SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name: Boric oxide
Chemical name: Diboron trioxide
Index number: 005-008-00-8
EC number: 215-125-8

REACH Registration number

<table>
<thead>
<tr>
<th>Registration number</th>
<th>Legal entity</th>
</tr>
</thead>
<tbody>
<tr>
<td>01-2119486655-24-0018</td>
<td>Rio Tinto Iron &amp; Titanium GmbH (5)</td>
</tr>
</tbody>
</table>

CAS number: 1303-86-2
Product type: Solid.
Other means of identification: Boric oxide, Boron trioxide, Anhydrous boric acid

1.2 Relevant identified uses of the substance or mixture and uses advised against

Material uses: Refer to the table "Identified uses" below.

<table>
<thead>
<tr>
<th>Identified uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Binding agent</td>
</tr>
<tr>
<td>Chemical production</td>
</tr>
<tr>
<td>Flame retardants</td>
</tr>
<tr>
<td>Flux agents for casting</td>
</tr>
<tr>
<td>Intermediate</td>
</tr>
<tr>
<td>Laboratory chemicals</td>
</tr>
<tr>
<td>Oxidising agents</td>
</tr>
<tr>
<td>Plating agents and metal surface treating agents</td>
</tr>
<tr>
<td>Process regulator (other than polymerisation or vulcanization processes)</td>
</tr>
</tbody>
</table>

A complete list of uses is provided in the introduction to Annex - Exposure Scenarios

<table>
<thead>
<tr>
<th>Uses advised against</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consumer uses above the specific concentration limit.</td>
</tr>
</tbody>
</table>

Reason: Annex XVII - Restrictions on the manufacture, placing on the market and use of certain dangerous substances, mixtures and articles

1.3 Details of the supplier of the safety data sheet

Borax Europe Limited
6 St. James's Square
London, SW1Y 4AD
United Kingdom

+44 (0)20 7781 2000

e-mail address of person responsible for this SDS: rtb.sds@riotinto.com

Date of issue/Date of revision: 18/07/2018
Version: 1/16

**Boric oxide**

### SECTION 1: Identification of the substance/mixture and of the company/undertaking

**1.4 Emergency telephone number**

Telephone number: +44 (0) 1235 239 670 (Rio Tinto Borates)

For advice on chemical emergencies, spillages, fires or First Aid.

### SECTION 2: Hazards identification

#### 2.1 Classification of the substance or mixture

**Product definition**: Mono-constituent substance

**Classification according to Regulation (EC) No. 1272/2008 [CLP/GHS]**

Repr. 1B, H360FD (Fertility and Unborn child)

Boric oxide has a specific concentration limit of ≥ 3.1% for toxic for reproduction classification.

The product is classified as hazardous according to Regulation (EC) 1272/2008 as amended. See Section 16 for the full text of the H statements declared above. See Section 11 for more detailed information on health effects and symptoms.

#### 2.2 Label elements

**Hazard pictograms**: ![Signal word](image)

**Signal word**: Danger

**Hazard statements**: May damage fertility. May damage the unborn child.

**Precautionary statements**

**General**: Do not handle until all safety precautions have been read and understood.

**Prevention**: Use personal protective equipment as required.

**Response**: IF exposed or concerned: Get medical attention.

**Storage**: Not applicable.

**Disposal**: Dispose of contents and container in accordance with all local, regional, national and international regulations.

**Hazardous ingredients**: diboron trioxide

**Supplemental label elements**: Restricted to professional users.

**Annex XVII - Restrictions on the manufacture, placing on the market and use of certain dangerous substances, mixtures and articles**

Restricted to professional users. The product is permitted for use in consumer products where it is below the specific concentration limit.

**Special packaging requirements**

**Containers to be fitted with child-resistant fastenings**: Not applicable.

**Tactile warning of danger**: Not applicable.

#### 2.3 Other hazards

Date of issue/Date of revision: 18/07/2018

Version: 1
SECTION 2: Hazards identification

- Substance meets the criteria for PBT according to Regulation (EC) No. 1907/2006, Annex XIII: Not applicable.
- Substance meets the criteria for vPvB according to Regulation (EC) No. 1907/2006, Annex XIII: Not applicable.
- Other hazards which do not result in classification: May be harmful if swallowed.

SECTION 3: Composition/information on ingredients

3.1 Substances: Mono-constituent substance

<table>
<thead>
<tr>
<th>Product/ingredient name</th>
<th>Identifiers</th>
<th>%</th>
<th>Regulation (EC) No. 1272/2008 [CLP]</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>diboron trioxide</td>
<td>REACH #: 01-2119486655-24, EC: 215-125-8, CAS: 1303-86-2, Index: 005-008-00-8</td>
<td>&gt;97.5</td>
<td>Repr. 1B, H360FD (Fertility and Unborn child)</td>
<td>[A]</td>
</tr>
</tbody>
</table>

There are no additional ingredients present which, within the current knowledge of the supplier, are classified and contribute to the classification of the substance and hence require reporting in this section.

Type

[A] Constituent
[B] Impurity
[C] Stabilising additive

Occupational exposure limits, if available, are listed in Section 8.

SECTION 4: First aid measures

4.1 Description of first aid measures

- Eye contact: Use eye wash fountain or fresh water to cleanse the eye. If irritation persists for more than 30 minutes, seek medical attention.
- Inhalation: If symptoms such as nose or throat irritation are observed, remove to fresh air.
- 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.
- Protection of first-aiders: No special protective clothing is required

4.2 Most important symptoms and effects, both acute and delayed

Over-exposure signs/symptoms

- Eye contact: No known significant effects or critical hazards.
- Inhalation: No known significant effects or critical hazards.
- Skin contact: 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.
SECTION 4: First aid measures

Ingestion: 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.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician: 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.

Specific treatments: No specific treatment.

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media: Use an extinguishing agent suitable for the surrounding fire.

Unsuitable extinguishing media: None known.

5.2 Special hazards arising from the substance or mixture

Hazards from the substance or mixture: None. The product is not flammable, combustible or explosive.

Hazardous combustion products: None.

5.3 Advice for firefighters

Special protective actions for fire-fighters: None.

Special protective equipment for fire-fighters: Not applicable.

Additional information: Not explosive.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

For non-emergency personnel: Eye goggles and gloves are not required for normal industrial exposures, but eye protection according to CEN 166:2001, Respirators (CEN 149:2001) should be considered if environment is excessively dusty.

For emergency responders: Eye goggles and gloves are not required for normal industrial exposures, but eye protection according to CEN 166:2001, Respirators (CEN 149:2001) should be considered if environment is excessively dusty.
Boric oxide

SECTION 6: Accidental release measures

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

Small spill

Move containers from spill area. Vacuum or sweep up material and place in a designated, labelled waste container. Dispose of via a licensed waste disposal contractor.

Large spill

Move containers from spill area. Approach the release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Vacuum or sweep up material and place in a designated, labelled waste container. Dispose of via a licensed waste disposal contractor. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

6.4 Reference to other sections

See Section 1 for emergency contact information. See Section 8 for information on appropriate personal protective equipment. See Section 13 for additional waste treatment information.

SECTION 7: Handling and storage

The information in this section contains generic advice and guidance. The list of Identified Uses in Section 1 should be consulted for any available use-specific information provided in the Exposure Scenario(s).

7.1 Precautions for safe handling

Protective measures

Good housekeeping procedures should be followed to minimise dust generation and accumulation. Avoid spills.

Advice on general occupational hygiene

Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

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

7.3 Specific end use(s)

Recommendations

Refer to Annex - Exposure Scenarios

Industrial sector specific solutions

Not available.
SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Occupational exposure limits

The information in this section contains generic advice and guidance. The list of Identified Uses in Section 1 should be consulted for any available use-specific information provided in the Exposure Scenario(s).

<table>
<thead>
<tr>
<th>Product/ingredient name</th>
<th>Exposure limit values</th>
</tr>
</thead>
<tbody>
<tr>
<td>diboron trioxide</td>
<td>ACGIH TLV (United States, 3/2016). TWA: 10 mg/m³ 8 hours.</td>
</tr>
</tbody>
</table>

**Recommended monitoring procedures**: In the absence of a national OEL, Rio Tinto Borates recommends and applies internally an Occupational Exposure Limit (OEL) of 1 mg B/m³. To convert product into equivalent boron (B) content, multiply by 0.311.

**DNELs/DMELs**

<table>
<thead>
<tr>
<th>Product/ingredient name</th>
<th>Type</th>
<th>Exposure</th>
<th>Value</th>
<th>Population</th>
<th>Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>diboron trioxide</td>
<td>DNEL</td>
<td>Short term Oral</td>
<td>0.55 mg/kg bw/day</td>
<td>Consumers</td>
<td>Systemic</td>
</tr>
<tr>
<td></td>
<td>DNEL</td>
<td>Long term Oral</td>
<td>0.55 mg/kg bw/day</td>
<td>Consumers</td>
<td>Systemic</td>
</tr>
<tr>
<td></td>
<td>DNEL</td>
<td>Long term Inhalation</td>
<td>2.34 mg/m³</td>
<td>Consumers</td>
<td>Systemic</td>
</tr>
<tr>
<td></td>
<td>DNEL</td>
<td>Long term Inhalation</td>
<td>4.66 mg/m³</td>
<td>Consumers</td>
<td>Systemic</td>
</tr>
<tr>
<td></td>
<td>DNEL</td>
<td>Long term Dermal</td>
<td>220.6 mg/kg bw/day</td>
<td>Workers</td>
<td>Systemic</td>
</tr>
<tr>
<td></td>
<td>DNEL</td>
<td>Long term Dermal</td>
<td>110.3 mg/kg bw/day</td>
<td>Consumers</td>
<td>Systemic</td>
</tr>
</tbody>
</table>

**PNECs**

<table>
<thead>
<tr>
<th>Product/ingredient name</th>
<th>Compartment Detail</th>
<th>Value</th>
<th>Method Detail</th>
</tr>
</thead>
<tbody>
<tr>
<td>diboron trioxide</td>
<td>Fresh water</td>
<td>2.02 mg B/L</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Marine water</td>
<td>2.02 mg B/L</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Water - intermittent</td>
<td>13.7 mg B/L</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Air</td>
<td>No exposure expected</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Soil</td>
<td>5.4 mg B/kg dry soil</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Sediment</td>
<td>Waived due to lack of partitioning to sediment</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Sewage Treatment Plant</td>
<td>10 mg B/L</td>
<td>-</td>
</tr>
</tbody>
</table>

**8.2 Exposure controls**

**Appropriate engineering controls**: If user operations generate dust, fumes, gas, vapour or mist, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits.

**Individual protection measures**

**Hygiene measures**: Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.
**SECTION 8: Exposure controls/personal protection**

**Eye/face protection**: Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: safety glasses with side-shields. Eye protection according to CEN 166:2001 may be warranted if environment is excessively dusty.  

**Skin protection**

- **Hand protection**: Standard work gloves (cotton, canvas or leather) may be warranted if environment is excessively dusty.  
- **Body protection**: No special protective clothing is required.  
- **Other skin protection**: Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.  
- **Respiratory protection**: Where airborne concentrations are expected to exceed exposure limits, respirators should be used. (CEN 149:2001).  
- **Eye/face protection**: Respiratory protection:  
- **Respiratory protection**:  
- **Eye/face protection**: 

**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 an 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**

**Appearance**

- **Physical state**: Solid. [Crystalline solid.]  
- **Colour**: White.  
- **Odour**: Odourless.  
- **Odour threshold**: Not applicable.  
- **pH**: 5 [Conc. (% w/w): 1%]  
- **Melting point/freezing point**: >360°C  
- **Initial boiling point and boiling range**: Not applicable.  
- **Flash point**: Not applicable.  
- **Evaporation rate**: Not applicable.  
- **Flammability (solid, gas)**: The product is not flammable, combustible or explosive.  
- **Upper/lower flammability or explosive limits**: Not available.  
- **Vapour pressure**: Not applicable.  
- **Vapour density**: Not available.
Boric oxide

SECTION 9: Physical and chemical properties

Bulk density : Not available.
Granulometry : Not available.
Relative density : 1.84
Solubility(ies) : Not available.
Partition coefficient: n-octanol/water : -0.757
Auto-ignition temperature : Not applicable.
Decomposition temperature : Not applicable.
Viscosity : Dynamic (room temperature): Not applicable. Kinematic (room temperature): Not applicable.
Explosive properties : Not explosive.
Oxidising properties : Not oxidising.

9.2 Other information
Solubility in water : Not available.

SECTION 10: Stability and reactivity

10.1 Reactivity : No specific test data related to reactivity available for this product or its ingredients.
10.2 Chemical stability : Under normal ambient temperatures (-40°C to +40°C), the product is stable. Reaction with water results in the liberation of heat (75.94 KJ/mol).
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 : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity

<table>
<thead>
<tr>
<th>Product/ingredient name</th>
<th>Result type</th>
<th>Species</th>
<th>Dose</th>
<th>Exposure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diboron trioxide (based on boric acid)</td>
<td>LC50 Inhalation</td>
<td>Rat</td>
<td>&gt;2 mg/l</td>
<td>4 hours</td>
</tr>
<tr>
<td>Diboron trioxide (based on boric acid)</td>
<td>LD50 Dermal</td>
<td>Rabbit</td>
<td>2000 mg/kg body weight</td>
<td>-</td>
</tr>
<tr>
<td>Diboron trioxide (based on boric acid)</td>
<td>LD50 Oral</td>
<td>Rat</td>
<td>2000 to 5000 mg/kg body weight</td>
<td>-</td>
</tr>
</tbody>
</table>

Conclusion/Summary : Based on the available data, the classification criteria are not met.

Irritation/Corrosion

<table>
<thead>
<tr>
<th>Product/ingredient name</th>
<th>Result</th>
<th>Species</th>
<th>Score</th>
<th>Exposure</th>
<th>Observation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diboron trioxide</td>
<td>Skin - Primary dermal irritation index (PDII)</td>
<td>New Zealand White Rabbit</td>
<td>0.1</td>
<td>0.5 g moistened with saline</td>
<td>-</td>
</tr>
<tr>
<td>Diboron trioxide</td>
<td>Eyes - Cornea opacity</td>
<td>New Zealand White Rabbit</td>
<td>&lt;1</td>
<td>0.1 g</td>
<td>-</td>
</tr>
</tbody>
</table>

Date of issue/Date of revision : 18/07/2018
**SECTION 11: Toxicological information**

### Carcinogenicity

<table>
<thead>
<tr>
<th>Product/ingredient name</th>
<th>Route of exposure</th>
<th>Species</th>
<th>Dose</th>
<th>Exposure</th>
</tr>
</thead>
<tbody>
<tr>
<td>boric acid</td>
<td>Oral - TC</td>
<td>Mouse</td>
<td>446 to 1150 mg/kg bw /day (mg Boric acid / kg body weight / day)</td>
<td>Oral feeding study</td>
</tr>
</tbody>
</table>

**Conclusion/Summary**: No evidence of carcinogenicity in mice. Based on the available data, the classification criteria are not met.

### Mutagenicity

<table>
<thead>
<tr>
<th>Product/ingredient name</th>
<th>Test</th>
<th>Experiment</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>diboron trioxide</td>
<td>(based on boric acid)</td>
<td>Experiment: In vitro Subject: Mammalian-Animal Cell: Germ</td>
<td>Negative</td>
</tr>
</tbody>
</table>

**Conclusion/Summary**: Not mutagenic (based on boric acid). Based on the available data, the classification criteria are not met.

### Sensitisation

<table>
<thead>
<tr>
<th>Product/ingredient name</th>
<th>Route of exposure</th>
<th>Species</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>diboron trioxide</td>
<td>skin</td>
<td>Guinea pig</td>
<td>Not sensitizing</td>
</tr>
</tbody>
</table>

**Conclusion/Summary**: Not a skin sensitiser. Based on the available data, the classification criteria are not met.

### Reproductive toxicity

<table>
<thead>
<tr>
<th>Product/ingredient name</th>
<th>Maternal toxicity</th>
<th>Fertility effects</th>
<th>Developmental effects</th>
<th>Species</th>
<th>Effects</th>
<th>Exposure</th>
</tr>
</thead>
<tbody>
<tr>
<td>boric acid</td>
<td>Positive</td>
<td>Negative</td>
<td>Negative</td>
<td>Rat</td>
<td>NOAEL in rats for effects on fertility in males is 17.5 mg B/kg body weight. 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. Epidemiological studies of human developmental effects have shown an absence of effects in exposed borate workers and</td>
<td>Oral feeding study</td>
</tr>
</tbody>
</table>
Boric oxide

SECTION 11: Toxicological information

Potential acute health effects

Inhalation

No known significant effects or critical hazards.

Skin contact

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.

Conclusion/Summary

Teratogenicity

Conclusion/Summary: See Reproductive toxicity.

Specific target organ toxicity (single exposure)

Based on the available data, the classification criteria are not met.

Specific target organ toxicity (repeated exposure)

Based on the available data, the classification criteria are not met.

Aspiration hazard

Product/ingredient name | Result
--- | ---
Diboron trioxide | Physical form of solid powder indicates no aspiration hazard potential.

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.**
SECTION 11: Toxicological information

Ingestion: This product is not intended for ingestion. Small amounts (e.g., a teaspoon) swallowed accidentally are not likely to cause effects; swallowing amounts larger than that may cause gastrointestinal symptoms. 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.

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact: No known significant effects or critical hazards.

Inhalation: No known significant effects or critical hazards.

Skin contact: 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.

Ingestion: 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.

Potential chronic health effects

<table>
<thead>
<tr>
<th>Product/ingredient name</th>
<th>Result</th>
<th>Species</th>
<th>Exposure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diboron trioxide</td>
<td>Chronic NOAEL Oral</td>
<td>Rat</td>
<td>Oral feeding study</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>17.5 mg/kg 0; 33 (5.9); 100 (17.5); 334 (58.5) mg boric acid (B)/kg bw per day (nominal in diet); and 0; 52 (5.9); 155 (17.5); 516 (58.5) mg borax (B)/kg/day (nominal in diet)</td>
</tr>
</tbody>
</table>

Conclusion/Summary: A NOAEL of 17.5 mg B/kg body weight/day equivalent to 100 mg boric acid/kg body weight/day was determined in a chronic feeding study (2 years) in rats and is based on testes effects.

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.

General: No known significant effects or critical hazards.

Carcinogenicity: No known significant effects or critical hazards.

Mutagenicity: No known significant effects or critical hazards.

Teratogenicity: May damage the unborn child.
**SECTION 11: Toxicological information**

**Developmental effects**: May damage the unborn child.

**Fertility effects**: May damage fertility.

**Toxicokinetics**

**Absorption**: Absorption of borates via the oral route is nearly 100 %. For the inhalation route also 100 % absorption is assumed as worst case scenario. Dermal absorption through intact skin is very low with a percent dose absorbed of < 0.5 %.

**Distribution**: Boric acid is distributed rapidly and evenly through the body, with concentrations in bone 2 - 3 higher than in other tissues.

**Metabolism**: In the blood boric acid is the main species present and is not further metabolised.

**Elimination**: Boric acid is excreted rapidly, with elimination half-lives of 1 h in the mouse, 3 h in the rat and < 27.8 h in humans, and has low potential for accumulation. Boric acid is mainly excreted in the urine.

**Other information**: Not available.

**SECTION 12: Ecological information**

### 12.1 Toxicity

<table>
<thead>
<tr>
<th>Product/ingredient name</th>
<th>Test</th>
<th>Result</th>
<th>Species</th>
<th>Exposure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diboron trioxide</td>
<td>Algae</td>
<td>EC50 52.4 mg/l (as Boron)</td>
<td>Pseudokirchneriella subcapitata</td>
<td>Fresh water - Acute</td>
</tr>
<tr>
<td></td>
<td>Invertebrate</td>
<td>LC50 91 mg/l (as Boron)</td>
<td>Ceriodaphnia dubia</td>
<td>Fresh water - Acute</td>
</tr>
<tr>
<td></td>
<td>Fish.</td>
<td>LC50 79.7 mg/l (as Boron)</td>
<td>Pimephales promelas</td>
<td>Fresh water - Acute</td>
</tr>
<tr>
<td></td>
<td>Fish.</td>
<td>NOEC 6.4 mg/l (as Boron)</td>
<td>Brachydanio rerio</td>
<td>Fresh water - Chronic</td>
</tr>
<tr>
<td></td>
<td>Invertebrate</td>
<td>NOEC 14.2 mg/l (as Boron)</td>
<td>Daphnia magna</td>
<td>Fresh water - Chronic</td>
</tr>
<tr>
<td></td>
<td>Algae</td>
<td>NOEC 17.5 mg/l (as Boron)</td>
<td>Pseudokirchneriella subcapitata</td>
<td>Fresh water - Chronic</td>
</tr>
</tbody>
</table>

**Conclusion/Summary**: Note that the data values are expressed as boron equivalents. To convert product into equivalent boron (B) content, multiply by 0.311. Studies judged to be unreliable or with insufficient information to evaluate are not included.

Boron is an essential micronutrient for healthy growth of plants; however, it can be harmful to boron sensitive plants in high quantities. Care should be taken to minimize the amount of this product released to the environment.

### 12.2 Persistence and degradability

**Conclusion/Summary**: Not applicable. Inorganic substance

### 12.3 Bioaccumulative potential

<table>
<thead>
<tr>
<th>Product/ingredient name</th>
<th>LogP&lt;sub&gt;ow&lt;/sub&gt;</th>
<th>BCF</th>
<th>Potential</th>
</tr>
</thead>
<tbody>
<tr>
<td>diboron trioxide</td>
<td>-0.757</td>
<td>-</td>
<td>low</td>
</tr>
</tbody>
</table>

### 12.4 Mobility in soil

**Soil/water partition coefficient (K<sub>oc</sub>)**: Not available.

**Mobility**: The product is soluble in water and is leachable through normal soil. Adsorption to soils or sediments is insignificant.

### 12.5 Results of PBT and vPvB assessment

**PBT**: Not applicable.
Boric oxide

SECTION 12: Ecological information

vPvB : Not applicable.

12.6 Other adverse effects : No known significant effects or critical hazards.

SECTION 13: Disposal considerations

The information in this section contains generic advice and guidance. The list of Identified Uses in Section 1 should be consulted for any available use-specific information provided in the Exposure Scenario(s).

13.1 Waste treatment methods

Product

Methods of disposal : The generation of waste should be avoided or minimised wherever possible. Significant quantities of waste product residues should not be disposed of via the foul sewer but processed in a suitable effluent treatment plant. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements.

Hazardous waste : Yes. This product is classified as toxic to reproduction (Repr. 1B) and falls within scope of Directive 2008/98/EC as hazardous waste (H10).

Packaging

Methods of disposal : The generation of waste should be avoided or minimised wherever possible. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible.

Special precautions : Care should be taken when handling emptied containers that have not been cleaned or rinsed out.

SECTION 14: Transport information

<table>
<thead>
<tr>
<th>ADR/RID</th>
<th>ADN</th>
<th>IMDG</th>
<th>IATA</th>
</tr>
</thead>
<tbody>
<tr>
<td>14.2 UN proper shipping name</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>14.3 Transport hazard class(es)</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>14.4 Packing group</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>14.5 Environmental hazards</td>
<td>No.</td>
<td>No.</td>
<td>No.</td>
</tr>
</tbody>
</table>

14.6 Special precautions for user : Not applicable.

14.7 Transport in bulk according to Annex II of Marpol and the IBC Code : Not available.
SECTION 15: Regulatory information

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

EU Regulation (EC) No. 1907/2006 (REACH)

Annex XIV - List of substances subject to authorisation

Annex XIV

None of the components are listed.

Substances of very high concern

<table>
<thead>
<tr>
<th>Ingredient name</th>
<th>Intrinsic property</th>
<th>Status</th>
<th>Reference number</th>
<th>Date of revision</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diboron trioxide</td>
<td>Toxic to reproduction</td>
<td>Candidate</td>
<td>ED/87/2012</td>
<td>6/18/2012</td>
</tr>
</tbody>
</table>

Annex XVII - Restrictions on the manufacture, placing on the market and use of certain dangerous substances, mixtures and articles

Restricted to professional users. The product is permitted for use in consumer products where it is below the specific concentration limit.

Other EU regulations

Industrial emissions (integrated pollution prevention and control) - Air
Not listed

Industrial emissions (integrated pollution prevention and control) - Water
Not listed

Ozone depleting substances (1005/2009/EU)
Not listed.

Prior Informed Consent (PIC) (649/2012/EU)
Not listed.

Seveso Directive
This product is not controlled under the Seveso Directive.

International regulations

Chemical Weapon Convention List Schedules I, II & III Chemicals
Not listed.

Montreal Protocol (Annexes A, B, C, E)
Not listed.

Stockholm Convention on Persistent Organic Pollutants
Not listed.

Rotterdam Convention on Prior Informed Consent (PIC)
Not listed.

UNECE Aarhus Protocol on POPs and Heavy Metals
Not listed.

Inventory list

Australia : All components are listed or exempted.
Canada : All components are listed or exempted.
China : All components are listed or exempted.
Europe : All components are listed or exempted.
**Boric oxide**

**SECTION 15: Regulatory information**

<table>
<thead>
<tr>
<th>Country</th>
<th>Japan inventory (ENCS): All components are listed or exempted. Japan inventory (ISHL): All components are listed or exempted.</th>
<th>Malaysia</th>
<th>New Zealand</th>
<th>Philippines</th>
<th>Republic of Korea</th>
<th>Taiwan</th>
<th>Thailand</th>
<th>Turkey</th>
<th>United States</th>
<th>Viet Nam</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Complete.</td>
<td>Not determined.</td>
<td>All components are listed or exempted.</td>
<td>All components are listed or exempted.</td>
<td>All components are listed or exempted.</td>
<td>All components are listed or exempted.</td>
<td>Not determined.</td>
<td>All components are listed or exempted.</td>
<td>All components are listed or exempted.</td>
<td>Not determined.</td>
</tr>
</tbody>
</table>

**SECTION 16: Other information**

**Abbreviations and acronyms**

- ATE = Acute Toxicity Estimate
- CLP = Classification, Labelling and Packaging Regulation [Regulation (EC) No. 1272/2008]
- DMEL = Derived Minimal Effect Level
- DNEL = Derived No Effect Level
- EUH statement = CLP-specific Hazard statement
- IMSBC = International Maritime Solid Bulk Cargoes Code
- PBT = Persistent, Bioaccumulative and Toxic
- PNEC = Predicted No Effect Concentration
- RRN = REACH Registration Number
- vPvB = Very Persistent and Very Bioaccumulative

**Key literature references and sources for data**


**Procedure used to derive the classification according to Regulation (EC) No. 1272/2008 [CLP/GHS]**

<table>
<thead>
<tr>
<th>Classification</th>
<th>Justification</th>
</tr>
</thead>
<tbody>
<tr>
<td>H360FD</td>
<td>May damage fertility. May damage the unborn child.</td>
</tr>
</tbody>
</table>

**Full text of abbreviations H statements**

<table>
<thead>
<tr>
<th>Classification</th>
<th>Justification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Repr. 1B, H360FD</td>
<td>REPRODUCTIVE TOXICITY (Fertility and Unborn child) - Category 1B</td>
</tr>
</tbody>
</table>

**Additional information**

- Restricted to professional users.
- Do not ingest.
- Keep out of reach of children.
- Refer to safety data sheet.
- Not for use in food or drugs.

**Date of issue/ Date of revision**

<table>
<thead>
<tr>
<th>Date of issue/ Date of revision</th>
</tr>
</thead>
<tbody>
<tr>
<td>18/07/2018</td>
</tr>
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</table>

**Date of previous issue**

<table>
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<th>Date of previous issue</th>
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<tbody>
<tr>
<td>No previous validation</td>
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</table>

**Version**

<table>
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<th>Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
</tr>
</tbody>
</table>

**Europe** / 4.9 / EN-GB
SECTION 16: Other information

Notice to reader
To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.
Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

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
<table>
<thead>
<tr>
<th>IU number</th>
<th>Sector</th>
<th>Identified Use</th>
<th>Life cycle stage</th>
<th>Sector of use category (SU)</th>
<th>Chemical Product Category (PC)</th>
<th>Process category (PROC)</th>
<th>Article category (AC)</th>
<th>Environmental release category (ERC)</th>
<th>Exposure Scenario</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Production and Import</td>
<td>Production and Import</td>
<td>X</td>
<td>3, 8, 9</td>
<td>1, 7, 8, 9a, 9b, 12, 14, 15, 17, 18, 19, 20, 21, 23, 24, 25, 26, 29, 30, 32, 37, 38, 39</td>
<td>1, 2, 3, 4, 8a, 8b, 9, 14, 15</td>
<td>-</td>
<td>1, 6a</td>
<td>E1 - Importing, manufacture, refining and packaging of borates</td>
</tr>
<tr>
<td>2</td>
<td>Abrasives</td>
<td>Formulation of borates in abrasives</td>
<td>X</td>
<td>3</td>
<td>UCN S351000</td>
<td>3, 4, 5, 8b, 9</td>
<td>4</td>
<td>3</td>
<td>E8 - Generic formulation of borates into materials</td>
</tr>
<tr>
<td>3</td>
<td>Abrasives</td>
<td>Industrial use of abrasives</td>
<td>X</td>
<td>3, 15, 17</td>
<td>UCN S351000</td>
<td>24</td>
<td>4</td>
<td>4</td>
<td>E9 - Generic industrial use of borates as processing aids in processes and products</td>
</tr>
<tr>
<td>4</td>
<td>Abrasives</td>
<td>Professional use of abrasives</td>
<td>X</td>
<td>X</td>
<td>22</td>
<td>UCN S351000</td>
<td>24</td>
<td>4</td>
<td>10b, 11b</td>
</tr>
<tr>
<td>5</td>
<td>Abrasives</td>
<td>Consumer use of abrasives</td>
<td>X</td>
<td>X</td>
<td>21</td>
<td>UCN S351000</td>
<td>-</td>
<td>4</td>
<td>10b, 11b</td>
</tr>
</tbody>
</table>

**Environment**
- ES3 - Refining and processing of borates
- ES14 - Loading of road tankers
- ES15 - Off-loading borates from ships
- ES19 - Packaging into bags (25-50kg)
- ES20 - Packaging into big bags (750-1500kg)
- ES21 - General maintenance activities
- ES32 - Working in a laboratory
- ES41 - Working in a warehouse

**Human Health**
- ES2 - Closed or largely closed production at high temperatures
- ES7 - Discharging bags (25-50 kg) into mixing vessels
- ES8 - Discharging big bags (750-1500 kg) into mixing vessels
- ES18 - Transfer of substances or preparations from/to large vessels/containers at dedicated facilities
- ES21 - General maintenance activities
- ES22 - Transfer of substances into small containers
- ES31 - Compaction and tabletting of borate-containing powders
- ES32 - Working in a laboratory
- ES39 - Industrial and professional use of abrasives
- ES39 - Industrial and professional use of abrasives
- ESC5 - Consumer exposure for the use of cutting wheels
<table>
<thead>
<tr>
<th>IU number</th>
<th>Sector</th>
<th>Identified Use</th>
<th>Life cycle stage</th>
<th>Sector of use category (SU)</th>
<th>Chemical Product Category (PC)</th>
<th>Process category (PROC)</th>
<th>Article category (AC)</th>
<th>Environmental release category (ERC)</th>
<th>Exposure Scenario</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>Analytical reagent</td>
<td>Formulation into analytical reagents</td>
<td>Manufacture</td>
<td>X</td>
<td>3</td>
<td>21</td>
<td>2, 3, 4, 5, 8b, 9, 15, 19</td>
<td>-</td>
<td>2</td>
</tr>
<tr>
<td>13</td>
<td>Analytical reagent</td>
<td>Laboratory use of analytical reagent</td>
<td>Manufacture</td>
<td>X</td>
<td>3, 22</td>
<td>21</td>
<td>15</td>
<td>-</td>
<td>8a, b, d, e</td>
</tr>
<tr>
<td>15</td>
<td>Catalysts</td>
<td>Manufacture of catalysts</td>
<td>Manufacture</td>
<td>X</td>
<td>X</td>
<td>UC P15500</td>
<td>3, 4, 5, 8b</td>
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<td>1, 3, 6a, 6b</td>
</tr>
<tr>
<td>IU number</td>
<td>Sector</td>
<td>Identified Use</td>
<td>Life cycle stage</td>
<td>Sector of use category (SU)</td>
<td>Chemical Product Category (PC)</td>
<td>Process category (PROC)</td>
<td>Article category (AC)</td>
<td>Environmental release category (ERC)</td>
<td>Exposure Scenario</td>
</tr>
<tr>
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<td>-----------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>20</td>
<td>Ceramics</td>
<td>Production of frits</td>
<td>X</td>
<td>X</td>
<td>3, 13, NACE 23.1</td>
<td>19</td>
<td>1, 2, 3, 8b, 22</td>
<td>4</td>
<td>2, 5, 6a</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ES16 - Closed production at ambient temperatures</td>
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<tr>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>ES18 - Transfer of substances or preparations from/to large vessels/containers at dedicated facilities</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ES21 - General maintenance activities</td>
</tr>
<tr>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ES32 - Working in a laboratory</td>
</tr>
<tr>
<td>21</td>
<td>Chemical synthesis</td>
<td>Manufacture of new chemicals using borates</td>
<td>X</td>
<td></td>
<td>3, 8, 9</td>
<td>19</td>
<td>2, 3, 4, 5, 8b, 9, 13, 15, 19, 21</td>
<td>-</td>
<td>1, 6a</td>
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<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ES8 - Discharging big bags (750 – 1500 kg) into mixing vessels</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td>ES16 - Closed production at ambient temperatures</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ES18 - Transfer of substances or preparations from/to large vessels/containers at dedicated facilities</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ES21 - General maintenance activities</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ES22 - Transfer of substances into small containers</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ES31 - Compaction and tabletting of borate-containing powders</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ES32 - Working in a laboratory</td>
</tr>
<tr>
<td>IU number</td>
<td>Sector</td>
<td>Identified Use</td>
<td>Life cycle stage</td>
<td>Sector of use category (SU)</td>
<td>Chemical Product Category (PC)</td>
<td>Process category (PROC)</td>
<td>Article category (AC)</td>
<td>Environmental release category (ERC)</td>
<td>Exposure Scenario</td>
</tr>
<tr>
<td>-----------</td>
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<td>---------------------</td>
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<td>--------------------</td>
</tr>
<tr>
<td>22</td>
<td>Coatings</td>
<td>Formulation of paints and coatings</td>
<td>X</td>
<td>3, 7, 8, 10</td>
<td>9a, 18</td>
<td>1, 2, 3, 4, 8a, 8b, 9, 15</td>
<td>--</td>
<td>2</td>
<td>E6 - Formulation of borates into paints and coatings</td>
</tr>
<tr>
<td>23</td>
<td>Coatings</td>
<td>Industrial use of paints and coatings</td>
<td>X</td>
<td>3, 7</td>
<td>9a, 18</td>
<td>7, 8b, 9, 10, 13</td>
<td>-</td>
<td>5</td>
<td>E13 - Industrial use of paints and coatings containing borate compounds</td>
</tr>
<tr>
<td>24</td>
<td>Coatings</td>
<td>Professional use of paints and coatings</td>
<td>X</td>
<td>22</td>
<td>9a, 18</td>
<td>5, 8a, 8b, 9, 10, 11, 13, 19</td>
<td>8c, 8f</td>
<td>E25 - Wide dispersive use of paints and coatings containing borates</td>
<td></td>
</tr>
<tr>
<td>34</td>
<td>Glass</td>
<td>Production of high alkali glass</td>
<td>X</td>
<td>3, 13, NACE 23.1</td>
<td>19</td>
<td>1, 2, 3, 8b, 22</td>
<td>4</td>
<td>2, 5, 6a</td>
<td>E15 - Industrial use of borates during the manufacture of high alkali glass</td>
</tr>
</tbody>
</table>

**Exposure Scenario**

- **ES7** - Discharging bags (25-50 kg) into mixing vessels
- **ES8** - Discharging big bags (750 – 1500kg) into mixing vessels
- **ES16** - Closed production at ambient temperatures
- **ES18** - Transfer of substances or preparations from/to large vessels/containers at dedicated facilities
- **ES21** - General maintenance activities
- **ES22** - Transfer of substances into small containers
- **ES31** - Compaction and tableting of borate-containing powders
- **ES32** - Working in a laboratory

**Environment**

- ES11 - Industrial use of paints and coatings.
<table>
<thead>
<tr>
<th>IU number</th>
<th>Sector</th>
<th>Identified Use</th>
<th>Life cycle stage</th>
<th>Sector of use category (SU)</th>
<th>Chemical Product Category (PC)</th>
<th>Process category (PROC)</th>
<th>Article category (AC)</th>
<th>Environmental release category (ERC)</th>
<th>Exposure Scenario</th>
</tr>
</thead>
<tbody>
<tr>
<td>35</td>
<td>Glass</td>
<td>Production of low alkali glass</td>
<td>X</td>
<td>X</td>
<td>3, 13, NACE 23.1</td>
<td>19</td>
<td>4</td>
<td>2, 5, 6a</td>
<td>E16 - Industrial use of borates during the manufacture of low alkali glass</td>
</tr>
<tr>
<td>38</td>
<td>Industrial fluids</td>
<td>Consumer use of automotive fluids</td>
<td>X</td>
<td>21</td>
<td>4, 16, 24</td>
<td>-</td>
<td>-</td>
<td>9a, 9b</td>
<td>E27 - Generic wide dispersive use of articles containing borates with low release</td>
</tr>
<tr>
<td>39</td>
<td>Metallurgy</td>
<td>Formulation into alloys</td>
<td>X</td>
<td>X</td>
<td>3, 14</td>
<td>7, 19</td>
<td>8b, 22, 23, 24</td>
<td>1, 2</td>
<td>E2 - Generic industrial use of borates resulting in the manufacture of another substance</td>
</tr>
</tbody>
</table>

**Environment**
- **ES2** - Closed or largely closed production at high temperatures
- **ES16** - Closed production at ambient temperatures
- **ES18** - Transfer of substances or preparations from/to large vessels/containers at dedicated facilities
- **ES21** - General maintenance activities
- **ES32** - Working in a laboratory

**Human Health**
- **ES2** - Closed or largely closed production at high temperatures
- **ES7** - Discharging bags (25 - 50 kg) into mixing vessels
- **ES8** - Discharging big bags (750 – 1500kg) into mixing vessels
- **ES18** - Transfer of substances or preparations from/to large vessels/containers at dedicated facilities
- **ES21** - General maintenance activities
- **ES32** - Working in a laboratory
<table>
<thead>
<tr>
<th>IU number</th>
<th>Sector</th>
<th>Identified Use</th>
<th>Life cycle stage</th>
<th>Sector of use category (SU)</th>
<th>Chemical Product Category (PC)</th>
<th>Process category (PROC)</th>
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<th>Exposure Scenario</th>
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<tbody>
<tr>
<td>40</td>
<td>Metallurgy</td>
<td>Manufacture of flux mixtures and pastes</td>
<td>X X</td>
<td>3, 10, 13</td>
<td>3, 4, 5, 8b, 9, 14</td>
<td>-</td>
<td>2</td>
<td>E4 - Generic formulation of borates into mixtures</td>
<td>ES2: Closed or largely closed production at high temperatures ES7: Discharging bags (25-50 kg) into mixing vessels ES8: Discharging big bags (750-1500 kg) into mixing vessels ES16: Closed production activities at ambient temperatures ES18: Transfer of substances or preparations from/to large vessels/containers at dedicated facilities ES21: General maintenance activities ES22: Transfer of substances into small containers ES32: Working in a laboratory</td>
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<tr>
<td>41</td>
<td>Metallurgy</td>
<td>Industrial use of fluxes for (Precious) Metal smelting</td>
<td>X</td>
<td>3, 14</td>
<td>7, 19</td>
<td>22</td>
<td>7</td>
<td>6b</td>
<td>E2 - Generic industrial use of borates resulting in the manufacture of another substance</td>
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<tr>
<td>42</td>
<td>Metallurgy</td>
<td>Industrial use of flux pastes for coating brazing and welding rods</td>
<td>X</td>
<td>3, 10</td>
<td>38</td>
<td>14</td>
<td>7</td>
<td>5</td>
<td>E11 - Generic industrial use of borates resulting in inclusion into or onto a matrix</td>
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<tr>
<td>43</td>
<td>Metallurgy</td>
<td>Industrial/Professional Use of welding, brazing or soldering rods</td>
<td>X</td>
<td>3, 14, 15, 17, 19</td>
<td>38</td>
<td>13, 25, 26</td>
<td>-</td>
<td>4</td>
<td>E9 - Generic industrial use of borates as processing aids in processes and products</td>
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| 45       | Non Oxide Ceramics | Intermediate use in the production of non oxide ceramic powders              | X                | 8,9,13                      | 3,4                           | 8b, 22, 23, 24         | 4                   | 1, 2, 5, 6a, 6b                     | E2 - Generic industrial use of borates resulting in the manufacture of another substance  
E4 - Generic formulation of borates into mixtures  
E11 - Generic industrial use of borates resulting in inclusion into or onto a matrix  
ES2 - Closed or largely closed production at high temperatures  
ES8 - Discharging big bags (750 – 1500kg) into mixing vessels  
ES18 - Transfer of substances or preparations from/to large vessels/containers at dedicated facilities  
ES38 - Crushing grinding borate-containing powders |
| 46       | Nuclear applications | Industrial use of borates in closed nuclear system                          | X                | 23                          | 37                            | 1, 2, 8b              | -                   | 7                                 | E19 - Industrial use of borates in nuclear power plants with release to water  
E20 - Industrial use of borates in nuclear power plants without release to water  
ES7 - Discharging bags (25 -50 kg) into mixing vessels  
ES8 - Discharging big bags (750 – 1500kg) into mixing vessels  
ES16 - Closed production at ambient temperatures  
ES18 - Transfer of substances or preparations from/to large vessels/containers at dedicated facilities  
ES32 - Working in a laboratory |
| 54       | Refractories     | Formulation in refractory mixtures                                            | X                | 3, 15, 10                   | 0                             | 1, 2, 3, 4, 5, 8a, 9, 21, 22, 23, 24 | 4                   | 2, 3                             | E4 - Generic formulation of borates into mixtures  
E8 - Generic formulation of borates into materials  
ES7 - Discharging bags (25 -50 kg) into mixing vessels  
ES8 - Discharging big bags (750 – 1500kg) into mixing vessels  
ES13 - Preparing and applying refractory mixtures  
ES16 - Closed production at ambient temperatures  
ES18 - Transfer of substances or preparations from/to large vessels/containers at dedicated facilities  
ES21 - General maintenance activities  
ES31 - Compaction and tabletting of borate-containing powders  
ES32 - Transfer of substances into small containers  
ES32 - Working in a laboratory |
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<td>7, 14, 19</td>
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<td></td>
<td>5</td>
<td>ES13 - Preparing and applying refractory mixes</td>
</tr>
</tbody>
</table>

*Note: The IU number as well as the Exposure Scenarios numbering is correct. Even if the numbering might be inconsistent in some cases, this is not a mistake. There are no documents missing.*