

FIRE DEFENDER MULTI-PURPOSE FR

Chemwatch Independent Material Safety Data Sheet
Issue Date: 25-Sep-2009
NC317ECP

CHEMWATCH 4695-10
Version No:2.0
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Section 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME

FIRE DEFENDER MULTI-PURPOSE FR

SYNONYMS

"Product Code: MPFR"

PRODUCT USE

Fire retardant treatment designed to retard the spread of flame and fire in fabrics, textiles, paper, cardboard and wood. Normally applied by dipping or spraying. For use as a pre-treatment and in-situ. Coverage: depends on fabric/material weight and density. On a fabric 200gm/sq mtr - approx. 15 sq mtr's per litre.

SUPPLIER

Company: Fire Defender
Address:
PO Box 218
Clontarf
QLD 4019
AUS
Telephone: 1300 347 374
Emergency Tel: 13 11 26
Fax: (07) 3880 2084

Section 2 - HAZARDS IDENTIFICATION

STATEMENT OF HAZARDOUS NATURE

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

POISONS SCHEDULE

None

RISK

None under normal operating conditions.

SAFETY

Safety Codes

S23
S24
S39
S26

Safety Phrases

- Do not breathe gas/ fumes/ vapour/ spray.
- Avoid contact with skin.
- Wear eye/ face protection.
- In case of contact with eyes rinse with plenty of water and contact Doctor or Poisons Information Centre.

Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

NAME	CAS RN	%
ammonium sulfamate	7773-06-0	>50
ammonium phosphate, monobasic	7722-76-1	}
diammonium phosphate	7783-28-0	}
dicyandiamide	461-58-5	}

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Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

boric acid	10043-35-3	}
water	7732-18-5	>50

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.

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.
- 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.
- Other measures are usually unnecessary.

NOTES TO PHYSICIAN

- Treat symptomatically.

Section 5 - FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA

- - 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.

FIRE/EXPLOSION HAZARD

- - Non combustible.
- Not considered to be a significant fire risk.
- Expansion or decomposition on heating may lead to violent rupture of containers.
- Decomposes on heating and may produce toxic fumes of carbon monoxide (CO).

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Section 5 - FIRE FIGHTING MEASURES

- May emit acrid smoke.

Other decomposition products include: carbon dioxide (CO₂), phosphorus oxides (PO_x), nitrogen oxides (NO_x), ammonia.

FIRE INCOMPATIBILITY

■ None known.

HAZCHEM: None

PERSONAL PROTECTION

Glasses:

Chemical goggles.

Gloves:

PVC chemical resistant type.

Respirator:

Particulate

Section 6 - ACCIDENTAL RELEASE MEASURES

MINOR SPILLS

- Slippery when spilt.
- Clean up all spills immediately.
- Avoid breathing vapours and contact with skin and eyes.
- Control personal contact by using protective equipment.
- Contain and absorb spill with sand, earth, inert material or vermiculite.
- Wipe up.
- Place in a suitable, labelled container for waste disposal.

MAJOR SPILLS

- Slippery when spilt.
- Minor hazard.
- Clear area of personnel.
- Alert Fire Brigade and tell them location and nature of hazard.
- Control personal contact by using protective equipment as required.
- Prevent spillage from entering drains or water ways.
- Contain spill with sand, earth or vermiculite.
- Collect recoverable product into labelled containers for recycling.
- Absorb remaining product with sand, earth or vermiculite and place in appropriate containers for disposal.
- Wash area and prevent runoff into drains or waterways.
- If contamination of drains or waterways occurs, advise emergency services.

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

Section 7 - HANDLING AND STORAGE

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.

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Section 7 - HANDLING AND STORAGE

SUITABLE CONTAINER

- - Lined metal can, lined metal pail/ can.
- Plastic pail.
- Polyliner drum.
- Packing as recommended by manufacturer.
- Check all containers are clearly labelled and free from leaks.

STORAGE INCOMPATIBILITY

- Do not store near strong acids, alkalies or oxidizing agents.

STORAGE REQUIREMENTS

- - Store in original containers.
 - Keep containers securely sealed.
 - Store in a cool, dry, well-ventilated area.
 - Store away from incompatible materials and foodstuff containers.
 - Protect containers against physical damage and check regularly for leaks.
 - Observe manufacturer's storing and handling recommendations.
- Store at 5-35 degC.

Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE CONTROLS

Source	Material	TWA mg/m ³
Australia Exposure Standards	ammonium sulfamate (Ammonium sulphamate)	10

The following materials had no OELs on our records

- ammonium phosphate, monobasic: CAS:7722- 76- 1
- diammonium phosphate: CAS:7783- 28- 0
- dicyandiamide: CAS:461- 58- 5
- boric acid: CAS:10043- 35- 3 CAS:11113- 50- 1 CAS:41685- 84- 1
- water: CAS:7732- 18- 5

EMERGENCY EXPOSURE LIMITS

Material	Revised IDLH Value (mg/m ³)	Revised IDLH Value (ppm)
ammonium sulfamate	1, 500	

MATERIAL DATA

FIRE DEFENDER MULTI-PURPOSE FR:
Not available

AMMONIUM SULFAMATE:

■ 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 consistent with the European Union (EU) Scientific Committee for Occupational Exposure Limits (SCOEL); this

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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.

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.

OSHA concluded that an exposure standard would protect the worker against eye and nose irritation, interference with vision and the danger of accidents caused by distraction and avoidance reactions typical of overexposure to dusts in the workplace.

AMMONIUM PHOSPHATE, MONOBASIC:

■ 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.

DIAMMONIUM PHOSPHATE:

■ for exposure to ammonia gas/ vapours:

Odour Threshold Value: Variously reported as 0.019 ppm and 55 ppm; AIHA Value 16.7 ppm (detection)

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

The TLV-TWA is thought to be protective against irritation of the eyes and respiratory tract and minimise discomfort among workers that are not inured to its effects and systemic damage. Acclimatised persons are able to tolerate prolonged exposures of up to 100 ppm without symptoms. Marked irritation has been seen in persons exposed to ammonia concentrations between 50 and 100 ppm only when the exposures involved sudden concentration peaks which do not permit short-term acclimatisation. The detoxification capacity of the liver is significant since the amount of ammonia formed endogenously in the intestines markedly exceeds that from external sources.

Human exposure effects, at vapour concentrations of about:

Concentration (ppm)	Possible Effects
5	minimal irritation
9- 50	nasal dryness, olfactory fatigue and moderate irritation
125- 137	definite nose, throat and chest irritation
140	slight eye irritation
150	laryngeal spasm
500	30 minute exposures may produce cyclic hypernea, increased blood pressure and pulse rate, and upper respiratory tract irritation which may persist for 24 hours
700	immediate eye irritation
1, 500- 10, 000	dyspnea, convulsive coughing, chest pain, respiratory spasm, pink frothy sputum, rapid asphyxia and delayed pulmonary oedema which may be fatal. Other effects

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>2, 500 include runny nose, swelling of the lips, restlessness, headache, salivation, nausea, vomiting, glottal oedema, pharyngitis, tracheitis, and speech difficulties. Bronchopneumonia, asphyxiation due to spasms, inflammation, and oedema of the larynx, may be fatal. Residual effects include hoarseness, productive cough, and decreased respiratory function

severe eye irritation, with swelling of the eyelids, lachrymation, blepharospasm, palpebral oedema, increased intraocular pressure, oval semi-dilated, fixed pupils, corneal ulceration (often severe) and temporary blindness. Depending on duration of exposure, there may be destruction of the epithelium, corneal and lenticular opacification, and iritis accompanied by hypopyon or haemorrhage and possible loss of pigment from the posterior layer of the iris. Less severe damage is often resolved. In the case of severe damage, symptoms may be delayed; late complications including persistent oedema, vascularisation and corneal scarring, permanent opacity, acute angle glaucoma, staphyloma, cataract, and atrophy of the retina, iris, and symblepharon. Long-term exposure to sub-acute concentrations or single exposures to high concentrations may produce chronic airway dysfunction, alveolar disease, bronchiolitis, bronchiectasis, emphysema and anxiety neuroses

Odour Safety Factor(OSF)

OSF=3.8 (AMMONIA).

DICYANDIAMIDE:

■ 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.

The concentration of dust, for application of respirable dust limits, is to be determined from the fraction that penetrates a separator whose size collection efficiency is described by a cumulative log-normal function with a median aerodynamic diameter of $4.0 \mu\text{m}$ (+-) $0.3 \mu\text{m}$ and with a geometric standard deviation of $1.5 \mu\text{m}$ (+-) $0.1 \mu\text{m}$, i.e. generally less than $5 \mu\text{m}$.

BORIC ACID:

■ 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.

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

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WATER:

- No exposure limits set by NOHSC or ACGIH.

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].

HANDS/FEET

- Wear chemical protective gloves, eg. PVC.
- Wear safety footwear.

OTHER

- - Overalls.
- P.V.C. apron.
- Barrier cream.
- Skin cleansing cream.
- Eye wash unit.

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	- AUS P	-
1000	50	-	- AUS P
5000	50	Airline *	-
5000	100	-	- 2 P
10000	100	-	- 3 P
	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 site specific CHEMWATCH data (if available), or your Occupational Health and Safety Advisor.

ENGINEERING CONTROLS

- General exhaust is adequate under normal operating conditions. If risk of overexposure exists, wear SAA approved respirator. Correct fit is essential to obtain adequate protection. Provide adequate ventilation in warehouse or closed storage areas.

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Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE

Colourless liquid with slight odour; mixes with water.

PHYSICAL PROPERTIES

Liquid.

Mixes with water.

Molecular Weight: Not applicable.

Melting Range (°C): <0

Solubility in water (g/L): Miscible

pH (1% solution): Not Available

Volatile Component (%vol): 70- 85

Relative Vapour Density (air=1): <1

Lower Explosive Limit (%): Not applicable

Autoignition Temp (°C): Not applicable

State: Liquid

Boiling Range (°C): 100+

Specific Gravity (water=1): 1.02- 1.12

pH (as supplied): Neutral

Vapour Pressure (kPa): 2.3 @ 20C

Evaporation Rate: Not available

Flash Point (°C): Not applicable

Upper Explosive Limit (%): Not applicable

Decomposition Temp (°C): Not available.

Viscosity: Not Available

Section 10 - CHEMICAL STABILITY AND REACTIVITY INFORMATION

CONDITIONS CONTRIBUTING TO INSTABILITY

■ Product is considered stable and 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

■ The material has NOT been classified by EC Directives or other classification systems as "harmful by ingestion". This is because of the lack of corroborating animal or human evidence. The material may still be damaging to the health of the individual, following ingestion, especially where pre-existing organ (eg. liver, kidney) damage is evident. Present definitions of harmful or toxic substances are generally based on doses producing mortality rather than those producing morbidity (disease, ill-health). Gastrointestinal tract discomfort may produce nausea and vomiting. In an occupational setting however, ingestion of insignificant quantities is not thought to be cause for concern.

EYE

■ There is some evidence to suggest that this material can cause eye irritation and damage in some persons.

SKIN

■ Skin contact is not thought to have harmful health effects (as classified under EC Directives); the material may still produce health damage following entry through wounds, lesions or abrasions. There is some evidence to suggest that this material can cause inflammation of the skin on contact in some persons.

INHALED

■ There is some evidence to suggest that the material can cause respiratory irritation in some persons. The body's response to such irritation can cause further lung damage. Acute effects from inhalation of high vapour concentrations may be chest and nasal irritation with coughing, sneezing, headache and even nausea.

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Section 11 - TOXICOLOGICAL INFORMATION

CHRONIC HEALTH EFFECTS

■ Long-term exposure to the product is not thought to produce chronic effects adverse to the health (as classified by EC Directives using animal models); nevertheless exposure by all routes should be minimised as a matter of course.

TOXICITY AND IRRITATION

■ Not available. Refer to individual constituents.

WATER:

■ No significant acute toxicological data identified in literature search.

Section 12 - ECOLOGICAL INFORMATION

■ DO NOT discharge into sewer or waterways.
Water danger class 3 (Self-assessment): hazardous for water.
Refer to data for ingredients, which follows:

AMMONIUM PHOSPHATE, MONOBASIC:

DIAMMONIUM PHOSPHATE:

■ May cause long-term adverse effects in the aquatic environment.

AMMONIUM PHOSPHATE, MONOBASIC:

DIAMMONIUM PHOSPHATE:

■ 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.

AMMONIUM PHOSPHATE, MONOBASIC:

DIAMMONIUM PHOSPHATE:

■ The principal problems of phosphate contamination of the environment relates to eutrophication processes in lakes and ponds. Phosphorus is an essential plant nutrient and is usually the limiting nutrient for blue-green algae. A lake undergoing eutrophication shows a rapid growth of algae in surface waters. Planktonic algae cause turbidity and flotation films. Shore algae cause ugly muddying, films and damage to reeds. Decay of these algae causes oxygen depletion in the deep water and shallow water near the shore. The process is self-perpetuating because anoxic conditions at the sediment/water interface causes the release of more adsorbed phosphates from the sediment. The growth of algae produces undesirable effects on the treatment of water for drinking purposes, on fisheries, and on the use of lakes for recreational purposes.

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Water danger class 3 (Self-assessment): hazardous for water.

AMMONIUM SULFAMATE:

Microbial degraded in soil ammonium sulfate within 6-8 weeks.

Ecotoxicity:

Exposure of three stickleback to 10 mg/l in a 24 hour bioassay resulted in death.

DICYANDIAMIDE:

■ On the basis of available evidence concerning either toxicity, persistence, potential to accumulate and or

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Section 12 - ECOLOGICAL INFORMATION

observed environmental fate and behaviour, the material may present a danger, immediate or long-term and /or delayed, to the structure and/ or functioning of natural ecosystems.

■ Soil Guidelines: Dutch Criteria:

free cyanide: 1 mg/kg (target)

20 mg/kg (intervention)

complex cyanide (pH 5): 5 mg/kg (target)

50 mg/kg (intervention)

Air Quality Standards: no safe guidelines recommended due to carcinogenic properties.

■ for dicyandiamide:

Henry's law Constant 2.25×10^{-10} atm.m³/mole

Vapour pressure $\leq 4.5 \times 10^{-6}$ kPa (100 C)

log Kow -0.52 (25 C)

Environmental fate:

Dicyandiamide does not hydrolyse under environmental conditions (regardless of pH). Indirect photo-oxidation by hydroxy radicals in the atmosphere is predicted to occur with a half-life of 3.1 hours. Dicyandiamide is not readily biodegradable under aerobic condition within 28 days (BOD = 0 %). However, a prolonged study showed that this substance is completely biodegraded within 34 weeks under aerobic conditions, while two-thirds of the total is biodegraded within 60 weeks under anaerobic conditions. Dicyandiamide has a low bioaccumulative potential (BCF (Cyprinus carpio, 48days): equal or less than 3.1). Fugacity modeling (Mackay level III) predicts that if the substance is released to water, it will not migrate into other compartments. When this substance is released to air or soil, it is mainly distributed to water and soil.

Ecotoxicity:

Fish LC50 (96 h): Oncorhynchus Mykiss 7700 mg/L

Daphnia Magna EC50 (48 h): 3177 mg/L

Pseudomonas Putida EC10: 131 mg/L

Dicyandiamide has been tested in aquatic species (algae, invertebrates and fish). An acute growth inhibition test was performed using green algae (OECD TG 201, Selenastrum capricornutum). The EC50 (biomass; 0-72 h) was 935 mg/L and the EC50 (growth rate; 24-72 h) was > 1,000 mg/L.

An acute toxicity test for invertebrates was performed using water fleas (OECD TG 202, Daphnia magna). The 48-h EC50 was > 1,000 mg/L.

An acute toxicity test [OECD TG 203] and a prolonged toxicity test [OECD TG 204] for fish were performed using Medaka (Oryzias latipes). The 96-h LC50 and the 14-d LC50 were both >100 mg/L.

A chronic reproduction toxicity test for invertebrates was performed using water fleas (OECD TG 211, Daphnia magna). The 21-d EC50 and the 21-d NOEC were 69.6 mg/L and 25.0 mg/L, respectively.

In microorganisms, dicyandiamide is known to have an inhibition activity of the nitrification of ammonium in various systems.

BORIC ACID:

■ Fish LC50 (96hr.) (mg/l): 79- 100

■ Daphnia magna EC50 (48hr.) (mg/l): 115- 153

■ For boron and borates:

Environmental fate:

Boron is generally found in nature bound to oxygen and is never found as the free element. Atmospheric boron may be in the form of particulate matter or aerosols as borides, boron oxides, borates, boranes, organoboron compounds, trihalide boron compounds, or borazines. Borates are relatively soluble in water, and will probably be removed from the atmosphere by precipitation and dry deposition. The half-life of airborne particles is usually on the order of days, depending on the size of the particle and atmospheric conditions. Boron readily hydrolyses in water to form the electrically neutral, weak monobasic acid boric acid (H₃BO₃) and the monovalent ion, B(OH)₄⁻. In concentrated solutions, boron may polymerise, leading to the formation of complex and diverse molecular arrangements. Because most environmentally relevant boron minerals are highly soluble in water, it is unlikely that mineral equilibria will control the fate of boron in water. Boron was found to not be significantly removed during the conventional treatment of waste water. Boron may, however, be co-precipitated with aluminum, silicon, or iron to form hydroxyborate compounds on the surfaces of

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Section 12 - ECOLOGICAL INFORMATION

minerals.

Waterborne boron may be adsorbed by soils and sediments. Adsorption-desorption reactions are expected to be the only significant mechanism that will influence the fate of boron in water. The extent of boron adsorption depends on the pH of the water and the chemical composition of the soil. The greatest adsorption is generally observed at pH 7.5-9.0. The single most important property of soil that will influence the mobility of boron is the abundance of amorphous aluminum oxide. The extent of boron adsorption has also been attributed to the levels of iron oxide, and to a lesser extent, the organic matter present in the soil, although other studies found that the amount of organic matter present was not important. The adsorption of boron may not be reversible in some soils. The lack of reversibility may be the result of solid-phase formation on mineral surfaces and/or the slow release of boron by diffusion from the interior of clay minerals.

It is unlikely that boron is bioconcentrated significantly by organisms from water. A bioconcentration factor (BCF) relates the concentration of a chemical in the tissues of aquatic and terrestrial animals or plants to the concentration of the chemical in water or soil. The BCFs of boron in marine and freshwater plants, fish, and invertebrates were estimated to be <100. Experimentally measured BCFs for fish have ranged from 52 to 198. These BCFs suggest that boron is not significantly bioconcentrated.

As an element, boron itself cannot be degraded in the environment; however, it may undergo various reactions that change the form of boron (e.g., precipitation, polymerization, and acid-base reactions) depending on conditions such as its concentration in water and pH. In nature, boron is generally found in its oxygenated form. In aqueous solution, boron is normally present as boric acid and borate ions, with the dominant form of inorganic boron in natural aqueous systems as undissociated boric acid. Boric acid acts as an electron acceptor in aqueous solution, accepting a hydroxide ion from water to form $(B(OH)_4)^-$ ion. In dilute solution, the favored form of boron is $B(OH)_4$. In more concentrated solutions (>0.1 M boric acid) and at neutral to alkaline pH (6– 11), polymeric species are formed (e.g., $B_3O_3(OH)_4^-$, $B_5O_6(OH)_4^-$, $B_3O_3(OH)_5^{2-}$, and $B_4O_5(OH)_4^{2-}$). Most boron compounds are transformed to borates in soil due to the presence of moisture. Borates themselves are not further degraded in soil. However, borates can exist in a variety of forms in soil. Borates removed from soils by water leaching and by assimilation by plants.

The most appreciable boron exposure to the general population is likely to be ingestion of food and to a lesser extent in water. As boron is a natural component of the environment, individuals will have some exposure from foods and drinking water.

Boron-containing salts (borates) are ubiquitous in the environment. Surface soil, unpolluted waterways and seawater all typically contain significant amounts of boron as borate. Boron is an essential micronutrient for healthy growth of plants, however, it can be harmful to boron sensitive plants in higher quantities. In some areas such as the American Southwest, boron occurs naturally in surface waters in concentrations that have been shown to be toxic to commercially important plants.

Based on the collected information regarding aquatic toxicity, boron is not regarded as dangerous to aquatic organisms. The concentration in treated municipal waste water is a factor 100 lower than the NOEC-value for *Daphnia magna*.

No quality criteria exist for the concentration of boron in soil and compost. Boron is added to farmland when sewage sludge is applied as a soil improving agent, but there is not sufficient data to evaluate its effect on soil organisms. Being an essential micro-nutrient, no adverse effects of boron are expected at low concentrations.

Ecotoxicity:

In aquatic environments low concentrations of borates generally promote the growth of algae, whereas higher concentrations inhibited algal growth. In a growth inhibition test with *Scenedesmus subspicatus*, an EC50 value of 34 mg B/l was determined. Boric acid toxicity in *Daphnia* 48 h-LC50 (static test) was found 95 mg B/l. In a separate study it was concluded that chronic effects of boron to *Daphnia* may occur at a concentration of > 10 mg/l.

The toxicity of boron in fish is often higher in soft water than in hard water. The acute toxicity of boron towards *Danio rerio* (96 h-LC50) has been determined to 14.2 mg B/l. In a fish early life stage test with rainbow trout NOEC levels of boron have been determined in the range between 0.009 and 0.103 mg B/l, whereas the EC50 ranged from 27 to 100 mg B/l dependent on the water hardness.

Ecotoxicity

Ingredient	Persistence: Water/Soil	Persistence: Air	Bioaccumulation	Mobility
Fire Defender		No data		
Multi- purpose FR		No data		
ammonium sulfamate		No data		
ammonium		No data		

continued...

FIRE DEFENDER MULTI-PURPOSE FR

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Section 12 - ECOLOGICAL INFORMATION

phosphate, monobasic diammonium	No data
phosphate dicyandiamide	No data
boric acid	No data
water	No data

Section 13 - DISPOSAL CONSIDERATIONS

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

Section 14 - TRANSPORTATION INFORMATION

HAZCHEM: None (ADG7)

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

Section 15 - REGULATORY INFORMATION

POISONS SCHEDULE: None

REGULATIONS

Regulations for ingredients

ammonium sulfamate (CAS: 7773-06-0) is found on the following regulatory lists;

"Australia Exposure Standards", "Australia Hazardous Substances", "Australia Inventory of Chemical Substances (AICS)"

ammonium phosphate, monobasic (CAS: 7722-76-1) is found on the following regulatory lists;

"Australia High Volume Industrial Chemical List (HVICL)", "Australia Inventory of Chemical Substances (AICS)", "International Council of Chemical Associations (ICCA) - High Production Volume List", "OECD Representative List of High Production Volume (HPV) Chemicals"

diammonium phosphate (CAS: 7783-28-0) is found on the following regulatory lists;

"Australia Inventory of Chemical Substances (AICS)", "IMO IBC Code Chapter 17: Summary of minimum requirements", "International Council of Chemical Associations (ICCA) - High Production Volume List", "OECD Representative List of High Production Volume (HPV) Chemicals"

dicyandiamide (CAS: 461-58-5) is found on the following regulatory lists;

"Australia Inventory of Chemical Substances (AICS)", "International Council of Chemical Associations (ICCA) - High Production Volume List", "OECD Representative List of High Production Volume (HPV) Chemicals"

boric acid (CAS: 10043-35-3, 11113-50-1, 41685-84-1) is found on the following regulatory lists;

"Australia Hazardous Substances", "Australia High Volume Industrial Chemical List (HVICL)", "Australia Inventory of Chemical Substances (AICS)", "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) - Schedule 5", "Australia Therapeutic Goods Administration (TGA) Substances that may be used as active ingredients in Listed medicines", "OECD Representative List of High Production Volume (HPV) Chemicals"

water (CAS: 7732-18-5) is found on the following regulatory lists;

"Australia Inventory of Chemical Substances (AICS)", "IMO IBC Code Chapter 18: List of products to which the Code does not apply", "OECD Representative List of High Production Volume (HPV) Chemicals"

No data for Fire Defender Multi-purpose FR (CW: 4695-10)

continued...

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Section 16 - OTHER INFORMATION

INGREDIENTS WITH MULTIPLE CAS NUMBERS

Ingredient Name	CAS
boric acid	10043- 35- 3, 11113- 50- 1, 41685- 84- 1

REPRODUCTIVE HEALTH GUIDELINES

Ingredient	ORG	UF	Endpoint	CR	Adeq TLV
boric acid	1.5 mg/m3	100	R	NA	-

■ These exposure guidelines have been derived from a screening level of risk assessment and should not be construed as unequivocally safe limits. ORGS represent an 8-hour time-weighted average unless specified otherwise.

CR = Cancer Risk/10000; UF = Uncertainty factor:

TLV believed to be adequate to protect reproductive health:

LOD: Limit of detection

Toxic endpoints have also been identified as:

D = Developmental; R = Reproductive; TC = Transplacental carcinogen

Jankovic J., Drake F.: A Screening Method for Occupational Reproductive

American Industrial Hygiene Association Journal 57: 641-649 (1996).

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

A list of reference resources used to assist the committee may be found at:

www.chemwatch.net/references.

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

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This is the end of the MSDS.