

# Safety Data Sheet

REVISION: May 2016  
Supersedes: March 2015 version



# Firebrake® 500

## Section 1 Identification of the substance/mixture and of the Company/undertaking

- 1.1 Product Identifier**
- Chemical name:** Hexaboron dizinc undecaoxide  
**CAS No:** 12767-90-7  
**REACH Registration Number:** 01-2119691658-19-0000  
**EC No:** 235-804-2  
**Synonyms:** Anhydrous zinc borate  
**Product Name:** Firebrake 500
- 1.2 Relevant identified uses of the substance or mixture and uses advised against**
- Identified Uses:** Anticorrosive adhesion polymer  
Anti tracking in polymers  
Corrosion inhibitors and anti-scaling agents  
Flame retardants  
*A complete list of uses is provided in the introduction to Annex – Exposure Scenarios*
- Uses advised against:** None.
- 1.3 Details of the supplier of the SDS**
- Company Name:** **Borax Europe Limited**  
**Address:** 6 St. James's Square  
London, SW1Y 4AD  
United Kingdom
- Telephone number:** +44 (0)20 7781 2000
- Email:** [rtm.msds@riotinto.com](mailto:rtm.msds@riotinto.com)
- 1.4 Emergency telephone number:** **+44 (0) 1235 239 670**  
**Official advisory body telephone number:** None

## Section 2 Hazards identification

### 2.1 Classification of the substance or mixture

**Classification (CLP Regulation (EC) No 1272/2008):** Classified as Toxic for reproduction (Repr. 2; H361d), and as Dangerous for the Environment (Env. Acute 1; H400 and Env. Chronic 2; H411) and as an eye irritant (Eye Irrit. 2; H319).

**Classification (Directive 67/548/EEC):** Classified as Dangerous for the Environment (N; R50/53) and as an eye irritant (Xi; R36).

Refer to Section 16 for the full text of Hazard Statements and R-phrases mentioned above.

### 2.2 Label Elements

Labelling according to Regulation (EC) No 1272/2008 (CLP)

#### Hazard Pictograms



**Signal word:** Warning

**Hazard statements:**

H361d: Suspected of damaging the unborn child.  
 H400: Very toxic to aquatic life.  
 H411: Toxic to aquatic life with long-lasting effects.  
 H319: Causes serious eye irritation.

**Precautionary statements:**

P202: Do not handle until all safety precautions have been read and understood.  
 P273: Avoid release to the environment.  
 P280: Wear eye protection.  
 P305+P351+P338: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.  
 P308+P313: IF exposed or concerned: Get medical advice/attention.  
 P501: Dispose of contents/container in accordance with local regulation.

**2.3 Other Hazards**

None

## Section 3 Composition/information on ingredients

**3.1 Substances**

Chemical Name	CAS#	EC#	% content	Classification (1272/2008/EC)	Classification (67/548/EEC)
Hexaboron dizinc undecaoxide	12767-90-7	235-804-2	>98.8	Repr. 2; H361d Env. acute 1; H400 Env. chronic 2 ; H411 Eye Irrit. 2; H319	N; R50/53 Xi; R36

Refer to Section 16 for the full text of Hazard statements and R-phrases mentioned above.

## Section 4 First aid measures

**4.1 Description of First aid measures**

Protection of first-aiders: No special protective clothing is required.

**Inhalation:** If symptoms such as nose or throat irritation are observed, remove to fresh air.

**Eye contact:** Use eye wash fountain or fresh water to cleanse eye. If irritation persists for more than 30 minutes, seek medical attention.

**Skin contact:** No treatment necessary.

**Ingestion:** Swallowing small quantities (one teaspoon) will cause no harm to healthy adults. If larger amounts are swallowed, give two glasses of water to drink and seek medical attention.

**4.2 Most important symptoms and effects both acute and delayed:** Symptoms of accidental over-exposure to high doses of inorganic borate salts have been associated with ingestion or absorption through large areas of severely damaged skin. These may include nausea, vomiting, and diarrhoea, with delayed effects of skin redness and peeling (see Section 11).

**4.3 Indication of any immediate medical attention and special treatment needed:** Note to physicians: Supportive care only is required for adult ingestion of less than a few grams of the product. For ingestion of larger amounts, maintain fluid and electrolyte balance and maintain adequate kidney function. Gastric lavage is only recommended for heavily exposed, symptomatic patients in whom emesis has not emptied the stomach. Hemodialysis should be reserved for patients with

massive acute absorption, especially for patients with compromised renal function. Boron analyses of urine or blood are only useful for verifying exposure and are not useful for evaluating severity of poisoning or as a guide in treatment<sup>1</sup>.

## Section 5 Fire-fighting measures

### 5.1 Extinguishing media

**Suitable extinguishing media:** Use extinguishing media that are appropriate to local circumstances and the surrounding environment.

**Unsuitable extinguishing media:** None

### 5.2 Special hazards arising from substance or mixture

None. The product is not flammable, combustible or explosive.

### 5.3 Advice for fire fighters

Not applicable. The product is itself a flame retardant.

## Section 6 Accidental release measures

### 6.1 Personal precautions, protective equipment and emergency procedures

**For non-emergency personnel:**

Eye protection according to CEN166:1996, Respirators (CEN149:2001).

**For emergency responders:**

Eye protection according to CEN166:1996, Respirators (CEN149:2001).

**6.2 Environmental precautions:** The product is a water-soluble white powder that may cause damage to trees or vegetation by root absorption. Avoid contamination of water bodies during clean up and disposal. Advise local water authority that none of the affected water should be used for irrigation or for the abstraction of potable water until natural dilution returns the boron value to its normal environmental background level or meets local water quality standards.

### 6.3 Methods and material for containment and cleaning up

**Appropriate containment:** Avoid spillage into water and cover drains.

**Land spill:** Vacuum, shovel or sweep up and place in containers for disposal in accordance with applicable local regulations.

**Spillage into water:** Where possible, remove any intact containers from the water.

### 6.4 Reference to other sections

Refer to sections 8, 12 and 13.

## Section 7 Handling and storage

### 7.1 Precautions for safe handling

Good housekeeping procedures should be followed to minimise dust generation and accumulation. Avoid spills. Do not eat, drink and smoke in work areas. Wash hands after use. Remove contaminated clothing and protective equipment before entering eating areas.

### 7.2 Conditions for safe storage, including any incompatibilities

No special handling precautions are required, but dry, indoor storage is recommended. To maintain package integrity and to minimise caking of the product, bags should be handled on a first-in first-out basis.

**Storage temperature:** Ambient  
**Storage pressure:** Atmospheric  
**Special sensitivity:** Moisture (Caking)

### 7.3 Specific end use(s)

Refer to Annex – Exposure Scenarios.

## Section 8 Exposure controls/personal protection

### 8.1 Control parameters

**Occupational exposure limit values:** In the absence of a national OEL, Rio Tinto Borax recommends and applies internally an Occupational Exposure Limit (OEL) of 1 mg B/m<sup>3</sup>. To convert this product to equivalent zinc (Zn), multiply by 0.352. To convert to equivalent boron (B), multiply by 0.175.

#### OELs of Member States of the EEA

There is no OEL for hexaboron dizinc undecaoxide (CAS 12767-90-7).

#### DNELs

Values given for hexaboron dizinc undecaoxide

Route of exposure	Workers				Consumers			
	Acute effects local	Acute effects systemic	Chronic effects local	Chronic effects systemic	Acute effects local	Acute effects systemic	Chronic effects local	Chronic effects systemic
Oral	Not Required				*	*	*	2.4 mg/kg/day
Inhalation	*	*	*	22.4 mg/m <sup>3</sup>	*	*	*	8.3 mg/m <sup>3</sup>
Dermal	*	*	*	1585 mg/kg/day	*	*	*	1205 mg/kg/day

\* No hazard identified  
Monitoring procedure: *BS EN 14042:2003 Title identifier: Workplace atmospheres. Guide for the application and use of procedures for the assessment of exposure to chemical and biological agents.*

#### PNECs

For zinc

Compartment (Environment)	PNEC (added values)
Water, fresh	20.6 µg/L
Water, marine	6.1 µg/L
Soil	107 mg/kg dry soil
Sediment, freshwater	117.8 mg/kg dry soil
Sediment, marine	56.5 mg/kg dry soil
STP	100 µg/L

For boron

Compartment (Environment)	PNEC (added values)
Water, fresh and marine	2900 µg/L
Water, intermittent	13700 µg/L
Soil	5.7 mg B/kg dry soil
STP	10 mg B/L

### 8.2 Exposure controls

**Appropriate engineering controls:** Use local exhaust ventilation to keep airborne concentrations of dust below permissible exposure limits.

#### Personal protection equipment:

Eye and face protection: Eye protection according to CEN166:1996 is required.

Skin protection: Standard work gloves (cotton, canvas or leather) may be warranted if environment is excessively dusty.

Respiratory protection: Where airborne concentrations are expected to exceed exposure limits, respirators should be used (CEN149:2001).

#### Environmental exposure controls:

**Limiting releases from site:** Where appropriate, material should be recovered and recycled through the process.

Spillages of powder or granulated borates should be swept or vacuumed up immediately and placed in containers for disposal in order to prevent unintentional release to the environment. Waste containing borates should be handled as a hazardous waste and removed by licensed operator to an offsite location where it can be incinerated or disposed to a hazardous landfill.

**Water Emissions:** Storage should be sheltered from precipitation. Avoid spillage into water and cover drains. Removal from water can only be accomplished by very specific treatment technologies including ion exchange resins, reverse osmosis etc. Removal efficiency is dependent upon a number of factors and will vary from 40 to 90%. Much of the technology is currently not appropriate to high volume or mixed waste streams. Boron is not removed in considerable amounts in conventional STP. If sites discharge to a municipal STP the concentration of boron should not exceed the PNEC in the municipal STP.

**Air Emissions:** Emissions to air can be removed by one or more of the following dust-control measures: electrostatic precipitators, cyclones, fabric or bag filters, membrane filters, ceramic and metal mesh filters, and wet scrubbers.

## Section 9 Physical and chemical properties

### 9.1 Information on basic physical and chemical properties

<b>Appearance:</b>	White, crystalline solid
<b>Odour</b>	Odourless
<b>Odour threshold:</b>	Not applicable: odourless
<b>pH @ 20°C:</b>	6.8 -7.5 (aqueous solution)
<b>Melting point/ Freezing point:</b>	>300°C
<b>Initial boiling point and boiling range:</b>	Not applicable: melting point >300°C
<b>Flash point:</b>	Not applicable: inorganic substance
<b>Evaporation rate:</b>	Not applicable: non-volatile
<b>Flammability (solid/gas):</b>	Non-flammable (used as a flame retardant)
<b>Upper/lower flammability or explosive limits:</b>	Not applicable: non-flammable
<b>Vapour pressure:</b>	Not applicable: melting point >300°C
<b>Vapour density:</b>	Not applicable: melting point >300°C
<b>Relative density:</b>	2.6 @ 20°C
<b>Solubility(ies):</b>	Water: <0.28% @ 25°C
<b>Partition coefficient; n-octanol/water:</b>	Not applicable: inorganic substance
<b>Auto-ignition temperature:</b>	Not applicable: not self-heating
<b>Decomposition temperature:</b>	Not applicable: melting point >300°C
<b>Viscosity:</b>	Not applicable: solid substance
<b>Explosive properties:</b>	Not explosive: does not contain chemical groups associated with explosive properties
<b>Oxidising properties:</b>	Not oxidising: does not contain chemical groups associated with oxidising properties

### 9.2 Other information

<b>Molecular weight:</b>	371.62
<b>Formula:</b>	2ZnO. 3B <sub>2</sub> O <sub>3</sub>

## Section 10 Stability and reactivity

- 10.1 Reactivity:** None known.
- 10.2 Chemical stability:** Under normal ambient temperatures (-40°C to +40°C), the product is stable.
- 10.3 Possibility of hazardous reactions:** Reaction with strong reducing agents such as metal hydrides or alkali metals will generate hydrogen gas which could create an explosive hazard.
- 10.4 Conditions to avoid:** Avoid contact with strong reducing agents by storing according to good industrial practice.
- 10.5 Incompatible materials:** Strong reducing agents.
- 10.6 Hazardous decomposition products:** None.

## Section 11 Toxicological Information

### 11.1 Information on toxicological effects

#### (a) Acute toxicity

Method: Acute Oral Toxicity Study – OECD Guideline 401 equivalent

Species: Rat

Dose: Limit test: 5.0 g/kg bw, 50% w/v formulation in corn oil.

Routes of Exposure: Oral

Results: Low acute oral toxicity. LD<sub>50</sub> in rats is >5,000 mg/kg bw. Based on available data, the classification criteria are not met.

Method: Acute Dermal Toxicity Study

Species: Rabbit

Dose: Limit test: 5.0 g/kg bw.

Routes of Exposure: Dermal

Results: Acute dermal LD<sub>50</sub> is > 5,000 mg/kg (limit of tested dosages). Based on the available data, the classification criteria are not met.

Method: Acute Inhalation Toxicity Study – OECD Guideline 403

Species: Rat

Dose: 4.95 mg/L of Zinc Borate 415

Routes of Exposure: Inhalation

Results: No acute inhalation toxicity data is available for zinc borate, anhydrous. LC<sub>50</sub> value in rats for acute inhalation toxicity > 4.95 mg /L based on an acute inhalation toxicity study on a similar zinc borate compound. Based on the available data, the classification criteria are not met.

**(b) Skin corrosion / irritation:**

Method: Primary Dermal Irritation Study – U.S. EPA FIFRA Guidelines, similar to OECD 404

Species: Rabbit

Dose: 500 mg

Routes of Exposure: Dermal

Results: No skin irritation. Primary Irritation Index of 0.2 based on erythema. No irritation persisted 72 hours following application. Based on the available data, the classification criteria are not met.

**(c) Serious eye damage / irritation:**

Method: Eye Irritation Study – similar to OECD Guideline 405

Species: Rabbit

Dose: 100 mg

Routes of Exposure: Eye

Results: Irritating, fully reversible in 14 days.

Classification: Eye irritation Category 2A (Hazard statement: H319: Causes serious eye irritation).

**(d) Respiratory or skin sensitisation:**

Method: Buehler Test – OECD Guideline 406

Species: Guinea Pig

Dose: 0.4 g zinc borate (hydrate)

Routes of Exposure: Dermal

Results: Not a skin sensitiser. No respiratory sensitisation studies have been conducted. There are no data to suggest that zinc borates are respiratory sensitisers. Based on the available data, the classification criteria are not met.

**(e) Germ cell mutagenicity:**

Method: mammalian cell gene mutation assay (gene mutation) – OECD Guideline 476.

Species: mouse lymphoma L5178Y cells

Dose: 0.001 - 0.075 mg/mL (1 - 75 ppm) zinc borate hydrate

Routes of Exposure: *in vitro*

Results: Not mutagenic. Based on the available data, the classification criteria are not met.

**(f) Carcinogenicity:**

No experimental test data on zinc borate.

Results: Zinc borate dissociates to zinc hydroxide and boric acid in the low pH environment of the stomach. No carcinogenic effects observed in chronic carcinogenicity studies of boric acid conducted in rats and mice, and no evidence of carcinogenic effects in zinc borate breakdown products. Based on the available data, the classification criteria are not met.

**(g) Reproductive toxicity:**

Method: 90-day Oral Toxicity Study – OECD 408

Species: Rat

Dose: 0, 50, 100, 200 and 375 mg zinc borate (hydrate)/kg/day

Routes of exposure: oral gavage

Results: NOAEL in rats for effects on fertility in males is 100 mg zinc borate (hydrate)/kg/bw.

Method: Prenatal Developmental Toxicity Study – OECD Guideline 414

Species: Rat

Dose: 0, 100, 125 and 150 mg zinc borate (hydrate)/kg bw

Routes of exposure: oral gavage

Results: NOAEL in rats for developmental effects on the foetus including foetal weight loss and minor skeletal variations is < 100 mg zinc borate hydrate/kg bw.

Classification: Reproductive Toxicity Category 2 (Hazard statement: H361d: Suspected of damaging the unborn child.)

Method: Occupational studies of evaluating sensitive sperm parameters in highly exposed borate workers. Epidemiological studies evaluating high environmental exposures to boron and developmental effects in humans have been conducted.

Species: Human

Dose: A subset of workers was exposed to 125 mg B/day

Routes of exposure: Combined oral ingestion and inhalation.

Results: No adverse fertility effects in male workers. Epidemiological studies of human developmental effects have shown an absence of effects in exposed borate workers and populations living in areas with high environmental levels of boron.

#### Summary of evaluation of the CMR properties:

Zinc borate is not mutagenic. No carcinogenicity studies with zinc borates are available, therefore no classification is possible. Zinc borate disassociates to zinc hydroxide and boric acid in the low pH environment of the stomach. No carcinogenic effects observed in chronic carcinogenicity studies of boric acid conducted in rats and mice, and no evidence of carcinogenic effects in zinc borate breakdown products. Developmental effects have been observed in laboratory animals, the most sensitive species being the rat with a NOAEL of 9.6 mg B/kg bw/day. While boron has been shown to adversely affect male reproduction in laboratory animals, there was no clear evidence of male reproductive effects attributable to boron studies of highly exposure workers. However, the low toxicity of zinc borate (acute oral LD<sub>50</sub> is > 10,000 mg/kg) compared to other borates indicates that the bioavailability of boron from zinc borate may be low.

#### (h) STOT-single exposure:

No target organ has been identified in humans.

#### (i) STOT-repeated exposure:

Method: Repeated Dose 28-Day Oral Toxicity in Rodents - OECD Guideline 407

Species: Rat

Dose: 15; 150; 300; and 1000 mg zinc borate 415/kg/day

Routes of Exposure: Oral gavage

Results: NOAEL: 150 mg/kg bw/day. At doses above 150 mg/kg/day, haematological changes indicative of anaemia was observed. The changes observed at a dose level of 150 mg/kg/day were considered not to represent serious damage to the health of the animals. Based on the available data, the classification criteria are not met.

(j) **Aspiration hazard:** Physical form of solid powder indicates no aspiration hazard potential.

#### Toxicokinetics

Following a single oral dose (1000 mg/kg) of zinc borate (hydrate), zinc and boron appeared in rat plasma and tissue samples, indicating the hydrolysis of zinc borate in the gastrointestinal tract and subsequent systemic absorption of zinc and boron. In plasma, T<sub>max</sub> occurred between 5 and 6 h after administration. Concentrations decreased to background levels by 72 h post-dose; T<sub>1/2</sub> ranged from 5.0 to 7.7 h (zinc and boron, respectively). The gastrointestinal route was the primary elimination route for zinc, while urinary excretion via the kidneys was the primary elimination route for boron.

#### Information on likely routes of exposure:

Inhalation is the most significant route of exposure in occupational and other settings. Dermal exposure is not usually a concern because product is poorly absorbed through intact skin. Product is *not* intended for ingestion.

#### Symptoms related to the physical, and chemical and toxicological characteristics:

At high concentrations irritation of nose, throat and eye may be observed. Not expected to be irritating to the skin. Products containing zinc borate *not* intended for ingestion. Zinc borate has a low acute toxicity. Small amounts (e.g. a teaspoon) swallowed accidentally are not likely to cause effects; swallowing amounts larger than that may cause gastrointestinal symptoms.

#### Delayed and immediate effects as well as chronic effects from short and long-term exposure:

Human epidemiological studies show no increase in pulmonary disease in occupational populations with chronic exposures to boric acid and sodium borate dust. Human epidemiological studies indicate no effect on fertility in occupational populations with chronic exposures to borate dust and indicate no effect to a general population with high exposures to borates in the environment.

## Section 12 Ecological information

### 12.1 Toxicity

Data values are expressed as zinc ion or boron equivalents. To convert to this product, divide the zinc equivalent by 0.352 and divide the boron equivalent by 0.174. Studies judged to be unreliable or with insufficient information to evaluate are not included. All toxicity values are reported as added concentrations, i.e. with subtraction of the background concentration of zinc or boron in the test media.

### Freshwater

#### Chronic studies

##### Zinc

Taxonomic Group	Number of Taxa Tested	Range of Endpoint Values (geometric NOEC/EC10)	References
Algal	2	0.019 mg Zn/L ( <i>Pseudokirchneriella subcapitata</i> ) to 0.048 mg Zn/L ( <i>Chlorella sp.</i> )	25
Higher plants	7	0.060 mg Zn/L ( <i>Cladophora glomerata</i> ) to >0.65 mg Zn/L ( <i>Elodea nuttalli</i> , <i>Callitriche platycarpa</i> , <i>Spirodella polyrhiza</i> , <i>Lemna gibba</i> , <i>L. minor</i> , <i>L. pauciscostata</i> )	25
Invertebrate and protozoan	13	0.037 mg Zn/L ( <i>Ceriodaphnia dubia</i> ) to 0.137 mg Zn/L ( <i>Chironomus tentans</i> )	25
Fish	7	0.044 mg Zn/L ( <i>Joranelia floridae</i> ) to 0.530 mg Zn/L ( <i>Salvenius fontinalis</i> )	25

Results: Based on the complete data set of 23 species, the HC5 value of the species sensitivity distribution is 0.021 mg Zn/L. For classification, two reference values are used: for low pH, the value of 0.082 mg Zn/L is used, for neutral and high pH, the value of 0.019 mg Zn/L is used.

##### Boron

Taxonomic Group	Number of Taxa Tested	Range of Endpoint Values (geometric NOEC/EC10)	References
Alga	1	17.5 mg B/L ( <i>Pseudokirchneriella subcapitata</i> )	2
Higher plants	1	6.0 mg B/L ( <i>Spirodella polyrhiza</i> )	3
Invertebrate	5	6.3 mg B/L ( <i>Hyalella azteca</i> ) to 30.0 mg B/L ( <i>Lampsilis siliquoidea</i> )	4, 5
Fish	6	6.3 mg B/L ( <i>Brachydanio rerio</i> ) to 36.8 mg B/L ( <i>Micropterus salmoides</i> )	6, 7
Amphibian	4	9.4 mg B/L ( <i>Xenopus laevis</i> ) to 69.9 mg B/L ( <i>Bufo fowleri</i> )	8, 9

Results<sup>2</sup>: Based on the complete data set of 17 species, the HC<sub>5-50</sub> value of the species sensitivity distribution is 5.7 mg B/L.

#### Acute studies

##### Zinc

Taxonomic Group	Number of Taxa Tested	Range of Endpoint Values (geometric EC/LC50)	References
Algal	1	0.142 mg Zn/L ( <i>Pseudokirchneriella subcapitata</i> )	25
Invertebrate and protozoan	5	0.147 mg Zn/L ( <i>Ceriodaphnia dubia</i> ) to 1.05 mg Zn/L ( <i>Daphnia magna</i> )	25
Fish	5	0.169 mg Zn/L ( <i>Oncorhynchus mykiss</i> ) to 1.16 mg Zn/L ( <i>Oncorhynchus kisutch</i> )	25

Results: Based on the data set, two acute reference values are used. For low pH, the value of 0.413 mg Zn/L is used (based on the lowest value for *Ceriodaphnia dubia* at low pH. For neutral and high pH, the value of 0.136 mg Zn/L is used (based on the lowest value for *Pseudokirchneriella subcapitata*).

##### Boron

Taxonomic Group	Number of Taxa Tested	Range of Endpoint Values (geometric EC/LC50)	References
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Algal	1	52.4 mg B/L ( <i>Pseudokirchneriella subcapitata</i> )	2
Invertebrate	7	112.9 mg B/L ( <i>Ceriodaphnia dubia</i> ) to >544 mg B/L ( <i>Megaloniais nervosa</i> )	4
Fish	1	79.7 mg B/L ( <i>Pimephales promelas</i> )	4

Classification: A study of the transformation/dissolution characteristics of zinc borate was conducted following the OECD 29 protocol<sup>25</sup>. The amount of zinc ion in solution after 24 hr exceeded the acute reference values, so zinc borate is classified as Aquatic Acute 1 (H400: Very toxic to aquatic life). The amount of zinc in solution after 28 days also exceeded the chronic reference values. Because over 70% of zinc ions were removed from the water column within 28 days (demonstrating "rapid partitioning") and zinc is not considered bioaccumulative, the Chronic 2 category applies (H411: Toxic to aquatic life with long-lasting effects).

### Marine and Estuarine Data

#### Chronic studies

#### Zinc

Taxonomic Group	Number of Taxa Tested	Range of Endpoint Values (geometric NOEC/EC10)	References
Micro-algae	4	0.011 mg Zn/L ( <i>Chaetoceros compressum</i> ) to 0.066 mg Zn/L ( <i>Nitzschia closterium</i> )	25
Macro-algae	8	0.008 mg Zn/L ( <i>Ceramium tenuicore</i> ) to 0.671 mg Zn/L ( <i>Pelvetia canaliculata</i> )	25
Invertebrate and protozoan	26	0.010 mg Zn/L ( <i>Arbacia lixula</i> , <i>Sphaerechinus granularis</i> ) to 0.900 mg Zn/L ( <i>Mya arenia</i> )	25
Fish	1	0.025 mg Zn/L ( <i>Clupea harengus</i> )	25

Results: Based on the complete data set of 39 species, the HC5 value of the species sensitivity distribution is 0.0061 mg Zn/L

#### Boron

Taxonomic Group	Number of Taxa Tested	Range of Endpoint Values (geometric NOEC/EC10)	References
Alga	1	27.9 mg B/L ( <i>Phaeodactylum tricorutum</i> )	10
Invertebrate	1	16.6 mg B/L ( <i>Americamysis bahia</i> )	11

Results: No data are available for vertebrate species. The results from the freshwater data set are recommended as applicable to marine and estuarine species.

#### Acute studies

#### Zinc

See freshwater acute data and marine chronic data.

#### Boron

Taxonomic Group	Number of Taxa Tested	Range of Endpoint Values (geometric EC/LC50)	References
Alga	1	66.0 mg B/L ( <i>Phaeodactylum tricorutum</i> )	10
Invertebrate	1	130.0 mg B/L ( <i>Litopenaeus vannamei</i> )	12
Fish	1	74.0 mg B/L ( <i>Limanda limanda</i> ) (total)	13

### Sediment

#### Zinc

Taxonomic Group	Number of Taxa Tested	Range of Endpoint Values (geometric NOEC/EC10)	References
Crustaceans	2	0.146 mg Zn/kg dw ( <i>Gammarus pulex</i> ) to 0.529 mg Zn/kg dw ( <i>Hyalella azteca</i> )	25
Insects	3	0.164 mg Zn/kg dw ( <i>Ephoron virgo</i> ) to 0.696 mg Zn/kg dw ( <i>Chironomus tentans</i> )	25
Worms	2	0.878 mg Zn/kg dw ( <i>Lumbriculus variegates</i> ) to 1.101 mg Zn/kg dw ( <i>Tubifex tubifex</i> )	25

Results: Based on the complete data set of 7 species, the HC5 value of the species sensitivity distribution is 0.118 mg Zn/kg dw.

#### Boron

Taxonomic Group	Number of Taxa Tested	Range of Endpoint Values (geometric EC/LC50)	References
Invertebrate	1	37.7 mg B/kg dw ( <i>Chironomus riparius</i> )	14

Results: The weight of evidence provided by the lack of partitioning of boron to the sediment and the results of the water only/whole sediment toxicity tests indicate that it is unlikely that boron will exert toxic effects via the sediment compartment and that the derivation of a sediment HC<sub>5-50</sub> value is not warranted for this product.

#### Sewage Treatment Plants (STP)

##### Zinc

Taxonomic Group	Number of Taxa Tested	Range of Endpoint Values (geometric NOEC)	References
Microbial process	1	>0.1 mg Zn/L (nitrification)	25

#### Boron

Taxonomic Group	Number of Taxa Tested	Range of Endpoint Values (geometric NOEC/EC10)	References
Activated sludge	NA	17.5 mg B/L to 10,000 mg B/L	15, 16
Microbes	3	10 mg B/L ( <i>Opercularia bimarginata</i> ) to 20 mg B/L ( <i>Paramecium caudatum</i> )	17

Results: The lowest NOEC for sewage treatment plant is 10 mg B/L.

#### Terrestrial Data

##### Chronic studies

##### Zinc

Taxonomic Group	Number of Taxa Tested	Range of Endpoint Values (geometric NOEC)	References
Plant	18	32 mg Zn/kg dw ( <i>Trifolium pratense</i> , <i>Vicia sativa</i> ) to 5855 mg Zn/kg dw ( <i>Triticum aestivum</i> )	25
Invertebrates	8	14.6 mg Zn/kg dw ( <i>Folsomia candida</i> ) to 1634 mg Zn/kg dw ( <i>Lumbricus terrestris</i> )	25
Soil micro	17	17 mg Zn/kg dw (Soil respiration) to 2623 mg Zn/kg dw (Phosphatase)	25

Results: Based on the complete data set of 43 endpoints, the HC5 value of the species sensitivity distribution is 35.6 mg Zn/kg dw.

#### Boron

Taxonomic Group	Number of Taxa Tested	Range of Endpoint Values (geometric NOEC/EC10)	References
Plant	28	7.2 mg B/kg dw ( <i>Zea mays</i> ) to 56 mg B/kg dw ( <i>Allium cepa</i> )	18, 19
Invertebrates	9	15.4 mg B/kg dw ( <i>Folsomia candida</i> ) to 86.7 mg B/kg dw ( <i>Caenorhabditis elegans</i> )	20, 21
Soil micro	3	41.3 mg B/kg dw (substrate induced nitrification) to 48.1 mg B/kg dw (soil nitrogen transformation test)	22, 23, 24

Results<sup>25</sup>: Based on the complete data set, the HC<sub>5-50</sub> value of the species sensitivity distribution is 11.3 mg B/kg dw.

**Phytotoxicity:** Boron is an essential micronutrient for healthy growth of plants. It can be harmful to boron sensitive plants in higher quantities. Care should be taken to minimise the amount of borate product released to the environment.

#### 12.2 Persistence and Degradability

Biodegradation is not an applicable endpoint since the product is an inorganic substance.

#### 12.3 Bioaccumulative potential

Zinc borate will hydrolyze under environmental conditions to boric acid and zinc hydroxide via zinc oxide. Boric acid will not biomagnify through the food chain. Zinc hydroxide solubility is low under neutral and basic conditions (pH). The rate of hydrolysis depends on the initial loading and pH. However, zinc is an essential element which is actively regulated by organisms, so bioaccumulation is not considered relevant.

#### 12.4 Mobility in soil

Zinc borate will hydrolyze under environmental conditions to boric acid and zinc hydroxide. Adsorption of boric acid to soils or sediments is minimal. Adsorption of zinc ions is described by partition coefficients and may vary with site-specific conditions. For boric acid, the solids-water partitioning coefficients are 2.19 L/kg (soil) and 2.8 L/kg (sediment). For zinc, the solids-water partitioning coefficients are 159 L/kg (soil), 73,000 L/kg (freshwater/sediment), and 6010 L/kg (seawater/sediment).

#### 12.5 Results of PBT and vPvB assessment

According to Annex XIII of REACH, criteria for the assessment of PBT and vPvB properties do not apply to inorganic substances.

#### 12.6 Other adverse effects

None

## Section 13 Disposal considerations

#### 13.1 Waste treatment methods

This product is classified as toxic to reproduction (Repr. 2) and as dangerous for the environment (Env. Acute 1) and falls within scope of Directive 2008/98/EC as hazardous waste (H10 and H14, respectively). Tonnage quantities of product should, if possible, be used for an appropriate application. Final disposal must be to a registered landfill site following the guidance of appropriate local authorities.

Zinc borate has a reportable quantity (RQ) of 454 kg (1000 lbs).

## Section 14 Transport information

Transport Classification for Road (ADR) / Rail (RID); Inland waterways (ADN); Sea (IMDG); Air (ICAO/IATA)

14.1 UN Number:	3077
14.2 UN Proper Shipping Name:	Environmentally Hazardous Substance. Solid, N.O.S. (Zinc borate)
14.3 Transport hazard class(es):	9
14.4 Packing Group:	III
14.5 Environmental Hazards	Marine pollutant
14.6 Special precautions for user:	Refer to sections 6, 8 and 12
14.7 Transport in bulk according to Annex II of Marpol 73/78 and the IBC code:	Not applicable: not transported in bulk.

## Section 15 Regulatory information

## 15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

**Regulation (EC) No 2037/2000 - Substances that deplete the ozone layer:** Not manufactured with and does not contain any Group I or Group II ozone depleting substances.

**Clean Air Act (Montreal Protocol) - Substances that deplete the ozone layer:** Not manufactured with and does not contain any Class I or Class II ozone depleting substances.

**Regulation (EC) No 689/2008 - Export and Import of Dangerous Chemicals:** Not listed.

**National Regulations:** Ensure all national/local regulations are observed.

**Chemical inventory listing:** The listing is sometimes under the Inventory number of the anhydrous form of this inorganic salt.

<b>U.S. EPA TSCA Inventory:</b>	12767-90-7
<b>Canada DSL:</b>	12767-90-7
<b>EINECS:</b>	235-804-2
<b>South Korea KECI:</b>	KE-18394
<b>Japan METI &amp; ISHL:</b>	(1)-73
<b>China IECSC:</b>	12767-90-7

## 15.2 Chemical safety assessment

A Chemical Safety Assessment has been carried out.

# Section 16 Other information

### Revision Details:

Section 1: Supplier address

### Abbreviations and acronyms:

ATP: Adaption to Technical Progress

CLP: Classification, Labelling and Packaging Regulation (EC) No. 1272/2008

CMR: Carcinogen, Mutagen, Reproductive Toxin

EC: Effect concentration

HC: Hazard Concentration

LC: Lethal Concentration

LD: Lethal Dose

STOT: Specific Target Organ Toxicity

DNEL: Derived No Effect Level

LOEC: Lowest Observed Effect Concentration

NA: Not applicable.

NOAEL: No observed adverse effect level

NOEC: No Observed Effect Concentration

PNEC: Predicted No Effect Concentration

PBT: Persistent, Bioaccumulative and Toxic

vPvB: very Persistent, very Bioaccumulative

TWA: Time Weighted Average

STEL: Short-term exposure limit

STP: Sewage Treatment Plant

### References:

- Litovitz T L, Norman S A, Veltri J C, Annual Report of the American Association of Poison Control Centers Data Collection System. Am. J. Emerg. Med. (1986), 4, 427-458
- Hanstveit AO, H Oldersma (2000). Unpublished report. Report no.: V99.157. Borax Europe Limited.
- Davis SM, KD Drake, KJ Maier (2002). Chemosphere 48, 615-620.
- Soucek D, A Dickinson, K Major (2010). Environ. Toxicol. Chem., 30(8):1906-1914
- Lockwood R (2011). Unpublished report. Report no.: 20-26107A RT-3. Rio Tinto Minerals.
- Hooftman RN, D van Drongelen-Sevenhuijsen, HPM de Haan (2000). Unpublished report. Report no.: IMW-99-9047-09. Borax Europe Limited.
- Birge WJ, JA Black (1981). Unpublished report. No report number. Procter and Gamble.
- Fort Douglas J (2011). Unpublished report. Report no.: RIOT01-00232. Rio Tinto Minerals.
- Laposata MM, WA Dunson (1998). Arch. Environ. Contam. Toxicol. 35, 615-619.
- Rebstock M (2011). Unpublished report. Report no.: 65484. REACH Consortium for Borates.

11. Hicks Stephen L (2011). Unpublished report. Report no.: 65481. REACH Consortium for Borates.
12. Bergfield A (2011). Unpublished report. Report no.: 65478. REACH Consortium for Borates.
13. Taylor D, BG Maddock, G Mance (1985). Aquatic Toxicology, 7 (1985) 135-144.
14. Gerke A (2011). Unpublished report. Report no.: Study No. 65474. REACH Consortium for Borates.
15. Hanstveit AO, JA Schoonmade (2000). Unpublished report. Report no.: V99.156. Borax Europe limited.
16. Muller, Bruns (2001). Unpublished report. Report no.: 1082 A/01 B. HC Starck.
17. Guhl W (2000). SÖFW-Journal, 126, Jahrgang 10-2000.
18. Hosseini SM, M Maftoun, N Karimian, A Ronaghi, Y Emam (2007). Journal of Plant Nutrition, 30 (5): 773-781.
19. Aquatarra Environmental (1998). Unpublished report. No report number. Environmental Technology Centre, Environment Canada.
20. Becker-van Slooten K, S Campiche, J Tarradellas (2003). Unpublished report. No report number. Environmental Technology Centre, Environment Canada.
21. Moser T, L Becker (2009). Unpublished report. No report number. Reach Consortium for Borates.
22. Van Laer L, P Salaets, E Smolders (2010). Unpublished report. No report number. Reach Consortium for Borates.
23. Förster B, L Becker (2009). Unpublished report. No report number. Reach Consortium for Borates.
24. Hanstveit R, JA Schoonmade, A Akdemir (2001). Unpublished report. Report no.: V99.1183. Borax Europe Limited.
- 25: Borax Europe Ltd (Registrant). 2010. Joint Chemical Safety Report (20 Oct 2014). Substance Name: Zinc borate, anhydrous , EC Number: 235-804-2, CAS Number: 12767-90-7.

**Full text of Hazard statements mentioned in sections 2 and 3:**

H319: Causes serious eye irritation.  
 H361d: Suspected of damaging the unborn child.  
 H400: Very toxic to aquatic life.  
 H411: Toxic to aquatic life with long-lasting effects.

**Full text of Risk Phrases mentioned in sections 2 and 3:**

R36 Irritating to eyes.  
 R50/53: Very toxic to aquatic organisms may cause long-term adverse effects in the aquatic environment.

**Precautionary statements:**

P202: Do not handle until all safety precautions have been read and understood.  
 P273: Avoid release to the environment.  
 P280: Wear eye protection.  
 P305+P351+P338: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.  
 P308+P313: IF exposed or concerned: Get medical advice/attention.  
 P501: Dispose of contents/container in accordance with local regulation.

**Precautionary Phrases:**

Do not ingest.  
 Keep out of reach of children.  
 Refer to safety data sheet.  
 Not for use in food, drugs or pesticides.

The table in Annex – Exposure Scenarios lists the uses identified and registered for this substance with the indication of the Exposure Scenario(s) that is relevant to each identified use.

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## Annex

### Exposure Scenarios

The following table lists the uses identified and registered for this substance. Each use has a number of applicable human health, environmental and consumer exposure scenarios. These can be found at [www.borax.com/EU-REACH/exposure-scenarios](http://www.borax.com/EU-REACH/exposure-scenarios)

IU-Number	Identified Use	Setting (industrial/professional worker/consumer)	Life cycle stage					Sector of use category (SU)	Chemical Product Category (PC)	Process Category (PROC)	Article Category (AC)	Environmental release category (ERC)	Exposure Scenario Title
			Manufacture	Formulation	End Use	Consumer	Service Life (for articles)						
1	Manufacture of zinc borate	Industrial	X					8	0 (flame retardant), 12, 19, 21	1, 2, 3, 8a, 8b, 15	-	1	ES1 Manufacture of zinc borate
2	Formulation of zinc borate into mixtures or materials	Industrial and professional			X			3, 6, 8, 10, 11, 12, 13, 14, 16, 19, 22	1, 9a, 32	1, 2, 3, 4, 5, 6, 8a, 8b, 9, 12, 14, 21, 24	1, 2, 4, 7, 8, 10, 11, 13	2, 3	ES2 Formulation of zinc borate into mixtures or materials
3	Industrial use of zinc borate formulations containing zinc borate	Industrial and professional				X		3, 10, 19, 21, 22	1, 9a, 32	5, 7, 8a, 10, 11, 13, 19	1, 2, 4, 7, 8, 11, 13	4, 5, 6, 7	ES3 Industrial use of zinc borate formulations containing zinc borate
4	Use of fertilizers containing zinc borate	Professional			X			1, 22	12	5, 8b	-	8e, 8f	ES4 Use of fertilizers containing zinc borate
5	Zinc borate in plastics during service life	Consumer				X		-	-	-	-	10, 11a	ES5 Zinc borate in plastics during service life
6	Use of zinc borate in lubricants in cars	Consumer				X		-	-	-	-	9b	ES6 Use of zinc borate in lubricants in cars
7	Consumer use of formulated products and materials containing zinc borate	Consumer				X		-	1, 9a, 32	-	1, 2, 4, 7, 8, 11, 13	6	ES7 Consumer use of formulated products and materials containing zinc borate