

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

Shower before changing to street clothing.
Separate work and street clothing.
Work with mercury in areas where spills can readily be cleaned up.

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RESPIRATOR
•Type HG-P Filter of sufficient capacity. (AS/NZS 1716 & 1715, EN 143:2000 & 149:2001, ANSI Z88 or national equivalent)
■ Selection of the Class and Type of respirator will depend upon the level of breathing zone contaminant and the chemical nature of the contaminant. Protection Factors (defined as the ratio of contaminant outside and inside the mask) may also be important.

Required minimum protection factor	Maximum gas/vapour concentration present in air p.p.m. (by volume)	Half- face Respirator	Full- Face Respirator
up to 10	1000	hg- AUS / Class1 p	-
up to 50	1000	-	hg- AUS / Class 1 p
up to 50	5000	Airline *	-
up to 100	5000	-	hg- 2 p
up to 100	10000	-	hg- 3 p
100+			Airline**

* - Continuous Flow ** - Continuous-flow or positive pressure demand
A(All classes) = Organic vapours, B AUS or B1 = Acid gasses, B2 = Acid gas or hydrogen cyanide(HCN), B3 = Acid gas or hydrogen cyanide(HCN), E = Sulfur dioxide(SO2), G = Agricultural chemicals, K = Ammonia(NH3), Hg = Mercury, NO = Oxides of nitrogen, MB = Methyl bromide, AX = Low boiling point organic compounds(below 65 degC).

The local concentration of material, quantity and conditions of use determine the type of personal protective equipment required.
Use appropriate NIOSH-certified respirator based on informed professional judgement. In conditions where no reasonable estimate of exposure can be made, assume the exposure is in a concentration IDLH and use NIOSH-certified full face pressure demand SCBA with a minimum service life of 30 minutes, or a combination full facepiece pressure demand SAR with auxiliary self-contained air supply. Respirators provided only for escape from IDLH atmospheres shall be NIOSH-certified for escape from the atmosphere in which they will be used.

ENGINEERING CONTROLS
■ Engineering controls are used to remove a hazard or place a barrier between the worker and the hazard. Well-designed engineering controls can be highly effective in protecting workers and will typically be independent of worker interactions to provide this high level of protection.
The basic types of engineering controls are:
Process controls which involve changing the way a job activity or process is done to reduce the risk.
Enclosure and/or isolation of emission source which keeps a selected hazard "physically" away from the worker and ventilation that strategically "adds" and "removes" air in the work environment. Ventilation can remove or dilute an air contaminant if designed properly. The design of a ventilation system must match the particular process and chemical or contaminant in use.
Employers may need to use multiple types of controls to prevent employee overexposure.

Local exhaust ventilation usually required. If risk of overexposure exists, wear approved respirator. Correct fit is essential to obtain adequate protection. Supplied-air type respirator may be required in special

continued...

circumstances. Correct fit is essential to ensure adequate protection.
An approved self contained breathing apparatus (SCBA) may be required in some situations.
Provide adequate ventilation in warehouse or closed storage area.

Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL PROPERTIES
Liquid.
Does not mix with water.
Sinks in water.
Corrosive.
Toxic or noxious vapours/gas.

State	Liquid	Molecular Weight	200.59
Melting Range (°F)	- 37	Viscosity	Not Available
Boiling Range (°F)	674	Solubility in water (g/L)	Immiscible
Flash Point (°F)	Not Applicable	pH (1% solution)	Not applicable.
Decomposition Temp (°F)	Not Applicable	pH (as supplied)	Not applicable
Autoignition Temp (°F)	Not applicable	Vapor Pressure (mmHg)	0.002 @ 25 C.
Upper Explosive Limit (%)	Not applicable	Specific Gravity (water=1)	13.534
Lower Explosive Limit (%)	Not applicable	Relative Vapour Density (air=1)	7.0
Volatile Component (%vol)	Not available.	Evaporation Rate	Very Slow

APPEARANCE
Silvery, odourless, poisonous liquid heavy metal; sinks in water. Has naturally occurring isotopes ranging in mass number from 189-206. When pure, mercury does not tarnish on exposure to air, but when heated slowly it oxidises to mercury oxide (HgO). Forms explosive compounds with ammonia, amines and acetylene. Forms alloys with most metals except iron. Rapidly corrodes aluminium and alloys. Insoluble in water. Reacts with nitric acid and hot, concentrated sulfuric acid. Extremely high surface tension gives mercury unique rheological properties. Passes readily into vapour at room temperature and when heated.

Section 10 - CHEMICAL STABILITY

CONDITIONS CONTRIBUTING TO INSTABILITY
• Presence of incompatible materials.
• Product is considered stable.
• Hazardous polymerisation will not occur.

STORAGE INCOMPATIBILITY
• WARNING: Avoid or control reaction with peroxides. All transition metal peroxides should be considered as potentially explosive. For example transition metal complexes of alkyl hydroperoxides may decompose explosively.
• The pi-complexes formed between chromium(0), vanadium(0) and other transition metals (haloarene-metal complexes) and mono-or poly-fluorobenzene show extreme sensitivity to heat and are explosive.
• Avoid reaction with borohydrides or cyanoborohydrides.
Mercury:

continued...

- reacts violently with alkali metals, aluminium, acetylenic compounds, azides, boron phosphodiiodide (vapour explodes), bromine, 3-bromopropyne, chlorine, chlorine dioxide, ethylene oxide, lithium, metals, methyl silane (when shaken in air), nitromethane, peroxyformic acid, potassium, propargyl bromide, rubidium, sodium, sodium carbide.
- forms sensitive explosive products with acetylene, ammonia (anhydrous), chlorine, picric acid
- increases the explosive sensitivity of methyl azide
- mixtures with sulfuric acid can be explosive
- is incompatible with calcium, sodium acetylide, nitric acid
- reacts with copper, silver and many other metals (except iron) to form amalgams.

For incompatible materials - refer to Section 7 - Handling and Storage.

Section 11 - TOXICOLOGICAL INFORMATION

mercury (elemental)

TOXICITY AND IRRITATION
MERCURY (ELEMENTAL):
■ unless otherwise specified data extracted from RTECS - Register of Toxic Effects of Chemical Substances.

Nil reported
(Source: RTECS)

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

US - California OEHHA/ARB - Acute Reference Exposure Levels and Target Organs (RELs): mercury (elemental)
Target organs: nervous
CAS: 7439-97-6

CARCINOGEN

Mercury and inorganic mercury compounds	International Agency for Research on Cancer (IARC) - Agents Reviewed by the IARC Monographs	Group	3
Mercury, elemental	US EPA Carcinogens Listing	Carcinogenicity	D

continued...

mercury (elemental)	US ACGIH Threshold Limit Values (TLV) - Carcinogens	Carcinogen Category	D
Mercury, as Hg Elemental and inorganic forms	US ACGIH Threshold Limit Values (TLV) - Carcinogens	Carcinogen Category	A4
mercury (elemental)	US - Rhode Island Hazardous Substance List	IARC	
METALS	US Environmental Defense Scorecard Suspected Carcinogens	Reference(s)	P65- MC
mercury (elemental)	US - Maine Chemicals of High Concern List	Carcinogen	D
CAS~	US - Maine Chemicals of High Concern List	Carcinogen	A4
PBIT_(PERS~	US - Maine Chemicals of High Concern List	Carcinogen	
CAS~	Canada - Prince Edward Island Occupational Exposure Limits - Carcinogens	Notes	TLV® Basis: CNS impair; kidney dam ; BEI
TWAPPM~	Canada - Prince Edward Island Occupational Exposure Limits - Carcinogens	Notes	TLV Basis: central nervous system impairment; kidney damage

REPROTOXIN

mercury (elemental)	ILO Chemicals in the electronics industry that have toxic effects on reproduction	Reduced fertility or sterility	H A si
mercury (elemental)	US - California Proposition 65 - Reproductive Toxicity	NSRL or MADL (µg/day)	

SKIN

mercury (elemental)	US - Vermont Permissible Exposure Limits Table Z- 1- A Final Rule Limits for Air Contaminants - Skin	Skin Designation	X
mercury (elemental)	US - Washington Permissible exposure limits of air contaminants - Skin	Skin	X
mercury (elemental)	US ACGIH Threshold Limit Values (TLV) - Skin	Skin Designation	X
mercury (elemental)	US NIOSH Recommended Exposure Limits (RELs) - Skin	Skin	Yes

continued...

mercury (elemental)	US - California OEHHA/ARB - Acute Reference Exposure Levels and Target Organs (RELs) - Skin	Skin	X
mercury (elemental)	US - California OEHHA/ARB - Chronic Reference Exposure Levels and Target Organs (CRELs) - Skin	Skin	X
mercury (elemental)	US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants - Skin	Skin Designation	X
mercury (elemental)	Canada - British Columbia Occupational Exposure Limits - Skin	Notation	Skin; R
mercury (elemental)	US - Minnesota Permissible Exposure Limits (PELs) - Skin	Skin Designation	X
mercury (elemental)	US - Hawaii Air Contaminant Limits - Skin Designation	Skin Designation	X
mercury (elemental)	US OSHA Permissible Exposure Levels (PELs) - Skin	Skin Designation	X
mercury (elemental)	US - Oregon Permissible Exposure Limits (Z2) - Skin	Skin	X
mercury (elemental)	US - California Permissible Exposure Limits for Chemical Contaminants - Skin	Skin	X
mercury (elemental)	US - California Permissible Exposure Limits for Chemical Contaminants - Skin	Skin	S
mercury (elemental)	Canada - Alberta Occupational Exposure Limits - Skin	Substance Interaction	1

Section 12 - ECOLOGICAL INFORMATION

MERCURY (ELEMENTAL):
■ Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
Do NOT allow product to come in contact with surface waters or to intertidal areas below the mean high water mark. Do not contaminate water when cleaning equipment or disposing of equipment wash-waters.
Wastes resulting from use of the product must be disposed of on site or at approved waste sites.
For Metal:
Atmospheric Fate - Metal-containing inorganic substances generally have negligible vapour pressure and are not expected to partition to air.
Environmental Fate: Environmental processes, such as oxidation, the presence of acids or bases and

continued...

microbiological processes, may transform insoluble metals to more soluble ionic forms. Environmental processes may enhance bioavailability and may also be important in changing solubilities.
Aquatic/Terrestrial Fate: When released to dry soil, most metals will exhibit limited mobility and remain in the upper layer; some will leach locally into ground water and/ or surface water ecosystems when soaked by rain or melt ice. A metal ion is considered infinitely persistent because it cannot degrade further. Once released to surface waters and moist soils their fate depends on solubility and dissociation in water. A significant proportion of dissolved/ sorbed metals will end up in sediments through the settling of suspended particles. The remaining metal ions can then be taken up by aquatic organisms. Ionic species may bind to dissolved ligands or sorb to solid particles in water.
Ecotoxicity: Even though many metals show few toxic effects at physiological pH levels, transformation may introduce new or magnified effects.
Mercury may occur in the environment as free mercury, Hg(0), mercury ions in salts and complexes, Hg+ and (Hg2)2+ and as organic mercury compounds. Each species has its own set of physical, chemical and toxicologic properties. In natural systems a dynamic equilibrium between soil and water mercury occurs, determined largely by the physicochemical and biological conditions which pertain.
Mercury ion is transported to aquatic ecosystems via surface run-off and from the atmosphere. It is complexed or tightly bound to both inorganic and organic particles, particularly sediments with high sulfur content.
Organic acids such as fulvic and humic acids are often associated with mercury not bound to particles. Methyl mercury is produced by sediment micro-organisms, non-biologically in sediments, and by certain species of fish. The methylation of mercury by micro-organisms is the detoxification response that allows the organism to dispose of the heavy metal ions as small organometallic complexes. Methylation occurs only within a narrow pH range in which the micro-organism might exist and the rate of synthesis depends on the redox potential, composition of the microbial population, availability of Hg2+ and temperature. In addition it has been demonstrated that the livers of yellow-fin tuna and albacore produce methyl mercury results in its removal thus little methyl mercury is found in sediments. Demethylation by sediment micro-organisms also occurs at a rapid rate compared with methylation. The best conversion rate for inorganic mercury to methyl mercury under ideal conditions is less than 1.5% per month. Methyl mercury released into surface waters may also be broken down into mercury when exposed to light. Methyl mercury can be bioaccumulated by planktonic algae and fish. In fish, the rate of absorption of methyl mercury is faster than that of inorganic mercury and the clearance rate is slower resulting in high concentrations of methyl mercury in muscle tissue. The ratio of organic mercury to total mercury is generally high in fish compared with other aquatic organisms. Selenium which is also present in seawater and other seafoods readily complexes with methyl mercury and is thought to have a protective effect against the toxic action of methyl mercury. The danger of methyl mercury poisoning has been illustrated in Minimata, Japan in the late 1950s following industrial release of mercury into the bay which subsequently resulted in at least 1200 cases of poisoning, some fatal.
Prevent, by any means available, spillage from entering drains or water courses.
DO NOT discharge into sewer or waterways.
The material is classified as an ecotoxin* because the Fish LC50 (96 hours) is less than or equal to 0.1 mg/l
* Classification of Substances as Ecotoxic (Dangerous to the Environment)
Appendix 8, Table 1
Compiler's Guide for the Preparation of International Chemical Safety Cards: 1993 Commission of the European Communities.

Ecotoxicity

Ingredient	Persistence: Water/Soil	Persistence: Air	Bioaccumulation	Mobility
mercury (elemental)	No Data Available	No Data Available	LOW	

Section 13 - DISPOSAL CONSIDERATIONS

US EPA Waste Number & Descriptions
A. General Product Information

Corrosivity characteristic: use EPA hazardous waste number D002 (waste code C)
Toxicity characteristic: use EPA hazardous waste number D009 (waste code E) if this substance, in a solid waste, produces an extract containing greater than 0.2 mg/L of mercury.

B. Component Waste Numbers

When mercury (elemental) is present as a solid waste as a discarded commercial chemical product, off-specification species, as a container residue, or a spill residue, use EPA waste number U151 (waste code T).

Disposal Instructions
All waste must be handled in accordance with local, state and federal regulations.
• Containers may still present a chemical hazard/ danger when empty.
• Return to supplier for reuse/ recycling if possible.
Otherwise:
• If container can not be cleaned sufficiently well to ensure that residuals do not remain or if the container cannot be used to store the same product, then puncture containers, to prevent re-use, and bury at an authorised landfill.
• Where possible retain label warnings and MSDS and observe all notices pertaining to the product.
Legislation addressing waste disposal requirements may differ by country, state and/ or territory. Each user must refer to laws operating in their area. In some areas, certain wastes must be tracked.
A Hierarchy of Controls seems to be common - the user should investigate:
• Reduction
• Reuse
• Recycling
• Disposal (if all else fails)
This material may be recycled if unused, or if it has not been contaminated so as to make it unsuitable for its intended use. If it has been contaminated, it may be possible to reclaim the product by filtration, distillation or some other means. Shelf life considerations should also be applied in making decisions of this type. Note that properties of a material may change in use, and recycling or reuse may not always be appropriate.
• DO NOT allow wash water from cleaning or process equipment to enter drains.
• It may be necessary to collect all wash water for treatment before disposal.
• In all cases disposal to sewer may be subject to local laws and regulations and these should be considered first.
• Where in doubt contact the responsible authority.

Section 14 - TRANSPORTATION INFORMATION

continued...

DOT:

Symbols:	A W	Hazard class or Division:	8
Identification Numbers:	UN2809	PG:	III
Label Codes:	8	Special provisions:	None
Packaging: Exceptions:	164	Packaging: Non- bulk:	164
Packaging: Exceptions:	164	Quantity limitations: Passenger aircraft/rail:	35 kg
Quantity Limitations: Cargo aircraft only:	35 kg	Vessel stowage: Location:	B
Vessel stowage: Other:	40, 97		

Hazardous materials descriptions and proper shipping names:
Mercury

Air Transport IATA:

ICAO/IATA Class:	8	ICAO/IATA Subrisk:	None
UN/ID Number:	2809	Packing Group:	III
Special provisions:	None		
Cargo Only			
Packing Instructions:	868	Maximum Qty/Pack:	35 kg
Passenger and Cargo		Passenger and Cargo	
Packing Instructions:	868	Maximum Qty/Pack:	35 kg
Passenger and Cargo Limited Quantity		Passenger and Cargo Limited Quantity	
Packing Instructions:	Forbidden	Maximum Qty/Pack:	Forbidden

Shipping name:MERCURY

Maritime Transport IMDG:

IMDG Class:	8	IMDG Subrisk:	None
UN Number:	2809	Packing Group:	III
EMS Number:	F-A,S-B	Special provisions:	941
Limited Quantities:	5 kg	Marine Pollutant:	Yes

Shipping name:MERCURY

Section 15 - REGULATORY INFORMATION

continued...

REGULATIONS

US EPCRA Section 313 Chemical List

Ingredient	CAS	% de minimus concentration
mercury (elemental)	7439-97-6	*

US CERCLA List of Hazardous Substances and Reportable Quantities

Ingredient	CAS	RQ
mercury (elemental)	7439-97-6	

mercury (elemental) (CAS: 7439-97-6) is found on the following regulatory lists;
"Canada - British Columbia Occupational Exposure Limits","Canada - Nova Scotia Occupational Exposure Limits", "Canada - Prince Edward Island Occupational Exposure Limits","Canada - Prince Edward Island Occupational Exposure Limits - Carcinogens","Canada - Quebec Permissible Exposure Values for Airborne Contaminants (English)","Canada - Saskatchewan Environmental Persistent or Chronic Hazardous Substances","Canada CEPA Environmental Registry Substance Lists - List of substances on the DSL that meet the ecological criteria for categorization (English)","Canada Domestic Substances List (DSL)","Canada Environmental Protection Act (CEPA) 1999 - Schedule 1 Toxic Substances List","Canada Environmental Quality Guidelines (EQGs) Water: Community", "Canada Ingredient Disclosure List (SOR/88-64)","Canada Toxicological Index Service - Workplace Hazardous Materials Information System - WHMIS (English)","International Chemical Secretariat (ChemSec) SIN List (*Substitute It Now!)","US - Alaska Limits for Air Contaminants","US - Arkansas Surface Water Quality Standards Dissolved Metals","US - California Air Toxics ""Hot Spots"" List (Assembly Bill 2588) Substances for which emissions must be quantified","US - California Code of Regulation; Identification and Listing of Hazardous Waste, Table 1 - Maximum Concentrations for the Toxicity Characteristics","US - California Proposition 65 - Priority List for the Development of MADLs for Chemicals Causing Reproductive Toxicity","US - Connecticut Hazardous Air Pollutants","US - Delaware Pollutant Discharge Requirements - Reportable Quantities","US - Georgia Primary Maximum Contaminant Levels for Drinking Water - Inorganics","US - Idaho - Acceptable Maximum Peak Concentrations","US - Idaho - Limits for Air Contaminants","US - Maine Chemicals of High Concern List","US - Massachusetts Drinking Water - Detection Limits for Inorganic Contaminants","US - Massachusetts Drinking Water - Inorganic Maximum Contaminant Levels (MCLs)","US - Massachusetts Oil & Hazardous Material List","US - Michigan Exposure Limits for Air Contaminants","US - Minnesota Hazardous Substance List","US - Minnesota Permissible Exposure Limits (PELs)","US - New Jersey Right to Know Hazardous Substances","US - Oregon Permissible Exposure Limits (Z-2)","US - Pennsylvania - Hazardous Substance List", "US - Rhode Island Hazardous Substance List","US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants","US - Utah Primary Drinking Water Standards - Inorganic Contaminants","US - Vermont Hazardous Constituents","US - Vermont Hazardous Waste - Maximum Contaminant Concentration for Toxicity","US - Vermont Hazardous wastes which are Discarded Commercial Chemical Products or Off-Specification Batches of Commercial Chemical Products or Spill Residues of Either","US - Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants","US - Vermont Permissible Exposure Limits Table Z-1-A Transitional Limits for Air Contaminants","US - Washington Discarded Chemical Products List - ""U"" Chemical Products","US - Washington Permissible exposure limits of air contaminants","US - Washington Toxic air pollutants and their ASIL, SQER and de minimis emission values","US - Wyoming Toxic and Hazardous Substances Table Z1 Limits for Air Contaminants","US - Wyoming Toxic and Hazardous Substances Table Z-2 Acceptable ceiling concentration, Acceptable maximum peak above the acceptable ceiling concentration for an 8-hr shift","US ACGIH Threshold Limit Values (TLV)","US American Apparel & Footwear Association (AAFA) Restricted Substance List (RSL)","US ATSDR Minimal Risk Levels for Hazardous Substances (MRLs)","US CERCLA Priority List of Hazardous Substances", "US CERCLA Top 20 Priority List of Hazardous Substances","US Department of Transportation (DOT) List of Hazardous Substances and Reportable Quantities - Hazardous Substances Other Than Radionuclides","US DOE Temporary Emergency Exposure Limits (TEELs)","US EPA Priority PBT Chemicals","US EPA Acute Exposure Guideline Levels (AEGLs) - Interim","US EPA Carcinogens Listing","US EPA National Priorities List - Superfund Chemical Data Matrix (SCDM) - Hazard Ranking System - Hazardous Substance Benchmarks","US EPA Toxic Chemical Release Inventory Persistent Bioaccumulative Toxic Chemical (PBT) List","US EPCRA Section 313 Chemical List",

continued...

"US List of Lists - Consolidated List of Chemicals Subject to EPCRA, CERCLA and Section 112(r) of the Clean Air Act","US OSHA Permissible Exposure Levels (PELs) - Table Z1","US OSHA Permissible Exposure Levels (PELs) - Table Z2","US RCRA (Resource Conservation & Recovery Act) - Hazardous Constituents - Appendix VIII to 40 CFR 261","US RCRA (Resource Conservation & Recovery Act) - List of Hazardous Wastes","US RCRA (Resource Conservation & Recovery Act) - Phase 4 LDR Rule - Universal Treatment Standards","US Spacecraft Maximum Allowable Concentrations (SMACs) for Airborne Contaminants","US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory","US TSCA Section 12(b) - List of Chemical Substances Subject to Export Notification Requirements","US TSCA Section 5(a)(2) - Significant New Use Rules (SNURs)","WHO Guidelines for Drinking-water Quality - Guideline values for chemicals that are of health significance in drinking-water"

Section 16 - OTHER INFORMATION

REPRODUCTIVE HEALTH GUIDELINES

■ Established occupational exposure limits frequently do not take into consideration reproductive end points that are clearly below the thresholds for other toxic effects. Occupational reproductive guidelines (ORGs) have been suggested as an additional standard. These have been established after a literature search for the reproductive no-observed-adverse effect-level (NOAEL) and the lowest-observed-adverse-effect-level (LOAEL). In addition the US EPA's procedures for risk assessment for hazard identification and dose-response assessment as applied by NIOSH were used in the creation of such limits. Uncertainty factors (UFs) have also been incorporated.

Ingredient	ORG	UF	Endpoint	CR	Adeq TLV
mercury (elemental)	0.01 mg/m3	NA	NA	NA	-

■ These exposure guidelines have been derived from a screening level of risk assessment and should not be construed as unequivocally safe limits. ORGS represent an 8-hour time-weighted average unless specified otherwise.
CR = Cancer Risk/10000; UF = Uncertainty factor:
TLV believed to be adequate to protect reproductive health:
LOD: Limit of detection
Toxic endpoints have also been identified as:
D = Developmental; R = Reproductive; TC = Transplacental carcinogen
Jankovic J., Drake F.: A Screening Method for Occupational Reproductive
American Industrial Hygiene Association Journal 57: 641-649 (1996).
■ Classification of the preparation and its individual components has drawn on official and authoritative sources as well as independent review by the Chemwatch Classification committee using available literature references.
A list of reference resources used to assist the committee may be found at:
www.chemwatch.net/references.

■ The (M)SDS is a Hazard Communication tool and should be used to assist in the Risk Assessment. Many factors determine whether the reported Hazards are Risks in the workplace or other settings. Risks may be determined by reference to Exposures Scenarios. Scale of use, frequency of use and current or available engineering controls must be considered.

■ For detailed advice on Personal Protective Equipment, refer to the following U.S. Regulations and Standards:
OSHA Standards - 29 CFR:
1910.132 - Personal Protective Equipment - General requirements
1910.133 - Eye and face protection
1910.134 - Respiratory Protection
1910.136 - Occupational foot protection
1910.138 - Hand Protection

continued...

Eye and face protection - ANSI Z87.1
Foot protection - ANSI Z41
Respirators must be NIOSH approved.

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