SDFCL
s d fine-chem limited

ACETALDEHYDE SOLN.ABT 20-30% PRACT

GHS Safety Data Sheet

Section 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME
ACETALDEHYDE

OTHER NAMES
CH3-CHO, C2-H4-O, "ethyl aldehyde", ethylaldehyde, "acetic aldehyde", ethanal, diethylacetal, "1, 1-diethyoxy ethane"

PROPER SHIPPING NAME
ACETALDEHYDE

PRODUCT USE
Manufacture of acetic acid, acetic anhydride, peracetic acid, n-butanol, synthetic flavours, perfumes, pentaerythritol, aniline dyes, plastics and synthetic rubber.
Intermediate

SUPPLIER
Company: S D FINE - CHEM LIMITED
Address:
315- 317, T.V.IND.ESTATE,
248 WORLI ROAD,
MUMBAI- 400 030, INDIA
technical@sdfine.com
Telephone: 91- 22 24959898
Telephone: 91- 22 24959899
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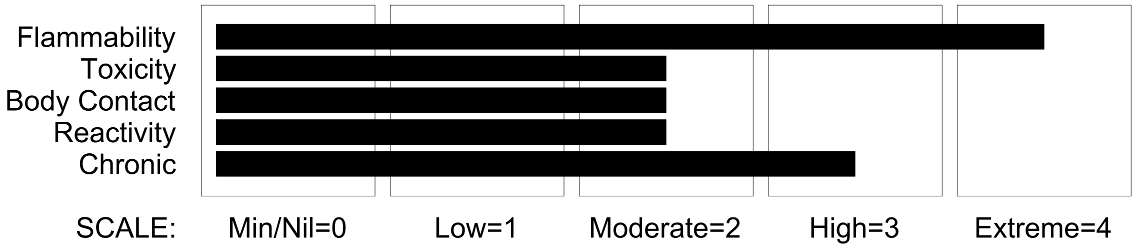
Section 2 - HAZARDS IDENTIFICATION

HAZARD RATINGS



GHS Classification

Acute Aquatic Hazard Category 3
Acute Toxicity (Oral) Category 4
Aspiration Hazard Category 1
Carcinogen Category 2

continued...

Eye Irritation Category 2A
Flammable Liquid Category 1
Reproductive Toxicity Category 1B
Respiratory Effects Category 3
Respiratory Irritation Category 3
Skin Corrosion/Irritation Category 3

EMERGENCY OVERVIEW

HAZARD

DANGER
Determined by using GHS criteria:
H335 H336 H224 H302 H304 H316 H319 H351 H360 H402
May cause respiratory irritation
May cause drowsiness or dizziness
Extremely flammable liquid and vapour
Harmful if swallowed
May be fatal if swallowed and enters airways
Causes mild skin irritation
Causes serious eye irritation
Suspected of causing cancer
May damage the unborn child
Harmful to aquatic life

PRECAUTIONARY STATEMENTS

Prevention

Obtain special instructions before use.
Do not handle until all safety precautions have been read and understood.
Keep away from heat/sparks/open flames/hot surfaces. - No smoking.
Keep container tightly closed.
Ground/bond container and receiving equipment.
Use explosion-proof electrical/ventilating/lighting equipment
Use only non-sparking tools.
Take precautionary measures against static discharge.
Avoid breathing dust/fume/gas/mist/vapours/spray.
Wash thoroughly after handling.
Do not eat, drink or smoke when using this product.
Use only outdoors or in a well-ventilated area.
Avoid release to the environment.
Wear protective gloves/protective clothing/eye protection/face protection.
Use personal protective equipment as required.

Response

IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician.
IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell.
IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.
IF INHALED: Remove to fresh air and keep at rest in a position comfortable for breathing.
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to

continued...

do. Continue rinsing.
IF exposed or concerned: Get medical advice/ attention.
Call a POISON CENTER or doctor/physician if you feel unwell.
Rinse mouth.
Do NOT induce vomiting.
If skin irritation occurs: Get medical advice/ attention.
If eye irritation persists: Get medical advice/attention.

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

Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

NAME	CAS RN	%
acetaldehyde	75-07-0	>99
may undergo decomposition in water or air to		
acetic acid glacial	64-19-7	

Section 4 - FIRST AID MEASURES

SWALLOWED
- If swallowed do NOT induce vomiting.
- If vomiting occurs, lean patient forward or place on left side (head-down position, if possible) to maintain open airway and prevent aspiration.
- Observe the patient carefully.
- Never give liquid to a person showing signs of being sleepy or with reduced awareness; i.e. becoming unconscious.
- Give water to rinse out mouth, then provide liquid slowly and as much as casualty can comfortably drink.
- Seek medical advice.
- Avoid giving milk or oils.
- Avoid giving alcohol.
- If spontaneous vomiting appears imminent or occurs, hold patient's head down, lower than their hips to help avoid possible aspiration of vomitus.

EYE
■ If this product comes in contact with the eyes:
- Wash out immediately with fresh 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.
- Seek medical attention without delay; if pain persists or recurs seek medical attention.
- 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.

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- Prostheses such as false teeth, which may block airway, should be removed, where possible, prior to initiating first aid procedures.
- Apply artificial respiration if not breathing, preferably with a demand valve resuscitator, bag-valve mask device, or pocket mask as trained. Perform CPR if necessary.
- Transport to hospital, or doctor, without delay.

NOTES TO PHYSICIAN

■ Any material aspirated during vomiting may produce lung injury. Therefore emesis should not be induced mechanically or pharmacologically. Mechanical means should be used if it is considered necessary to evacuate the stomach contents; these include gastric lavage after endotracheal intubation. If spontaneous vomiting has occurred after ingestion, the patient should be monitored for difficult breathing, as adverse effects of aspiration into the lungs may be delayed up to 48 hours.
For acute or short-term repeated exposures to formaldehyde:
INGESTION:

- Patients present early with severe corrosion of the gastro-intestinal tract and systemic effects.
- Inflammation and ulceration may progress to strictures.
- Severe acidosis results from rapid conversion of formaldehyde to formic acid. Coma, hypotension, renal failure and apnoea complicate ingestion.
- Decontaminate by dilution with milk or water containing ammonium acetate; vomiting should be induced. Follow with gastric lavage using a weak ammonia solution (converts formaldehyde to relatively inert pentamethylenetetramine)
- Gastric lavage is warranted only in first 15 minutes following ingestion.

SKIN:

- Formaldehyde can combine with epidermal protein to produce a hapten-protein couple capable of sensitising T-lymphocytes. Subsequent exposures cause a type IV hypersensitivity reaction (i.e allergic contact dermatitis). [Ellenhorn & Barceloux: Medical Toxicology].

Intoxication is treated in a fashion similar to its congener, formaldehyde

Section 5 - FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA

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

FIRE FIGHTING

- Alert Fire Brigade and tell them location and nature of hazard.
- May be violently or explosively reactive.
- Wear breathing apparatus plus protective gloves.
- Prevent, by any means available, spillage from entering drains or water course.
- Consider evacuation (or protect in place).
- Fight fire from a safe distance, with adequate cover.
- If safe, switch off electrical equipment until vapour fire hazard removed.
- Use water delivered as a fine spray to control the fire and cool adjacent area.
- Avoid spraying water onto liquid pools.
- Do not approach containers suspected to be hot.
- Cool fire exposed containers with water spray from a protected location.
- If safe to do so, remove containers from path of fire.

FIRE/EXPLOSION HAZARD

- Liquid and vapour are highly flammable.
- Severe fire hazard when exposed to heat, flame and/or oxidisers.
- Vapour forms an explosive mixture with air.

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Section 5 - FIRE FIGHTING MEASURES

- Severe explosion hazard, in the form of vapour, when exposed to flame or spark.
- Vapour may travel a considerable distance to source of ignition.
- Heating may cause expansion / decomposition with violent rupture of containers.
- On combustion, may emit toxic fumes of carbon monoxide (CO).

Combustion products include: carbon dioxide (CO_2), other pyrolysis products typical of burning organic material.

Contains low boiling substance: Closed containers may rupture due to pressure buildup under fire conditions.

WARNING: Long standing in contact with air and light may result in the formation of potentially explosive peroxides.

FIRE INCOMPATIBILITY

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

PERSONAL PROTECTION

Glasses:	Gloves:	Respirator:
Chemical goggles.	1.PE/EVAL/PE 2.BUTYL 3.PVA	Type BAX Filter of sufficient capacity

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Section 6 - ACCIDENTAL RELEASE MEASURES

MINOR SPILLS

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

MAJOR SPILLS

- Clear area of personnel and move upwind.
- Alert Fire Brigade and tell them location and nature of hazard.
- May be violently or explosively reactive.
- Wear breathing apparatus plus protective gloves.
- Prevent, by any means available, spillage from entering drains or water course.
- Consider evacuation (or protect in place).
- No smoking, naked lights or ignition sources.
- Increase ventilation.
- Stop leak if safe to do so.
- Water spray or fog may be used to disperse /absorb vapour.
- Contain spill with sand, earth or vermiculite.
- Use only spark-free shovels and explosion proof equipment.
- Collect recoverable product into labelled containers for recycling.
- Absorb remaining product with sand, earth or vermiculite.
- Collect solid residues and seal in labelled drums for disposal.
- Wash area and prevent runoff into drains.
- If contamination of drains or waterways occurs, advise emergency services.

PROTECTIVE ACTIONS FOR SPILL

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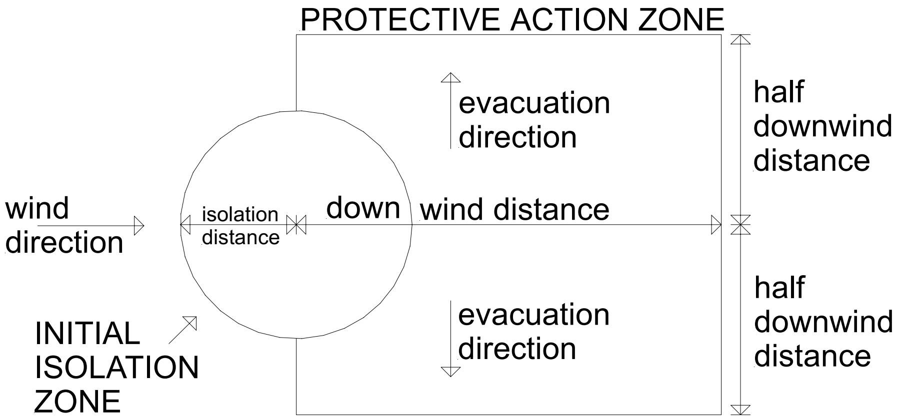

From IERG (Canada/Australia)

Isolation Distance	50 metres
Downwind Protection Distance	300 metres
IERG Number	18

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 vapour 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 vapour 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 localised 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 129 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:

acetaldehyde	1000ppm

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

acetaldehyde	200ppm

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

acetaldehyde	10ppm

American Industrial Hygiene Association (AIHA)

Ingredients considered according to the following cutoffs

Very Toxic (T+)	>= 0.1%	Toxic (T)	>= 3.0%

continued...

R50	>= 0.25%	Corrosive (C)	>= 5.0%
R51	>= 2.5%		
else	>= 10%		

where percentage is percentage of ingredient found in the mixture

Personal Protective Equipment advice is contained in Section 8 of the MSDS.

Section 7 - HANDLING AND STORAGE

PROCEDURE FOR HANDLING

- Containers, even those that have been emptied, may contain explosive vapours.
- Do NOT cut, drill, grind, weld or perform similar operations on or near containers.
- DO NOT allow clothing wet with material to stay in contact with skin.

The substance accumulates peroxides which may become hazardous only if it evaporates or is distilled or otherwise treated to concentrate the peroxides. The substance may concentrate around the container opening for example.

Purchases of peroxidisable chemicals should be restricted to ensure that the chemical is used completely before it can become peroxidised.

- A responsible person should maintain an inventory of peroxidisable chemicals or annotate the general chemical inventory to indicate which chemicals are subject to peroxidation. An expiration date should be determined. The chemical should either be treated to remove peroxides or disposed of before this date.
- The person or laboratory receiving the chemical should record a receipt date on the bottle. The individual opening the container should add an opening date.
- Unopened containers received from the supplier should be safe to store for 18 months.
- Opened containers should not be stored for more than 12 months.

Contains low boiling substance:

Storage in sealed containers may result in pressure buildup causing violent rupture of containers not rated appropriately.

- Check for bulging containers.
- Vent periodically
- Always release caps or seals slowly to ensure slow dissipation of vapours.
- Avoid all personal contact, including inhalation.
- Wear protective clothing when risk of exposure occurs.
- Use in a well-ventilated area.
- Prevent concentration in hollows and sumps.
- DO NOT enter confined spaces until atmosphere has been checked.
- Avoid smoking, naked lights, heat or ignition sources.
- When handling, DO NOT eat, drink or smoke.
- Vapour may ignite on pumping or pouring due to static electricity.
- DO NOT use plastic buckets.
- Earth and secure metal containers when dispensing or pouring product.
- Use spark-free tools when handling.
- Avoid contact with incompatible materials.
- Keep containers securely sealed.
- Avoid physical damage to containers.
- Always wash hands with soap and water after handling.
- Work clothes should be laundered separately.
- 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.

SUITABLE CONTAINER

- Packing as supplied by manufacturer.
- Plastic containers may only be used if approved for flammable liquid.
- Check that containers are clearly labelled and free from leaks.

continued...

- For low viscosity materials (i) : Drums and jerry cans must be of the non-removable head type. (ii) : 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)
- For manufactured product having a viscosity of at least 250 cSt. (23 deg. C)
- Manufactured product that requires stirring before use and having a viscosity of at least 20 cSt (25 deg. C)

(i) : Removable head packaging;
(ii) : Cans with friction closures and
(iii) : low pressure tubes and cartridges may be used.

- Where combination packages are used, and the inner packages are of glass, there must be sufficient inert cushioning material in contact with inner and outer packages
- In addition, where inner packagings are glass and contain liquids of packing group I there must be sufficient inert absorbent to absorb any spillage, unless the outer packaging is a close fitting moulded plastic box and the substances are not incompatible with the plastic.

Store bulk quantities in refrigerated tanks, blanketed with nitrogen.

STORAGE INCOMPATIBILITY

■ WARNING: Acetaldehyde is oxidised rapidly and exothermically, by air, to peroxyacetic acid.

- Mixtures of 30-60% acetaldehyde vapour with air or with 60-80% oxygen may ignite on surfaces at 176 and 105 deg. C, respectively, owing to the formation and subsequent violent decomposition of peroxyacetic acid.
- Acetaldehyde is extremely or violently reactive with acid anhydrides, alcohols, halogens, ketones, phenols, amines, anhydrous ammonia, alkalis, isocyanates, phosphorus, hydrogen cyanide or hydrogen sulfide.
- Oxygenation of acetaldehyde in the presence of cobalt acetate at -20 deg. C. caused precipitation of 1-hydroxyethyl peroxyacetate (acetaldehyde hemi-peracetate) which exploded violently on heating. Ozone or UV light catalyses the autooxidation.
- Reaction with acetic acid produces exothermic polymerisation.
- Some of the products of interaction of acetaldehyde and mercury(II) chlorate are highly explosive and extremely shock sensitive.
- The impure material polymerises readily in the presence of trace metals (iron) or acids.
- In one incident, oxygen leaked into free space above acetaldehyde in a storage tank normally purged with nitrogen. An accelerating exothermic oxidation led to detonation. The self-ignition temperature of acetaldehyde-oxygen mixtures depends on the dimensions of the reactor and the partial pressure of peroxyacetic acid accumulated on the walls. Spontaneous ignition temperatures of 71-93 deg. C. were observed.
- Decomposition above 400 deg. C. produces methane and carbon monoxide.
- Flammable and/or toxic gases are generated by the combination of aldehydes with azo, diazo compounds, dithiocarbamates, nitrides, and strong reducing agents.
- Many aldehydes are incompatible with strong acids, amines, strong oxidisers, and alkaline materials.
- Several medium range aldehydes ignite in air, particularly if exposure is increased by sorption on paper or cloth - ignition often occurs within 2 hours.
- Avoid any contamination of this material as it is very reactive and any contamination is potentially hazardous.
- Hazardous, even explosive polymerisation may result from mixing with incompatible materials.
- Avoid reaction with oxidising agents.

STORAGE REQUIREMENTS

- Outside or detached storage is preferred.
- Store in original containers in approved flame-proof area.
- No smoking, naked lights, heat or ignition sources.
- DO NOT store in pits, depressions, basements or areas where vapours may be trapped.
- Keep containers securely sealed.
- Store away from incompatible materials in a cool, dry well ventilated area.
- Protect containers against physical damage and check regularly for leaks.
- Observe manufacturer's storing and handling recommendations.

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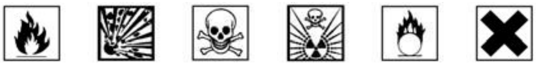
SAFE STORAGE WITH OTHER CLASSIFIED CHEMICALS



+	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
Australia Exposure Standards	acetaldehyde (Acetaldehyde)	20	36	50	91
Australia Exposure Standards	acetic acid glacial (Acetic acid)	10	25	15	37

EMERGENCY EXPOSURE LIMITS

Material	Revised IDLH Value (mg/m3)	Revised IDLH Value (ppm)
acetaldehyde		2, 000
acetic acid glacial		50

MATERIAL DATA

ACETALDEHYDE:

■ Odour Threshold Value for acetaldehyde: 0.067 ppm (detection)

NOTE:Detection tubes for acetaldehyde, measuring in excess of 5 ppm, are commercially available.

Exposure at or below the recommended TLV is thought to prevent excessive eye irritation and potential injury to the respiratory tract.

The US EPA has assigned an upper limit unit risk estimate of 4 x 10(exp-3) per ppm inhaled and a relative potency for tumour formation of 1/250 of that for formaldehyde. The US EPA also reported that for chronic exposure at 2 ppm with limited daily exposure at 10-40 ppm,the estimated risks of a tumourigenic response are 10(exp-4) to 10(exp-5).

ACETIC ACID GLACIAL:

■ for acetic acid:

NOTE:Detector tubes for acetic acid, measuring in excess of 1 ppm, are commercially available.

Exposure at or below the TLV-TWA and TLV-STEL is thought to protect the worker against conjunctival, nose and respiratory tract irritation.

Odour Safety Factor(OSF)

OSF=21 ("ACETIC ACID, GLACIAL").

PERSONAL PROTECTION

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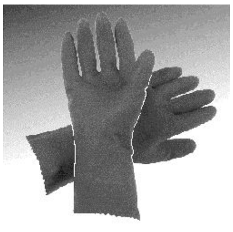

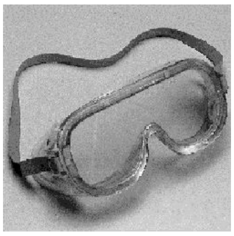

EYE

- 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].

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: such as:

- 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).

- 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) 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) 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.

OTHER

- Overalls.
- PVC Apron.
- PVC protective suit may be required if exposure severe.
- Eyewash unit.
- Ensure there is ready access to a safety shower.
- Some plastic personal protective equipment (PPE) (e.g. gloves, aprons, overshoes) are not recommended as they may produce static electricity.
- For large scale or continuous use wear tight-weave non-static clothing (no metallic fasteners, cuffs or pockets), non sparking safety footwear.

GLOVE SELECTION INDEX

■ Glove selection is based on a modified presentation of the:
" Forsberg Clothing Performance Index" .
The effect(s) of the following substance(s) are taken into account in the
computer- generated selection: acetaldehyde

■ Protective Material:

continued...

PE/EVAL/PE	A
BUTYL	A
NATURAL+NEOPRENE	C
PVA	C
NATURAL RUBBER	C
NEOPRENE	C

■

A: Best Selection
B: Satisfactory; may degrade after 4 hours continuous immersion
C: Poor to Dangerous Choice for other than short term immersion

NOTE: As a series of factors will influence the actual performance of the glove, a final selection must be based on detailed observation. -

* Where the glove is to be used on a short term, casual or infrequent basis, factors such as "feel" or convenience (e.g. disposability), may dictate a choice of gloves which might otherwise be unsuitable following long-term or frequent use. A qualified practitioner should be consulted.

RESPIRATOR

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

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

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

The local concentration of material, quantity and conditions of use determine the type of personal protective equipment required. For further information consult your Occupational Health and Safety Advisor.

ENGINEERING CONTROLS

- Employees exposed to confirmed human carcinogens should be authorized to do so by the employer, and work in a regulated area.
- Work should be undertaken in an isolated system such as a "glove-box" . Employees should wash their hands and arms upon completion of the assigned task and before engaging in other activities not associated with the isolated system.
- Within regulated areas, the carcinogen should be stored in sealed containers, or enclosed in a closed system, including piping systems, with any sample ports or openings closed while the carcinogens are contained within.
- Open-vessel systems are prohibited.
- Each operation should be provided with continuous local exhaust ventilation so that air movement is always from ordinary work areas to the operation.
- Exhaust air should not be discharged to regulated areas, non-regulated areas or the external environment unless decontaminated. Clean make-up air should be introduced in sufficient volume to maintain correct operation of the local exhaust system.

continued...

- For maintenance and decontamination activities, authorized employees entering the area should be provided with and required to wear clean, impervious garments, including gloves, boots and continuous-air supplied hood. Prior to removing protective garments the employee should undergo decontamination and be required to shower upon removal of the garments and hood.
- Except for outdoor systems, regulated areas should be maintained under negative pressure (with respect to non-regulated areas).
- Local exhaust ventilation requires make-up air be supplied in equal volumes to replaced air.
- Laboratory hoods must be designed and maintained so as to draw air inward at an average linear face velocity of 150 feet/ min. with a minimum of 125 feet/ min. Design and construction of the fume hood requires that insertion of any portion of the employees body, other than hands and arms, be disallowed.

Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE

Colourless, highly volatile, extremely flammable liquid with an irritating characteristic pungent, fruity odour. Mixes with water, alcohol.

PHYSICAL PROPERTIES

Liquid.
Mixes with water.

State	Liquid	Molecular Weight	44.06
Melting Range (°C)	- 123.5	Viscosity	Not Available
Boiling Range (°C)	21	Solubility in water (g/L)	Miscible
Flash Point (°C)	- 38 (TCC)	pH (1% solution)	Not applicable.
Decomposition Temp (°C)	Not Available	pH (as supplied)	Not applicable
Autoignition Temp (°C)	185- 193	Vapour Pressure (kPa)	98.7 @ 20C
Upper Explosive Limit (%)	60.5	Specific Gravity (water=1)	0.788 @ 16C
Lower Explosive Limit (%)	4	Relative Vapour Density (air=1)	> 1
Volatile Component (%vol)	100	Evaporation Rate	Very Fast
Gas group	IIA		

Material	Value
ACETALDEHYDE:	
log Kow	- 0.4

Section 10 - CHEMICAL STABILITY AND REACTIVITY INFORMATION

CONDITIONS CONTRIBUTING TO INSTABILITY

- Presence of incompatible materials.
- Product is considered stable.
- Hazardous polymerisation will occur.

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

Section 11 - TOXICOLOGICAL INFORMATION

POTENTIAL HEALTH EFFECTS

ACUTE HEALTH EFFECTS

continued...

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.

■ Swallowing of the liquid may cause aspiration into the lungs with the risk of chemical pneumonitis; serious consequences may result. (ICSC13733).

■ Ingestion of acetaldehyde may depress the central nervous system, with symptoms similar to alcohol intoxication. Large doses may produce breathing paralysis. Symptoms of central nervous system depression may include nonspecific discomfort, giddiness, headache, dizziness, nausea, anaesthetic effects, slowed reaction time, slurred speech and may progress to unconsciousness. Serious poisonings may result in depression of breathing, which may cause death.

EYE

■ Eye contact with liquid acetaldehyde may produce a painful burning sensation, lachrymation and blurred vision but not serious burns. A majority of unacclimatised subjects experienced eye irritation at 50 ppm after 15 minutes. Irritation in sensitive persons occurred after exposures at concentrations as low as 25 ppm for 15 minutes.

At 200 ppm all subjects had red eyes and transient conjunctivitis.

■ There is evidence that material may produce eye irritation in some persons and produce eye damage 24 hours or more after instillation. Severe inflammation may be expected with pain. There may be damage to the cornea. Unless treatment is prompt and adequate there may be permanent loss of vision. Conjunctivitis can occur following repeated exposure.

SKIN

■ Skin contact with the material may damage the health of the individual; systemic effects may result following absorption.

■ There is some evidence to suggest that the material may cause mild but significant inflammation of the skin either following direct contact or after a delay of some time. Repeated exposure can cause contact dermatitis which is characterised by redness, swelling and blistering.

■ Prolonged dermal exposure to acetaldehyde can cause erythema and burns in humans; repeat contact may result in dermatitis.

■ 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

■ The material can cause respiratory irritation in some persons. The body's response to such irritation can cause further lung damage.

■ Inhalation of vapours may cause drowsiness and dizziness. This may be accompanied by sleepiness, reduced alertness, loss of reflexes, lack of co-ordination, and vertigo.

■ Inhalation of vapours or aerosols (mists, fumes), generated by the material during the course of normal handling, may be damaging to the health of the individual.

■ The irritating effects of the vapour may provide adequate warning of exposure to acetaldehyde. Exposure is limited by the intense irritation of mucous membranes and conjunctiva. Acetaldehyde is less toxic by inhalation than the unsaturated aldehydes, producing less airway constriction but more lung irritation.

Clinical effects of exposure to vapours include skin reddening, coughing and sleepiness. At higher concentrations, paralysis and death may occur.

Acetaldehyde may make other contaminants in the air more easily taken up by the airway, because it is toxic to the cilia of the cells and it coagulates mucus.

■ If exposure to highly concentrated vapour atmosphere is prolonged this may lead to narcosis, unconsciousness, even coma and unless resuscitated - death.

CHRONIC HEALTH EFFECTS

■ There has been concern that this material can cause cancer or mutations, but there is not enough data to make an assessment.

■ Long-term exposure to respiratory irritants may result in disease of the airways involving difficult breathing and related systemic problems.

There is ample evidence that this material can be regarded as being able to cause cancer in humans based on experiments and other information.

continued...

Substance accumulation, in the human body, may occur and may cause some concern following repeated or long-term occupational exposure.
There is some evidence from animal testing that exposure to this material may result in toxic effects to the unborn baby.
Chronic exposure to acetaldehyde may produce kidney and liver damage, delirium, hallucinations and mental deterioration.
Animal experiments found that acetaldehyde increased the incidence of cancers in the nose and larynx of mouse and hamsters.

TOXICITY AND IRRITATION

- ■ unless otherwise specified data extracted from RTECS - Register of Toxic Effects of Chemical Substances.

TOXICITY	IRRITATION
Oral (rat) LD50: 661 mg/kg	Eye (human): 50 ppm/15min
Inhalation (human) TCLo: 134 ppm/30m	Eye (rabbit): 40 mg SEVERE
Inhalation (rat) LC50: 37000 mg/m^3/30m	Skin (rabbit): 500 mg Open Mild
Dermal (rabbit) LD50: 3540 mg/kg	

- ■ 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.

The material may cause skin irritation after prolonged or repeated exposure and may produce on contact skin redness, swelling, the production of vesicles, scaling and thickening of the skin.
WARNING: This substance has been classified by the IARC as Group 2B: Possibly Carcinogenic to Humans.
Tenth Annual Report on Carcinogens: Substance anticipated to be Carcinogen
[National Toxicology Program: U.S. Dep. of Health & Human Services 2002].

CARCINOGEN

Acetaldehyde	International Agency for Research on Cancer (IARC) - Agents Reviewed by the IARC Monographs	Group	2B

Section 12 - ECOLOGICAL INFORMATION

acetaldehyde 96 hr LC50 (37.2) mg/L Fathead minnow Fish Source: Experimental
acetic acid glacial 96 hr LC50 (88) mg/L Fathead minnow Fish Source: Experimental

Refer to data for ingredients, which follows:

ACETIC ACID GLACIAL:
ACETALDEHYDE:
- ■ DO NOT discharge into sewer or waterways.

ACETALDEHYDE:
- ■ Hazardous Air Pollutant: Yes

continued...

■ Fish LC50 (96hr.) (mg/l):	30.8
■ log Kow (Prager 1995):	0.43, - 0.34
■ log Kow (Sangster 1997):	0.45

■ Acetaldehyde occurs in nature as an intermediate product in the respiration of higher plants and can be found in ripening fruit such as apples. It is also an intermediate product of fermentation of alcohol and in metabolism of sugars in the body. It may form in wine and other alcoholic beverages after exposure to air. Natural sources include forest fires, volcanoes, animal wastes, and insects. Acetaldehyde is a volatile component of cotton leaves and blossoms. Acetaldehyde occurs in oak and tobacco leaves and is a natural component of apples, broccoli, coffee, grapefruit, grapes, lemons, mushrooms, onions, oranges, peaches, pears, pineapples, raspberries, and strawberries. It has been detected in the essential oils of alfalfa, rosemary, balm, clary sage, daffodil, bitter orange, camphor, angelica, fennel, mustard, and peppermint.
The Henry's Law constant for acetaldehyde, 7.89x10-5 atm.m3/mol at 25 C, and its high vapor pressure, 740 mm Hg @ 20 C., indicate that volatilisation of the chemical from surface soil or water to the atmosphere will be considerable.
Transformation/Persistence

- Air - In air (at 25 C.), acetaldehyde reacts with OH radicals, NO3, singlet oxygen, and NO2 at the following rates: 0.15x10-10, 0.12x10-14, 0.31x10-12, and 0.20x10-24 cm3/molecule-sec, respectively. The estimated half-life for the reaction of acetaldehyde with OH produced by UV light is 6.2 hours; the products of this reaction include peroxyacetylnitrate (PAN), methyl nitrate, methyl nitrite, and nitric acid . Acetaldehyde absorbs UV light at wavelengths of 290 to 342 nm, indicating some potential for photolysis. The photolytic half-lives for acetaldehyde are about 34 hours in the summer and 296 hours in winter at 55 deg. N latitude. The estimated half-life for the reaction of acetaldehyde with ozone at 25 C, based on the rate constant of 6x10-21 cm3/molecule-sec, is 1910 days (5.2 years)
- Soil - Acetaldehyde will volatilize rapidly in near surface and surface soils [v.p. 740 mm Hg at 20 C. or leach into the ground, or undergo microbial degradation. Acetaldehyde is not expected to adsorb to soils, other than those containing montmorillonite clay.
- Water - If released to water, acetaldehyde will rapidly biodegrade or volatilise (for a typical river, the half-life is 9.3 hours). Laboratory tests demonstrate that acetaldehyde is easily biodegraded (1) by acclimated sludge and sewage with theoretical biological oxygen demand (BOD) values for several studies ranging from 28% in 24 hours to 100% in 5 hours; (2) by anaerobic treatment; and (3) in seawater (25% degradation in 1 hour, compared with no decline in concentration in sterile controls).
- Biota - The estimated, low KOW and bioconcentration values for acetaldehyde indicate that there is little potential for the bioaccumulation or bioconcentration of acetaldehyde in biota.

As a VOC, acetaldehyde can contribute to the formation of photochemical smog in the presence of other VOCs. Potential environmental degradation products of acetaldehyde such as PAN, methyl nitrate, and methyl nitrite are components of photochemical smog.
log Kow: -0.4
BOD 5 if unstated: 1.27-1.3
ThOD: 1.82
Toxicity Fish: TLm(96)70mg/L
Toxicity invertebrate: cell mult. inhib. 57mg/L
Anaerobic effects: sig degrad
Degradation Biological: sig
processes Abiotic: photol

ACETIC ACID GLACIAL:

■ Fish LC50 (96hr.) (mg/l):	88, 92
■ Daphnia magna EC50 (48hr.) (mg/l):	32
■ Algae IC50 (72hr.) (mg/l):	90
■ log Kow (Prager 1995):	- 0.31
■ log Kow (Sangster 1997):	- 0.17
■ log Pow (Verschueren 1983):	1.8E+0

■ Ecotoxicity:
The tolerance of water organisms towards pH margin and variation is diverse. Recommended pH values for test species listed in OECD guidelines are between 6.0 and almost 9. Acute testing with fish showed 96h-LC50 at about pH 3.5.

continued...

■ Acetic acid and its salts (the acetates) can be grouped together because of their close structural relationships, their natural occurrence in plants and animals, and their fundamental role in cell metabolism, particularly in the tricarboxylic acid cycle (also known as the citric acid or Kreb’s cycle), which is where humans get their energy.

- Acetic acid is degraded photochemically in the atmosphere to produce hydroxyl radicals (estimated typical half-life of 22 days). Physical removal of acetates on atmospheric particulates may occur via wet or dry deposition.
- Natural water will neutralise dilute solutions of acetic acid.
- Spills of acetic acid on soil will readily biodegrade - the biodegradation rate for acetic acid after 14 days under aerobic conditions is 74 days.
- In invertebrates the toxicity of acetic acid (EC50 = 50-450 mg/L, depending on test species) -under static conditions, the 48 hour EC50 value for acetic acid is 65 mg/L for aquatic invertebrates (the test media was not neutralised). When the test solutions are neutralised, to form acetates, the static 48 hour EC50 for acetic acid is 6000 mg/L. In renewal systems with aquatic invertebrates, 48 hour EC50s for acetic acid are 100 mg/L and 180 mg/L.
- Fish LC50 (96 h): 75-88 mg/L.
- Acetic acid is not expected to bioconcentrate in the aquatic system.
- Low concentrations of acetic acid are harmful to fish.
- Drinking water standards: none available.
- Soil Guidelines: none available.
- Air Quality Standards: none available.

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

Ecotoxicity

Ingredient	Persistence: Water/Soil	Persistence: Air	Bioaccumulation	Mobility
acetaldehyde	LOW		LOW	HIGH
acetic acid glacial	LOW		LOW	HIGH

GESAMP/EHS COMPOSITE LIST - GESAMP Hazard Profiles

Name / Cas No / RTECS No	EHS	TRN	A1a	A1b	A1	A2	B1	B2	C1	C2	C3	D1	D2	D3	E1	E2	E3
- CAS:75-07- 0 /	2266	2825	5	2	(2)	NR	1	NI	0	0	(1)	1	1			FE	2

Legend:
EHS=EHS Number (EHS=GESAMP Working Group on the Evaluation of the Hazards of Harmful Substances Carried by Ships) NRT=Net Register Tonnage, A1a=Bioaccumulation log Pow, A1b=Bioaccumulation BCF, A1=Bioaccumulation, A2=Biodegradation, B1=Acuteaquatic toxicity LC/ECIC50 (mg/l), B2=Chronic aquatic toxicity NOEC (mg/l), C1=Acute mammalian oral toxicity LD50 (mg/kg), C2=Acutemammalian dermal toxicity LD50 (mg/kg), C3=Acute mammalian inhalation toxicity LC50 (mg/kg), D1=Skin irritation & corrosion, D2=Eye irritation& corrosion, D3=Long-term health effects, E1=Tainting, E2=Physical effects on wildlife & benthic habitats, E3=Interference with coastal amenities,
For column A2: R=Readily biodegradable, NR=Not readily biodegradable.
For column D3: C=Carcinogen, M=Mutagenic, R=Reprotoxic, S=Sensitising, A=Aspiration hazard, T=Target organ systemic toxicity, L=Lunginjury, N=Neurotoxic, I=Immunotoxic.
For column E1: NT=Not tainting (tested), T=Tainting test positive.
For column E2: Fp=Persistent floater, F=Floater, S=Sinking substances.
The numerical scales start from 0 (no hazard), while higher numbers reflect increasing hazard.
(GESAMP/EHS Composite List of Hazard Profiles - Hazard evaluation of substances transported by ships)

continued...

Section 13 - DISPOSAL CONSIDERATIONS

- 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.
- Recycle wherever possible.
- Consult manufacturer for recycling options or consult local or regional waste management authority for disposal if no suitable treatment or disposal facility can be identified.
- Dispose of by: burial in a land-fill specifically licenced to accept chemical and / or pharmaceutical wastes or Incineration in a licenced apparatus (after admixture with suitable combustible material).
- Decontaminate empty containers. Observe all label safeguards until containers are cleaned and destroyed.

Section 14 - TRANSPORTATION INFORMATION

Labels Required: FLAMMABLE LIQUID

HAZCHEM:

☐ *2YE Use alcohol resistant foam

Land Transport UNDG:

Class or division:	3	Subsidiary risk:	None
UN No.:	1089	UN packing group:	I

Shipping Name:ACETALDEHYDE

Air Transport IATA:

ICAO/IATA Class:	3	ICAO/IATA Subrisk:	None
UN/ID Number:	1089	Packing Group:	I

continued...

Special provisions:	A1		
Cargo Only			
Packing Instructions:	304	Maximum Qty/Pack:	30 L
Passenger and Cargo		Passenger and Cargo	
Packing Instructions:	Forbidden	Maximum Qty/Pack:	Forbidden
Passenger and Cargo		Passenger and Cargo	
Limited Quantity		Limited Quantity	
Packing Instructions:	-	Maximum Qty/Pack:	-

Shipping Name: ACETALDEHYDE

Maritime Transport IMDG:

IMDG Class:	3	IMDG Subrisk:	None
UN Number:	1089	Packing Group:	I
EMS Number:	F- E, S- D	Special provisions:	None
Limited Quantities:	None		

Shipping Name: ACETALDEHYDE

GESAMP hazard profiles for this material can be found in section 12 of the MSDS.

Section 15 - REGULATORY INFORMATION

REGULATIONS

acetaldehyde (CAS: 75-07-0) is found on the following regulatory lists;
"Australia Exposure Standards","Australia Hazardous Substances","Australia Illicit Drug Precursors/Reagents - Category II","Australia Inventory of Chemical Substances (AICS)","Australia National Pollutant Inventory","IMO MARPOL 73/78 (Annex II) - List of Noxious Liquid Substances Carried in Bulk","International Agency for Research on Cancer (IARC) - Agents Reviewed by the IARC Monographs","International Council of Chemical Associations (ICCA) - High Production Volume List","OECD Representative List of High Production Volume (HPV) Chemicals"
Regulations for ingredients

acetic acid glacial (CAS: 64-19-7) is found on the following regulatory lists;
"Australia Exposure Standards","Australia Hazardous Substances","Australia High Volume Industrial Chemical List (HVICL)","Australia Illicit Drug Reagents/Essential Chemicals - Category III","Australia Inventory of Chemical Substances (AICS)","Australia National Pollutant Inventory","Australia Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP) - Appendix E (Part 2)","Australia Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP) - Appendix F (Part 3)","Australia Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP) - Schedule 2","Australia Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP) - Schedule 5","Australia Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP) - Schedule 6","CODEX General Standard for Food Additives (GSFA) - Additives Permitted for Use in Food in General, Unless Otherwise Specified, in Accordance with GMP","GESAMP/EHS Composite List - GESAMP Hazard Profiles","IMO IBC Code Chapter 17: Summary of minimum requirements","IMO MARPOL 73/78 (Annex II) - List of Noxious Liquid Substances Carried in Bulk","International Council of Chemical Associations (ICCA) - High Production Volume List","OECD Representative List of High Production Volume (HPV) Chemicals"

Section 16 - OTHER INFORMATION

REPRODUCTIVE HEALTH GUIDELINES

Ingredient	ORG	UF	Endpoint	CR	Adeq TLV
acetaldehyde	14.4 mg/m3	100	D	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).

continued...

MSDS SECTION CHANGES

The following table displays the version number of and date on which each section was last changed.

Section Name	Version	Date	Section Name	Version	Date	Section Name	Version	Date
Ingredients	4	5- Jan- 2006	Handling Procedure	4	5- Jan- 2006	Physical Properties	4	5- Jan- 2006
Advice to Doctor	4	5- Jan- 2006	Storage (storage incompatibility)	4	5- Jan- 2006	Instability Condition	4	5- Jan- 2006
First Aid (eye)	4	5- Jan- 2006	Storage (storage requirement)	4	5- Jan- 2006	Acute Health (eye)	4	5- Jan- 2006
First Aid (inhaled)	4	5- Jan- 2006	Storage (suitable container)	4	5- Jan- 2006	Acute Health (inhaled)	4	5- Jan- 2006
First Aid (skin)	4	5- Jan- 2006	Engineering Control	4	5- Jan- 2006	Acute Health (skin)	4	5- Jan- 2006
First Aid (swallowed)	4	5- Jan- 2006	Exposure Standard	4	5- Jan- 2006	Acute Health (swallowed)	4	5- Jan- 2006
Fire Fighter (extinguishing media)	4	5- Jan- 2006	Personal Protection (eye)	4	5- Jan- 2006	Chronic Health	4	5- Jan- 2006
Fire Fighter (fire fighting)	4	5- Jan- 2006	Personal Protection (hands/feet)	4	5- Jan- 2006	Environmental	4	5- Jan- 2006
Fire Fighter (fire/explosion hazard)	4	5- Jan- 2006	Personal Protection (other)	4	5- Jan- 2006	Disposal	4	5- Jan- 2006
Spills (major)	4	5- Jan- 2006						

■ Classification of the preparation and its individual components has drawn on official and authoritative sources as well as independent review by the Classification committee using available literature 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.

The above information is believed to be accurate and represent the best information currently available to us,but doesnot represent any warranty expressed or implied of the properties of the product. User should make their own investigation to determine the suitability of the information for their particular purpose.

Issue Date: 28-Apr-2018