

# BRASS

Chemwatch Independent Material Safety Data Sheet

Issue Date: 15-Oct-2010

NC317TCP

CHEMWATCH 21662

Version No:2.0

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## Section 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

### PRODUCT NAME

BRASS

### PRODUCT USE

Domestic plumbing, taps & cocks, condenser tubes, piping, hose nozzles, couplings, gauges, bearings, marine equipment, jewellery, fine arts.

### SUPPLIER

Company: Metal Manufactures Technical Services

Contact

Address:

PO Box 21

Port Kembla

NSW, 2505

Australia

Telephone: +61 2 4223 5171

Telephone: +61 2 4223 5258

Fax: +61 2 4223 5251

Email: [hzotter@kembla.com.au](mailto:hzotter@kembla.com.au)

Website: <http://www.kembla.com.au/>

## Section 2 - HAZARDS IDENTIFICATION

### STATEMENT OF HAZARDOUS NATURE

HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS. According to NOHSC Criteria, and ADG Code.

### CHEMWATCH HAZARD RATINGS

Flammability  
Toxicity  
Body Contact  
Reactivity  
Chronic



SCALE:

Min/Nil=0

Low=1

Moderate=2

High=3

Extreme=4



### RISK

- Toxic by inhalation and if swallowed.
- Danger of cumulative effects.
- Limited evidence of a carcinogenic effect.
- Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

### SAFETY

- Keep locked up.
- Avoid contact with skin.
- Avoid contact with eyes.
- Wear suitable protective clothing.

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### Section 2 - HAZARDS IDENTIFICATION

- May cause harm to the unborn child.
  - Possible risk of impaired fertility.
  - May produce discomfort of the respiratory system and skin\*.
  - Eye contact may produce serious damage\*.
  - Possible skin sensitiser\*.
- \* (limited evidence).
- In case of insufficient ventilation, wear suitable respiratory equipment.
  - Wear suitable gloves.
  - Wear eye/ face protection.
  - Use only in well ventilated areas.
  - Keep container in a well ventilated place.
  - Avoid exposure - obtain special instructions before use.
  - Do not empty into drains.
  - To clean the floor and all objects contaminated by this material, use water and detergent.
  - This material and its container must be disposed of in a safe way.
  - Keep away from food, drink and animal feeding stuffs.
  - Take off immediately all contaminated clothing.
  - In case of contact with eyes, rinse with plenty of water and contact Doctor or Poisons Information Centre.
  - Use appropriate container to avoid environment contamination.
  - Avoid release to the environment. Refer to special instructions/ safety data sheets.
  - In case of accident by inhalation: remove casualty to fresh air and keep at rest.

### Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

NAME	CAS RN	%
copper	7440-50-8	> 60
zinc	7440-66-6	35 ap.
tin	7440-31-5	1-6
lead	7439-92-1	1-8 ^
aluminium	7429-90-5	0-4 ^
iron, powder	7439-89-6	0-4 ^
manganese	7439-96-5	0-4 ^
silicon	7440-21-3	0-4 ^
arsenic	7440-38-2	0-1 ^

Above composition is generic for all brass

### Section 4 - FIRST AID MEASURES

#### SWALLOWED

- Rinse mouth out with plenty of water.
- For advice, contact a Poisons Information Centre or a doctor at once.
- Urgent hospital treatment is likely to be needed.
- 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.

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Section 4 - FIRST AID MEASURES

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- Transport to hospital or doctor without delay.

### 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 or hair contact occurs:
  - 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 device, or pocket mask as trained. Perform CPR if necessary.
- Transport to hospital, or doctor.

### NOTES TO PHYSICIAN

- Copper, magnesium, aluminium, antimony, iron, manganese, nickel, zinc (and their compounds) in welding, brazing, galvanising or smelting operations all give rise to thermally produced particulates of smaller dimension than may be produced if the metals are divided mechanically. Where insufficient ventilation or respiratory protection is available these particulates may produce "metal fume fever" in workers from an acute or long term exposure.
  - Onset occurs in 4-6 hours generally on the evening following exposure. Tolerance develops in workers but may be lost over the weekend. (Monday Morning Fever)
  - Pulmonary function tests may indicate reduced lung volumes, small airway obstruction and decreased carbon monoxide diffusing capacity but these abnormalities resolve after several months.
  - Although mildly elevated urinary levels of heavy metal may occur they do not correlate with clinical effects.
  - The general approach to treatment is recognition of the disease, supportive care and prevention of exposure.
  - Seriously symptomatic patients should receive chest x-rays, have arterial blood gases determined and be observed for the development of tracheobronchitis and pulmonary edema.
- [Ellenhorn and Barceloux: Medical Toxicology].

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## Section 5 - FIRE FIGHTING MEASURES

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### EXTINGUISHING MEDIA

- Non combustible.
- There is no restriction on the type of extinguisher which may be used.

### FIRE FIGHTING

- Alert Fire Brigade and tell them location and nature of hazard.
- Wear breathing apparatus plus protective gloves for fire only.
- Prevent, by any means available, spillage from entering drains or water courses.
- 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.

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Section 5 - FIRE FIGHTING MEASURES

## FIRE/EXPLOSION HAZARD

- Non combustible.

## HAZCHEM

None

## Personal Protective Equipment

Breathing apparatus.

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## Section 6 - ACCIDENTAL RELEASE MEASURES

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### MINOR SPILLS

- Clean up all spills immediately.
- Secure load if safe to do so.
- Bundle/collect recoverable product.
- Collect remaining material in containers with covers for disposal.

### MAJOR SPILLS

- Clean up all spills immediately.
- Secure load if safe to do so.
- Bundle/collect recoverable product.
- Collect remaining material in containers with covers for disposal.

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

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## Section 7 - HANDLING AND STORAGE

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### PROCEDURE FOR HANDLING

- Limit all unnecessary personal contact.
- Wear protective clothing when risk of exposure occurs.
- Use in a well-ventilated area.
- When handling DO NOT eat, drink or smoke.
- Always wash hands with soap and water after handling.
- Avoid physical damage to containers.
- Use good occupational work practice.
- Observe manufacturer's storing and handling recommendations.

### SUITABLE CONTAINER

- Packaging as recommended by manufacturer.
- Store flat in load designed racking.

### STORAGE INCOMPATIBILITY

- Segregate from strong acids, ammonia.

### STORAGE REQUIREMENTS

- Keep dry.
- Store under cover.
- Protect containers against physical damage.
- Observe manufacturer's storing and handling recommendations.

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### SAFE STORAGE WITH OTHER CLASSIFIED CHEMICALS



X



X



+



X



X



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Section 7 - HANDLING AND STORAGE

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

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## Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

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### EXPOSURE CONTROLS

Source	Material	TWA mg/m <sup>3</sup>	Notes
Australia Exposure Standards	copper (Copper, dusts & mists (as Cu))	1	
Australia Exposure Standards	copper (Copper (fume))	0.2	
Australia Exposure Standards	copper (Inspirable dust (not otherwise classified))	10	
Australia Exposure Standards	tin (Tin, metal)	2	
Australia Exposure Standards	aluminium (Emery (dust) (a))	10	(see Chapter 14)
Australia Exposure Standards	aluminium (Aluminium (welding fumes) (as Al))	5	

### EMERGENCY EXPOSURE LIMITS

Material	Revised	IDLH
copper 10072	100	
copper 10072	100	
tin 21900	25	
tin 21900	100	

### MATERIAL DATA

TIN:

ZINC:

■ It is the goal of the ACGIH (and other Agencies) to recommend TLVs (or their equivalent) for all substances for which there is evidence of health effects at airborne concentrations encountered in the workplace.

At this time no TLV has been established, even though this material may produce adverse health effects (as evidenced in animal experiments or clinical experience). Airborne concentrations must be maintained as low as is practically possible and occupational exposure must be kept to a minimum.

NOTE: The ACGIH occupational exposure standard for Particles Not Otherwise Specified (P.N.O.S) does NOT apply.

BRASS:

- None assigned. Refer to individual constituents.

ZINC:

■ Sensory irritants are chemicals that produce temporary and undesirable side-effects on the eyes, nose or throat. Historically occupational exposure standards for these irritants have been based on observation of workers' responses to various airborne concentrations. Present day expectations require that nearly every individual should be protected against even minor sensory irritation and exposure standards are established using uncertainty factors or safety factors of 5 to 10 or more. On occasion animal no-observable-effect-levels (NOEL) are used to determine these limits where human results are unavailable. An additional approach, typically used by the TLV committee (USA) in determining respiratory standards for this group of chemicals, has been to assign ceiling values (TLV C) to rapidly acting irritants and to assign short-term exposure limits (TLV STELs) when the weight of evidence from irritation, bioaccumulation and other endpoints combine to warrant such a limit. In contrast the MAK Commission (Germany) uses a five-category system based on intensive odour, local irritation, and elimination half-life. However this system is being replaced to be

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## Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

consistent with the European Union (EU) Scientific Committee for Occupational Exposure Limits (SCOEL); this is more closely allied to that of the USA.

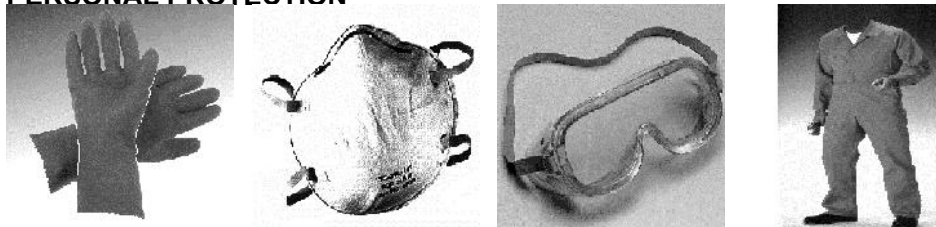
OSHA (USA) concluded that exposure to sensory irritants can:

- cause inflammation
- cause increased susceptibility to other irritants and infectious agents
- lead to permanent injury or dysfunction
- permit greater absorption of hazardous substances and
- acclimate the worker to the irritant warning properties of these substances thus increasing the risk of overexposure.

TIN:

■ A TLV-TWA is recommended so as to minimise the risk of stannosis. The STEL (4.0 mg/m<sup>3</sup>) has been eliminated (since 1986) so that additional toxicological data and industrial hygiene experience may become available to provide a better base for quantifying on a toxicological basis what the STEL should in fact be.

### PERSONAL PROTECTION



### EYE

- Safety glasses with side shields; or as required,
- 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

- Cotton gloves or • Heavy gloves, eg. leather or Welding Gloves
- Safety footwear.
- When handling hot or molten liquids, wear trousers or overalls outside of boots, to avoid spills entering boots.

### OTHER

- Overalls.
- Eyewash unit.

The local concentration of material, quantity and conditions of use determine the type of personal protective equipment required. For further information consult site specific CHEMWATCH data (if available), or your Occupational Health and Safety Advisor.

### ENGINEERING CONTROLS

- Use in a well-ventilated area.
  - Hazard relates to dust released by cutting, grinding, trimming or other shaping operations.
- 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.

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### Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

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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.

For brazing or soldering the nature of ventilation is determined by the location of the work.

- For outdoor work, natural ventilation is generally sufficient.
- For indoor work, conducted in either open or limited spaces, use mechanical (general exhaust or plenum) ventilation. (Open work spaces exceed 300 cubic meters per welder)

For work conducted in confined spaces, mechanical ventilation, using local exhaust systems, is required. (In confined spaces always check that oxygen has not been depleted by excessive rusting of steel or snowflake corrosion of aluminium) Mechanical or local exhaust ventilation may not be required where the process working time does not exceed 24 mins. (in an 8 hr. shift) provided the work is intermittent (a maximum of 5 mins. every hour). Local exhaust systems must be designed to provide a minimum capture velocity at the fume source, away from the worker, of 0.5 metre/sec. Air contaminants generated in the workplace possess varying "escape" velocities which, in turn, determine the "capture velocities" of fresh circulating air required to effectively remove the contaminant.

Type of Contaminant:

welding, brazing fumes (released at relatively low velocity into moderately still air)

Air Speed:

0.5- 1, 0 m/s (100- 200 f/min.)

Within each range the appropriate value depends on:

Lower end of the range

- 1: Room air currents minimal or favourable to capture
- 2: Contaminants of low toxicity or of nuisance value only.
- 3: Intermittent, low production.
- 4: Large hood or large air mass in motion

Upper end of the range

- 1: Disturbing room air currents
- 2: Contaminants of high toxicity
- 3: High production, heavy use
- 4: Small hood- local control only

Simple theory shows that air velocity falls rapidly with distance away from the opening of a simple extraction pipe. Velocity generally decreases with the square of distance from the extraction point (in simple cases). Therefore the air speed at the extraction point should be adjusted, accordingly, after reference to distance from the contaminating source. The air velocity at the extraction fan, for example, should be a minimum of 1-2 m/s (200-400 f/min.) for extraction of welding or brazing fumes generated 2 meters distant from the extraction point. Other mechanical considerations, producing performance deficits within the extraction apparatus, make it essential that theoretical air velocities are multiplied by factors of 10 or more when extraction systems are installed or used.

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### Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

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#### APPEARANCE

Coppery red / yellow to brown metal; primarily a copper - zinc alloy.

Red brass (15% zinc), yellow brass (35% zinc; some harder alloys with minor amounts of tin. Brass with 0.5-3% lead used in antifriction bearings.

Insoluble in water. As billets, rod, tube, shapes, turnings, powder.

Rolled sheet and drawn tube may have surface film of forming lubricant.

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## Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

Special brasses are leaded brass, arsenical brass, aluminium brass.

### PHYSICAL PROPERTIES

Does not mix with water.

Sinks in water.

State	Manufactured	Molecular Weight	Not applicable.
Melting Range (°C)	700- 1240	Boiling Range (°C)	Not available.
Solubility in water (g/L)	Immiscible	Flash Point (°C)	Non Flammable
pH (1% solution)	Not applicable.	Decomposition Temp (°C)	Not available.
pH (as supplied)	Not applicable	Autoignition Temp (°C)	Not available
Vapour Pressure (kPa)	Not applicable.	Upper Explosive Limit (%)	Not applicable
Specific Gravity (water=1)	7.4- 8.5	Lower Explosive Limit (%)	Not applicable
Relative Vapour Density (air=1)	Not applicable.	Volatile Component (%vol)	Negligible
Evaporation Rate	Non Volatile		

## Section 10 - STABILITY AND REACTIVITY

### CONDITIONS CONTRIBUTING TO INSTABILITY

- Presence of incompatible materials.
- Product is considered stable.
- Hazardous polymerisation will not occur.

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

## Section 11 - TOXICOLOGICAL INFORMATION

### POTENTIAL HEALTH EFFECTS

#### ACUTE HEALTH EFFECTS

##### SWALLOWED

- Considered an unlikely route of entry in commercial/industrial environments.

Not normally a hazard due to the physical form of product. The material is a physical irritant to the gastrointestinal tract and may be harmful if swallowed.

##### EYE

- Particulate/dust is discomforting and abrasive to the eyes.
- Fumes from welding/brazing operations may be irritating to the eyes.

##### SKIN

- The material may be abrasive and may cause laceration by sharp edges.
- 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.
- Irritation and skin reactions are possible with sensitive skin.

##### INHALED

- Not normally a hazard due to non-volatile nature of product.
- Inhalation hazard is increased at higher temperatures.
- Inhalation of fumes (as from welding) may cause coughing, nasal irritation, mucous membrane irritation and is harmful if exposure is prolonged.
- Inhalation of fume may aggravate a pre-existing respiratory condition such as asthma, bronchitis, emphysema.

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## Section 11 - TOXICOLOGICAL INFORMATION

### CHRONIC HEALTH EFFECTS

■ Principal routes of exposure are usually by inhalation of generated dust and inhalation of fumes from the heated material, skin contact with the molten material.

### TOXICITY AND IRRITATION

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

#### BRASS:

Data for brass powder only

Oral (rat) LD50: 1561 mg/kg

Eye (rabbit): 100 mg - irritant

Skin (rabbit): 500 mg mild

#### COPPER:

##### TOXICITY

Oral (human) TDLo: 0.12 mg/kg

Oral (rat) LD50: 5800 mg/kg

WARNING: Inhalation of high concentrations of copper fume may cause "metal

fume fever", an acute industrial disease of short duration. Symptoms are tiredness, influenza like respiratory tract irritation with fever.

##### IRRITATION

Nil Reported

#### ZINC:

■ 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.

#### TIN:

■ No significant acute toxicological data identified in literature search.

### SKIN

tin	Australia Exposure Standards - Skin	Notes	Sk
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## Section 12 - ECOLOGICAL INFORMATION

#### ZINC:

#### TIN:

#### COPPER:

■ DO NOT discharge into sewer or waterways.

#### ZINC:

#### COPPER:

■ 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.

#### COPPER:

■ Harmful to aquatic organisms.

Copper is unlikely to accumulate in the atmosphere due to a short residence time for airborne copper aerosols. Airborne coppers, however, may be transported over large distances. Copper accumulates significantly in the food chain.

Drinking Water Standards:

3000 ug/l (UK max)

2000 ug/l (WHO provisional Guideline)

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### Section 12 - ECOLOGICAL INFORMATION

1000 ug/l (WHO level where individuals complain)

Soil Guidelines: Dutch Criteria

36 mg/kg (target)

190 mg/kg (intervention)

Air Quality Standards: no data available.

The toxic effect of copper in the aquatic biota depends on the bio-availability of copper in water which, in turn, depends on its physico-chemical form (ie.speciation). Bioavailability is decreased by complexation and adsorption of copper by natural organic matter, iron and manganese hydrated oxides, and chelating agents excreted by algae and other aquatic organisms. Toxicity is also affected by pH and hardness. Total copper is rarely useful as a predictor of toxicity. In natural sea water, more than 98% of copper is organically bound and in river waters a high percentage is often organically bound, but the actual percentage depends on the river water and its pH.

Copper exhibits significant toxicity in some aquatic organisms. Some algal species are very sensitive to copper with EC50 (96 hour) values as low as 47 ug/litre dissolved copper whilst for other algal species EC50 values of up to 481 ug/litre have been reported. However many of the reportedly high EC50 values may arise in experiments conducted with a culture media containing copper-complexing agents such as silicate, iron, manganese and EDTA which reduce bioavailability.

Toxic effects arising following exposure by aquatic species to copper are typically:

Algae EC50 (96 h)	Daphnia magna LC50 (48- 96 h)	Amphipods LC50 (48- 96 h)	Gastropods LC50 (48- 96 h)	Crab larvae LC50 (48- 96 h)
47- 481 *	7- 54 *	37- 183 *	58- 112 *	50- 100 *

\* ug/litre

Exposure to concentrations ranging from one to a few hundred micrograms per litre has led to sublethal effects and effects on long-term survival. For high bioavailability waters, effect concentrations for several sensitive species may be below 10 ug Cu/litre.

In fish, the acute lethal concentration of copper ranges from a few ug/litre to several mg/litre, depending both on test species and exposure conditions. Where the value is less than 50 ug Cu/litre, test waters generally have a low dissolved organic carbon (DOC) level, low hardness and neutral to slightly acidic pH. Exposure to concentrations ranging from one to a few hundred micrograms per litre has led to sublethal effects and effects on long-term survival. Lower effect concentrations are generally associated with test waters of high bioavailability.

In summary:

Responses expected for high concentration ranges of copper \*

Total dissolved Cu concentration range (ug/litre)

1- 10

Effects of high availability in water

Significant effects are expected for diatoms and sensitive invertebrates, notably cladocerans. Effects on fish could be significant in freshwaters with low pH and hardness.

10- 100

Significant effects are expected on various species of microalgae, some species of macroalgae, and a range of invertebrates, including crustaceans, gastropods and sea urchins. Survival of sensitive fish will be affected and a variety of fish show sublethal effects.

100- 1000

Most taxonomic groups of macroalgae and invertebrates will be severely affected. Lethal levels for most fish species will be reached.

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Section 12 - ECOLOGICAL INFORMATION

>1000

Lethal concentrations for most tolerant organisms are reached.

\* Sites chosen have moderate to high bioavailability similar to water used in most toxicity tests. In soil, copper levels are raised by application of fertiliser, fungicides, from deposition of highway dusts and from urban, mining and industrial sources. Generally, vegetation rooted in soils reflects the soil copper levels in its foliage. This is dependent upon the bioavailability of copper and the physiological requirements of species concerned.

Typical foliar levels of copper are:

Uncontaminated soils (0.3- 250 mg/kg)	Contaminated soils (150- 450 mg/kg)	Mining/smelting soils
6.1- 25 mg/kg	80 mg/kg	300 mg/kg

Plants rarely show symptoms of toxicity or of adverse growth effects at normal soil concentrations of copper. Crops are often more sensitive to copper than the native flora, so protection levels for agricultural crops range from 25 mg Cu/kg to several hundred mg/kg, depending on country. Chronic and or acute effects on sensitive species occur at copper levels occurring in some soils as a result of human activities such as copper fertiliser addition, and addition of sludge.

When soil levels exceed 150 mg Cu/kg, native and agricultural species show chronic effects. Soils in the range 500-1000 mg Cu/kg act in a strongly selective fashion allowing the survival of only copper-tolerant species and strains. At 2000 Cu mg/kg most species cannot survive. By 3500 mg Cu/kg areas are largely devoid of vegetation cover. The organic content of the soil appears to be a key factor affecting the bioavailability of copper.

On normal forest soils, non-rooted plants such as mosses and lichens show higher copper concentrations. The fruiting bodies and mycorrhizal sheaths of soil fungi associated with higher plants in forests often accumulate copper to much higher levels than plants at the same site. International Programme on Chemical Safety (IPCS): Environmental Health Criteria 200.

### ZINC:

■ 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 zinc and its compounds:

Environmental fate:

Zinc is capable of forming complexes with a variety of organic and inorganic groups (ligands). Biological activity can affect the mobility of zinc in the aquatic environment, although the biota contains relatively little zinc compared to the sediments. Zinc bioconcentrates moderately in aquatic organisms; bioconcentration is higher in crustaceans and bivalve species than in fish. Zinc does not concentrate appreciably in plants, and it does not biomagnify significantly through terrestrial food chains.

However biomagnification may be of concern if concentration of zinc exceeds 1632 ppm in the top 12 inches of soil.

Zinc can persist in water indefinitely and can be toxic to aquatic life. The threshold concentration for fish is 0.1 ppm. Zinc may be concentrated in the aquatic food chain; it is concentrated over 200,000 times in oysters. Copper is synergistic but calcium is antagonistic to zinc toxicity in fish. Zinc can accumulate in freshwater animals at 5 -1,130 times the concentration present in the water. Furthermore, although zinc actively bioaccumulates in aquatic systems, biota appears to represent a relatively minor sink compared to sediments. Steady-state zinc bioconcentration factors (BCFs) for 12 aquatic species range from 4 to 24,000. Crustaceans and fish can accumulate zinc from both water and food. A BCF of 1,000 was reported for both aquatic plants and fish, and a value of 10,000 was reported for aquatic invertebrates. The order of enrichment of zinc in different aquatic organisms was as follows (zinc concentrations in µg/g dry weight appear in parentheses): fish (25), shrimp (50), mussel (60), periphyton (260), zooplankton (330), and oyster (3,300). The high enrichment in oysters may be due to their ingestion of particulate matter containing higher concentrations of zinc than ambient water. Other investigators have also indicated that organisms associated with sediments have higher zinc concentrations than organisms living in the aqueous layer. With respect to

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Section 12 - ECOLOGICAL INFORMATION

bioconcentration from soil by terrestrial plants, invertebrates, and mammals, BCFs of 0.4, 8, and 0.6, respectively, have been reported. The concentration of zinc in plants depends on the plant species, soil pH, and the composition of the soil.

Plant species do not concentrate zinc above the levels present in soil.

In some fish, it has been observed that the level of zinc found in their bodies did not directly relate to the exposure concentrations. Bioaccumulation of zinc in fish is inversely related to the aqueous exposure.

This evidence suggests that fish placed in environments with lower zinc concentrations can sequester zinc in their bodies.

The concentration of zinc in drinking water may increase as a result of the distribution system and household plumbing. Common piping materials used in distribution systems often contain zinc, as well as other metals and alloys. Trace metals may enter the water through corrosion products or simply by the dissolution of small amounts of metals with which the water comes in contact. Reactions with materials of the distribution system, particularly in soft low-pH waters, very often have produced concentrations of zinc in tap water much greater than those in the raw or treated waters at the plant of origin. Zinc gives water a metallic taste at low levels. Overexposures to zinc also have been associated with toxic effects. Ingestion of zinc or zinc-containing compounds has resulted in a variety of systemic effects in the gastrointestinal and hematological systems and alterations in the blood lipid profile in humans and animals. In addition, lesions have been observed in the liver, pancreas, and kidneys of animals.

Environmental toxicity of zinc in water is dependent upon the concentration of other minerals and the pH of the solution, which affect the ligands that associate with zinc.

Zinc occurs in the environment mainly in the +2 oxidation state. Sorption is the dominant reaction, resulting in the enrichment of zinc in suspended and bed sediments. Zinc in aerobic waters is partitioned into sediments through sorption onto hydrous iron and manganese oxides, clay minerals, and organic material. The efficiency of these materials in removing zinc from solution varies according to their concentrations, pH, redox potential (Eh), salinity, nature and concentrations of complexing ligands, cation exchange capacity, and the concentration of zinc. Precipitation of soluble zinc compounds appears to be significant only under reducing conditions in highly polluted water. Generally, at lower pH values, zinc remains as the free ion.

The free ion ( $Zn^{+2}$ ) tends to be adsorbed and transported by suspended solids in unpolluted waters.

Zinc is an essential nutrient that is present in all organisms. Although biota appears to be a minor reservoir of zinc relative to soils and sediments, microbial decomposition of biota in water can produce ligands, such as humic acids, that can affect the mobility of zinc in the aquatic environment through zinc precipitation and adsorption.

The relative mobility of zinc in soil is determined by the same factors that affect its transport in aquatic systems (i.e., solubility of the compound, pH, and salinity)

The redox status of the soil may shift zinc partitioning. Reductive dissolution of iron and manganese (hydr)oxides under suboxic conditions release zinc into the aqueous phase; the persistence of suboxic conditions may then lead to a repartitioning of zinc into sulfide and carbonate solids. The mobility of zinc in soil depends on the solubility of the speciated forms of the element and on soil properties such as cation exchange capacity, pH, redox potential, and chemical species present in soil; under anaerobic conditions, zinc sulfide is the controlling species.

Since zinc sulfide is insoluble, the mobility of zinc in anaerobic soil is low. In a study of the effect of pH on zinc solubility: When the pH is  $<7$ , an inverse relationship exists between the pH and the amount of zinc in solution. As negative charges on soil surfaces increase with increasing pH, additional sites for zinc adsorption are activated and the amount of zinc in solution decreases. The active zinc species in the adsorbed state is the singly charged zinc hydroxide species (i.e.,  $Zn[OH]^+$ ). Other investigators have also shown that the mobility of zinc in soil increases at lower soil pH under oxidizing conditions and at a lower cation exchange capacity of soil. On the other hand, the amount of zinc in solution generally increases when the pH is  $>7$  in soils high in organic matter. This is a result of the release of organically complexed zinc, reduced zinc adsorption at higher pH, or an increase in the concentration of chelating agents in soil. For calcareous soils, the relationship between zinc solubility and pH is nonlinear. At a high pH, zinc in solution is precipitated as  $Zn(OH)_2$ , zinc carbonate ( $ZnCO_3$ ), or calcium zincate. Clay and metal oxides are capable of sorbing zinc and tend to retard its mobility in soil. Zinc was more mobile at pH 4 than at pH 6.5 as a consequence of sorption

Zinc concentrations in the air are relatively low, except near industrial sources such as smelters. No estimate for the atmospheric lifetime of zinc is available at this time, but the fact that zinc is transported long distances in air indicates that its lifetime in air is at least on the order of days. There are few data regarding the speciation of zinc released to the atmosphere. Zinc is removed from the air by dry and wet deposition, but zinc particles with small diameters and low densities suspended in the atmosphere travel long distances from emission sources.

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The product has no effect on the environment unless in finely divided form. In this form it can be harmful to aquatic life.

Acute toxicity data in the form of 96 hour LC50s for Australian freshwater animals are:

fish - 0.14 to 38 mg Zn/L; and crustaceans 0.43 to 32 mg Zn/L.

### TIN:

■ Metal-containing inorganic substances generally have negligible vapour pressure and are not expected to partition to air. Once released to surface waters and moist soils their fate depends on solubility and dissociation in water. Environmental processes (such as oxidation and the presence of acids or bases) may transform insoluble metals to more soluble ionic forms. Microbiological processes may also transform insoluble metals to more soluble forms. Such ionic species may bind to dissolved ligands or sorb to solid particles in aquatic or aqueous media. 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.

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.

Environmental processes may also be important in changing solubilities.

Even though many metals show few toxic effects at physiological pHs, transformation may introduce new or magnified effects.

A metal ion is considered infinitely persistent because it cannot degrade further.

The current state of science does not allow for an unambiguous interpretation of various measures of bioaccumulation.

The counter-ion may also create health and environmental concerns once isolated from the metal. Under normal physiological conditions the counter-ion may be essentially insoluble and may not be bioavailable.

Environmental processes may enhance bioavailability.

Tin may exist in either divalent ( $\text{Sn}^{2+}$ ) or tetravalent ( $\text{Sn}^{4+}$ ) cationic (positively charged) ions under environmental conditions. Tin(II) dominates in reduced (oxygen-poor) water, and will readily precipitate as a sulfide ( $\text{SnS}$ ) or as a hydroxide ( $\text{Sn}(\text{OH})_2$ ) in alkaline water. Tin(IV) readily hydrolyses, and can precipitate as a hydroxide. The solubility product of  $\text{Sn}(\text{OH})_4$  has been measured at approximately  $10 \times 10^{-56}$  g/L at 25 °C. In general, tin(IV) would be expected to be the only stable ionic species in the weathering cycle.

Tin in water may partition to soils and sediments. Cations such as  $\text{Sn}^{2+}$  and  $\text{Sn}^{4+}$  will generally be adsorbed by soils to some extent, which reduces their mobility. Tin is generally regarded as being relatively immobile in the environment. However, tin may be transported in water if it partitions to suspended sediments, but the significance of this mechanism has not been studied in detail. Transfer coefficients for tin in a soil-plant system were reported to be 0.01-0.1.

A bioconcentration factor (BCF) relates the concentration of a chemical in plants and animals to the concentration of the chemical in the medium in which they live. It was estimated that the BCFs of inorganic tin were 100, 1,000, and 3,000 for marine and freshwater plants, invertebrates, and fish, respectively.

Marine algae can bioconcentrate tin(IV) ion by a factor of 1,900.

Inorganic tin cannot be degraded in the environment, but may undergo oxidation-reduction, ligand exchange, and precipitation reactions. It has been established that inorganic tin can be transformed into organometallic forms by microbial methylation. Inorganic tin may also be converted to stannane ( $\text{H}_4\text{Sn}$ ) in extremely anaerobic (oxygen-poor) conditions by macroalgae.

### Ecotoxicity

Ingredient	Persistence: Water/Soil	Persistence: Air	Bioaccumulation	Mobility
brass	No Data Available	No Data Available		
copper	No Data Available	No Data Available	LOW	
zinc	No Data Available	No Data Available	LOW	
tin	No Data Available	No Data Available		

continued...

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### Section 13 - DISPOSAL CONSIDERATIONS

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- Recycle wherever possible or consult manufacturer for recycling options.
- Consult State Land Waste Management Authority for disposal.
- Bury residue in an authorised landfill.

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### Section 14 - TRANSPORTATION INFORMATION

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#### HAZCHEM:

None (ADG7)

NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS: ADG7, UN, IATA, IMDG

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### Section 15 - REGULATORY INFORMATION

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POISONS SCHEDULE None

#### REGULATIONS

##### Regulations for ingredients

##### **copper (CAS: 7440-50-8) is found on the following regulatory lists;**

"Australia - Australian Capital Territory - Environment Protection Regulation: Ambient environmental standards (AQUA/1 to 6 - inorganic chemicals)", "Australia - Australian Capital Territory - Environment Protection Regulation: Ambient environmental standards (Domestic water supply - inorganic chemicals)", "Australia - Australian Capital Territory - Environment Protection Regulation: Ambient environmental standards (IRRIG - inorganic chemicals)", "Australia - Australian Capital Territory - Environment Protection Regulation: Ambient environmental standards (STOCK - inorganic chemicals)", "Australia - Australian Capital Territory - Environment Protection Regulation: Pollutants entering waterways taken to cause environmental harm (Aquatic habitat)", "Australia - Australian Capital Territory - Environment Protection Regulation: Pollutants entering waterways taken to cause environmental harm (Domestic water supply quality)", "Australia - Australian Capital Territory - Environment Protection Regulation: Pollutants entering waterways taken to cause environmental harm (IRRIG)", "Australia - Australian Capital Territory Environment Protection Regulation Pollutants entering waterways - Agricultural uses (Stock)", "Australia ADI list - Acceptable daily intakes for agricultural and veterinary chemicals", "Australia Hazardous Substances", "Australia High Volume Industrial Chemical List (HVICL)", "Australia Inventory of Chemical Substances (AICS)", "International Maritime Dangerous Goods Requirements (IMDG Code) - Marine Pollutants", "International Maritime Dangerous Goods Requirements (IMDG Code) - Substance Index", "WHO Guidelines for Drinking-water Quality - Guideline values for chemicals that are of health significance in drinking-water"

##### **zinc (CAS: 7440-66-6) is found on the following regulatory lists;**

"Australia - Australian Capital Territory - Environment Protection Regulation: Ambient environmental standards (AQUA/1 to 6 - inorganic chemicals)", "Australia - Australian Capital Territory - Environment Protection Regulation: Ambient environmental standards (Domestic water supply - inorganic chemicals)", "Australia - Australian Capital Territory - Environment Protection Regulation: Ambient environmental standards (IRRIG - inorganic chemicals)", "Australia - Australian Capital Territory - Environment Protection Regulation: Ambient environmental standards (STOCK - inorganic chemicals)", "Australia - Australian Capital Territory - Environment Protection Regulation: Pollutants entering waterways taken to cause environmental harm (Aquatic habitat)", "Australia - Australian Capital Territory - Environment Protection Regulation: Pollutants entering waterways taken to cause environmental harm (Domestic water supply quality)", "Australia - Australian Capital Territory - Environment Protection Regulation: Pollutants entering waterways taken to cause environmental harm (IRRIG)", "Australia - Australian Capital Territory Environment Protection Regulation Pollutants entering waterways - Agricultural uses (Stock)", "Australia Hazardous Substances", "Australia High Volume Industrial Chemical List (HVICL)", "Australia Inventory of Chemical Substances (AICS)", "WHO Guidelines for Drinking-water Quality - Chemicals for which guideline values have not been established"

##### **tin (CAS: 7440-31-5) is found on the following regulatory lists;**

"Australia - Western Australia Hazardous Substances Prohibited for Specified Uses or Methods of Handling", "Australia Exposure Standards", "Australia Inventory of Chemical Substances (AICS)", "WHO Guidelines for Drinking-water Quality - Chemicals for which guideline values have not been established"

**No data for brass (CW: 21662)**

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## Section 16 - OTHER INFORMATION

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■ 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](http://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.

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*This is the end of the MSDS.*