EXPOSURE SCENARIO FOR COMMUNICATION

Metallurgy

Substance Information:

Substance	CAS Number	EC Number
Boric acid	10043-35-3	233-139-2
Boric oxide	1303-86-2	215-125-8
Disodium tetraborate	1330-43-4	215-540-4
Disodium octaborate	12008-41-2	234-541-0
Sodium metaborate	7775-19-1	231-891-6
Sodium pentaborate	12007-92-0	234-522-7
Dipotassium tetraborate	1332-77-0	215-575-5
Potassium pentaborate	11128-29-3	234-371-7

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Author: Chemservice S.A.

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0. General information

0.1 Qualitative assessment – Additional conditions and measures based on human health classification

The borates which are covered in this ES for communication are classified as follows:

Substance	CLP
Boric acid	Repro 1B (H360)
Boric oxide	Repro 1B (H360)
Disodium tetraborate	Repro 1B (H360) Eye Irrit 2 (H319)
Disodium octaborate	Repro 1B (H360)
Sodium metaborate	Repro 2 (H361) Eye Irrit 2 (H319)
Sodium pentaborate	Repro 2 (H361)
Dipotassium tetraborate	Repro 2 (H361)
Potassium pentaborate	Repro 2 (H361)

Hence, specific conditions of use (OCs and RMMs) should be implemented and PPE should be in place if the respective concentration is higher than the specific concentration limit (SCL) and exposure is expected.
The following measures are suggested to ensure that the risk attributed to the classification as toxic to reproduction (H360 and H361) is adequately controlled:

PPE

- Wear substance/task appropriate respirator;
- Wear substance/task appropriate gloves;
- Wear full skin coverage with appropriate barrier material;
- Wear chemical goggles.

General OCs and RMMs

- Ensure that any measure to eliminate exposure is considered;
- Ensure a very high level of containment, except for short term exposures e.g. taking samples;
- A closed system designed to allow for easy maintenance is assumed;
- (If possible) ensure equipment is kept under negative pressure;
- Assumes that staff is controlled upon entry to work area;
- Ensure all equipment well maintained;
- Assumes a permit to work for maintenance work;
- Assumes regular cleaning of equipment and work area;
- Ensure management/supervision in place to check that the RMMs in place are being used correctly and OCs followed;
- Ensure training for staff on good practice;
- Ensure procedures and training for emergency decontamination and disposal;
- Assumes a good standard of personal hygiene;
- Ensure that special instructions are obtained before use;
- Ensure that the substance is not handled until all safety precautions have been read and understood;
- Assumes medical advice/attention if exposed or concerned;
- Ensure that the substance is stored locked up.

Additionally, for **Disodium tetraborate** and **Sodium metaborate** which are classified as Eye Irritant 2 (H319), the following measures are suggested to ensure that the risk is adequately controlled:

- Assumes thorough washing after handling.
- Ensure that eyes are rinsed cautiously with water for several minutes if substance is the eyes. Also, ensure to remove contact lenses, if present and easy to do and continue rinsing afterwards;

- Assumes medical advice/attention if eye irritation persists.

0.2 Information regarding exposure assessment and Boron equivalent

Not all of the herein described identified uses are relevant for every substance indicated below. Please refer to the following overview table:

	Exposure Scenario (ES)												
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
Boric acid	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Boric oxide	✓	✓	✓	✓	✓	✓			✓		✓	✓	✓
Disodium tetraborate	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Disodium octaborate	✓	✓						✓		✓			
Sodium metaborate	✓	✓					✓						
Sodium pentaborate	✓	✓		✓	✓	✓	✓		✓		✓	✓	✓
Dipotassium tetraborate	✓	✓		✓	✓	✓	✓		✓		✓	✓	✓
Potassium pentaborate	✓	✓		✓	✓	✓	✓		✓		✓	✓	✓

For comparative purposes, exposures to borates are expressed in terms of boron (B) equivalents based on the fraction of boron in the source substance on a molecular weight basis. The exposure assessment is conducted on the basis of elemental Boron, hence all values indicated in the ES for communication are boron equivalents.

Table 1 Conversion factors of Boron equivalents

Substance		**Boron equivalent**
Boric acid (H_3BO_3)		0.1748
Boric oxide (B_2O_3)		0.311
Disodium tetraborate	anhydrous ($Na_2B_4O_7$)	0.2149
	pentahydrate ($Na_2B_4O_7$ * 5 H_2O)	0.1484
	decahydrate ($Na_2B_4O_7$ * 10 H_2O)	0.1134
Disodium octaborate	tetrahydrate ($Na_2B_8O_{13}$ * 4 H_2O)	0.2096
Sodium metaborate	anhydrous (NaBO2)	0.1643
	dehydrate (NaBO2 * 2 H_2O)	0.1062
	tetrahydrate (NaBO2 * 4 H_2O)	0.0784
Sodium pentaborate	anhydrous (NaB5O8)	0.2636
	pentahydrate (NaB5O8 * 5 H_2O)	0.1832
Dipotassium tetraborate	anhydrous ($K_2B_4O_7$)	0.185
	tetrahydrate ($K_2B_4O_7$ * 4 H_2O)	0.1415
Potassium pentaborate	anhydrous (B_2KO_8)	0.244
	tetrahydrate (B_2KO_8 * 4 H_2O)	0.1843

Environmental exposure assessment

When using a borate or boric acid the amount of boron indicated in the environmental exposure assessment, i.e. the “daily use amount per site”, the “annual amount per site”, can be recalculated using the respective conversion factor as indicated in the table above (Table 1). Also, the release rates should be recalculated based on the respective conversion factor.

Human health assessment (workers and/or consumers)

When using a borate or boric acid the concentration covered in the human health exposure assessment can be adapted using the respective conversion factor as indicated in the table above (Table 1).

1. ES 1: Formulation or re-packing; Other (PC 0)

1.1. Use descriptors

ES name: *Formulation into mixture*
Product category: *Other (PC 0)*

Environment		SPERC
1: *Formulation into mixture*	ERC 2	*Eurometaux SPERC 2.2b.v2.1*
Worker		SWED
2: *Off-loading of borates from ships*	PROC 8a	
3: *Attach/detach loading chute to/from road tanker*	PROC 8b	
4: *Closed transfer of borate from road tankers to large vessels or containers (e.g. silos) at site*	PROC 1	
5: *Transfer to silos or via trucks to warehouses*	PROC 8a	
6: *Storage of borates - indoor*	PROC 2	
7: *Storage of borates - outdoor*	PROC 2	
8: *Transfer of borates to mixing vessel with no dedicated engineering controls in place for reducing the exposure*	PROC 8a	
9: *Weighing of borates prior to discharge into mixing vessel*	PROC 9	
10: *Mixing in closed or largely closed production processes at high temperature*	PROC 2	
11: *Mixing*	PROC 3	
12: *Packaging of substances into small containers (including packing and unpacking) - liquid*	PROC 9	
13: *Packaging of substances into small containers (including packing and unpacking) - paste*	PROC 9	
14: *Maintenance & routine cleaning - solid*	PROC 28	
15: *Maintenance & routine cleaning - liquid*	PROC 28	
16: *Taking samples (< 1kg/sample)*	PROC 9	
17: *Laboratory work including weighing and quality control processes*	PROC 15	

1.2. Conditions of use affecting exposure

1.2.1. Control of environmental exposure: *Formulation into mixture* (ERC 2)

Amount used, frequency and duration of use (or from service life)
Daily amount per site ≤ 66.66 tonnes/day
Annual amount per site ≤ 10000 tonnes/year
Technical and organisational conditions and measures
Electrostatic precipitators or wet electrostatic precipitators or cyclones or fabric/bag filter or ceramic/metal mesh filter
Chemical precipitation or sedimentation or filtration or electrolysis or reverse osmosis or ion exchange
Conditions and measures related to biological sewage treatment plant
Municipal sewage treatment plant is assumed.
Assumed domestic sewage treatment plant flow ≥ 2000 m³/day
Conditions and measures related to external treatment of waste (including article waste)
Dispose of waste product or used containers according to local regulations.

1.2.2. Control of worker exposure: *Off-loading of borates from ships* (PROC 8a)

Product (article) characteristics
Covers the use of solid material such as powders and dust consisting of relatively coarse particles with a moderate potential to become (and stay) airborne.
Powders, granules or pelletised material
Covers the use of coarse dust materials.
Covers dry product with <5 % moisture content.
Covers the use of a material containing up to 90 % of the substance.
Amount used (or contained in articles), frequency and duration of use/exposure
Assumes that open trucks, waggons or ships are handled.
Covers use up to 8 h/day
Technical and organisational conditions and measures
Assumes that the process is mostly enclosed during standard operation.
Assumes that the process is highly automated. Very limited manual intervention is required to run. Contact with the substance may be possible for a very limited duration of time.
Assumes that there are no adjacent workplaces contributing to exposure of the substance.
Covers a far field emission source where the emission source is not located in the breathing zone of the worker (i.e. the emission source is further than 1 meter away in any direction of the workers head).
Covers the falling transfer of powders, granules or pelletised material.
Covers the transfer of >1000 kg/min.
Cover a drop height of > 0.5 m.
Assumes a partial personal enclosure which is ventilated. Also a positive pressure is assumed to be maintained inside the personal enclosure.
Conditions and measures related to personal protection, hygiene and health evaluation
Assumes occasional general cleaning operations at the workplace.
Effective housekeeping practices (e.g. daily cleaning using appropriate methods, preventive maintenance of machinery, use of protective clothing that will repel spills and reduce personal cloud) in place.
Wear standard safety clothing.
Other conditions affecting workers exposure
Outdoor use
Covers the outdoor application in completely open areas.
Covers the outdoor application where the worker is located further than 4 meters from the emission source

1.2.3. Control of worker exposure: *Attach/detach loading chute to/from road tanker* (PROC 8b)

Product (article) characteristics
Covers the use of solid material such as powders and dust consisting of relatively coarse particles with a moderate potential to become (and stay) airborne.
Covers concentrations up to 100 %
Powders, granules or pelletised material
Covers the use of coarse dust materials.
Covers dry product with <5 % moisture content.

Amount used (or contained in articles), frequency and duration of use/exposure
Assumes that open trucks, waggons or ships are handled.
Covers the use of up to 100 containers.
Covers use up to 2 h/day
Technical and organisational conditions and measures
Assumes that the process is completely enclosed for the vast majority of its duration. Very infrequent and controlled opening during operation may occur.
Assumes that the process is highly automated. Very limited manual intervention is required to run. Contact with the substance may be possible for a very limited duration of time.
Assumes that there are no adjacent workplaces contributing to exposure of the substance.
Coves the handling of contaminated solid objects or paste.
Covers the handling of objects with limited residual dust (thin layer visible).
Covers the normal handling, involves regular work procedures.
Covers handling that reduces contact between product and adjacent air.
Conditions and measures related to personal protection, hygiene and health evaluation
Assumes occasional general cleaning operations at the workplace.
Effective housekeeping practices (e.g. daily cleaning using appropriate methods, preventive maintenance of machinery, use of protective clothing that will repel spills and reduce personal cloud) in place.
Wear standard safety clothing.
Other conditions affecting workers exposure
Outdoor use
Covers the outdoor application close to buildings or in completely open areas.

1.2.4. Control of worker exposure: *Closed transfer of borate from road tankers to large vessels or containers (e.g. silos) at site* (PROC 1)

Product (article) characteristics
Covers the use of solid material such as powders and dust consisting of relatively coarse particles with a moderate potential to become (and stay) airborne.
Covers concentrations > 25 %.
Amount used (or contained in articles), frequency and duration of use/exposure
Covers use of > 4 h/day.
Technical and organisational conditions and measures
Assumes that the process is completely closed during standard operation.
Assumes that the process is fully automated. Workers are only involved in supervision and control walks. Direct contact with the substance is not possible.
Assumes that there are no adjacent workplaces contributing to exposure of the substance.
Covers an indoor use where a basic mechanical ventilation of at least 1 ACH is provided as well as an outdoor use.
Conditions and measures related to personal protection, hygiene and health evaluation
Assumes occasional general cleaning operations at the workplace.
Wear standard safety clothing.
Other conditions affecting workers exposure
Outdoor use

1.2.5. Control of worker exposure: *Transfer to silos or via trucks to warehouses* (PROC 8a)

Product (article) characteristics
Covers the use of solid material such as powders and dust consisting of relatively coarse particles with a moderate potential to become (and stay) airborne.
Powders, granules or pelletised material
Covers the use of coarse dust materials.
Covers dry product with <5 % moisture content.
Covers the use of a material containing up to 90 % of the substance.
Amount used (or contained in articles), frequency and duration of use/exposure
Assumes that open trucks, waggons or ships are handled.
Covers use up to 8 h/day
Technical and organisational conditions and measures
Assumes that the process is mostly enclosed during standard operation.
Assumes that the process is highly automated. Very limited manual intervention is required to run. Contact with the substance may be possible for a very limited duration of time.
Assumes that there are no adjacent workplaces contributing to exposure of the substance.
Covers a far field emission source where the emission source is not located in the breathing zone of the worker (i.e. the emission source is further than 1 meter away in any direction of the workers head).
Covers the falling transfer of powders, granules or pelletised material.
Covers the transfer of 100 to 1000 kg/min.
Cover a drop height of > 0.5 m.
Assumes a partial personal enclosure which is ventilated. Also a positive pressure is assumed to be maintained inside the personal enclosure.
Conditions and measures related to personal protection, hygiene and health evaluation
Assumes occasional general cleaning operations at the workplace.
Effective housekeeping practices (e.g. daily cleaning using appropriate methods, preventive maintenance of machinery, use of protective clothing that will repel spills and reduce personal cloud) in place.
Wear standard safety clothing.
Other conditions affecting workers exposure
Outdoor use
Covers the outdoor application close to buildings or in completely open areas.
Covers the outdoor application where the worker is located further than 4 meters from the emission source

1.2.6. Control of worker exposure: *Storage of borates - indoor* (PROC 2)

Product (article) characteristics
Covers the use of solid material such as powders and dust consisting of relatively coarse particles with a moderate potential to become (and stay) airborne.
Covers concentrations > 25 %.
Amount used (or contained in articles), frequency and duration of use/exposure
Covers use of > 4 h/day.

Technical and organisational conditions and measures
Assumes that the process is completely enclosed for the vast majority of its duration. Very infrequent and controlled opening during operation may occur.
Assumes that the process is highly automated. Very limited manual intervention is required to run. Contact with the substance may be possible for a very limited duration of time.
Assumes that there are no adjacent workplaces contributing to exposure of the substance.
Covers an indoor use where a basic mechanical ventilation of at least 1 ACH is provided as well as an outdoor use.
Conditions and measures related to personal protection, hygiene and health evaluation
Assumes occasional general cleaning operations at the workplace.
Wear standard safety clothing.
Other conditions affecting workers exposure
Assumes process temperature up to 40 °C

1.2.7. Control of worker exposure: *Storage of borates - outdoor* (PROC 2)

Product (article) characteristics
Covers the use of solid material such as powders and dust consisting of relatively coarse particles with a moderate potential to become (and stay) airborne.
Covers concentrations > 25 %.
Amount used (or contained in articles), frequency and duration of use/exposure
Covers use of > 4 h/day.
Technical and organisational conditions and measures
Assumes that the process is completely enclosed for the vast majority of its duration. Very infrequent and controlled opening during operation may occur.
Assumes that the process is highly automated. Very limited manual intervention is required to run. Contact with the substance may be possible for a very limited duration of time.
Assumes that there are no adjacent workplaces contributing to exposure of the substance.
Covers an indoor use where a basic mechanical ventilation of at least 1 ACH is provided as well as an outdoor use.
Conditions and measures related to personal protection, hygiene and health evaluation
Assumes occasional general cleaning operations at the workplace.
Wear standard safety clothing.
Other conditions affecting workers exposure
Outdoor use
Assumes process temperature up to 40 °C

1.2.8. Control of worker exposure: *Transfer of borates to mixing vessel with no dedicated engineering controls in place for reducing the exposure* (PROC 8a)

Product (article) characteristics
Covers the use of solid material such as powders and dust consisting of relatively coarse particles with a moderate potential to become (and stay) airborne.
Powders, granules or pelletised material
Covers the use of coarse dust materials.
Covers dry product with <5 % moisture content.
Covers the use of a material containing up to 90 % of the substance.

Amount used (or contained in articles), frequency and duration of use/exposure
Assumes that a system such as a conveyer belt is installed for transfer/handling operation.
Covers use up to 4 h/day
Technical and organisational conditions and measures
Assumes that the process is mostly enclosed during standard operation.
Assumes that the process is semi-automated. Manual intervention is repeatedly required although large parts of the process are machinery assisted.
Assumes that there are no adjacent workplaces contributing to exposure of the substance.
Local exhaust ventilation - efficiency of at least 90 % (e.g. fixed capturing hoods, on-tool extraction, horizontal/downward laminar flow booth, other enclosing hoods).
Provide a ventilation of at least 3 ACH.
Covers the falling transfer of powders, granules or pelletised material.
Covers the transfer of 10 to 100 kg/min.
Covers a drop height of < 0.5 m.
Conditions and measures related to personal protection, hygiene and health evaluation
Assumes regular cleaning operations at the workplace.
Effective housekeeping practices (e.g. daily cleaning using appropriate methods, preventive maintenance of machinery, use of protective clothing that will repel spills and reduce personal cloud) in place.
Wear appropriate selected gloves. For further specification, refer to section 8 of the SDS. Assumes that gloves are used by trained workers.
Wear standard safety clothing.
Other conditions affecting workers exposure
Indoor use
Indoor use (workrooms >1000 m³).

1.2.9. Control of worker exposure: *Weighing of borates prior to discharge into mixing vessel* (PROC 9)

Product (article) characteristics
Covers the use of solid material such as powders and dust consisting of relatively coarse particles with a moderate potential to become (and stay) airborne.
Covers concentrations > 25 %.
Amount used (or contained in articles), frequency and duration of use/exposure
Covers use of > 4 h/day.
Assumes that bottles and cans with an approximate volume of 1L are used.
Technical and organisational conditions and measures
Assumes that the process is mostly enclosed during standard operation.
Assumes that there are no adjacent workplaces contributing to exposure of the substance.
Covers an indoor use where a basic mechanical ventilation of at least 1 ACH is provided as well as an outdoor use.
Conditions and measures related to personal protection, hygiene and health evaluation
Assumes occasional general cleaning operations at the workplace.
Wear standard safety clothing.

1.2.10. Control of worker exposure: *Mixing in closed or largely closed production processes at high temperature* (PROC 2)

Product (article) characteristics
Covers the use of solid material such as powders and dust consisting of relatively coarse particles with a moderate potential to become (and stay) airborne.
Covers concentrations > 25 %.
Amount used (or contained in articles), frequency and duration of use/exposure
Covers use of > 4 h/day.
Technical and organisational conditions and measures
Assumes that the process is completely enclosed for the vast majority of its duration. Very infrequent and controlled opening during operation may occur.
Assumes that the process is highly automated. Very limited manual intervention is required to run. Contact with the substance may be possible for a very limited duration of time.
Assumes that there are no adjacent workplaces contributing to exposure of the substance.
Covers an indoor use where a basic mechanical ventilation of at least 1 ACH is provided as well as an outdoor use.
Conditions and measures related to personal protection, hygiene and health evaluation
Assumes occasional general cleaning operations at the workplace.
Wear standard safety clothing.
Other conditions affecting workers exposure
Assumes process temperature up to 1000 °C

1.2.11. Control of worker exposure: *Mixing* (PROC 3)

Product (article) characteristics
Covers the use of a substance handled in solution.
Covers concentrations ≤ 5 %.
Amount used (or contained in articles), frequency and duration of use/exposure
Covers use of > 4 h/day.
Technical and organisational conditions and measures
Assumes that the process is completely enclosed for the vast majority of its duration. Very infrequent and controlled opening during operation may occur.
Assumes that the process is highly automated. Very limited manual intervention is required to run. Contact with the substance may be possible for a very limited duration of time.
Assumes that there are no adjacent workplaces contributing to exposure of the substance.
Covers an indoor use where a basic mechanical ventilation of at least 1 ACH is provided as well as an outdoor use.
Conditions and measures related to personal protection, hygiene and health evaluation
Wear standard safety clothing.
Assumes occasional general cleaning operations at the workplace.
Other conditions affecting workers exposure
Assumes process temperature up to 1000 °C

1.2.12. Control of worker exposure: *Packaging of substances into small containers (including packing and unpacking) - liquid* (PROC 9)

Product (article) characteristics
Covers the use of a liquid.
Covers concentrations ≤ 25 %.
Amount used (or contained in articles), frequency and duration of use/exposure
Assumes that bottles and cans with an approximate volume of 1L are used.
Covers use of > 4 h/day.
Technical and organisational conditions and measures
Assumes that the process is completely enclosed for the vast majority of its duration. Very infrequent and controlled opening during operation may occur.
Assumes that the process is highly automated. Very limited manual intervention is required to run. Contact with the substance may be possible for a very limited duration of time.
Assumes that there are no adjacent workplaces contributing to exposure of the substance.
Covers an indoor use where a basic mechanical ventilation of at least 1 ACH is provided as well as an outdoor use.
Conditions and measures related to personal protection, hygiene and health evaluation
Assumes occasional general cleaning operations at the workplace.
Wear standard safety clothing.

1.2.13. Control of worker exposure: *Packaging of substances into small containers (including packing and unpacking) - paste* (PROC 9)

Product (article) characteristics
Covers the use of a paste.
Covers concentrations ≤ 25 %.
Amount used (or contained in articles), frequency and duration of use/exposure
Assumes that bottles and cans with an approximate volume of 1L are used.
Covers use of > 4 h/day.
Technical and organisational conditions and measures
Assumes that the process is completely enclosed for the vast majority of its duration. Very infrequent and controlled opening during operation may occur.
Assumes that the process is highly automated. Very limited manual intervention is required to run. Contact with the substance may be possible for a very limited duration of time.
Assumes that there are no adjacent workplaces contributing to exposure of the substance.
Covers an indoor use where a basic mechanical ventilation of at least 1 ACH is provided as well as an outdoor use.
Conditions and measures related to personal protection, hygiene and health evaluation
Assumes occasional general cleaning operations at the workplace.
Wear standard safety clothing.

1.2.14. Control of worker exposure: *Maintenance & routine cleaning - solid* (PROC 28)

Product (article) characteristics
Covers the use of solid material such as fine powders having a high potential to become and stay airborne.
Covers concentrations > 25 %.
Amount used (or contained in articles), frequency and duration of use/exposure
Covers use of up to 1 h/day.
Assumes a contamination level of the workplace of up to 5 mg/m³.
Technical and organisational conditions and measures
Assumes that the main cleaning device is a wet cleaning car.
Provide a mechanical ventilation of at least 3 ACH.
Conditions and measures related to personal protection, hygiene and health evaluation
Wear standard safety clothing.

1.2.15. Control of worker exposure: *Maintenance & routine cleaning - liquid* (PROC 28)

Product (article) characteristics
Covers the use of a liquid.
Covers concentrations > 25 %.
Amount used (or contained in articles), frequency and duration of use/exposure
Covers use of up to 1 h/day.
Assumes a contamination level of the workplace of up to 5 mg/m³.
Technical and organisational conditions and measures
Covers an indoor use where a basic mechanical ventilation of at least 1 ACH is provided as well as an outdoor use.
Assumes that the main cleaning device is a mop.
Conditions and measures related to personal protection, hygiene and health evaluation
Wear standard safety clothing.

1.2.16. Control of worker exposure: *Taking samples (< 1kg/sample)* (PROC 9)

Product (article) characteristics
Covers the use of solid material such as powders and dust consisting of relatively coarse particles with a moderate potential to become (and stay) airborne.
Covers concentrations > 25 %.
Amount used (or contained in articles), frequency and duration of use/exposure
Assumes that bottles and cans with an approximate volume of 1L are used.
Covers the use of up to 10 containers.
Covers use of up to 1 h/day.
Technical and organisational conditions and measures
Assumes that there are no adjacent workplaces contributing to exposure of the substance.
Covers an indoor use where a basic mechanical ventilation of at least 1 ACH is provided as well as an outdoor use.
Assumes that the main cleaning device is a mop.
Conditions and measures related to personal protection, hygiene and health evaluation
Assumes occasional general cleaning operations at the workplace.
Wear standard safety clothing.

1.2.17. Control of worker exposure: *Laboratory work including weighing and quality control processes* (PROC 15)

Product (article) characteristics
Covers the use of solid material such as powders and dust consisting of relatively coarse particles with a moderate potential to become (and stay) airborne.
Covers concentrations > 25 %.
Amount used (or contained in articles), frequency and duration of use/exposure
Assumes that bottles and cans with an approximate volume of 1L are used.
Covers the use of up to 10 containers.
Covers use of up to 1 h/day.
Technical and organisational conditions and measures
Assumes that there are no adjacent workplaces contributing to exposure of the substance.
Covers an indoor use where a basic mechanical ventilation of at least 1 ACH is provided as well as an outdoor use.
Conditions and measures related to personal protection, hygiene and health evaluation
Assumes occasional general cleaning operations at the workplace.
Wear standard safety clothing.

1.3. Exposure estimation and reference to its source

1.3.1. Environmental release and exposure: *Formulation into mixture* (ERC 2)

Release route	**Release rate**	**Release estimation method**
Water	6.667 kg/day	SPERC
Air	3.333 kg/day	SPERC
Soil	6.667 kg/day	SPERC

Protection target	**Exposure estimate**	**RCR**
Fresh water	0.385 mg/L (EUSES 2.1.2)	0.133
Marine water	0.038 mg/L (EUSES 2.1.2)	0.013
Sewage Treatment Plant	3.332 mg/L (EUSES 2.1.2)	0.333
Agricultural soil	0.165 mg/kg dw (EUSES 2.1.2)	0.029
Man via environment - Inhalation (systemic effects)	0.000381 mg/m³ (EUSES 2.1.2)	< 0.01
Man via environment - Oral	0.064 mg/kg bw/day (EUSES 2.1.2)	0.376
Man via environment - combined routes		0.376

1.3.2. Worker exposure: *Off-loading of borates from ships* (PROC 8a)

Route of exposure and type of effects	**Exposure estimate**	**RCR**
Inhalation, systemic, long term	0.8 mg/m³ (ART)	0.552
Dermal, systemic, long term	6.825 mg/kg bw/day (MEASE)	0.099
Combined, systemic, long term		0.651

1.3.3. Worker exposure: *Attach/detach loading chute to/from road tanker* (PROC 8b)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.43 mg/m³ (ART)	0.297
Dermal, systemic, long term	2.457 mg/kg bw/day (MEASE)	0.036
Combined, systemic, long term		0.332

1.3.4. Worker exposure: *Closed transfer of borate from road tankers to large vessels or containers (e.g. silos) at site* (PROC 1)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.001 mg/m³ (MEASE)	< 0.01
Dermal, systemic, long term	0.003 mg/kg bw/day (MEASE)	< 0.01
Combined, systemic, long term		< 0.01

1.3.5. Worker exposure: *Transfer to silos or via trucks to warehouses* (PROC 8a)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.82 mg/m³ (ART)	0.566
Dermal, systemic, long term	6.825 mg/kg bw/day (MEASE)	0.099
Combined, systemic, long term		0.665

1.3.6. Worker exposure: *Storage of borates - indoor* (PROC 2)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.013 mg/m³ (MEASE)	< 0.01
Dermal, systemic, long term	0.035 mg/kg bw/day (MEASE)	< 0.01
Combined, systemic, long term		< 0.01

1.3.7. Worker exposure: *Storage of borates - outdoor* (PROC 2)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.011 mg/m³ (MEASE)	< 0.01
Dermal, systemic, long term	0.035 mg/kg bw/day (MEASE)	< 0.01
Combined, systemic, long term		< 0.01

1.3.8. Worker exposure: *Transfer of borates to mixing vessel with no dedicated engineering controls in place for reducing the exposure* (PROC 8a)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.67 mg/m³ (ART)	0.462
Dermal, systemic, long term	20.37 mg/kg bw/day (MEASE)	0.297
Combined, systemic, long term		0.759

1.3.9. Worker exposure: *Weighing of borates prior to discharge into mixing vessel* (PROC 9)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.316 mg/m³ (MEASE)	0.218
Dermal, systemic, long term	0.518 mg/kg bw/day (MEASE)	< 0.01
Combined, systemic, long term		0.225

1.3.10. Worker exposure: *Mixing in closed or largely closed production processes at high temperature* (PROC 2)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.013 mg/m³ (MEASE)	< 0.01
Dermal, systemic, long term	0.035 mg/kg bw/day (MEASE)	< 0.01
Combined, systemic, long term		< 0.01

1.3.11. Worker exposure: *Mixing* (PROC 3)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.253 mg/m³ (MEASE)	0.174
Dermal, systemic, long term	0.007 mg/kg bw/day (MEASE)	< 0.01
Combined, systemic, long term		0.175

1.3.12. Worker exposure: *Packaging of substances into small containers (including packing and unpacking) - liquid* (PROC 9)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.008 mg/m³ (MEASE)	< 0.01
Dermal, systemic, long term	0.031 mg/kg bw/day (MEASE)	< 0.01
Combined, systemic, long term		< 0.01

1.3.13. Worker exposure: *Packaging of substances into small containers (including packing and unpacking) - paste* (PROC 9)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.008 mg/m³ (MEASE)	< 0.01
Dermal, systemic, long term	0.031 mg/kg bw/day (MEASE)	< 0.01
Combined, systemic, long term		< 0.01

1.3.14. Worker exposure: *Maintenance & routine cleaning - solid* (PROC 28)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	1.063 mg/m³ (MEASE)	0.733
Dermal, systemic, long term	2.492 mg/kg bw/day (MEASE)	0.036
Combined, systemic, long term		0.769

1.3.15. Worker exposure: *Maintenance & routine cleaning - liquid* (PROC 28)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.116 mg/m³ (MEASE)	0.08
Dermal, systemic, long term	2.492 mg/kg bw/day (MEASE)	0.036
Combined, systemic, long term		0.116

1.3.16. Worker exposure: *Taking samples (< 1kg/sample)* (PROC 9)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.013 mg/m³ (MEASE)	< 0.01
Dermal, systemic, long term	0.104 mg/kg bw/day (MEASE)	< 0.01
Combined, systemic, long term		0.01

1.3.17. Worker exposure: *Laboratory work including weighing and quality control processes* (PROC 15)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.013 mg/m³ (MEASE)	< 0.01
Dermal, systemic, long term	0.069 mg/kg bw/day (MEASE)	< 0.01
Combined, systemic, long term		< 0.01

1.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Guidance:
The conditions of use at downstream users' sites may differ in some way from those described in the exposure scenario. In case of differences between the description of conditions of use in the exposure scenario and your own practice it does not mean that the use is not covered. The risk may still be adequately controlled. The way in which you determine if your conditions are equivalent or lower is termed "scaling". Scaling instructions are given below.

Human health: The workers' exposure is addressed using MEASE 2.0. However, for some PROCs ART v1.5 is used instead of MEASE 2.0 to estimate the inhalation exposure.

Environment: Emissions to the environment are estimated using EUSES v.2.1.2 as implemented in CHESAR v3.5. The releases have been estimated on the basis of SPERC Eurometaux SPERC 2.2b.v2.1.

Scaling tool:
Please use the above indicated publicly available modelling tools for scaling.

Scaling instructions:
Scaling can be used to check whether your conditions are "equivalent" to the conditions defined in the exposure scenario. If your conditions of use differ slightly from those indicated in the respective exposure scenario you might be able to demonstrate that, under your conditions of use, the exposure levels are equivalent or lower than under the described conditions. It may be possible to demonstrate this by compensating a variation in one particular condition with a variation in other conditions.

Scalable parameters:
In the following, the key determinants which are likely to vary in the actual use situation are given to be used for scaling.

- **Workers:**
  ART 1.5: Powder weight fraction, Concentration of the substance, Handling of contaminated solid object or paste, Duration of activity, Emission source, Transfer rate, Drop height, LEV, PPE.

  MEASE 2.0: Concentration of the substance, Duration of exposure, Level of automation, Dust suppression techniques, Extraction device, ACH, Process temperature, Room size, Container capacity, Number of containers used, Contamination level of workplace, PPE.

  Remark regarding RMMs: Effectiveness is the key information related to risk management measures. You can be sure that your risk management measures are covered if their effectiveness is equal to, or higher than, what is specified in the exposure scenario.

- **Environment:**
  Daily use amount, Annual use amount, Number of emission days, Release factors, Discharge rate of STP, Receiving surface water flow rate.

Further details on scaling are provided in ECHA's Guidance for downstream users v2.1 (October 2014) as well as in ECHA's Practical Guide 13 (June 2012).

Boundaries of scaling:
RCRs not to be exceeded are described in Section 1.3.

2. ES 2: Formulation or re-packing; Other (PC 0)

2.1. Use descriptors

ES name: *Formulation into solid matrix*
Product category: *Other (PC 0)*

Environment	
1: *Formulation into solid matrix*	ERC 3
Worker	
2: *Attach/detach loading chute to/from road tanker*	PROC 8b
3: *Closed transfer of borate from road tankers to large vessels or containers (e.g. silos) at site*	PROC 1
4: *Storage of borates - indoor*	PROC 2
5: *Storage of borates - outdoor*	PROC 2
6: *Transfer of borates to mixing vessel with no dedicated engineering controls in place for reducing the exposure*	PROC 8a
7: *Weighing of borates prior to discharge into mixing vessel*	PROC 9
8: *Mixing in closed or largely closed production processes at high temperature*	PROC 2
9: *Mixing in closed continuous process at elevated temperature with occasional controlled exposure during opening*	PROC 2
10: *Hot gunning repair including spraying*	PROC 7
11: *Casting into shape for use*	PROC 23
12: *Grinding of solids to a powder in enclosed grinding mill*	PROC 24
13: *Compaction and tabletting of borates and borate mixtures*	PROC 14
14: *Packaging of substances into small containers (including packing and unpacking) - powder*	PROC 9
15: *Packaging of substances into small containers (including packing and unpacking) - pellet*	PROC 9
16: *Maintenance & routine cleaning - indoor*	PROC 28
17: *Taking samples (< 1kg/sample)*	PROC 9
18: *Laboratory work including weighing and quality control processes*	PROC 15

2.2. Conditions of use affecting exposure

2.2.1. Control of environmental exposure: *Formulation into solid matrix* (ERC 3)

Amount used, frequency and duration of use (or from service life)
Daily amount per site ≤ 27.5 tonnes/day
Annual amount per site ≤ 10000 tonnes/year
Conditions and measures related to biological sewage treatment plant
Municipal sewage treatment plant is assumed.
Assumed domestic sewage treatment plant flow ≥ 2000 m³/day
Conditions and measures related to external treatment of waste (including article waste)
Dispose of waste product or used containers according to local regulations.
Other conditions affecting environmental exposure
Receiving surface water flow ≥ 18000 m³/day

2.2.2. Control of worker exposure: *Attach/detach loading chute to/from road tanker* (PROC 8b)

Product (article) characteristics
Covers the use of solid material such as powders and dust consisting of relatively coarse particles with a moderate potential to become (and stay) airborne.
Covers concentrations up to 100 %
Powders, granules or pelletised material
Covers the use of coarse dust materials.
Covers dry product with <5 % moisture content.
Amount used (or contained in articles), frequency and duration of use/exposure
Assumes that open trucks, waggons or ships are handled.
Covers the use of up to 100 containers.
Covers use up to 2 h/day
Technical and organisational conditions and measures
Assumes that the process is completely enclosed for the vast majority of its duration. Very infrequent and controlled opening during operation may occur.
Assumes that the process is highly automated. Very limited manual intervention is required to run. Contact with the substance may be possible for a very limited duration of time.
Assumes that there are no adjacent workplaces contributing to exposure of the substance.
Coves the handling of contaminated solid objects or paste.
Covers the handling of objects with limited residual dust (thin layer visible).
Covers the normal handling, involves regular work procedures.
Covers handling that reduces contact between product and adjacent air.
Conditions and measures related to personal protection, hygiene and health evaluation
Assumes occasional general cleaning operations at the workplace.
Effective housekeeping practices (e.g. daily cleaning using appropriate methods, preventive maintenance of machinery, use of protective clothing that will repel spills and reduce personal cloud) in place.
Wear standard safety clothing.
Other conditions affecting workers exposure
Outdoor use
Covers the outdoor application close to buildings or in completely open areas.

2.2.3. Control of worker exposure: *Closed transfer of borate from road tankers to large vessels or containers (e.g. silos) at site* (PROC 1)

Product (article) characteristics
Covers the use of solid material such as powders and dust consisting of relatively coarse particles with a moderate potential to become (and stay) airborne.
Covers concentrations > 25 %.
Amount used (or contained in articles), frequency and duration of use/exposure
Covers use of > 4 h/day.

Technical and organisational conditions and measures
Assumes that the process is completely closed during standard operation.
Assumes that the process is fully automated. Workers are only involved in supervision and control walks. Direct contact with the substance is not possible.
Assumes that there are no adjacent workplaces contributing to exposure of the substance.
Covers an indoor use where a basic mechanical ventilation of at least 1 ACH is provided as well as an outdoor use.
Conditions and measures related to personal protection, hygiene and health evaluation
Assumes occasional general cleaning operations at the workplace.
Wear standard safety clothing.
Other conditions affecting workers exposure
Outdoor use

2.2.4. Control of worker exposure: *Storage of borates - indoor* (PROC 2)

Product (article) characteristics
Covers the use of solid material such as powders and dust consisting of relatively coarse particles with a moderate potential to become (and stay) airborne.
Covers concentrations > 25 %.
Amount used (or contained in articles), frequency and duration of use/exposure
Covers use of > 4 h/day.
Technical and organisational conditions and measures
Assumes that the process is completely enclosed for the vast majority of its duration. Very infrequent and controlled opening during operation may occur.
Assumes that the process is highly automated. Very limited manual intervention is required to run. Contact with the substance may be possible for a very limited duration of time.
Assumes that there are no adjacent workplaces contributing to exposure of the substance.
Covers an indoor use where a basic mechanical ventilation of at least 1 ACH is provided as well as an outdoor use.
Conditions and measures related to personal protection, hygiene and health evaluation
Assumes occasional general cleaning operations at the workplace.
Wear standard safety clothing.
Other conditions affecting workers exposure
Assumes process temperature up to 40 °C

2.2.5. Control of worker exposure: *Storage of borates - outdoor* (PROC 2)

Product (article) characteristics
Covers the use of solid material such as powders and dust consisting of relatively coarse particles with a moderate potential to become (and stay) airborne.
Covers concentrations > 25 %.
Amount used (or contained in articles), frequency and duration of use/exposure
Covers use of > 4 h/day.

Technical and organisational conditions and measures
Assumes that the process is completely enclosed for the vast majority of its duration. Very infrequent and controlled opening during operation may occur.
Assumes that the process is highly automated. Very limited manual intervention is required to run. Contact with the substance may be possible for a very limited duration of time.
Assumes that there are no adjacent workplaces contributing to exposure of the substance.
Covers an indoor use where a basic mechanical ventilation of at least 1 ACH is provided as well as an outdoor use.
Conditions and measures related to personal protection, hygiene and health evaluation
Assumes occasional general cleaning operations at the workplace.
Wear standard safety clothing.
Other conditions affecting workers exposure
Outdoor use
Assumes process temperature up to 40 °C

2.2.6. Control of worker exposure: *Transfer of borates to mixing vessel with no dedicated engineering controls in place for reducing the exposure* (PROC 8a)

Product (article) characteristics
Covers the use of solid material such as powders and dust consisting of relatively coarse particles with a moderate potential to become (and stay) airborne.
Powders, granules or pelletised material
Covers the use of coarse dust materials.
Covers dry product with <5 % moisture content.
Covers the use of a material containing up to 90 % of the substance.
Amount used (or contained in articles), frequency and duration of use/exposure
Assumes that a system such as a conveyer belt is installed for transfer/handling operation.
Covers use up to 4 h/day
Technical and organisational conditions and measures
Assumes that the process is mostly enclosed during standard operation.
Assumes that the process is semi-automated. Manual intervention is repeatedly required although large parts of the process are machinery assisted.
Assumes that there are no adjacent workplaces contributing to exposure of the substance.
Local exhaust ventilation - efficiency of at least 90 % (e.g. fixed capturing hoods, on-tool extraction, horizontal/downward laminar flow booth, other enclosing hoods).
Provide a ventilation of at least 3 ACH.
Covers the falling transfer of powders, granules or pelletised material.
Covers the transfer of 10 to 100 kg/min.
Covers a drop height of < 0.5 m.
Conditions and measures related to personal protection, hygiene and health evaluation
Assumes regular cleaning operations at the workplace.
Effective housekeeping practices (e.g. daily cleaning using appropriate methods, preventive maintenance of machinery, use of protective clothing that will repel spills and reduce personal cloud) in place.
Wear appropriate selected gloves. For further specification, refer to section 8 of the SDS. Assumes that gloves are used by trained workers.
Wear standard safety clothing.

Other conditions affecting workers exposure
Indoor use
Indoor use (workrooms >1000 m³).

2.2.7. Control of worker exposure: *Weighing of borates prior to discharge into mixing vessel* (PROC 9)

Product (article) characteristics
Covers the use of solid material such as powders and dust consisting of relatively coarse particles with a moderate potential to become (and stay) airborne.
Covers concentrations > 25 %.
Amount used (or contained in articles), frequency and duration of use/exposure
Covers use of > 4 h/day.
Assumes that bottles and cans with an approximate volume of 1L are used.
Technical and organisational conditions and measures
Assumes that the process is mostly enclosed during standard operation.
Assumes that there are no adjacent workplaces contributing to exposure of the substance.
Covers an indoor use where a basic mechanical ventilation of at least 1 ACH is provided as well as an outdoor use.
Conditions and measures related to personal protection, hygiene and health evaluation
Assumes occasional general cleaning operations at the workplace.
Wear standard safety clothing.

2.2.8. Control of worker exposure: *Mixing in closed or largely closed production processes at high temperature* (PROC 2)

Product (article) characteristics
Covers the use of solid material such as powders and dust consisting of relatively coarse particles with a moderate potential to become (and stay) airborne.
Covers concentrations > 25 %.
Amount used (or contained in articles), frequency and duration of use/exposure
Covers use of > 4 h/day.
Technical and organisational conditions and measures
Assumes that the process is completely enclosed for the vast majority of its duration. Very infrequent and controlled opening during operation may occur.
Assumes that the process is highly automated. Very limited manual intervention is required to run. Contact with the substance may be possible for a very limited duration of time.
Assumes that there are no adjacent workplaces contributing to exposure of the substance.
Covers an indoor use where a basic mechanical ventilation of at least 1 ACH is provided as well as an outdoor use.
Conditions and measures related to personal protection, hygiene and health evaluation
Assumes occasional general cleaning operations at the workplace.
Wear standard safety clothing.
Other conditions affecting workers exposure
Assumes process temperature up to 1000 °C

2.2.9. Control of worker exposure: *Mixing in closed continuous process at elevated temperature with occasional controlled exposure during opening* (PROC 2)

Product (article) characteristics
Covers concentrations > 25 %.
Covers the use of a substance handled in solution.
Amount used (or contained in articles), frequency and duration of use/exposure
Covers use of > 4 h/day.
Technical and organisational conditions and measures
Assumes that the process is completely enclosed for the vast majority of its duration. Very infrequent and controlled opening during operation may occur.
Assumes that the process is highly automated. Very limited manual intervention is required to run. Contact with the substance may be possible for a very limited duration of time.
Assumes that there are no adjacent workplaces contributing to exposure of the substance.
Covers an indoor use where a basic mechanical ventilation of at least 1 ACH is provided as well as an outdoor use.
Conditions and measures related to personal protection, hygiene and health evaluation
Wear standard safety clothing.
Assumes occasional general cleaning operations at the workplace.
Other conditions affecting workers exposure
Assumes process temperature up to 500 °C

2.2.10. Control of worker exposure*: Hot gunning repair including spraying* (PROC 7)

Product (article) characteristics
Covers concentrations < 1 %.
Covers concentrations up to 1 %
Covers the use of a substance handled in solution.
Powders dissolved in a liquid or incorporated in a liquid matrix
Covers liquids with low to medium viscosity.
Amount used (or contained in articles), frequency and duration of use/exposure
Covers use up to 8 h/day
Technical and organisational conditions and measures
Assumes that the process is semi-automated. Manual intervention is repeatedly required although large parts of the process are machinery assisted.
Assumes that there are no adjacent workplaces contributing to exposure of the substance.
Covers the spray application of liquids (surface spraying).
Covers a low application rate (0.03 - 0.3 l/min).
Covers the spraying with no or low compressed air use.
Covers horizontal or downward spraying.
Provide good natural ventilation.
Conditions and measures related to personal protection, hygiene and health evaluation
Wear standard safety clothing.
Assumes occasional general cleaning operations at the workplace.
Effective housekeeping practices (e.g. daily cleaning using appropriate methods, preventive maintenance of machinery, use of protective clothing that will repel spills and reduce personal cloud) in place.

Other conditions affecting workers exposure
Indoor use
Indoor use (workrooms >30 m³).

2.2.11. Control of worker exposure: *Casting into shape for use* (PROC 23)

Product (article) characteristics
Covers concentrations < 1 %.
Covers the use of a molten substance/material.
Amount used (or contained in articles), frequency and duration of use/exposure
Covers use of > 4 h/day.
Technical and organisational conditions and measures
Assumes that the process is mostly enclosed during standard operation.
Assumes that the process is semi-automated. Manual intervention is repeatedly required although large parts of the process are machinery assisted.
Assumes that there are no adjacent workplaces contributing to exposure of the substance.
Covers an indoor use where a basic mechanical ventilation of at least 1 ACH is provided as well as an outdoor use.
Conditions and measures related to personal protection, hygiene and health evaluation
Wear standard safety clothing.
Assumes occasional general cleaning operations at the workplace.
Other conditions affecting workers exposure
Assumes process temperature up to 1000 °C

2.2.12. Control of worker exposure: *Grinding of solids to a powder in enclosed grinding mill* (PROC 24)

Product (article) characteristics
Covers the use of massive objects with a very low intrinsic emission potential.
Covers a concentration > 25% of the substance in the layer to which mechanical treatment is applied to.
The substance is not present the part of the tool or machinery used for the mechanical treatment.
Amount used (or contained in articles), frequency and duration of use/exposure
Covers use of > 4 h/day.
Technical and organisational conditions and measures
Covers grinding.
Assumes that the process is completely closed during standard operation.
Assumes that the process is fully automated. Workers are only involved in supervision and control walks. Direct contact with the substance is not possible.
Assumes that there are no adjacent workplaces contributing to exposure of the substance.
Covers an indoor use where a basic mechanical ventilation of at least 1 ACH is provided as well as an outdoor use.
Conditions and measures related to personal protection, hygiene and health evaluation
Wear standard safety clothing.
Assumes occasional general cleaning operations at the workplace.

2.2.13. Control of worker exposure: *Compaction and tabletting of borates and borate mixtures* (PROC 14)

Product (article) characteristics
Covers concentrations > 25 %.
Covers the use of solid material such as powders and dust consisting of relatively coarse particles with a moderate potential to become (and stay) airborne.
Amount used (or contained in articles), frequency and duration of use/exposure
Covers use of > 4 h/day.
Technical and organisational conditions and measures
Assumes that the process is completely enclosed for the vast majority of its duration. Very infrequent and controlled opening during operation may occur.
Assumes that the process is highly automated. Very limited manual intervention is required to run. Contact with the substance may be possible for a very limited duration of time.
Assumes that there are no adjacent workplaces contributing to exposure of the substance.
Covers an indoor use where a basic mechanical ventilation of at least 1 ACH is provided as well as an outdoor use.
Conditions and measures related to personal protection, hygiene and health evaluation
Wear standard safety clothing.
Assumes occasional general cleaning operations at the workplace.

2.2.14. Control of worker exposure: *Packaging of substances into small containers (including packing and unpacking) - powder* (PROC 9)

Product (article) characteristics
Covers concentrations ≤ 25 %.
Covers the use of solid material such as fine powders having a high potential to become and stay airborne.
Amount used (or contained in articles), frequency and duration of use/exposure
Assumes that bottles and cans with an approximate volume of 1L are used.
Covers use of > 4 h/day.
Technical and organisational conditions and measures
Assumes that the process is completely enclosed for the vast majority of its duration. Very infrequent and controlled opening during operation may occur.
Assumes that the process is highly automated. Very limited manual intervention is required to run. Contact with the substance may be possible for a very limited duration of time.
Covers an indoor use where a basic mechanical ventilation of at least 1 ACH is provided as well as an outdoor use.
Assumes that there are no adjacent workplaces contributing to exposure of the substance.
Conditions and measures related to personal protection, hygiene and health evaluation
Wear standard safety clothing.
Assumes occasional general cleaning operations at the workplace.

2.2.15. Control of worker exposure: *Packaging of substances into small containers (including packing and unpacking) - pellet* (PROC 9)

Product (article) characteristics
Covers concentrations ≤ 25 %.
Covers the use of solid material with a low dustiness such as granules, pellets, wetted/moistened powders, etc. with a low potential for dust emissions.

Amount used (or contained in articles), frequency and duration of use/exposure
Covers use of > 4 h/day.
Assumes that bottles and cans with an approximate volume of 1L are used.
Technical and organisational conditions and measures
Assumes that the process is completely enclosed for the vast majority of its duration. Very infrequent and controlled opening during operation may occur.
Assumes that the process is highly automated. Very limited manual intervention is required to run. Contact with the substance may be possible for a very limited duration of time.
Assumes that there are no adjacent workplaces contributing to exposure of the substance.
Covers an indoor use where a basic mechanical ventilation of at least 1 ACH is provided as well as an outdoor use.
Conditions and measures related to personal protection, hygiene and health evaluation
Wear appropriate selected gloves. For further specification, refer to section 8 of the SDS.
Wear standard safety clothing.
Assumes occasional general cleaning operations at the workplace.

2.2.16. Control of worker exposure: *Maintenance & routine cleaning - indoor* (PROC 28)

Product (article) characteristics
Covers concentrations > 25 %.
Covers the use of solid material such as powders and dust consisting of relatively coarse particles with a moderate potential to become (and stay) airborne.
Amount used (or contained in articles), frequency and duration of use/exposure
Covers use of up to 1 h/day.
Assumes a contamination level of the workplace of up to 5 mg/m³.
Technical and organisational conditions and measures
Assumes that the main cleaning device is a hoover.
Provide a mechanical ventilation of at least 3 ACH.
Conditions and measures related to personal protection, hygiene and health evaluation
Wear standard safety clothing.

2.2.17. Control of worker exposure: *Taking samples* (< 1kg/sample) (PROC 9)

Product (article) characteristics
Covers the use of solid material such as powders and dust consisting of relatively coarse particles with a moderate potential to become (and stay) airborne.
Covers concentrations > 25 %.
Amount used (or contained in articles), frequency and duration of use/exposure
Assumes that bottles and cans with an approximate volume of 1L are used.
Covers the use of up to 10 containers.
Covers use of up to 1 h/day.
Technical and organisational conditions and measures
Assumes that there are no adjacent workplaces contributing to exposure of the substance.
Covers an indoor use where a basic mechanical ventilation of at least 1 ACH is provided as well as an outdoor use.
Assumes that the main cleaning device is a mop.

Conditions and measures related to personal protection, hygiene and health evaluation
Assumes occasional general cleaning operations at the workplace.
Wear standard safety clothing.

2.2.18. Control of worker exposure: *Laboratory work including weighing and quality control processes* (PROC 15)

Product (article) characteristics
Covers the use of solid material such as powders and dust consisting of relatively coarse particles with a moderate potential to become (and stay) airborne.
Covers concentrations > 25 %.
Amount used (or contained in articles), frequency and duration of use/exposure
Assumes that bottles and cans with an approximate volume of 1L are used.
Covers the use of up to 10 containers.
Covers use of up to 1 h/day.
Technical and organisational conditions and measures
Assumes that there are no adjacent workplaces contributing to exposure of the substance.
Covers an indoor use where a basic mechanical ventilation of at least 1 ACH is provided as well as an outdoor use.
Conditions and measures related to personal protection, hygiene and health evaluation
Assumes occasional general cleaning operations at the workplace.
Wear standard safety clothing.

2.3. Exposure estimation and reference to its source

2.3.1. Environmental release and exposure: *Formulation into solid matrix* (ERC 3)

Release route	Release rate	Release estimation method
Water	0 kg/day	Estimated release factor
Air	2.75 kg/day	Estimated release factor
Soil	27.5 kg/day	ERC

Protection target	Exposure estimate	RCR
Fresh water	0.051 mg/L (EUSES 2.1.2)	0.018
Marine water	0.00508 mg/L (EUSES 2.1.2)	< 0.01
Sewage Treatment Plant	0 mg/L (EUSES 2.1.2)	< 0.01
Agricultural soil	0.147 mg/kg dw (EUSES 2.1.2)	0.026
Man via environment - Inhalation (systemic effects)	0.000762 mg/m³ (EUSES 2.1.2)	< 0.01
Man via environment - Oral	0.117 mg/kg bw/day (EUSES 2.1.2)	0.687
Man via environment - combined routes		0.688

2.3.2. Worker exposure: *Attach/detach loading chute to/from road tanker* (PROC 8b)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.43 mg/m³ (ART)	0.297
Dermal, systemic, long term	2.457 mg/kg bw/day (MEASE)	0.036
Combined, systemic, long term		0.332

2.3.3. Worker exposure: *Closed transfer of borate from road tankers to large vessels or containers (e.g. silos) at site* (PROC 1)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.001 mg/m³ (MEASE)	< 0.01
Dermal, systemic, long term	0.003 mg/kg bw/day (MEASE)	< 0.01
Combined, systemic, long term		< 0.01

2.3.4. Worker exposure: *Storage of borates - indoor* (PROC 2)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.013 mg/m³ (MEASE)	< 0.01
Dermal, systemic, long term	0.035 mg/kg bw/day (MEASE)	< 0.01
Combined, systemic, long term		< 0.01

2.3.5. Worker exposure: *Storage of borates - outdoor* (PROC 2)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.011 mg/m³ (MEASE)	< 0.01
Dermal, systemic, long term	0.035 mg/kg bw/day (MEASE)	< 0.01
Combined, systemic, long term		< 0.01

2.3.6. Worker exposure: *Transfer of borates to mixing vessel with no dedicated engineering controls in place for reducing the exposure* (PROC 8a)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.67 mg/m³ (ART)	0.462
Dermal, systemic, long term	20.38 mg/kg bw/day (MEASE)	0.297
Combined, systemic, long term		0.759

2.3.7. Worker exposure: *Weighing of borates prior to discharge into mixing vessel* (PROC 9)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.316 mg/m³ (MEASE)	0.218
Dermal, systemic, long term	0.518 mg/kg bw/day (MEASE)	< 0.01
Combined, systemic, long term		0.225

2.3.8. Worker exposure: *Mixing in closed or largely closed production processes at high temperature* (PROC 2)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.013 mg/m³ (MEASE)	< 0.01
Dermal, systemic, long term	0.035 mg/kg bw/day (MEASE)	< 0.01
Combined, systemic, long term		< 0.01

2.3.9. Worker exposure: *Mixing in closed continuous process at elevated temperature with occasional controlled exposure during opening* (PROC 2)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.379 mg/m³ (MEASE)	0.261
Dermal, systemic, long term	0.035 mg/kg bw/day (MEASE)	< 0.01
Combined, systemic, long term		0.262

2.3.10. Worker exposure: *Hot gunning repair including spraying* (PROC 7)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.42 mg/m³ (ART)	0.29
Dermal, systemic, long term	7.501 mg/kg bw/day (MEASE)	0.109
Combined, systemic, long term		0.399

2.3.11. Worker exposure: *Casting into shape for use* (PROC 23)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.19 mg/m³ (MEASE)	0.131
Dermal, systemic, long term	0.102 mg/kg bw/day (MEASE)	< 0.01
Combined, systemic, long term		0.133

2.3.12. Worker exposure: *Grinding of solids to a powder in enclosed grinding mill* (PROC 24)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.127 mg/m³ (MEASE)	0.088
Dermal, systemic, long term	0.014 mg/kg bw/day (MEASE)	< 0.01
Combined, systemic, long term		0.088

2.3.13. Worker exposure: *Compaction and tabletting of borates and borate mixtures* (PROC 14)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.127 mg/m³ (MEASE)	0.088
Dermal, systemic, long term	0.069 mg/kg bw/day (MEASE)	< 0.01
Combined, systemic, long term		0.089

2.3.14. Worker exposure: *Packaging of substances into small containers (including packing and unpacking) - powder* (PROC 9)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.19 mg/m³ (MEASE)	0.131
Dermal, systemic, long term	0.031 mg/kg bw/day (MEASE)	< 0.01
Combined, systemic, long term		0.131

2.3.15. Worker exposure: *Packaging of substances into small containers (including packing and unpacking) - pellet* (PROC 9)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.038 mg/m³ (MEASE)	0.026
Dermal, systemic, long term	0.031 mg/kg bw/day (MEASE)	< 0.01
Combined, systemic, long term		0.027

2.3.16. Worker exposure: *Maintenance & routine cleaning - indoor* (PROC 28)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	1.063 mg/m³ (MEASE)	0.733
Dermal, systemic, long term	2.493 mg/kg bw/day (MEASE)	0.036
Combined, systemic, long term		0.769

2.3.17. Worker exposure: *Taking samples (< 1kg/sample)* (PROC 9)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.013 mg/m³ (MEASE)	< 0.01
Dermal, systemic, long term	0.104 mg/kg bw/day (MEASE)	< 0.01
Combined, systemic, long term		0.01

2.3.18. Worker exposure: *Laboratory work including weighing and quality control processes* (PROC 15)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.013 mg/m³ (MEASE)	< 0.01
Dermal, systemic, long term	0.069 mg/kg bw/day (MEASE)	< 0.01
Combined, systemic, long term		< 0.01

2.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Guidance:
The conditions of use at downstream users' sites may differ in some way from those described in the exposure scenario. In case of differences between the description of conditions of use in the exposure scenario and your own practice it does not mean that the use is not covered. The risk may still be adequately controlled. The way in which you determine if your conditions are equivalent or lower is termed "scaling". Scaling instructions are given below.

Human health: The workers' exposure is addressed using MEASE 2.0. However, for some PROCs ART v1.5 is used instead of MEASE 2.0 to estimate the inhalation exposure.

Environment: Emissions to the environment are estimated using EUSES v.2.1.2 as implemented in CHESAR v3.5.

Scaling tool:
Please use the above indicated publicly available modelling tools for scaling.

Scaling instructions:
Scaling can be used to check whether your conditions are "equivalent" to the conditions defined in the exposure scenario. If your conditions of use differ slightly from those indicated in the respective exposure scenario you might be able to demonstrate that, under your conditions of use, the exposure levels are equivalent or lower than under the described conditions. It may be possible to demonstrate this by compensating a variation in one particular condition with a variation in other conditions.

Scalable parameters:
In the following, the key determinants which are likely to vary in the actual use situation are given to be used for scaling.

- **Workers:**
  ART 1.5: Powder weight fraction, Concentration of the substance, Handling of contaminated solid object or paste, Duration of activity, Emission source, Transfer rate, Drop height, LEV, Ventilation rate, Spray direction/technique, Application rate, workroom size, PPE.

  MEASE 2.0: Concentration of the substance, Duration of exposure, Level of automation, Dust suppression techniques, Extraction device, ACH, Process temperature, Room size, Container capacity, Number of containers used, Contamination level of workplace, PPE.

  Remark regarding RMMs: Effectiveness is the key information related to risk management measures. You can be sure that your risk management measures are covered if their effectiveness is equal to, or higher than, what is specified in the exposure scenario.

- **Environment:**
  Daily use amount, Annual use amount, Number of emission days, Release factors, Discharge rate of STP, Receiving surface water flow rate.

Further details on scaling are provided in ECHA's Guidance for downstream users v2.1 (October 2014) as well as in ECHA's Practical Guide 13 (June 2012).

Boundaries of scaling:
RCRs not to be exceeded are described in Section 2.3.

3. ES 3: Use at industrial sites; Base metals and alloys (PC 7); Manufacture of basic metals, including alloys (SU 14)

3.1. Use descriptors

ES name: *Formulation into alloys*
Product category: *Base metals and alloys (PC 7)*
Sector of use: *Manufacture of basic metals, including alloys (SU 14)*

Environment		SPERC
1: *Use as industrial site leading to inclusion into/onto article*	ERC 5	*Eurometaux SPERC 5.1.v2*
Worker		SWED
2: *Attach/detach loading chute to/from road tanker*	PROC 8b	
3: *Closed transfer of borate from road tankers to large vessels or containers (e.g. silos) at site*	PROC 1	
4: *Storage of borates - indoor*	PROC 2	
5: *Storage of borates - outdoor*	PROC 2	
6: *Transfer of borates to mixing vessel with no dedicated engineering controls in place for reducing the exposure*	PROC 8a	
7: *Weighing of borates prior to discharge into mixing vessel*	PROC 9	
8: *Mixing in closed or largely closed production processes at high temperature*	PROC 2	
9: *Maintenance & routine cleaning - solid*	PROC 28	
10: *Removal of slag*	PROC 0	
11: *Taking samples (< 1kg/sample)*	PROC 9	
12: *Laboratory work including weighing and quality control processes*	PROC 15	
Subsequent service life exposure scenario(s)		
ES 11: Service life (worker at industrial site); Metal articles (AC 7)		
ES 12: Service life (professional worker); Metal articles (AC 7)		
ES 13: Service life (consumers); Metal articles (AC 7)		

3.2. Conditions of use affecting exposure

3.2.1. Control of environmental exposure: *Use as industrial site leading to inclusion into/onto article* (ERC 5)

Amount used, frequency and duration of use (or from service life)
Daily amount per site ≤ 0.909 tonnes/day
Annual amount per site ≤ 200 tonnes/year
Technical and organisational conditions and measures
Electrostatic precipitators or wet electrostatic precipitators or cyclones or fabric/bag filter or ceramic/metal mesh filter
Chemical precipitation or sedimentation or filtration or electrolysis or reverse osmosis or ion exchange

Conditions and measures related to biological sewage treatment plant
Provide onsite wastewater treatment.
Assumed domestic sewage treatment plant flow ≥ 2000 m³/day
No application of sewage sludge to soil
Conditions and measures related to external treatment of waste (including article waste)
Dispose of waste product or used containers according to local regulations.

3.2.2. Control of worker exposure: *Attach/detach loading chute to/from road tanker* (PROC 8b)

Product (article) characteristics
Covers the use of solid material such as powders and dust consisting of relatively coarse particles with a moderate potential to become (and stay) airborne.
Covers concentrations up to 100 %
Powders, granules or pelletised material
Covers the use of coarse dust materials.
Covers dry product with <5 % moisture content.
Amount used (or contained in articles), frequency and duration of use/exposure
Assumes that open trucks, waggons or ships are handled.
Covers the use of up to 100 containers.
Covers use up to 2 h/day
Technical and organisational conditions and measures
Assumes that the process is completely enclosed for the vast majority of its duration. Very infrequent and controlled opening during operation may occur.
Assumes that the process is highly automated. Very limited manual intervention is required to run. Contact with the substance may be possible for a very limited duration of time.
Assumes that there are no adjacent workplaces contributing to exposure of the substance.
Coves the handling of contaminated solid objects or paste.
Covers the handling of objects with limited residual dust (thin layer visible).
Covers the normal handling, involves regular work procedures.
Covers handling that reduces contact between product and adjacent air.
Conditions and measures related to personal protection, hygiene and health evaluation
Assumes occasional general cleaning operations at the workplace.
Effective housekeeping practices (e.g. daily cleaning using appropriate methods, preventive maintenance of machinery, use of protective clothing that will repel spills and reduce personal cloud) in place.
Wear standard safety clothing.
Other conditions affecting workers exposure
Outdoor use
Covers the outdoor application close to buildings or in completely open areas.

3.2.3. Control of worker exposure: *Closed transfer of borate from road tankers to large vessels or containers (e.g. silos) at site* (PROC 1)

Product (article) characteristics
Covers the use of solid material such as powders and dust consisting of relatively coarse particles with a moderate potential to become (and stay) airborne.
Covers concentrations > 25 %.
Amount used (or contained in articles), frequency and duration of use/exposure
Covers use of > 4 h/day.
Technical and organisational conditions and measures
Assumes that the process is completely closed during standard operation.
Assumes that the process is fully automated. Workers are only involved in supervision and control walks. Direct contact with the substance is not possible.
Assumes that there are no adjacent workplaces contributing to exposure of the substance.
Covers an indoor use where a basic mechanical ventilation of at least 1 ACH is provided as well as an outdoor use.
Conditions and measures related to personal protection, hygiene and health evaluation
Assumes occasional general cleaning operations at the workplace.
Wear standard safety clothing.
Other conditions affecting workers exposure
Outdoor use

3.2.4. Control of worker exposure: *Storage of borates - indoor* (PROC 2)

Product (article) characteristics
Covers the use of solid material such as powders and dust consisting of relatively coarse particles with a moderate potential to become (and stay) airborne.
Covers concentrations > 25 %.
Amount used (or contained in articles), frequency and duration of use/exposure
Covers use of > 4 h/day.
Technical and organisational conditions and measures
Assumes that the process is completely enclosed for the vast majority of its duration. Very infrequent and controlled opening during operation may occur.
Assumes that the process is highly automated. Very limited manual intervention is required to run. Contact with the substance may be possible for a very limited duration of time.
Assumes that there are no adjacent workplaces contributing to exposure of the substance.
Covers an indoor use where a basic mechanical ventilation of at least 1 ACH is provided as well as an outdoor use.
Conditions and measures related to personal protection, hygiene and health evaluation
Assumes occasional general cleaning operations at the workplace.
Wear standard safety clothing.
Other conditions affecting workers exposure
Assumes process temperature up to 40 °C

3.2.5. Control of worker exposure: *Storage of borates - outdoor* (PROC 2)

Product (article) characteristics
Covers the use of solid material such as powders and dust consisting of relatively coarse particles with a moderate potential to become (and stay) airborne.
Covers concentrations > 25 %.
Amount used (or contained in articles), frequency and duration of use/exposure
Covers use of > 4 h/day.
Technical and organisational conditions and measures
Assumes that the process is completely enclosed for the vast majority of its duration. Very infrequent and controlled opening during operation may occur.
Assumes that the process is highly automated. Very limited manual intervention is required to run. Contact with the substance may be possible for a very limited duration of time.
Assumes that there are no adjacent workplaces contributing to exposure of the substance.
Covers an indoor use where a basic mechanical ventilation of at least 1 ACH is provided as well as an outdoor use.
Conditions and measures related to personal protection, hygiene and health evaluation
Assumes occasional general cleaning operations at the workplace.
Wear standard safety clothing.
Other conditions affecting workers exposure
Outdoor use
Assumes process temperature up to 40 °C

3.2.6. Control of worker exposure: *Transfer of borates to mixing vessel with no dedicated engineering controls in place for reducing the exposure* (PROC 8a)

Product (article) characteristics
Covers the use of solid material such as powders and dust consisting of relatively coarse particles with a moderate potential to become (and stay) airborne.
Powders, granules or pelletised material
Covers the use of coarse dust materials.
Covers dry product with <5 % moisture content.
Covers the use of a material containing up to 90 % of the substance.
Amount used (or contained in articles), frequency and duration of use/exposure
Assumes that a system such as a conveyer belt is installed for transfer/handling operation.
Covers use up to 4 h/day
Technical and organisational conditions and measures
Assumes that the process is mostly enclosed during standard operation.
Assumes that the process is semi-automated. Manual intervention is repeatedly required although large parts of the process are machinery assisted.
Assumes that there are no adjacent workplaces contributing to exposure of the substance.
Local exhaust ventilation - efficiency of at least 90 % (e.g. fixed capturing hoods, on-tool extraction, horizontal/downward laminar flow booth, other enclosing hoods).
Provide a ventilation of at least 3 ACH.
Covers the falling transfer of powders, granules or pelletised material.
Covers the transfer of 10 to 100 kg/min.
Covers a drop height of < 0.5 m.

Conditions and measures related to personal protection, hygiene and health evaluation
Assumes regular cleaning operations at the workplace.
Effective housekeeping practices (e.g. daily cleaning using appropriate methods, preventive maintenance of machinery, use of protective clothing that will repel spills and reduce personal cloud) in place.
Wear appropriate selected gloves. For further specification, refer to section 8 of the SDS. Assumes that gloves are used by trained workers.
Wear standard safety clothing.
Other conditions affecting workers exposure
Indoor use
Indoor use (workrooms >1000 m³).

3.2.7. Control of worker exposure: *Weighing of borates prior to discharge into mixing vessel* (PROC 9)

Product (article) characteristics
Covers the use of solid material such as powders and dust consisting of relatively coarse particles with a moderate potential to become (and stay) airborne.
Covers concentrations > 25 %.
Amount used (or contained in articles), frequency and duration of use/exposure
Covers use of > 4 h/day.
Assumes that bottles and cans with an approximate volume of 1L are used.
Technical and organisational conditions and measures
Assumes that the process is mostly enclosed during standard operation.
Assumes that there are no adjacent workplaces contributing to exposure of the substance.
Covers an indoor use where a basic mechanical ventilation of at least 1 ACH is provided as well as an outdoor use.
Conditions and measures related to personal protection, hygiene and health evaluation
Assumes occasional general cleaning operations at the workplace.
Wear standard safety clothing.

3.2.8. Control of worker exposure: *Mixing in closed or largely closed production processes at high temperature* (PROC 2)

Product (article) characteristics
Covers the use of solid material such as powders and dust consisting of relatively coarse particles with a moderate potential to become (and stay) airborne.
Covers concentrations > 25 %.
Amount used (or contained in articles), frequency and duration of use/exposure
Covers use of > 4 h/day.
Technical and organisational conditions and measures
Assumes that the process is completely enclosed for the vast majority of its duration. Very infrequent and controlled opening during operation may occur.
Assumes that the process is highly automated. Very limited manual intervention is required to run. Contact with the substance may be possible for a very limited duration of time.
Assumes that there are no adjacent workplaces contributing to exposure of the substance.
Covers an indoor use where a basic mechanical ventilation of at least 1 ACH is provided as well as an outdoor use.

Conditions and measures related to personal protection, hygiene and health evaluation
Assumes occasional general cleaning operations at the workplace.
Wear standard safety clothing.
Other conditions affecting workers exposure
Assumes process temperature up to 1000 °C

3.2.9. Control of worker exposure: *Maintenance & routine cleaning - solid* (PROC 28)

Product (article) characteristics
Covers the use of solid material such as fine powders having a high potential to become and stay airborne.
Covers concentrations > 25 %.
Amount used (or contained in articles), frequency and duration of use/exposure
Covers use of up to 1 h/day.
Assumes a contamination level of the workplace of up to 5 mg/m³.
Technical and organisational conditions and measures
Assumes that the main cleaning device is a wet cleaning car.
Provide a mechanical ventilation of at least 3 ACH.
Conditions and measures related to personal protection, hygiene and health evaluation
Wear standard safety clothing.

3.2.10. Control of worker exposure: *Removal of slag* (PROC 0)

Product (article) characteristics
Covers concentrations ≤ 5 %.
Covers the use of solid material with a low dustiness such as granules, pellets, wetted/moistened powders, etc. with a low potential for dust emissions.
Amount used (or contained in articles), frequency and duration of use/exposure
Covers use of less than 15 min/day.
Assumes a contamination level of the workplace of more than 5 mg/m³.
Technical and organisational conditions and measures
Covers an indoor use where a basic mechanical ventilation of at least 1 ACH is provided as well as an outdoor use.
Assumes that the main cleaning device is a mop.
Conditions and measures related to personal protection, hygiene and health evaluation
Wear standard safety clothing.

3.2.11. Control of worker exposure: *Taking samples (< 1kg/sample)* (PROC 9)

Product (article) characteristics
Covers the use of solid material such as powders and dust consisting of relatively coarse particles with a moderate potential to become (and stay) airborne.
Covers concentrations > 25 %.
Amount used (or contained in articles), frequency and duration of use/exposure
Assumes that bottles and cans with an approximate volume of 1L are used.
Covers the use of up to 10 containers.
Covers use of up to 1 h/day.

Technical and organisational conditions and measures
Assumes that there are no adjacent workplaces contributing to exposure of the substance.
Covers an indoor use where a basic mechanical ventilation of at least 1 ACH is provided as well as an outdoor use.
Assumes that the main cleaning device is a mop.
Conditions and measures related to personal protection, hygiene and health evaluation
Assumes occasional general cleaning operations at the workplace.
Wear standard safety clothing.

3.2.12. Control of worker exposure: *Laboratory work including weighing and quality control processes* (PROC 15)

Product (article) characteristics
Covers the use of solid material such as powders and dust consisting of relatively coarse particles with a moderate potential to become (and stay) airborne.
Covers concentrations > 25 %.
Amount used (or contained in articles), frequency and duration of use/exposure
Assumes that bottles and cans with an approximate volume of 1L are used.
Covers the use of up to 10 containers.
Covers use of up to 1 h/day.
Technical and organisational conditions and measures
Assumes that there are no adjacent workplaces contributing to exposure of the substance.
Covers an indoor use where a basic mechanical ventilation of at least 1 ACH is provided as well as an outdoor use.
Conditions and measures related to personal protection, hygiene and health evaluation
Assumes occasional general cleaning operations at the workplace.
Wear standard safety clothing.

3.3. Exposure estimation and reference to its source

3.3.1. Environmental release and exposure: *Use as industrial site leading to inclusion into/onto article* (ERC 5)

Release route	Release rate	Release estimation method
Water	4.545 kg/day	SPERC
Air	1.818 kg/day	SPERC
Soil	9.091 kg/day	SPERC

Protection target	Exposure estimate	RCR
Fresh water	0.279 mg/L (EUSES 2.1.2)	0.096
Marine water	0.028 mg/L (EUSES 2.1.2)	< 0.01
Sewage Treatment Plant	2.272 mg/L (EUSES 2.1.2)	0.227
Agricultural soil	0.144 mg/kg dw (EUSES 2.1.2)	0.025
Man via environment - Inhalation (systemic effects)	0.000305 mg/m³ (EUSES 2.1.2)	< 0.01
Man via environment - Oral	0.052 mg/kg bw/day (EUSES 2.1.2)	0.308
Man via environment - combined routes		0.308

3.3.2. Worker exposure: *Attach/detach loading chute to/from road tanker* (PROC 8b)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.43 mg/m³ (ART)	0.297
Dermal, systemic, long term	2.457 mg/kg bw/day (MEASE)	0.036
Combined, systemic, long term		0.332

3.3.3. Worker exposure: *Closed transfer of borate from road tankers to large vessels or containers (e.g. silos) at site* (PROC 1)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.001 mg/m³ (MEASE)	< 0.01
Dermal, systemic, long term	0.003 mg/kg bw/day (MEASE)	< 0.01
Combined, systemic, long term		< 0.01

3.3.4. Worker exposure: *Storage of borates - indoor* (PROC 2)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.013 mg/m³ (MEASE)	< 0.01
Dermal, systemic, long term	0.035 mg/kg bw/day (MEASE)	< 0.01
Combined, systemic, long term		< 0.01

3.3.5. Worker exposure: *Storage of borates - outdoor* (PROC 2)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.011 mg/m³ (MEASE)	< 0.01
Dermal, systemic, long term	0.035 mg/kg bw/day (MEASE)	< 0.01
Combined, systemic, long term		< 0.01

3.3.6. Worker exposure: *Transfer of borates to mixing vessel with no dedicated engineering controls in place for reducing the exposure* (PROC 8a)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.67 mg/m³ (ART)	0.462
Dermal, systemic, long term	20.38 mg/kg bw/day (MEASE)	0.297
Combined, systemic, long term		0.759

3.3.7. Worker exposure: *Weighing of borates prior to discharge into mixing vessel* (PROC 9)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.316 mg/m³ (MEASE)	0.218
Dermal, systemic, long term	0.518 mg/kg bw/day (MEASE)	< 0.01
Combined, systemic, long term		0.225

3.3.8. Worker exposure: *Mixing in closed or largely closed production processes at high temperature* (PROC 2)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.013 mg/m³ (MEASE)	< 0.01
Dermal, systemic, long term	0.035 mg/kg bw/day (MEASE)	< 0.01
Combined, systemic, long term		< 0.01

3.3.9. Worker exposure: *Maintenance & routine cleaning - solid* (PROC 28)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	1.063 mg/m³ (MEASE)	0.733
Dermal, systemic, long term	2.492 mg/kg bw/day (MEASE)	0.036
Combined, systemic, long term		0.769

3.3.10. Worker exposure: *Removal of slag* (PROC 0)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.116 mg/m³ (MEASE)	0.08
Dermal, systemic, long term	0.186 mg/kg bw/day (MEASE)	< 0.01
Combined, systemic, long term		0.083

3.3.11. Worker exposure: *Taking samples (< 1kg/sample)* (PROC 9)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.013 mg/m³ (MEASE)	< 0.01
Dermal, systemic, long term	0.104 mg/kg bw/day (MEASE)	< 0.01
Combined, systemic, long term		0.01

3.3.12. Worker exposure: *Laboratory work including weighing and quality control processes* (PROC 15)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.013 mg/m³ (MEASE)	< 0.01
Dermal, systemic, long term	0.069 mg/kg bw/day (MEASE)	< 0.01
Combined, systemic, long term		< 0.01

3.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Guidance:
The conditions of use at downstream users' sites may differ in some way from those described in the exposure scenario. In case of differences between the description of conditions of use in the exposure scenario and your own practice it does not mean that the use is not covered. The risk may still be adequately controlled. The way in which you determine if your conditions are equivalent or lower is termed "scaling". Scaling instructions are given below.

Human health: The workers' exposure is addressed using MEASE 2.0. However, for "Attach/detach loading chute to/from road tanker" (PROC 8b) and the "Transfer of borates to mixing vessel with no dedicated engineering controls in place for reducing the exposure" (PROC 8a) ART v1.5 is used instead of MEASE 2.0 to estimate the inhalation exposure.

Environment: Emissions to the environment are estimated using EUSES v.2.1.2 as implemented in CHESAR v3.5. The releases have been estimated on the basis of SPERC Eurometaux SPERC 5.1.v2.

Scaling tool:
Please use the above indicated publicly available modelling tools for scaling.

Scaling instructions:
Scaling can be used to check whether your conditions are "equivalent" to the conditions defined in the exposure scenario. If your conditions of use differ slightly from those indicated in the respective exposure scenario you might be able to demonstrate that, under your conditions of use, the exposure levels are equivalent or lower than under the described conditions. It may be possible to demonstrate this by compensating a variation in one particular condition with a variation in other conditions.

Scalable parameters:
In the following, the key determinants which are likely to vary in the actual use situation are given to be used for scaling.

- **Workers:**
  ART 1.5: Concentration of the substance, Handling of contaminated solid object or paste, Duration of activity, Emission source, Transfer rate, Drop height, LEV, Ventilation rate, Room size, PPE.

  MEASE 2.0: Concentration of the substance, Duration of exposure, Level of automation, Dust suppression techniques, Extraction device, ACH, Process temperature, Room size, Container capacity, Number of containers used, Contamination level of workplace, PPE.

  Remark regarding RMMs: Effectiveness is the key information related to risk management measures. You can be sure that your risk management measures are covered if their effectiveness is equal to, or higher than, what is specified in the exposure scenario.

- **Environment:**
  Daily use amount, Annual use amount, Number of emission days, Release factors, Discharge rate of STP, Receiving surface water flow rate.

Further details on scaling are provided in ECHA's Guidance for downstream users v2.1 (October 2014) as well as in ECHA's Practical Guide 13 (June 2012).

Boundaries of scaling:
RCRs not to be exceeded are described in Section 3.3.

4. ES 4: Use at industrial sites; Base metals and alloys (PC 7); Manufacture of basic metals, including alloys (SU 14)

4.1. Use descriptors

ES name: *Industrial use of fluxes for (precious) metal smelting*
Product category: *Base metals and alloys (PC 7)*
Sector of use: *Manufacture of basic metals, including alloys (SU 14)*

Environment	
1: *Use of reactive processing aid at industrial site (no inclusion into or onto article)*	ERC 6b
Worker	
2: *Attach/detach loading chute to/from road tanker*	PROC 8b
3: *Closed transfer of borate from road tankers to large vessels or containers (e.g. silos) at site*	PROC 1
4: *Storage of borates - indoor*	PROC 2
5: *Storage of borates - outdoor*	PROC 2
6: *Transfer of borates to mixing vessel with no dedicated engineering controls in place for reducing the exposure - indoor*	PROC 8a
7: *Transfer of borates to mixing vessel with no dedicated engineering controls in place for reducing the exposure - outdoor*	PROC 8a
8: *Weighing of borates prior to discharge into mixing vessel*	PROC 9
9: *Mixing in closed or largely closed production processes at high temperature*	PROC 2
10: *Maintenance & routine cleaning - solid*	PROC 28
11: *Removal of slag*	PROC 0
12: *Taking samples (< 1kg/sample)*	PROC 9
13: *Laboratory work including weighing and quality control processes*	PROC 15

4.2. Conditions of use affecting exposure

4.2.1. Control of environmental exposure: *Use of reactive processing aid at industrial site (no inclusion into or onto article)* (ERC 6b)

Amount used, frequency and duration of use (or from service life)
Daily amount per site ≤ 10 tonnes/day
Annual amount per site ≤ 200 tonnes/year
Conditions and measures related to biological sewage treatment plant
Municipal sewage treatment plant is assumed.
Assumed domestic sewage treatment plant flow ≥ 2000 m³/day
Conditions and measures related to external treatment of waste (including article waste)
Dispose of waste product or used containers according to local regulations.
Other conditions affecting environmental exposure
Receiving surface water flow ≥ 18000 m³/day

4.2.2. Control of worker exposure: *Attach/detach loading chute to/from road tanker* (PROC 8b)

Product (article) characteristics
Covers the use of solid material such as powders and dust consisting of relatively coarse particles with a moderate potential to become (and stay) airborne.
Covers concentrations up to 100 %
Powders, granules or pelletised material
Covers the use of coarse dust materials.
Covers dry product with <5 % moisture content.
Amount used (or contained in articles), frequency and duration of use/exposure
Assumes that open trucks, waggons or ships are handled.
Covers the use of up to 100 containers.
Covers use up to 2 h/day
Technical and organisational conditions and measures
Assumes that the process is completely enclosed for the vast majority of its duration. Very infrequent and controlled opening during operation may occur.
Assumes that the process is highly automated. Very limited manual intervention is required to run. Contact with the substance may be possible for a very limited duration of time.
Assumes that there are no adjacent workplaces contributing to exposure of the substance.
Coves the handling of contaminated solid objects or paste.
Covers the handling of objects with limited residual dust (thin layer visible).
Covers the normal handling, involves regular work procedures.
Covers handling that reduces contact between product and adjacent air.
Conditions and measures related to personal protection, hygiene and health evaluation
Assumes occasional general cleaning operations at the workplace.
Effective housekeeping practices (e.g. daily cleaning using appropriate methods, preventive maintenance of machinery, use of protective clothing that will repel spills and reduce personal cloud) in place.
Wear standard safety clothing.
Other conditions affecting workers exposure
Outdoor use
Covers the outdoor application close to buildings or in completely open areas.

4.2.3. Control of worker exposure: *Closed transfer of borate from road tankers to large vessels or containers (e.g. silos) at site* (PROC 1)

Product (article) characteristics
Covers the use of solid material such as powders and dust consisting of relatively coarse particles with a moderate potential to become (and stay) airborne.
Covers concentrations > 25 %.
Amount used (or contained in articles), frequency and duration of use/exposure
Covers use of > 4 h/day.

Technical and organisational conditions and measures
Assumes that the process is completely closed during standard operation.
Assumes that the process is fully automated. Workers are only involved in supervision and control walks. Direct contact with the substance is not possible.
Assumes that there are no adjacent workplaces contributing to exposure of the substance.
Covers an indoor use where a basic mechanical ventilation of at least 1 ACH is provided as well as an outdoor use.
Conditions and measures related to personal protection, hygiene and health evaluation
Assumes occasional general cleaning operations at the workplace.
Wear standard safety clothing.
Other conditions affecting workers exposure
Outdoor use

4.2.4. Control of worker exposure: *Storage of borates - indoor* (PROC 2)

Product (article) characteristics
Covers the use of solid material such as powders and dust consisting of relatively coarse particles with a moderate potential to become (and stay) airborne.
Covers concentrations > 25 %.
Amount used (or contained in articles), frequency and duration of use/exposure
Covers use of > 4 h/day.
Technical and organisational conditions and measures
Assumes that the process is completely enclosed for the vast majority of its duration. Very infrequent and controlled opening during operation may occur.
Assumes that the process is highly automated. Very limited manual intervention is required to run. Contact with the substance may be possible for a very limited duration of time.
Assumes that there are no adjacent workplaces contributing to exposure of the substance.
Covers an indoor use where a basic mechanical ventilation of at least 1 ACH is provided as well as an outdoor use.
Conditions and measures related to personal protection, hygiene and health evaluation
Assumes occasional general cleaning operations at the workplace.
Wear standard safety clothing.
Other conditions affecting workers exposure
Assumes process temperature up to 40 °C

4.2.5. Control of worker exposure: *Storage of borates - outdoor* (PROC 2)

Product (article) characteristics
Covers the use of solid material such as powders and dust consisting of relatively coarse particles with a moderate potential to become (and stay) airborne.
Covers concentrations > 25 %.
Amount used (or contained in articles), frequency and duration of use/exposure
Covers use of > 4 h/day.

Technical and organisational conditions and measures
Assumes that the process is completely enclosed for the vast majority of its duration. Very infrequent and controlled opening during operation may occur.
Assumes that the process is highly automated. Very limited manual intervention is required to run. Contact with the substance may be possible for a very limited duration of time.
Assumes that there are no adjacent workplaces contributing to exposure of the substance.
Covers an indoor use where a basic mechanical ventilation of at least 1 ACH is provided as well as an outdoor use.
Conditions and measures related to personal protection, hygiene and health evaluation
Assumes occasional general cleaning operations at the workplace.
Wear standard safety clothing.
Other conditions affecting workers exposure
Outdoor use
Assumes process temperature up to 40 °C

4.2.6. Control of worker exposure: *Transfer of borates to mixing vessel with no dedicated engineering controls in place for reducing the exposure - indoor* (PROC 8a)

Product (article) characteristics
Covers the use of solid material such as powders and dust consisting of relatively coarse particles with a moderate potential to become (and stay) airborne.
Powders, granules or pelletised material
Covers the use of coarse dust materials.
Covers dry product with <5 % moisture content.
Covers the use of a material containing up to 90 % of the substance.
Amount used (or contained in articles), frequency and duration of use/exposure
Assumes that a system such as a conveyer belt is installed for transfer/handling operation.
Covers use up to 4 h/day
Technical and organisational conditions and measures
Assumes that the process is mostly enclosed during standard operation.
Assumes that the process is semi-automated. Manual intervention is repeatedly required although large parts of the process are machinery assisted.
Assumes that there are no adjacent workplaces contributing to exposure of the substance.
Local exhaust ventilation - efficiency of at least 90 % (e.g. fixed capturing hoods, on-tool extraction, horizontal/downward laminar flow booth, other enclosing hoods).
Provide a ventilation of at least 3 ACH.
Covers the falling transfer of powders, granules or pelletised material.
Covers the transfer of 10 to 100 kg/min.
Covers a drop height of < 0.5 m.
Conditions and measures related to personal protection, hygiene and health evaluation
Assumes regular cleaning operations at the workplace.
Effective housekeeping practices (e.g. daily cleaning using appropriate methods, preventive maintenance of machinery, use of protective clothing that will repel spills and reduce personal cloud) in place.
Wear appropriate selected gloves. For further specification, refer to section 8 of the SDS. Assumes that gloves are used by trained workers.
Wear standard safety clothing.

Other conditions affecting workers exposure
Indoor use
Indoor use (workrooms >1000 m³).

4.2.7. Control of worker exposure: *Transfer of borates to mixing vessel with no dedicated engineering controls in place for reducing the exposure - outdoor* (PROC 8a)

Product (article) characteristics
Covers concentrations > 25 %.
Covers the use of solid material such as powders and dust consisting of relatively coarse particles with a moderate potential to become (and stay) airborne.
Amount used (or contained in articles), frequency and duration of use/exposure
Assumes that containers such as big bags with a capacity of > 500 kg are used.
Covers the use of up to 100 containers.
Covers use of up to 1 h/day.
Technical and organisational conditions and measures
Assumes that the process is mostly enclosed during standard operation.
Assumes that the process is highly automated. Very limited manual intervention is required to run. Contact with the substance may be possible for a very limited duration of time.
Assumes that there are no adjacent workplaces contributing to exposure of the substance.
Covers an indoor use where a basic mechanical ventilation of at least 1 ACH is provided as well as an outdoor use.
Conditions and measures related to personal protection, hygiene and health evaluation
Wear standard safety clothing.
Assumes occasional general cleaning operations at the workplace.
Other conditions affecting workers exposure
Outdoor use

4.2.8. Control of worker exposure: *Weighing of borates prior to discharge into mixing vessel* (PROC 9)

Product (article) characteristics
Covers the use of solid material such as powders and dust consisting of relatively coarse particles with a moderate potential to become (and stay) airborne.
Covers concentrations > 25 %.
Amount used (or contained in articles), frequency and duration of use/exposure
Covers use of > 4 h/day.
Assumes that bottles and cans with an approximate volume of 1L are used.
Technical and organisational conditions and measures
Assumes that the process is mostly enclosed during standard operation.
Assumes that there are no adjacent workplaces contributing to exposure of the substance.
Covers an indoor use where a basic mechanical ventilation of at least 1 ACH is provided as well as an outdoor use.
Conditions and measures related to personal protection, hygiene and health evaluation
Assumes occasional general cleaning operations at the workplace.
Wear standard safety clothing.

4.2.9. Control of worker exposure: *Mixing in closed or largely closed production processes at high temperature* (PROC 2)

Product (article) characteristics
Covers the use of solid material such as powders and dust consisting of relatively coarse particles with a moderate potential to become (and stay) airborne.
Covers concentrations > 25 %.
Amount used (or contained in articles), frequency and duration of use/exposure
Covers use of > 4 h/day.
Technical and organisational conditions and measures
Assumes that the process is completely enclosed for the vast majority of its duration. Very infrequent and controlled opening during operation may occur.
Assumes that the process is highly automated. Very limited manual intervention is required to run. Contact with the substance may be possible for a very limited duration of time.
Assumes that there are no adjacent workplaces contributing to exposure of the substance.
Covers an indoor use where a basic mechanical ventilation of at least 1 ACH is provided as well as an outdoor use.
Conditions and measures related to personal protection, hygiene and health evaluation
Assumes occasional general cleaning operations at the workplace.
Wear standard safety clothing.
Other conditions affecting workers exposure
Assumes process temperature up to 1000 °C

4.2.10. Control of worker exposure: *Maintenance & routine cleaning - solid* (PROC 28)

Product (article) characteristics
Covers the use of solid material such as fine powders having a high potential to become and stay airborne.
Covers concentrations > 25 %.
Amount used (or contained in articles), frequency and duration of use/exposure
Covers use of up to 1 h/day.
Assumes a contamination level of the workplace of up to 5 mg/m³.
Technical and organisational conditions and measures
Assumes that the main cleaning device is a wet cleaning car.
Provide a mechanical ventilation of at least 3 ACH.
Conditions and measures related to personal protection, hygiene and health evaluation
Wear standard safety clothing.

4.2.11. Control of worker exposure: *Removal of slag* (PROC 0)

Product (article) characteristics
Covers concentrations ≤ 5 %.
Covers the use of solid material with a low dustiness such as granules, pellets, wetted/moistened powders, etc. with a low potential for dust emissions.
Amount used (or contained in articles), frequency and duration of use/exposure
Covers use of less than 15 min/day.
Assumes a contamination level of the workplace of more than 5 mg/m³.

Technical and organisational conditions and measures
Covers an indoor use where a basic mechanical ventilation of at least 1 ACH is provided as well as an outdoor use.
Assumes that the main cleaning device is a mop.
Conditions and measures related to personal protection, hygiene and health evaluation
Wear standard safety clothing.

4.2.12. Control of worker exposure: *Taking samples (< 1kg/sample)* (PROC 9)

Product (article) characteristics
Covers the use of solid material such as powders and dust consisting of relatively coarse particles with a moderate potential to become (and stay) airborne.
Covers concentrations > 25 %.
Amount used (or contained in articles), frequency and duration of use/exposure
Assumes that bottles and cans with an approximate volume of 1L are used.
Covers the use of up to 10 containers.
Covers use of up to 1 h/day.
Technical and organisational conditions and measures
Assumes that there are no adjacent workplaces contributing to exposure of the substance.
Covers an indoor use where a basic mechanical ventilation of at least 1 ACH is provided as well as an outdoor use.
Assumes that the main cleaning device is a mop.
Conditions and measures related to personal protection, hygiene and health evaluation
Assumes occasional general cleaning operations at the workplace.
Wear standard safety clothing.

4.2.13. Control of worker exposure: *Laboratory work including weighing and quality control processes* (PROC 15)

Product (article) characteristics
Covers the use of solid material such as powders and dust consisting of relatively coarse particles with a moderate potential to become (and stay) airborne.
Covers concentrations > 25 %.
Amount used (or contained in articles), frequency and duration of use/exposure
Assumes that bottles and cans with an approximate volume of 1L are used.
Covers the use of up to 10 containers.
Covers use of up to 1 h/day.
Technical and organisational conditions and measures
Assumes that there are no adjacent workplaces contributing to exposure of the substance.
Covers an indoor use where a basic mechanical ventilation of at least 1 ACH is provided as well as an outdoor use.
Conditions and measures related to personal protection, hygiene and health evaluation
Assumes occasional general cleaning operations at the workplace.
Wear standard safety clothing.

4.3. Exposure estimation and reference to its source

4.3.1. Environmental release and exposure: *Use of reactive processing aid at industrial site (no inclusion into or onto article)* (ERC 6b)

Release route	Release rate	Release estimation method
Water	10 kg/day	Estimated release factor
Air	10 kg/day	ERC
Soil	2.5 kg/day	ERC

Protection target	Exposure estimate	RCR
Fresh water	0.551 mg/L (EUSES 2.1.2)	0.19
Marine water	0.055 mg/L (EUSES 2.1.2)	0.019
Sewage Treatment Plant	4.998 mg/L (EUSES 2.1.2)	0.5
Agricultural soil	0.173 mg/kg dw (EUSES 2.1.2)	0.03
Man via environment - Inhalation (systemic effects)	0.000152 mg/m³ (EUSES 2.1.2)	< 0.01
Man via environment - Oral	0.026 mg/kg bw/day (EUSES 2.1.2)	0.155
Man via environment - combined routes		0.155

4.3.2. Worker exposure: *Attach/detach loading chute to/from road tanker* (PROC 8b)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.43 mg/m³ (ART)	0.297
Dermal, systemic, long term	2.457 mg/kg bw/day (MEASE)	0.036
Combined, systemic, long term		0.332

4.3.3. Worker exposure: *Closed transfer of borate from road tankers to large vessels or containers (e.g. silos) at site* (PROC 1)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.001 mg/m³ (MEASE)	< 0.01
Dermal, systemic, long term	0.003 mg/kg bw/day (MEASE)	< 0.01
Combined, systemic, long term		< 0.01

4.3.4. Worker exposure: *Storage of borates - indoor* (PROC 2)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.013 mg/m³ (MEASE)	< 0.01
Dermal, systemic, long term	0.035 mg/kg bw/day (MEASE)	< 0.01
Combined, systemic, long term		< 0.01

4.3.5. Worker exposure: *Storage of borates - outdoor* (PROC 2)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.011 mg/m³ (MEASE)	< 0.01
Dermal, systemic, long term	0.035 mg/kg bw/day (MEASE)	< 0.01
Combined, systemic, long term		< 0.01

4.3.6. Worker exposure: *Transfer of borates to mixing vessel with no dedicated engineering controls in place for reducing the exposure - indoor* (PROC 8a)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.67 mg/m³ (ART)	0.462
Dermal, systemic, long term	20.38 mg/kg bw/day (MEASE)	0.297
Combined, systemic, long term		0.759

4.3.7. Worker exposure: *Transfer of borates to mixing vessel with no dedicated engineering controls in place for reducing the exposure - outdoor* (PROC 8a)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	1.092 mg/m³ (MEASE)	0.753
Dermal, systemic, long term	0.273 mg/kg bw/day (MEASE)	< 0.01
Combined, systemic, long term		0.757

4.3.8. Worker exposure: *Weighing of borates prior to discharge into mixing vessel* (PROC 9)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.316 mg/m³ (MEASE)	0.218
Dermal, systemic, long term	0.518 mg/kg bw/day (MEASE)	< 0.01
Combined, systemic, long term		0.225

4.3.9. Worker exposure: *Mixing in closed or largely closed production processes at high temperature* (PROC 2)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.013 mg/m³ (MEASE)	< 0.01
Dermal, systemic, long term	0.035 mg/kg bw/day (MEASE)	< 0.01
Combined, systemic, long term		< 0.01

4.3.10. Worker exposure: *Maintenance & routine cleaning - solid* (PROC 28)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	1.063 mg/m³ (MEASE)	0.733
Dermal, systemic, long term	2.492 mg/kg bw/day (MEASE)	0.036
Combined, systemic, long term		0.769

4.3.11. Worker exposure: *Removal of slag* (PROC 0)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.116 mg/m³ (MEASE)	0.08
Dermal, systemic, long term	0.186 mg/kg bw/day (MEASE)	< 0.01
Combined, systemic, long term		0.083

4.3.12. Worker exposure: *Taking samples (< 1kg/sample)* (PROC 9)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.013 mg/m³ (MEASE)	< 0.01
Dermal, systemic, long term	0.104 mg/kg bw/day (MEASE)	< 0.01
Combined, systemic, long term		0.01

4.3.13. Worker exposure: *Laboratory work including weighing and quality control processes* (PROC 15)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.013 mg/m³ (MEASE)	< 0.01
Dermal, systemic, long term	0.069 mg/kg bw/day (MEASE)	< 0.01
Combined, systemic, long term		< 0.01

4.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Guidance:
The conditions of use at downstream users' sites may differ in some way from those described in the exposure scenario. In case of differences between the description of conditions of use in the exposure scenario and your own practice it does not mean that the use is not covered. The risk may still be adequately controlled. The way in which you determine if your conditions are equivalent or lower is termed "scaling". Scaling instructions are given below.

Human health: The workers' exposure is addressed using MEASE 2.0. However, for "Attach/detach loading chute to/from road tanker" (PROC 8b) and the "Transfer of borates to mixing vessel with no dedicated engineering controls in place for reducing the exposure – indoor" (PROC 8a) ART v1.5 is used instead of MEASE 2.0 to estimate the inhalation exposure.

Environment: Emissions to the environment are estimated using EUSES v.2.1.2 as implemented in CHESAR v3.5.

Scaling tool:
Please use the above indicated publicly available modelling tools for scaling.

Scaling instructions:
Scaling can be used to check whether your conditions are "equivalent" to the conditions defined in the exposure scenario. If your conditions of use differ slightly from those indicated in the respective exposure scenario you might be able to demonstrate that, under your conditions of use, the exposure levels are equivalent or lower than under the described conditions. It may be possible to demonstrate this by compensating a variation in one particular condition with a variation in other conditions.

Scalable parameters:
In the following, the key determinants which are likely to vary in the actual use situation are given to be used for scaling.

- **Workers:**
  ART 1.5: Concentration of the substance, Handling of contaminated solid object or paste, Duration of activity, Emission source, Transfer rate, Drop height, LEV, Ventilation rate, Room size, PPE.

  MEASE 2.0: Concentration of the substance, Duration of exposure, Level of automation, Dust suppression techniques, Extraction device, ACH, Process temperature, Room size, Container capacity, Number of containers used, Contamination level of workplace, PPE.

  Remark regarding RMMs: Effectiveness is the key information related to risk management measures. You can be sure that your risk management measures are covered if their effectiveness is equal to, or higher than, what is specified in the exposure scenario.

- **Environment:**
  Daily use amount, Annual use amount, Number of emission days, Release factors, Discharge rate of STP, Receiving surface water flow rate.

Further details on scaling are provided in ECHA's Guidance for downstream users v2.1 (October 2014) as well as in ECHA's Practical Guide 13 (June 2012).

Boundaries of scaling:
RCRs not to be exceeded are described in Section 4.3.

5. ES 5: Use at industrial sites; Welding and soldering products, flux products (PC 38); Manufacture of fabricated metal products, except machinery and equipment (SU 15)

5.1. Use descriptors

ES name: *Industrial use of flux pastes for coating brazing and welding rods*
Product category: *Welding and soldering products, flux products (PC 38)*
Sector of use: *Manufacture of fabricated metal products, except machinery and equipment (SU 15)*

Environment		SPERC
1: *Use at industrial site leading to inclusion into/onto article*	ERC 5	*Eurometaux SPERC 5.1.v2*
Worker		SWED
2: *Transfer of borates*	PROC 8a	
3: *Storage*	PROC 2	
4: *Coating of welding/brazing rods with flux paste containing boron in enclosed system*	PROC 2	
5: *Maintenance and routine cleaning*	PROC 28	
Subsequent service life exposure scenario(s)		
ES 11: Service life (worker at industrial site); Metal articles (AC 7)		
ES 12: Service life (professional worker); Metal articles (AC 7)		
ES 13: Service life (consumers); Metal articles (AC 7)		

5.2. Conditions of use affecting exposure

5.2.1. Control of environmental exposure: *Use at industrial site leading to inclusion into/onto article* (ERC 5)

Amount used, frequency and duration of use (or from service life)
Daily amount per site ≤ 0.909 tonnes/day
Annual amount per site ≤ 200 tonnes/year
Technical and organisational conditions and measures
Electrostatic precipitators or wet electrostatic precipitators or cyclones or fabric/bag filter or ceramic/metal mesh filter
Chemical precipitation or sedimentation or filtration or electrolysis or reverse osmosis or ion exchange
Conditions and measures related to biological sewage treatment plant
Provide onsite wastewater treatment.
Assumed domestic sewage treatment plant flow ≥ 2000 m³/day
No application of sewage sludge to soil
Conditions and measures related to external treatment of waste (including article waste)
Dispose of waste product or used containers according to local regulations.

5.2.2. Control of worker exposure: *Transfer of borates* (PROC 8a)

Product (article) characteristics
Covers concentrations ≤ 5 %.
Covers the use of a paste.
Amount used (or contained in articles), frequency and duration of use/exposure
Assumes that containers such as kegs and drums with a capacity of up to 200 L are used.
Covers the use of up to 100 containers.
Covers use of up to 1 h/day.
Technical and organisational conditions and measures
Assumes that there are no adjacent workplaces contributing to exposure of the substance.
Covers an indoor use where a basic mechanical ventilation of at least 1 ACH is provided as well as an outdoor use.
Conditions and measures related to personal protection, hygiene and health evaluation
Wear standard safety clothing.
Assumes occasional general cleaning operations at the workplace.
Wear suitable respiratory protection. Inhalation - minimum efficiency of 90 %. For further specification, refer to section 8 of the SDS.

5.2.3. Control of worker exposure: *Storage* (PROC 2)

Product (article) characteristics
Covers concentrations ≤ 5 %.
Covers the use of a paste.
Amount used (or contained in articles), frequency and duration of use/exposure
Covers use of > 4 h/day.
Technical and organisational conditions and measures
Assumes that there are no adjacent workplaces contributing to exposure of the substance.
Covers an indoor use where a basic mechanical ventilation of at least 1 ACH is provided as well as an outdoor use.
Assumes that the process is highly automated. Very limited manual intervention is required to run. Contact with the substance may be possible for a very limited duration of time.
Assumes that the process is completely enclosed for the vast majority of its duration. Very infrequent and controlled opening during operation may occur.
Conditions and measures related to personal protection, hygiene and health evaluation
Wear standard safety clothing.
Assumes occasional general cleaning operations at the workplace.
Other conditions affecting workers exposure
Assumes process temperature up to 40 °C

5.2.4. Control of worker exposure: *Coating of welding/brazing rods with flux paste containing boron in enclosed system* (PROC 2)

Product (article) characteristics
Covers concentrations ≤ 5 %.
Covers the use of a paste.
Amount used (or contained in articles), frequency and duration of use/exposure
Covers use of > 4 h/day.

Technical and organisational conditions and measures
Assumes that there are no adjacent workplaces contributing to exposure of the substance.
Covers an indoor use where a basic mechanical ventilation of at least 1 ACH is provided as well as an outdoor use.
Assumes that the process is highly automated. Very limited manual intervention is required to run. Contact with the substance may be possible for a very limited duration of time.
Assumes that the process is completely enclosed for the vast majority of its duration. Very infrequent and controlled opening during operation may occur.
Conditions and measures related to personal protection, hygiene and health evaluation
Wear standard safety clothing.
Assumes occasional general cleaning operations at the workplace.
Other conditions affecting workers exposure
Assumes process temperature up to 40 °C

5.2.5. Control of worker exposure: *Maintenance and routine cleaning* (PROC 28)

Product (article) characteristics
Covers concentrations ≤ 5 %.
Covers the use of a paste.
Amount used (or contained in articles), frequency and duration of use/exposure
Assumes a contamination level of the workplace of up to 5 mg/m³.
Covers use of up to 1 h/day.
Technical and organisational conditions and measures
Covers an indoor use where a basic mechanical ventilation of at least 1 ACH is provided as well as an outdoor use.
Assumes that the main cleaning device is a hoover.
Assumes that the process is semi-automated. Manual intervention is repeatedly required although large parts of the process are machinery assisted.
Conditions and measures related to personal protection, hygiene and health evaluation
Wear standard safety clothing.

5.3. Exposure estimation and reference to its source

5.3.1. Environmental release and exposure: *Use at industrial site leading to inclusion into/onto article* (ERC 5)

Release route	Release rate	Release estimation method
Water	4.545 kg/day	SPERC
Air	1.818 kg/day	SPERC
Soil	9.091 kg/day	SPERC

Protection target	Exposure estimate	RCR
Fresh water	0.279 mg/L (EUSES 2.1.2)	0.096
Marine water	0.028 mg/L (EUSES 2.1.2)	< 0.01
Sewage Treatment Plant	2.272 mg/L (EUSES 2.1.2)	0.227
Agricultural soil	0.144 mg/kg dw (EUSES 2.1.2)	0.025
Man via environment - Inhalation (systemic effects)	0.000305 mg/m³ (EUSES 2.1.2)	< 0.01
Man via environment - Oral	0.052 mg/kg bw/day (EUSES 2.1.2)	0.308
Man via environment - combined routes		0.308

5.3.2. Worker exposure: *Transfer of borates* (PROC 8a)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.127 mg/m³ (MEASE)	0.088
Dermal, systemic, long term	0.355 mg/kg bw/day (MEASE)	< 0.01
Combined, systemic, long term		0.093

5.3.3. Worker exposure: *Storage* (PROC 2)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.003 mg/m³ (MEASE)	< 0.01
Dermal, systemic, long term	0.007 mg/kg bw/day (MEASE)	< 0.01
Combined, systemic, long term		< 0.01

5.3.4. Worker exposure: *Coating of welding/brazing rods with flux paste containing boron in enclosed system* (PROC 2)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.003 mg/m³ (MEASE)	< 0.01
Dermal, systemic, long term	0.007 mg/kg bw/day (MEASE)	< 0.01
Combined, systemic, long term		< 0.01

5.3.5. Worker exposure: *Maintenance and routine cleaning* (PROC 28)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.002 mg/m³ (MEASE)	< 0.01
Dermal, systemic, long term	0.05 mg/kg bw/day (MEASE)	< 0.01
Combined, systemic, long term		< 0.01

5.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Guidance:
The conditions of use at downstream users' sites may differ in some way from those described in the exposure scenario. In case of differences between the description of conditions of use in the exposure scenario and your own practice it does not mean that the use is not covered. The risk may still be adequately controlled. The way in which you determine if your conditions are equivalent or lower is termed "scaling". Scaling instructions are given below.

Human health: The workers' exposure is addressed using MEASE 2.0.

Environment: Emissions to the environment are estimated using EUSES v.2.1.2 as implemented in CHESAR v3.5. The releases have been estimated on the basis of SPERC Eurometaux SPERC 5.1.v2.

Scaling tool:
Please use the above indicated publicly available modelling tools for scaling.

Scaling instructions:
Scaling can be used to check whether your conditions are "equivalent" to the conditions defined in the exposure scenario. If your conditions of use differ slightly from those indicated in the respective exposure scenario you might be able to demonstrate that, under your conditions of use, the exposure levels are equivalent or lower than under the described conditions. It may be possible to demonstrate this by compensating a variation in one particular condition with a variation in other conditions.

Scalable parameters:
In the following, the key determinants which are likely to vary in the actual use situation are given to be used for scaling.

- **Workers:**
  Concentration of the substance, Duration of exposure, Level of automation, Dust suppression techniques, Extraction device, ACH, Process temperature, Room size, Container capacity, Number of containers used, Contamination level of workplace, PPE.

  Remark regarding RMMs: Effectiveness is the key information related to risk management measures. You can be sure that your risk management measures are covered if their effectiveness is equal to, or higher than, what is specified in the exposure scenario.

- **Environment:**
  Daily use amount, Annual use amount, Number of emission days, Release factors, Discharge rate of STP, Receiving surface water flow rate.

Further details on scaling are provided in ECHA's Guidance for downstream users v2.1 (October 2014) as well as in ECHA's Practical Guide 13 (June 2012).

Boundaries of scaling:
RCRs not to be exceeded are described in Section 5.3.

6. ES 6: Use at industrial sites; Welding and soldering products, flux products (PC 38); Various sectors (SU 14, SU 15, SU 17, SU 19)

6.1. Use descriptors

ES name: *Industrial use of welding, brazing or soldering rods*
Product category: Welding and soldering products, flux products (PC 38)
Sector of use: Manufacture of basic metals, including alloys (SU 14), Manufacture of fabricated metal products, except machinery and equipment (SU 15), General manufacturing, e.g. machinery, equipment, vehicles, other transport equipment. (SU 17), Building and construction work (SU 19)

Environment	
1: *Use of non-reactive processing aid at industrial site (no inclusion into or onto article)*	ERC 4
2: *Use of reactive processing aid at industrial site (no inclusion into or onto article)*	ERC 6b
Worker	
3: *Transfer of boron-containing welding, brazing and soldering rods*	PROC 8a
4: *Storage of boron-containing welding, brazing and soldering rods*	PROC 2
5: *Use of flux paste in welding/brazing*	PROC 25
6: *Maintenance and routine cleaning*	PROC 28

6.2. Conditions of use affecting exposure

6.2.1. Control of environmental exposure: *Use of non-reactive processing aid at industrial site (no inclusion into or onto article)* (ERC 4)

Amount used, frequency and duration of use (or from service life)
Daily amount per site ≤ 1 tonnes/day
Annual amount per site ≤ 20 tonnes/year
Conditions and measures related to biological sewage treatment plant
Municipal sewage treatment plant is assumed.
Assumed domestic sewage treatment plant flow ≥ 2000 m³/day
Conditions and measures related to external treatment of waste (including article waste)
Dispose of waste product or used containers according to local regulations.
Other conditions affecting environmental exposure
Receiving surface water flow ≥ 18000 m³/day

6.2.2. Control of environmental exposure: *Use of reactive processing aid at industrial site (no inclusion into or onto article)* (ERC 6b)

Amount used, frequency and duration of use (or from service life)
Daily amount per site ≤ 10 tonnes/day
Annual amount per site ≤ 200 tonnes/year
Conditions and measures related to biological sewage treatment plant
Municipal sewage treatment plant is assumed.
Assumed domestic sewage treatment plant flow ≥ 2000 m³/day
Conditions and measures related to external treatment of waste (including article waste)
Dispose of waste product or used containers according to local regulations.

Other conditions affecting environmental exposure
Receiving surface water flow ≥ 18000 m³/day

6.2.3. Control of worker exposure: *Transfer of boron-containing welding, brazing and soldering rods* (PROC 8a)

Product (article) characteristics
Covers concentrations ≤ 5 %.
Covers the use of massive objects with a very low intrinsic emission potential.
Amount used (or contained in articles), frequency and duration of use/exposure
Covers use of up to 1 h/day.
Technical and organisational conditions and measures
Assumes that there are no adjacent workplaces contributing to exposure of the substance.
Covers an indoor use where a basic mechanical ventilation of at least 1 ACH is provided as well as an outdoor use.
Conditions and measures related to personal protection, hygiene and health evaluation
Wear standard safety clothing.
Assumes occasional general cleaning operations at the workplace.

6.2.4. Control of worker exposure: *Storage of boron-containing welding, brazing and soldering rods* (PROC 2)

Product (article) characteristics
Covers concentrations ≤ 5 %.
Covers the use of massive objects with a very low intrinsic emission potential.
Amount used (or contained in articles), frequency and duration of use/exposure
Covers use of > 4 h/day.
Technical and organisational conditions and measures
Assumes that there are no adjacent workplaces contributing to exposure of the substance.
Covers an indoor use where a basic mechanical ventilation of at least 1 ACH is provided as well as an outdoor use.
Assumes that the process is highly automated. Very limited manual intervention is required to run. Contact with the substance may be possible for a very limited duration of time.
Assumes that the process is completely enclosed for the vast majority of its duration. Very infrequent and controlled opening during operation may occur.
Conditions and measures related to personal protection, hygiene and health evaluation
Wear standard safety clothing.
Assumes occasional general cleaning operations at the workplace.
Other conditions affecting workers exposure
Assumes process temperature up to 40 °C

6.2.5. Control of worker exposure: *Use of flux paste in welding/brazing* (PROC 25)

Product (article) characteristics
Covers concentrations ≤ 5 %.
Covers the use of a molten substance/material.
Amount used (or contained in articles), frequency and duration of use/exposure
Covers use of > 4 h/day.

Technical and organisational conditions and measures
Assumes that there are no adjacent workplaces contributing to exposure of the substance.
Covers an indoor use where a basic mechanical ventilation of at least 1 ACH is provided as well as an outdoor use.
Assumes that the process is semi-automated. Manual intervention is repeatedly required although large parts of the process are machinery assisted.
Assumes that the process is mostly enclosed during standard operation.
Covers welding of the material
Conditions and measures related to personal protection, hygiene and health evaluation
Wear standard safety clothing.
Assumes occasional general cleaning operations at the workplace.
Other conditions affecting workers exposure
Assumes process temperature up to 40 °C

6.2.6. Control of worker exposure: *Maintenance and routine cleaning* (PROC 28)

Product (article) characteristics
Covers concentrations ≤ 5 %.
Covers the use of solid material such as fine powders having a high potential to become and stay airborne.
Amount used (or contained in articles), frequency and duration of use/exposure
Assumes a contamination level of the workplace of up to 5 mg/m³.
Covers use of up to 1 h/day.
Technical and organisational conditions and measures
Covers an indoor use where a basic mechanical ventilation of at least 1 ACH is provided as well as an outdoor use.
Assumes that the main cleaning device is a hoover.
Assumes that the process is semi-automated. Manual intervention is repeatedly required although large parts of the process are machinery assisted.
Conditions and measures related to personal protection, hygiene and health evaluation
Wear standard safety clothing.

6.3. Exposure estimation and reference to its source

6.3.1. Environmental release and exposure: *Use of non-reactive processing aid at industrial site (no inclusion into or onto article)* (ERC 4)

Release route	Release rate	Release estimation method
Water	0 kg/day	Estimated release factor
Air	37 kg/day	Estimated release factor
Soil	50 kg/day	ERC

Protection target	Exposure estimate	RCR
Fresh water	0.051 mg/L (EUSES 2.1.2)	0.018
Marine water	0.00508 mg/L (EUSES 2.1.2)	< 0.01
Sewage Treatment Plant	0 mg/L (EUSES 2.1.2)	< 0.01
Agricultural soil	0.146 mg/kg dw (EUSES 2.1.2)	0.026
Man via environment - Inhalation (systemic effects)	0.000564 mg/m³ (EUSES 2.1.2)	< 0.01
Man via environment - Oral	0.087 mg/kg bw/day (EUSES 2.1.2)	0.513
Man via environment - combined routes		0.513

6.3.2. Environmental release and exposure: *Use of reactive processing aid at industrial site (no inclusion into or onto article)* (ERC 6b)

Release route	Release rate	Release estimation method
Water	0 kg/day	Estimated release factor
Air	10 kg/day	ERC
Soil	2.5 kg/day	ERC

Protection target	Exposure estimate	RCR
Fresh water	0.051 mg/L (EUSES 2.1.2)	0.018
Marine water	0.00508 mg/L (EUSES 2.1.2)	< 0.01
Sewage Treatment Plant	0 mg/L (EUSES 2.1.2)	< 0.01
Agricultural soil	0.142 mg/kg dw (EUSES 2.1.2)	0.025
Man via environment - Inhalation (systemic effects)	0.000152 mg/m³ (EUSES 2.1.2)	< 0.01
Man via environment - Oral	0.026 mg/kg bw/day (EUSES 2.1.2)	0.15
Man via environment - combined routes		0.15

6.3.3. Worker exposure: *Transfer of boron-containing welding, brazing and soldering rods* (PROC 8a)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.001 mg/m³ (MEASE)	< 0.01
Dermal, systemic, long term	0.028 mg/kg bw/day (MEASE)	< 0.01
Combined, systemic, long term		< 0.01

6.3.4. Worker exposure: *Storage of boron-containing welding, brazing and soldering rods* (PROC 2)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.001 mg/m³ (MEASE)	< 0.01
Dermal, systemic, long term	0.007 mg/kg bw/day (MEASE)	< 0.01
Combined, systemic, long term		< 0.01

6.3.5. Worker exposure: *Use of flux paste in welding/brazing* (PROC 25)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.506 mg/m³ (MEASE)	0.349
Dermal, systemic, long term	0.273 mg/kg bw/day (MEASE)	< 0.01
Combined, systemic, long term		0.353

6.3.6. Worker exposure: *Maintenance and routine cleaning* (PROC 28)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.231 mg/m³ (MEASE)	0.159
Dermal, systemic, long term	0.499 mg/kg bw/day (MEASE)	< 0.01
Combined, systemic, long term		0.167

6.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Guidance:
The conditions of use at downstream users' sites may differ in some way from those described in the exposure scenario. In case of differences between the description of conditions of use in the exposure scenario and your own practice it does not mean that the use is not covered. The risk may still be adequately controlled. The way in which you determine if your conditions are equivalent or lower is termed "scaling". Scaling instructions are given below.

Human health: The workers' exposure is addressed using MEASE 2.0.

Environment: Emissions to the environment are estimated using EUSES v.2.1.2 as implemented in CHESAR v3.5.

Scaling tool:
Please use the above indicated publicly available modelling tools for scaling.

Scaling instructions:
Scaling can be used to check whether your conditions are "equivalent" to the conditions defined in the exposure scenario. If your conditions of use differ slightly from those indicated in the respective exposure scenario you might be able to demonstrate that, under your conditions of use, the exposure levels are equivalent or lower than under the described conditions. It may be possible to demonstrate this by compensating a variation in one particular condition with a variation in other conditions.

Scalable parameters:
In the following, the key determinants which are likely to vary in the actual use situation are given to be used for scaling.

- **Workers:**
  Concentration of the substance, Duration of exposure, Level of automation, Dust suppression techniques, Extraction device, ACH, Process temperature, Room size, Contamination level of workplace, PPE.

  Remark regarding RMMs: Effectiveness is the key information related to risk management measures. You can be sure that your risk management measures are covered if their effectiveness is equal to, or higher than, what is specified in the exposure scenario.

- **Environment:**
  Daily use amount, Annual use amount, Number of emission days, Release factors, Discharge rate of STP, Receiving surface water flow rate.

Further details on scaling are provided in ECHA's Guidance for downstream users v2.1 (October 2014) as well as in ECHA's Practical Guide 13 (June 2012).

Boundaries of scaling:
RCRs not to be exceeded are described in Section 6.3.

7. ES 7: Use at industrial sites; Metal surface treatment products (PC 14); Various sectors (SU 14, SU 17)

7.1. Use descriptors

ES name: *Use of borates in metal treatment (plating, passivation, galvanising, cleaning, etc)*
Product category: *Metal surface treatment products (PC 14)*
Sector of use: *Manufacture of basic metals, including alloys (SU 14), General manufacturing, e.g. machinery, equipment, vehicles, other transport equipment. (SU 17)*

Environment		SPERC
1: *Use at industrial site leading to inclusion into/onto article*	ERC 5	*Eurometaux SPERC 5.1.v2*
Worker		SWED
2: *Transfer of borates*	PROC 8a	
3: *Storage*	PROC 2	
4: *Initial filling of treatment baths for galvanising, plating and other surface treatments*	PROC 8b	
5: *Top-up of treatment baths for galvanising, glating and other surface treatments*	PROC 8b	
6: *Galvanising, plating and other surface treatment of metal articles*	PROC 13	
7: *Spray cleaning of large scale objects using a boron-containing cleaner (powder) which is dissolved in a liquid*	PROC 7	
8: *Spray cleaning of large scale objects using a liquid boron-containing cleaner*	PROC 7	
9: *Surface cleaning using a liquid boron-containing cleaner*	PROC 10	
10: *Surface cleaning using a boron-containing cleaner (powder) which is dissolved in a liquid*	PROC 10	
11: *Specific cleaning processes*	PROC 28	
Subsequent service life exposure scenario(s)		
ES 11: Service life (worker at industrial site); Metal articles (AC 7)		
ES 12: Service life (professional worker); Metal articles (AC 7)		
ES 13: Service life (consumers); Metal articles (AC 7)		

7.2. Conditions of use affecting exposure

7.2.1. Control of environmental exposure: *Use at industrial site leading to inclusion into/onto article* (ERC 5)

Amount used, frequency and duration of use (or from service life)
Daily amount per site ≤ 0.909 tonnes/day
Annual amount per site ≤ 200 tonnes/year
Technical and organisational conditions and measures
Electrostatic precipitators or wet electrostatic precipitators or cyclones or fabric/bag filter or ceramic/metal mesh filter
Chemical precipitation or sedimentation or filtration or electrolysis or reverse osmosis or ion exchange

Conditions and measures related to biological sewage treatment plant
Provide onsite wastewater treatment.
Assumed domestic sewage treatment plant flow ≥ 2000 m³/day
No application of sewage sludge to soil
Conditions and measures related to external treatment of waste (including article waste)
Dispose of waste product or used containers according to local regulations.

7.2.2. Control of worker exposure: *Transfer of borates* (PROC 8a)

Product (article) characteristics
Covers concentrations ≤ 25 %.
Covers the use of solid material such as fine powders having a high potential to become and stay airborne.
Amount used (or contained in articles), frequency and duration of use/exposure
Assumes that containers such as kegs and drums with a capacity of up to 200 L are used.
Covers the use of up to 10 containers.
Covers use of up to 1 h/day.
Technical and organisational conditions and measures
Assumes that there are no adjacent workplaces contributing to exposure of the substance.
Covers an indoor use where a basic mechanical ventilation of at least 1 ACH is provided as well as an outdoor use.
Assumes that the process is semi-automated. Manual intervention is repeatedly required although large parts of the process are machinery assisted.
Assumes that the process is mostly enclosed during standard operation.
Conditions and measures related to personal protection, hygiene and health evaluation
Wear standard safety clothing.
Assumes occasional general cleaning operations at the workplace.

7.2.3. Control of worker exposure: *Storage* (PROC 2)

Product (article) characteristics
Covers concentrations ≤ 25 %.
Covers the use of solid material such as fine powders having a high potential to become and stay airborne.
Amount used (or contained in articles), frequency and duration of use/exposure
Covers use of > 4 h/day.
Technical and organisational conditions and measures
Covers an indoor use where a basic mechanical ventilation of at least 1 ACH is provided as well as an outdoor use.
Assumes that there are no adjacent workplaces contributing to exposure of the substance.
Assumes that the process is highly automated. Very limited manual intervention is required to run. Contact with the substance may be possible for a very limited duration of time.
Assumes that the process is completely enclosed for the vast majority of its duration. Very infrequent and controlled opening during operation may occur.
Conditions and measures related to personal protection, hygiene and health evaluation
Wear standard safety clothing.
Assumes occasional general cleaning operations at the workplace.
Other conditions affecting workers exposure
Assumes process temperature up to 40 °C

7.2.4. Control of worker exposure: *Initial filling of treatment baths for galvanising, plating and other surface treatments* (PROC 8b)

Product (article) characteristics
Covers concentrations ≤ 25 %.
Covers the use of solid material such as fine powders having a high potential to become and stay airborne.
Amount used (or contained in articles), frequency and duration of use/exposure
Assumes that containers such as kegs and drums with a capacity of up to 200 L are used.
Covers the use of up to 10 containers.
Covers use of up to 1 h/day.
Technical and organisational conditions and measures
Assumes that there are no adjacent workplaces contributing to exposure of the substance.
Covers an indoor use where a basic mechanical ventilation of at least 1 ACH is provided as well as an outdoor use.
Assumes that the process is semi-automated. Manual intervention is repeatedly required although large parts of the process are machinery assisted.
Assumes that the process is mostly enclosed during standard operation.
Conditions and measures related to personal protection, hygiene and health evaluation
Wear standard safety clothing.
Assumes occasional general cleaning operations at the workplace.

7.2.5. Control of worker exposure: *Top-up of treatment baths for galvanising, glating and other surface treatments* (PROC 8b)

Product (article) characteristics
Covers concentrations ≤ 25 %.
Covers the use of solid material such as fine powders having a high potential to become and stay airborne.
Amount used (or contained in articles), frequency and duration of use/exposure
Assumes that containers such as kegs and drums with a capacity of up to 200 L are used.
Covers the use of up to 2 containers.
Covers use of up to 1 h/day.
Technical and organisational conditions and measures
Assumes that there are no adjacent workplaces contributing to exposure of the substance.
Covers an indoor use where a basic mechanical ventilation of at least 1 ACH is provided as well as an outdoor use.
Assumes that the process is semi-automated. Manual intervention is repeatedly required although large parts of the process are machinery assisted.
Assumes that the process is mostly enclosed during standard operation.
Conditions and measures related to personal protection, hygiene and health evaluation
Wear standard safety clothing.
Assumes occasional general cleaning operations at the workplace.

7.2.6. Control of worker exposure: *Galvanising, plating and other surface treatment of metal articles* (PROC 13)

Product (article) characteristics
Covers concentrations < 1 %.
Covers the use of a liquid.
Amount used (or contained in articles), frequency and duration of use/exposure
Covers use of > 4 h/day.
Technical and organisational conditions and measures
Assumes that there are no adjacent workplaces contributing to exposure of the substance.
Covers an indoor use where a basic mechanical ventilation of at least 1 ACH is provided as well as an outdoor use.
Assumes that the process is mostly enclosed during standard operation.
Conditions and measures related to personal protection, hygiene and health evaluation
Wear standard safety clothing.
Assumes occasional general cleaning operations at the workplace.
Other conditions affecting workers exposure
Assumes process temperature up to 60 °C

7.2.7. Control of worker exposure: *Spray cleaning of large scale objects using a boron-containing cleaner (powder) which is dissolved in a liquid* (PROC 7)

Product (article) characteristics
Covers concentrations ≤ 5 %.
Covers the use of a substance handled in solution.
Amount used (or contained in articles), frequency and duration of use/exposure
Covers use of up to 4 h/day.
Technical and organisational conditions and measures
Assumes that there are no adjacent workplaces contributing to exposure of the substance.
Provide a mechanical ventilation of at least 3 ACH.
Provide a specifically designed LEV.
Fixed LEV that is installed at or near the emission source and is not moveable.
Assumes that the process is semi-automated. Manual intervention is repeatedly required although large parts of the process are machinery assisted.
Assumes that the process is mostly enclosed during standard operation.
Conditions and measures related to personal protection, hygiene and health evaluation
Wear standard safety clothing.
Assumes occasional general cleaning operations at the workplace.
Wear suitable respiratory protection. Inhalation - minimum efficiency of 90 %. For further specification, refer to section 8 of the SDS.

7.2.8. Control of worker exposure: *Spray cleaning of large scale objects using a liquid boron-containing cleaner* (PROC 7)

Product (article) characteristics
Covers concentrations ≤ 25 %.
Covers the use of a liquid.
Amount used (or contained in articles), frequency and duration of use/exposure
Covers use of up to 4 h/day.
Technical and organisational conditions and measures
Assumes that there are no adjacent workplaces contributing to exposure of the substance.
Provide a mechanical ventilation of at least 3 ACH.
Provide a specifically designed LEV.
Fixed LEV that is installed at or near the emission source and is not moveable.
Assumes that the process is semi-automated. Manual intervention is repeatedly required although large parts of the process are machinery assisted.
Conditions and measures related to personal protection, hygiene and health evaluation
Wear standard safety clothing.
Assumes occasional general cleaning operations at the workplace.
Wear suitable respiratory protection. Inhalation - minimum efficiency of 90 %. For further specification, refer to section 8 of the SDS.

7.2.9. Control of worker exposure: *Surface cleaning using a liquid boron-containing cleaner* (PROC 10)

Product (article) characteristics
Covers concentrations ≤ 25 %.
Covers the use of a liquid.
Amount used (or contained in articles), frequency and duration of use/exposure
Covers use of up to 4 h/day.
Technical and organisational conditions and measures
Assumes that there are no adjacent workplaces contributing to exposure of the substance.
Provide a mechanical ventilation of at least 3 ACH.
Assumes that the process is semi-automated. Manual intervention is repeatedly required although large parts of the process are machinery assisted.
Assumes that the process is mostly enclosed during standard operation.
Conditions and measures related to personal protection, hygiene and health evaluation
Wear standard safety clothing.
Assumes occasional general cleaning operations at the workplace.

7.2.10. Control of worker exposure: *Surface cleaning using a boron-containing cleaner (powder) which is dissolved in a liquid* (PROC 10)

Product (article) characteristics
Covers concentrations ≤ 25 %.
Covers the use of a substance handled in solution.
Amount used (or contained in articles), frequency and duration of use/exposure
Covers use of > 4 h/day.

Technical and organisational conditions and measures
Assumes that there are no adjacent workplaces contributing to exposure of the substance.
Provide a mechanical ventilation of at least 3 ACH.
Assumes that the process is semi-automated. Manual intervention is repeatedly required although large parts of the process are machinery assisted.
Assumes that the process is mostly enclosed during standard operation.
Conditions and measures related to personal protection, hygiene and health evaluation
Wear standard safety clothing.
Assumes occasional general cleaning operations at the workplace.

7.2.11. Control of worker exposure: *Specific cleaning processes* (PROC 28)

Product (article) characteristics
Covers concentrations ≤ 5 %.
Covers the use of a liquid.
Amount used (or contained in articles), frequency and duration of use/exposure
Assumes a contamination level of the workplace of up to 5 mg/m³.
Covers use of up to 1 h/day.
Technical and organisational conditions and measures
Covers an indoor use where a basic mechanical ventilation of at least 1 ACH is provided as well as an outdoor use.
Assumes that the main cleaning device is a hoover.
Assumes that the process is semi-automated. Manual intervention is repeatedly required although large parts of the process are machinery assisted.
Conditions and measures related to personal protection, hygiene and health evaluation
Wear standard safety clothing.

7.3. Exposure estimation and reference to its source

7.3.1. Environmental release and exposure: *Use at industrial site leading to inclusion into/onto article* (ERC 5)

Release route	Release rate	Release estimation method
Water	4.545 kg/day	SPERC
Air	1.818 kg/day	SPERC
Soil	9.091 kg/day	SPERC

Protection target	Exposure estimate	RCR
Fresh water	0.279 mg/L (EUSES 2.1.2)	0.096
Marine water	0.028 mg/L (EUSES 2.1.2)	< 0.01
Sewage Treatment Plant	2.272 mg/L (EUSES 2.1.2)	0.227
Agricultural soil	0.144 mg/kg dw (EUSES 2.1.2)	0.025
Man via environment - Inhalation (systemic effects)	0.000305 mg/m³ (EUSES 2.1.2)	< 0.01
Man via environment - Oral	0.052 mg/kg bw/day (EUSES 2.1.2)	0.308
Man via environment - combined routes		0.308

7.3.2. Worker exposure: *Transfer of borates* (PROC 8a)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.759 mg/m³ (MEASE)	0.523
Dermal, systemic, long term	0.164 mg/kg bw/day (MEASE)	< 0.01
Combined, systemic, long term		0.526

7.3.3. Worker exposure: *Storage* (PROC 2)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.076 mg/m³ (MEASE)	0.052
Dermal, systemic, long term	0.021 mg/kg bw/day (MEASE)	< 0.01
Combined, systemic, long term		0.053

7.3.4. Worker exposure: *Initial filling of treatment baths for galvanising, plating and other surface treatments* (PROC 8b)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.759 mg/m³ (MEASE)	0.523
Dermal, systemic, long term	0.164 mg/kg bw/day (MEASE)	< 0.01
Combined, systemic, long term		0.526

7.3.5. Worker exposure: *Top-up of treatment baths for galvanising, glating and other surface treatments* (PROC 8b)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.076 mg/m³ (MEASE)	0.052
Dermal, systemic, long term	0.164 mg/kg bw/day (MEASE)	< 0.01
Combined, systemic, long term		0.055

7.3.6. Worker exposure: *Galvanising, plating and other surface treatment of metal articles* (PROC 13)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.127 mg/m³ (MEASE)	0.088
Dermal, systemic, long term	0.089 mg/kg bw/day (MEASE)	< 0.01
Combined, systemic, long term		0.089

7.3.7. Worker exposure: *Spray cleaning of large scale objects using a boron-containing cleaner (powder) which is dissolved in a liquid* (PROC 7)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.251 mg/m³ (MEASE)	0.173
Dermal, systemic, long term	5.401 mg/kg bw/day (MEASE)	0.079
Combined, systemic, long term		0.252

7.3.8. Worker exposure: *Spray cleaning of large scale objects using a liquid boron-containing cleaner* (PROC 7)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.754 mg/m³ (MEASE)	0.52
Dermal, systemic, long term	16.20 mg/kg bw/day (MEASE)	0.236
Combined, systemic, long term		0.756

7.3.9. Worker exposure: *Surface cleaning using a liquid boron-containing cleaner* (PROC 10)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.419 mg/m³ (MEASE)	0.289
Dermal, systemic, long term	0.54 mg/kg bw/day (MEASE)	< 0.01
Combined, systemic, long term		0.297

7.3.10. Worker exposure: *Surface cleaning using a boron-containing cleaner (powder) which is dissolved in a liquid* (PROC 10)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.698 mg/m³ (MEASE)	0.481
Dermal, systemic, long term	0.9 mg/kg bw/day (MEASE)	0.013
Combined, systemic, long term		0.494

7.3.11. Worker exposure: *Specific cleaning processes* (PROC 28)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.002 mg/m³ (MEASE)	< 0.01
Dermal, systemic, long term	0.05 mg/kg bw/day (MEASE)	< 0.01
Combined, systemic, long term		< 0.01

7.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Guidance:
The conditions of use at downstream users' sites may differ in some way from those described in the exposure scenario. In case of differences between the description of conditions of use in the exposure scenario and your own practice it does not mean that the use is not covered. The risk may still be adequately controlled. The way in which you determine if your conditions are equivalent or lower is termed "scaling". Scaling instructions are given below.

Human health: The workers' exposure is addressed using MEASE 2.0.

Environment: Emissions to the environment are estimated using EUSES v.2.1.2 as implemented in CHESAR v3.5. The releases have been estimated on the basis of SPERC Eurometaux SPERC 5.1.v2.

Scaling tool:
Please use the above indicated publicly available modelling tools for scaling.

Scaling instructions:
Scaling can be used to check whether your conditions are "equivalent" to the conditions defined in the exposure scenario. If your conditions of use differ slightly from those indicated in the respective exposure scenario you might be able to demonstrate that, under your conditions of use, the exposure levels are equivalent or lower than under the described conditions. It may be possible to demonstrate this by compensating a variation in one particular condition with a variation in other conditions.

Scalable parameters:
In the following, the key determinants which are likely to vary in the actual use situation are given to be used for scaling.

- **Workers:**
  Concentration of the substance, Duration of exposure, Level of automation, Dust suppression techniques, Extraction device, ACH, Process temperature, Room size, Container capacity, Number of containers used, Contamination level of workplace, PPE.

Remark regarding RMMs: Effectiveness is the key information related to risk management measures. You can be sure that your risk management measures are covered if their effectiveness is equal to, or higher than, what is specified in the exposure scenario.

- **Environment:**
  Daily use amount, Annual use amount, Number of emission days, Release factors, Discharge rate of STP, Receiving surface water flow rate.

Further details on scaling are provided in ECHA's Guidance for downstream users v2.1 (October 2014) as well as in ECHA's Practical Guide 13 (June 2012).

Boundaries of scaling:
RCRs not to be exceeded are described in Section 7.3.

8. ES 8: Use at industrial sites; Base metals and alloys (PC 7); Manufacture of basic metals, including alloys (SU 14)

8.1. Use descriptors

ES name: *Industrial use for slag stabilisation treatment*
Product category: *Base metals and alloys (PC 7)*
Sector of use: *Manufacture of basic metals, including alloys (SU 14)*

Environment	
1: *Use of reactive processing aid at industrial site (no inclusion into or onto article)*	ERC 6b
Worker	
2: *Transfer of boron-containing substance-indoor*	PROC 8a
3: *Transfer of boron-containing substance-outdoor*	PROC 8a
4: *Storage of boron-containing substance - indoor*	PROC 2
5: *Storage of boron-containing substance - outdoor*	PROC 2
6: *Addition of boron-containing substance to slag indoor*	PROC 4
7: *Addition of boron-containing substance to slag outdoor*	PROC 4
8: *Maintenance and routine cleaning*	PROC 28

8.2. Conditions of use affecting exposure

8.2.1. Control of environmental exposure: *Use of reactive processing aid at industrial site (no inclusion into or onto article)* (ERC 6b)

Amount used, frequency and duration of use (or from service life)
Daily amount per site ≤ 5 tonnes/day
Annual amount per site ≤ 100 tonnes/year
Conditions and measures related to biological sewage treatment plant
Municipal sewage treatment plant is assumed.
Assumed domestic sewage treatment plant flow ≥ 2000 m³/day
Conditions and measures related to external treatment of waste (including article waste)
Dispose of waste product or used containers according to local regulations.
Other conditions affecting environmental exposure
Receiving surface water flow ≥ 18000 m³/day

8.2.2. Control of worker exposure: *Transfer of boron-containing substance-indoor* (PROC 8a)

Product (article) characteristics
Covers concentrations > 25 %.
Covers the use of solid material such as powders and dust consisting of relatively coarse particles with a moderate potential to become (and stay) airborne.
Amount used (or contained in articles), frequency and duration of use/exposure
Assumes that containers such as kegs and drums with a capacity of up to 200 L are used.
Covers the use of up to 10 containers.
Covers use of up to 1 h/day.

Technical and organisational conditions and measures
Assumes that there are no adjacent workplaces contributing to exposure of the substance.
Provide a mechanical ventilation of at least 3 ACH.
Assumes that the process is semi-automated. Manual intervention is repeatedly required although large parts of the process are machinery assisted.
Assumes that the process is mostly enclosed during standard operation.
Conditions and measures related to personal protection, hygiene and health evaluation
Wear standard safety clothing.
Assumes regular cleaning operations at the workplace.

8.2.3. Control of worker exposure: *Transfer of boron-containing substance-outdoor* (PROC 8a)

Product (article) characteristics
Covers concentrations > 25 %.
Covers the use of solid material such as powders and dust consisting of relatively coarse particles with a moderate potential to become (and stay) airborne.
Amount used (or contained in articles), frequency and duration of use/exposure
Assumes that containers such as kegs and drums with a capacity of up to 200 L are used.
Covers use of up to 1 h/day.
Covers the use of up to 10 containers.
Technical and organisational conditions and measures
Assumes that there are no adjacent workplaces contributing to exposure of the substance.
Covers an indoor use where a basic mechanical ventilation of at least 1 ACH is provided as well as an outdoor use.
Assumes that the process is semi-automated. Manual intervention is repeatedly required although large parts of the process are machinery assisted.
Assumes that the process is mostly enclosed during standard operation.
Conditions and measures related to personal protection, hygiene and health evaluation
Wear standard safety clothing.
Assumes regular cleaning operations at the workplace.
Other conditions affecting workers exposure
Outdoor use

8.2.4. Control of worker exposure: *Storage of boron-containing substance - indoor* (PROC 2)

Product (article) characteristics
Covers concentrations > 25 %.
Covers the use of solid material such as powders and dust consisting of relatively coarse particles with a moderate potential to become (and stay) airborne.
Amount used (or contained in articles), frequency and duration of use/exposure
Covers use of > 4 h/day.

Technical and organisational conditions and measures
Assumes that there are no adjacent workplaces contributing to exposure of the substance.
Covers an indoor use where a basic mechanical ventilation of at least 1 ACH is provided as well as an outdoor use.
Assumes that the process is highly automated. Very limited manual intervention is required to run. Contact with the substance may be possible for a very limited duration of time.
Assumes that the process is completely enclosed for the vast majority of its duration. Very infrequent and controlled opening during operation may occur.
Conditions and measures related to personal protection, hygiene and health evaluation
Wear standard safety clothing.
Assumes occasional general cleaning operations at the workplace.
Other conditions affecting workers exposure
Assumes process temperature up to 40 °C

8.2.5. Control of worker exposure: *Storage of boron-containing substance - outdoor* (PROC 2)

Product (article) characteristics
Covers concentrations ≤ 25 %.
Covers the use of solid material such as powders and dust consisting of relatively coarse particles with a moderate potential to become (and stay) airborne.
Amount used (or contained in articles), frequency and duration of use/exposure
Covers use of > 4 h/day.
Technical and organisational conditions and measures
Assumes that there are no adjacent workplaces contributing to exposure of the substance.
Covers an indoor use where a basic mechanical ventilation of at least 1 ACH is provided as well as an outdoor use.
Assumes that the process is highly automated. Very limited manual intervention is required to run. Contact with the substance may be possible for a very limited duration of time.
Assumes that the process is completely enclosed for the vast majority of its duration. Very infrequent and controlled opening during operation may occur.
Conditions and measures related to personal protection, hygiene and health evaluation
Wear standard safety clothing.
Assumes occasional general cleaning operations at the workplace.
Other conditions affecting workers exposure
Assumes process temperature up to 40 °C
Outdoor use

8.2.6. Control of worker exposure: *Addition of boron-containing substance to slag indoor* (PROC 4)

Product (article) characteristics
Covers concentrations ≤ 5 %.
Covers the use of solid material such as powders and dust consisting of relatively coarse particles with a moderate potential to become (and stay) airborne.
Amount used (or contained in articles), frequency and duration of use/exposure
Covers use of up to 1 h/day.

Technical and organisational conditions and measures
Assumes that there are no adjacent workplaces contributing to exposure of the substance.
Provide a mechanical ventilation of at least 3 ACH.
Assumes that the process is semi-automated. Manual intervention is repeatedly required although large parts of the process are machinery assisted.
Conditions and measures related to personal protection, hygiene and health evaluation
Wear standard safety clothing.
Assumes regular cleaning operations at the workplace.
Other conditions affecting workers exposure
Assumes process temperature up to 40 °C

8.2.7. Control of worker exposure: *Addition of boron-containing substance to slag outdoor* (PROC 4)

Product (article) characteristics
Covers concentrations ≤ 5 %.
Covers the use of solid material such as powders and dust consisting of relatively coarse particles with a moderate potential to become (and stay) airborne.
Amount used (or contained in articles), frequency and duration of use/exposure
Covers use of up to 1 h/day.
Technical and organisational conditions and measures
Assumes that there are no adjacent workplaces contributing to exposure of the substance.
Covers an indoor use where a basic mechanical ventilation of at least 1 ACH is provided as well as an outdoor use.
Assumes that the process is semi-automated. Manual intervention is repeatedly required although large parts of the process are machinery assisted.
Conditions and measures related to personal protection, hygiene and health evaluation
Wear standard safety clothing.
Assumes regular cleaning operations at the workplace.
Other conditions affecting workers exposure
Assumes process temperature up to 40 °C
Outdoor use

8.2.8. Control of worker exposure: *Maintenance and routine cleaning* (PROC 28)

Product (article) characteristics
Covers concentrations > 25 %.
Covers the use of solid material such as powders and dust consisting of relatively coarse particles with a moderate potential to become (and stay) airborne.
Amount used (or contained in articles), frequency and duration of use/exposure
Assumes a contamination level of the workplace of up to 5 mg/m³.
Covers use of up to 1 h/day.
Technical and organisational conditions and measures
Assumes that there are no adjacent workplaces contributing to exposure of the substance.
Provide a mechanical ventilation of at least 3 ACH.
Assumes that the main cleaning device is a hoover.
Assumes that the process is semi-automated. Manual intervention is repeatedly required although large parts of the process are machinery assisted.

Conditions and measures related to personal protection, hygiene and health evaluation
Wear standard safety clothing.

8.3. Exposure estimation and reference to its source

8.3.1. Environmental release and exposure: *Use of reactive processing aid at industrial site (no inclusion into or onto article)* (ERC 6b)

Release route	Release rate	Release estimation method
Water	12.5 kg/day	Estimated release factor
Air	5 kg/day	ERC
Soil	1.25 kg/day	ERC

Protection target	Exposure estimate	RCR
Fresh water	0.676 mg/L (EUSES 2.1.2)	0.233
Marine water	0.068 mg/L (EUSES 2.1.2)	0.023
Sewage Treatment Plant	6.248 mg/L (EUSES 2.1.2)	0.625
Agricultural soil	0.18 mg/kg dw (EUSES 2.1.2)	0.032
Man via environment - Inhalation (systemic effects)	0.0000762 mg/m³ (EUSES 2.1.2)	< 0.01
Man via environment - Oral	0.015 mg/kg bw/day (EUSES 2.1.2)	0.089
Man via environment - combined routes		0.089

8.3.2. Worker exposure: *Transfer of boron-containing substance-indoor* (PROC 8a)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	1.063 mg/m³ (MEASE)	0.733
Dermal, systemic, long term	0.25 mg/kg bw/day (MEASE)	< 0.01
Combined, systemic, long term		0.737

8.3.3. Worker exposure: *Transfer of boron-containing substance-outdoor* (PROC 8a)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.998 mg/m³ (MEASE)	0.688
Dermal, systemic, long term	0.25 mg/kg bw/day (MEASE)	< 0.01
Combined, systemic, long term		0.692

8.3.4. Worker exposure: *Storage of boron-containing substance - indoor* (PROC 2)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.013 mg/m³ (MEASE)	< 0.01
Dermal, systemic, long term	0.035 mg/kg bw/day (MEASE)	< 0.01
Combined, systemic, long term		< 0.01

8.3.5. Worker exposure: *Storage of boron-containing substance - outdoor* (PROC 2)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.007 mg/m³ (MEASE)	< 0.01
Dermal, systemic, long term	0.021 mg/kg bw/day (MEASE)	< 0.01
Combined, systemic, long term		< 0.01

8.3.6. Worker exposure: *Addition of boron-containing substance to slag indoor* (PROC 4)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	1.063 mg/m³ (MEASE)	0.733
Dermal, systemic, long term	0.324 mg/kg bw/day (MEASE)	< 0.01
Combined, systemic, long term		0.738

8.3.7. Worker exposure: *Addition of boron-containing substance to slag outdoor* (PROC 4)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.998 mg/m³ (MEASE)	0.688
Dermal, systemic, long term	0.324 mg/kg bw/day (MEASE)	< 0.01
Combined, systemic, long term		0.693

8.3.8. Worker exposure: *Maintenance and routine cleaning* (PROC 28)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	1.063 mg/m³ (MEASE)	0.733
Dermal, systemic, long term	2.493 mg/kg bw/day (MEASE)	0.036
Combined, systemic, long term		0.769

8.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Guidance:
The conditions of use at downstream users' sites may differ in some way from those described in the exposure scenario. In case of differences between the description of conditions of use in the exposure scenario and your own practice it does not mean that the use is not covered. The risk may still be adequately controlled. The way in which you determine if your conditions are equivalent or lower is termed "scaling". Scaling instructions are given below.

Human health: The workers' exposure is addressed using MEASE 2.0.

Environment: Emissions to the environment are estimated using EUSES v.2.1.2 as implemented in CHESAR v3.5.

Scaling tool:
Please use the above indicated publicly available modelling tools for scaling.

Scaling instructions:
Scaling can be used to check whether your conditions are "equivalent" to the conditions defined in the exposure scenario. If your conditions of use differ slightly from those indicated in the respective exposure scenario you might be able to demonstrate that, under your conditions of use, the exposure levels are equivalent or lower than under the described conditions. It may be possible to demonstrate this by compensating a variation in one particular condition with a variation in other conditions.

Scalable parameters:
In the following, the key determinants which are likely to vary in the actual use situation are given to be used for scaling.

- **Workers:**
  Concentration of the substance, Duration of exposure, Level of automation, Dust suppression techniques, Extraction device, ACH, Process temperature, Room size, Container capacity, Number of containers used, Contamination level of workplace, PPE.

  Remark regarding RMMs: Effectiveness is the key information related to risk management measures. You can be sure that your risk management measures are covered if their effectiveness is equal to, or higher than, what is specified in the exposure scenario.

- **Environment:**
  Daily use amount, Annual use amount, Number of emission days, Release factors, Discharge rate of STP, Receiving surface water flow rate.

Further details on scaling are provided in ECHA's Guidance for downstream users v2.1 (October 2014) as well as in ECHA's Practical Guide 13 (June 2012).

Boundaries of scaling:
RCRs not to be exceeded are described in Section 8.3.

9. ES 9: Widespread use by professional workers; Welding and soldering products, flux products (PC 38); Various sectors (SU 14, SU 15, SU 17, SU 19)

9.1. Use descriptors

ES name: *Professional use of welding, brazing or soldering rods*
Product category: *Welding and soldering products, flux products (PC 38)*
Sector of use: *Manufacture of basic metals, including alloys (SU 14), Manufacture of fabricated metal products, except machinery and equipment (SU 15), General manufacturing, e.g. machinery, equipment, vehicles, other transport equipment. (SU 17), Building and construction work (SU 19)*

Environment	
1: *Widespread use of non-reactive processing aid (no inclusion into or onto article, indoor)*	ERC 8a
2: *Widespread use of non-reactive processing aid (no inclusion into or onto article, outdoor)*	ERC 8d
Worker	
3: *Transfer of flux paste for welding and brazing*	PROC 8a
4: *Storage of flux paste for welding and brazing*	PROC 2
5: *Use of flux paste in welding*	PROC 25
6: *Use of flux paste in brazing*	PROC 25
7: *Maintenance and routine cleaning*	PROC 28

9.2. Conditions of use affecting exposure

9.2.1. Control of environmental exposure: *Widespread use of non-reactive processing aid (no inclusion into or onto article, indoor)* (ERC 8a)

Conditions and measures related to biological sewage treatment plant
Municipal sewage treatment plant is assumed.
Conditions and measures related to external treatment of waste (including article waste)
Dispose of waste product or used containers according to local regulations.

9.2.2. Control of environmental exposure: *Widespread use of non-reactive processing aid (no inclusion into or onto article, outdoor)* (ERC 8d)

Conditions and measures related to biological sewage treatment plant
Municipal sewage treatment plant is assumed.
Conditions and measures related to external treatment of waste (including article waste)
Dispose of waste product or used containers according to local regulations.

9.2.3. Control of worker exposure: *Transfer of flux paste for welding and brazing* (PROC 8a)

Product (article) characteristics
Covers concentrations ≤ 5 %.
Covers the use of a paste.

Amount used (or contained in articles), frequency and duration of use/exposure
Assumes that containers such as kegs and drums with a capacity of up to 200 L are used.
Covers the use of up to 10 containers.
Covers use of up to 1 h/day.
Technical and organisational conditions and measures
Assumes that there are no adjacent workplaces contributing to exposure of the substance.
Covers an indoor use where a basic mechanical ventilation of at least 1 ACH is provided as well as an outdoor use.
Assumes that the process is mostly enclosed during standard operation.
Conditions and measures related to personal protection, hygiene and health evaluation
Wear standard safety clothing.
Assumes occasional general cleaning operations at the workplace.

9.2.4. Control of worker exposure: *Storage of flux paste for welding and brazing* (PROC 2)

Product (article) characteristics
Covers concentrations ≤ 5 %.
Covers the use of a paste.
Amount used (or contained in articles), frequency and duration of use/exposure
Covers use of > 4 h/day.
Technical and organisational conditions and measures
Assumes that there are no adjacent workplaces contributing to exposure of the substance.
Covers an indoor use where a basic mechanical ventilation of at least 1 ACH is provided as well as an outdoor use.
Assumes that the process is highly automated. Very limited manual intervention is required to run. Contact with the substance may be possible for a very limited duration of time.
Assumes that the process is completely enclosed for the vast majority of its duration. Very infrequent and controlled opening during operation may occur.
Conditions and measures related to personal protection, hygiene and health evaluation
Wear standard safety clothing.
Assumes occasional general cleaning operations at the workplace.
Other conditions affecting workers exposure
Assumes process temperature up to 40 °C

9.2.5. Control of worker exposure: *Use of flux paste in welding* (PROC 25)

Product (article) characteristics
Covers concentrations ≤ 5 %.
Covers the use of a molten substance/material.
Amount used (or contained in articles), frequency and duration of use/exposure
Covers use of up to 4 h/day.

Technical and organisational conditions and measures
Assumes that there are no adjacent workplaces contributing to exposure of the substance.
Covers an indoor use where a basic mechanical ventilation of at least 1 ACH is provided as well as an outdoor use.
Assumes that the process is semi-automated. Manual intervention is repeatedly required although large parts of the process are machinery assisted.
Assumes that the process is mostly enclosed during standard operation.
Covers welding of the material
Conditions and measures related to personal protection, hygiene and health evaluation
Wear standard safety clothing.
Assumes occasional general cleaning operations at the workplace.
Other conditions affecting workers exposure
Assumes process temperature up to 40 °C

9.2.6. Control of worker exposure: *Use of flux paste in brazing* (PROC 25)

Product (article) characteristics
Covers concentrations ≤ 5 %.
Covers the use of a molten substance/material.
Amount used (or contained in articles), frequency and duration of use/exposure
Covers use of up to 4 h/day.
Technical and organisational conditions and measures
Assumes that there are no adjacent workplaces contributing to exposure of the substance.
Covers an indoor use where a basic mechanical ventilation of at least 1 ACH is provided as well as an outdoor use.
Assumes that the process is semi-automated. Manual intervention is repeatedly required although large parts of the process are machinery assisted.
Assumes that the process is mostly enclosed during standard operation.
Covers brazing of the material
Conditions and measures related to personal protection, hygiene and health evaluation
Wear standard safety clothing.
Assumes occasional general cleaning operations at the workplace.
Other conditions affecting workers exposure
Assumes process temperature up to 900 °C

9.2.7. Control of worker exposure: *Maintenance and routine cleaning* (PROC 28)

Product (article) characteristics
Covers concentrations ≤ 5 %.
Covers the use of a liquid.
Amount used (or contained in articles), frequency and duration of use/exposure
Assumes a contamination level of the workplace of up to 5 mg/m³.
Covers use of up to 1 h/day.
Technical and organisational conditions and measures
Covers an indoor use where a basic mechanical ventilation of at least 1 ACH is provided as well as an outdoor use.
Assumes that the main cleaning device is a mop.

Conditions and measures related to personal protection, hygiene and health evaluation
Wear standard safety clothing.

9.3. Exposure estimation and reference to its source

9.3.1. Environmental release and exposure: *Widespread use of non-reactive processing aid (no inclusion into or onto article, indoor)* (ERC 8a)

Release route	Release rate	Release estimation method
Water	0.027 kg/day	ERC
Air	0.027 kg/day	ERC
Soil	0 kg/day	ERC

Protection target	Exposure estimate	RCR
Fresh water	0.053 mg/L (EUSES 2.1.2)	0.018
Marine water	0.00522 mg/L (EUSES 2.1.2)	< 0.01
Sewage Treatment Plant	0.014 mg/L (EUSES 2.1.2)	< 0.01
Agricultural soil	0.141 mg/kg dw (EUSES 2.1.2)	0.025
Man via environment - Inhalation (systemic effects)	0.0000000000106 mg/m³ (EUSES 2.1.2)	< 0.01
Man via environment - Oral	0.00274 mg/kg bw/day (EUSES 2.1.2)	0.016
Man via environment - combined routes		0.016

9.3.2. Environmental release and exposure: *Widespread use of non-reactive processing aid (no inclusion into or onto article, outdoor)* (ERC 8d)

Release route	Release rate	Release estimation method
Water	0.027 kg/day	ERC
Air	0.027 kg/day	ERC
Soil	0.0055 kg/day	ERC

Protection target	Exposure estimate	RCR
Fresh water	0.053 mg/L (EUSES 2.1.2)	0.018
Marine water	0.00522 mg/L (EUSES 2.1.2)	< 0.01
Sewage Treatment Plant	0.014 mg/L (EUSES 2.1.2)	< 0.01
Agricultural soil	0.141 mg/kg dw (EUSES 2.1.2)	0.025
Man via environment - Inhalation (systemic effects)	0.0000000000106 mg/m³ (EUSES 2.1.2)	< 0.01
Man via environment - Oral	0.00274 mg/kg bw/day (EUSES 2.1.2)	0.016
Man via environment - combined routes		0.016

9.3.3. Worker exposure: *Transfer of flux paste for welding and brazing* (PROC 8a)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.127 mg/m³ (MEASE)	0.088
Dermal, systemic, long term	0.035 mg/kg bw/day (MEASE)	< 0.01
Combined, systemic, long term		0.088

9.3.4. Worker exposure: *Storage of flux paste for welding and brazing* (PROC 2)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.003 mg/m³ (MEASE)	< 0.01
Dermal, systemic, long term	0.007 mg/kg bw/day (MEASE)	< 0.01
Combined, systemic, long term		< 0.01

9.3.5. Worker exposure: *Use of flux paste in welding* (PROC 25)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.304 mg/m³ (MEASE)	0.21
Dermal, systemic, long term	0.164 mg/kg bw/day (MEASE)	< 0.01
Combined, systemic, long term		0.212

9.3.6. Worker exposure: *Use of flux paste in brazing* (PROC 25)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.061 mg/m³ (MEASE)	0.042
Dermal, systemic, long term	0.164 mg/kg bw/day (MEASE)	< 0.01
Combined, systemic, long term		0.044

9.3.7. Worker exposure: *Maintenance and routine cleaning* (PROC 28)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.023 mg/m³ (MEASE)	0.016
Dermal, systemic, long term	0.499 mg/kg bw/day (MEASE)	< 0.01
Combined, systemic, long term		0.023

9.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Guidance:
The conditions of use at downstream users' sites may differ in some way from those described in the exposure scenario. In case of differences between the description of conditions of use in the exposure scenario and your own practice it does not mean that the use is not covered. The risk may still be adequately controlled. The way in which you determine if your conditions are equivalent or lower is termed "scaling". Scaling instructions are given below.

Human health: The workers' exposure is addressed using MEASE 2.0.

Environment: Emissions to the environment are estimated using EUSES v.2.1.2 as implemented in CHESAR v3.5.

Scaling tool:
Please use the above indicated publicly available modelling tools for scaling.

Scaling instructions:
Scaling can be used to check whether your conditions are "equivalent" to the conditions defined in the exposure scenario. If your conditions of use differ slightly from those indicated in the respective exposure scenario you might be able to demonstrate that, under your conditions of use, the exposure levels are equivalent or lower than under the described conditions. It may be possible to demonstrate this by compensating a variation in one particular condition with a variation in other conditions.

Scalable parameters:
In the following, the key determinants which are likely to vary in the actual use situation are given to be used for scaling.

- **Workers:**
  Concentration of the substance, Duration of exposure, Level of automation, Dust suppression techniques, Extraction device, ACH, Process temperature, Room size, Container capacity, Number of containers used, Contamination level of workplace, PPE.

  Remark regarding RMMs: Effectiveness is the key information related to risk management measures. You can be sure that your risk management measures are covered if their effectiveness is equal to, or higher than, what is specified in the exposure scenario.

- **Environment:**
  Release factors.

Further details on scaling are provided in ECHA's Guidance for downstream users v2.1 (October 2014) as well as in ECHA's Practical Guide 13 (June 2012).

Boundaries of scaling:
RCRs not to be exceeded are described in Section 9.3.

10. ES 10: Widespread use by professional workers; Base metals and alloys (PC 7); Manufacture of basic metals, including alloys (SU 14)

10.1. Use descriptors

ES name: *Professional use for slag stabilisation treatment*
Product category: *Base metals and alloys (PC 7)*
Sector of use: *Manufacture of basic metals, including alloys (SU 14)*

Environment	
1: *Widespread use of reactive processing aid (no inclusion into or onto article, indoor)*	ERC 8b
Worker	
2: *Transfer of boron-containing substance-indoor*	PROC 8a
3: *Transfer of boron-containing substance-outdoor*	PROC 8a
4: *Storage of boron-containing substance - indoor*	PROC 2
5: *Storage of boron-containing substance - outdoor*	PROC 2
6: *Addition of boron-containing substance to slag indoor*	PROC 4
7: *Addition of boron-containing substance to slag outdoor*	PROC 4
8: *Maintenance and routine cleaning*	PROC 28

10.2. Conditions of use affecting exposure

10.2.1. Control of environmental exposure: *Widespread use of reactive processing aid (no inclusion into or onto article, indoor)* (ERC 8b)

Conditions and measures related to biological sewage treatment plant
Municipal sewage treatment plant is assumed.
Conditions and measures related to external treatment of waste (including article waste)
Dispose of waste product or used containers according to local regulations.

10.2.2. Control of worker exposure: *Transfer of boron-containing substance-indoor* (PROC 8a)

Product (article) characteristics
Covers concentrations > 25 %.
Covers the use of solid material such as powders and dust consisting of relatively coarse particles with a moderate potential to become (and stay) airborne.
Amount used (or contained in articles), frequency and duration of use/exposure
Assumes that containers such as IBC with a capacity of up to approximately 1000 L are used.
Covers the use of up to 10 containers.
Covers use of up to 1 h/day.
Technical and organisational conditions and measures
Assumes that there are no adjacent workplaces contributing to exposure of the substance.
Provide a mechanical ventilation of at least 3 ACH.
Assumes that the process is semi-automated. Manual intervention is repeatedly required although large parts of the process are machinery assisted.
Assumes that the process is mostly enclosed during standard operation.

Conditions and measures related to personal protection, hygiene and health evaluation
Wear standard safety clothing.
Assumes regular cleaning operations at the workplace.

10.2.3. Control of worker exposure: *Transfer of boron-containing substance-outdoor* (PROC 8a)

Product (article) characteristics
Covers concentrations > 25 %.
Covers the use of solid material such as powders and dust consisting of relatively coarse particles with a moderate potential to become (and stay) airborne.
Amount used (or contained in articles), frequency and duration of use/exposure
Assumes that containers such as IBC with a capacity of up to approximately 1000 L are used.
Covers the use of up to 10 containers.
Covers use of up to 1 h/day.
Technical and organisational conditions and measures
Assumes that there are no adjacent workplaces contributing to exposure of the substance.
Covers an indoor use where a basic mechanical ventilation of at least 1 ACH is provided as well as an outdoor use.
Assumes that the process is semi-automated. Manual intervention is repeatedly required although large parts of the process are machinery assisted.
Assumes that the process is mostly enclosed during standard operation.
Conditions and measures related to personal protection, hygiene and health evaluation
Wear standard safety clothing.
Assumes occasional general cleaning operations at the workplace.
Other conditions affecting workers exposure
Outdoor use

10.2.4. Control of worker exposure: *Storage of boron-containing substance - indoor* (PROC 2)

Product (article) characteristics
Covers concentrations > 25 %.
Covers the use of solid material such as powders and dust consisting of relatively coarse particles with a moderate potential to become (and stay) airborne.
Amount used (or contained in articles), frequency and duration of use/exposure
Covers use of > 4 h/day.
Technical and organisational conditions and measures
Assumes that there are no adjacent workplaces contributing to exposure of the substance.
Covers an indoor use where a basic mechanical ventilation of at least 1 ACH is provided as well as an outdoor use.
Assumes that the process is highly automated. Very limited manual intervention is required to run. Contact with the substance may be possible for a very limited duration of time.
Assumes that the process is completely enclosed for the vast majority of its duration. Very infrequent and controlled opening during operation may occur.
Conditions and measures related to personal protection, hygiene and health evaluation
Wear standard safety clothing.
Assumes occasional general cleaning operations at the workplace.

Other conditions affecting workers exposure
Assumes process temperature up to 40 °C

10.2.5. Control of worker exposure: *Storage of boron-containing substance - outdoor* (PROC 2)

Product (article) characteristics
Covers concentrations > 25 %.
Covers the use of solid material such as powders and dust consisting of relatively coarse particles with a moderate potential to become (and stay) airborne.
Amount used (or contained in articles), frequency and duration of use/exposure
Covers use of > 4 h/day.
Technical and organisational conditions and measures
Assumes that there are no adjacent workplaces contributing to exposure of the substance.
Covers an indoor use where a basic mechanical ventilation of at least 1 ACH is provided as well as an outdoor use.
Assumes that the process is highly automated. Very limited manual intervention is required to run. Contact with the substance may be possible for a very limited duration of time.
Assumes that the process is completely enclosed for the vast majority of its duration. Very infrequent and controlled opening during operation may occur.
Conditions and measures related to personal protection, hygiene and health evaluation
Wear standard safety clothing.
Assumes occasional general cleaning operations at the workplace.
Other conditions affecting workers exposure
Assumes process temperature up to 40 °C
Outdoor use

10.2.6. Control of worker exposure: *Addition of boron-containing substance to slag indoor* (PROC 4)

Product (article) characteristics
Covers concentrations ≤ 5 %.
Covers the use of solid material such as powders and dust consisting of relatively coarse particles with a moderate potential to become (and stay) airborne.
Amount used (or contained in articles), frequency and duration of use/exposure
Covers use of up to 1 h/day.
Technical and organisational conditions and measures
Assumes that there are no adjacent workplaces contributing to exposure of the substance.
Provide a mechanical ventilation of at least 3 ACH.
Assumes that the process is semi-automated. Manual intervention is repeatedly required although large parts of the process are machinery assisted.
Conditions and measures related to personal protection, hygiene and health evaluation
Wear standard safety clothing.
Assumes regular cleaning operations at the workplace.
Other conditions affecting workers exposure
Assumes process temperature up to 40 °C

10.2.7. Control of worker exposure: *Addition of boron-containing substance to slag outdoor* (PROC 4)

Product (article) characteristics
Covers concentrations ≤ 5 %.
Covers the use of solid material such as powders and dust consisting of relatively coarse particles with a moderate potential to become (and stay) airborne.
Amount used (or contained in articles), frequency and duration of use/exposure
Covers use of up to 1 h/day.
Technical and organisational conditions and measures
Assumes that there are no adjacent workplaces contributing to exposure of the substance.
Covers an indoor use where a basic mechanical ventilation of at least 1 ACH is provided as well as an outdoor use.
Assumes that the process is semi-automated. Manual intervention is repeatedly required although large parts of the process are machinery assisted.
Conditions and measures related to personal protection, hygiene and health evaluation
Wear standard safety clothing.
Assumes occasional general cleaning operations at the workplace.
Other conditions affecting workers exposure
Assumes process temperature up to 40 °C
Outdoor use

10.2.8. Control of worker exposure: *Maintenance and routine cleaning* (PROC 28)

Product (article) characteristics
Covers concentrations > 25 %.
Covers the use of solid material such as powders and dust consisting of relatively coarse particles with a moderate potential to become (and stay) airborne.
Amount used (or contained in articles), frequency and duration of use/exposure
Assumes a contamination level of the workplace of up to 5 mg/m³.
Covers use of up to 1 h/day.
Technical and organisational conditions and measures
Provide a mechanical ventilation of at least 3 ACH.
Assumes that the main cleaning device is a mop.
Conditions and measures related to personal protection, hygiene and health evaluation
Wear standard safety clothing.

10.3. Exposure estimation and reference to its source

10.3.1. Environmental release and exposure: *Widespread use of reactive processing aid (no inclusion into or onto article, indoor)* (ERC 8b)

Release route	Release rate	Release estimation method
Water	0.000275 kg/day	ERC
Air	0.0000137 kg/day	ERC
Soil	0 kg/day	ERC

Protection target	Exposure estimate	RCR
Fresh water	0.051 mg/L (EUSES 2.1.2)	0.018
Marine water	0.00508 mg/L (EUSES 2.1.2)	< 0.01
Sewage Treatment Plant	0.000137 mg/L (EUSES 2.1.2)	< 0.01
Agricultural soil	0.141 mg/kg dw (EUSES 2.1.2)	0.025
Man via environment - Inhalation (systemic effects)	0.0000000000103 mg/m³ (EUSES 2.1.2)	< 0.01
Man via environment - Oral	0.00273 mg/kg bw/day (EUSES 2.1.2)	0.016
Man via environment - combined routes		0.016

10.3.2. Worker exposure: *Transfer of boron-containing substance-indoor* (PROC 8a)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	1.063 mg/m³ (MEASE)	0.733
Dermal, systemic, long term	0.249 mg/kg bw/day (MEASE)	< 0.01
Combined, systemic, long term		0.737

10.3.3. Worker exposure: *Transfer of boron-containing substance-outdoor* (PROC 8a)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	1.093 mg/m³ (MEASE)	0.754
Dermal, systemic, long term	0.273 mg/kg bw/day (MEASE)	< 0.01
Combined, systemic, long term		0.758

10.3.4. Worker exposure: *Storage of boron-containing substance - indoor* (PROC 2)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.013 mg/m³ (MEASE)	< 0.01
Dermal, systemic, long term	0.035 mg/kg bw/day (MEASE)	< 0.01
Combined, systemic, long term		< 0.01

10.3.5. Worker exposure: *Storage of boron-containing substance - outdoor* (PROC 2)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.013 mg/m³ (MEASE)	< 0.01
Dermal, systemic, long term	0.035 mg/kg bw/day (MEASE)	< 0.01
Combined, systemic, long term		< 0.01

10.3.6. Worker exposure: *Addition of boron-containing substance to slag indoor* (PROC 4)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	1.063 mg/m³ (MEASE)	0.733
Dermal, systemic, long term	0.324 mg/kg bw/day (MEASE)	< 0.01
Combined, systemic, long term		0.738

10.3.7. Worker exposure: *Addition of boron-containing substance to slag outdoor* (PROC 4)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	1.093 mg/m³ (MEASE)	0.754
Dermal, systemic, long term	0.355 mg/kg bw/day (MEASE)	< 0.01
Combined, systemic, long term		0.759

10.3.8. Worker exposure: *Maintenance and routine cleaning* (PROC 28)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	1.063 mg/m³ (MEASE)	0.733
Dermal, systemic, long term	2.493 mg/kg bw/day (MEASE)	0.036
Combined, systemic, long term		0.769

10.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Guidance:
The conditions of use at downstream users' sites may differ in some way from those described in the exposure scenario. In case of differences between the description of conditions of use in the exposure scenario and your own practice it does not mean that the use is not covered. The risk may still be adequately controlled. The way in which you determine if your conditions are equivalent or lower is termed "scaling". Scaling instructions are given below.

Human health: The workers' exposure is addressed using MEASE 2.0.

Environment: Emissions to the environment are estimated using EUSES v.2.1.2 as implemented in CHESAR v3.5.

Scaling tool:
Please use the above indicated publicly available modelling tools for scaling.

Scaling instructions:
Scaling can be used to check whether your conditions are "equivalent" to the conditions defined in the exposure scenario. If your conditions of use differ slightly from those indicated in the respective exposure scenario you might be able to demonstrate that, under your conditions of use, the exposure levels are equivalent or lower than under the described conditions. It may be possible to demonstrate this by compensating a variation in one particular condition with a variation in other conditions.

Scalable parameters:
In the following, the key determinants which are likely to vary in the actual use situation are given to be used for scaling.

- **Workers:**
  Concentration of the substance, Duration of exposure, Level of automation, Dust suppression techniques, Extraction device, ACH, Process temperature, Room size, Container capacity, Number of containers used, Contamination level of workplace, PPE.

  Remark regarding RMMs: Effectiveness is the key information related to risk management measures. You can be sure that your risk management measures are covered if their effectiveness is equal to, or higher than, what is specified in the exposure scenario.

- **Environment:**
  Release factors.

Further details on scaling are provided in ECHA's Guidance for downstream users v2.1 (October 2014) as well as in ECHA's Practical Guide 13 (June 2012).

Boundaries of scaling:
RCRs not to be exceeded are described in Section 10.3.

11. ES 11: Service life (worker at industrial site); Metal articles (AC 7)

11.1. Use descriptors

ES name: *Industrial service life of metal articles*
Article category: *Metal articles (AC 7)*

Environment		SPERC
1: *Processing of articles at industrial sites with low release*	ERC 12a	*Eurometaux SPERC 12a.1.v2.1*
2: *Use of articles at industrial sites with low release*	ERC 12c	
Worker		SWED
3: *Handling of boron-containing articles - indoor*	PROC 21	
4: *Handling of boron-containing articles - outdoor*	PROC 21	
Exposure scenario of the uses leading to the inclusion of the substance into the article		
ES 3: Use at industrial sites; Base metals and alloys (PC 7); Manufacture of basic metals, including alloys (SU 14)		
ES 5: Use at industrial sites; Welding and soldering products, flux products (PC 38); Manufacture of fabricated metal products, except machinery and equipment (SU 15)		
ES 7: Use at industrial sites; Metal surface treatment products (PC 14); Various sectors (SU 14, SU 17)		

11.2. Conditions of use affecting exposure

11.2.1. Control of environmental exposure: *Processing of articles at industrial sites with low release* (ERC 12a)

Amount used, frequency and duration of use (or from service life)
Daily amount per site ≤ 1.852 tonnes/day
Annual amount per site ≤ 400 tonnes/year
Technical and organisational conditions and measures
Electrostatic precipitators or wet electrostatic precipitators or cyclones or fabric/bag filter or ceramic/metal mesh filter
Chemical precipitation or sedimentation or filtration or electrolysis or reverse osmosis or ion exchange
Conditions and measures related to biological sewage treatment plant
Municipal sewage treatment plant is assumed.
Assumed domestic sewage treatment plant flow ≥ 2000 m³/day
Conditions and measures related to external treatment of waste (including article waste)
Dispose of waste product or used containers according to local regulations.

11.2.2. Control of environmental exposure: *Use of articles at industrial sites with low release* (ERC 12c)

Amount used, frequency and duration of use (or from service life)
Daily amount per site ≤ 20 tonnes/day
Annual amount per site ≤ 400 tonnes/year
Conditions and measures related to biological sewage treatment plant
Municipal sewage treatment plant is assumed.
Assumed domestic sewage treatment plant flow ≥ 2000 m³/day
Conditions and measures related to external treatment of waste (including article waste)
Dispose of waste product or used containers according to local regulations.
Other conditions affecting environmental exposure
Receiving surface water flow ≥ 18000 m³/day

11.2.3. Control of worker exposure: *Handling of boron-containing articles - indoor* (PROC 21)

Product (article) characteristics
Covers concentrations < 1 %.
Covers the use of massive objects with a very low intrinsic emission potential.
Amount used (or contained in articles), frequency and duration of use/exposure
Covers use of > 4 h/day.
Technical and organisational conditions and measures
Assumes that there are no adjacent workplaces contributing to exposure of the substance.
Covers an indoor use where a basic mechanical ventilation of at least 1 ACH is provided as well as an outdoor use.
Conditions and measures related to personal protection, hygiene and health evaluation
Assumes occasional general cleaning operations at the workplace.
Wear standard safety clothing.
Other conditions affecting workers exposure
Assumes that no abrasion takes place during handling of object containing the substance.

11.2.4. Control of worker exposure: *Handling of boron-containing articles - outdoor* (PROC 21)

Product (article) characteristics
Covers concentrations < 1 %.
Covers the use of massive objects with a very low intrinsic emission potential.
Amount used (or contained in articles), frequency and duration of use/exposure
Covers use of > 4 h/day.
Technical and organisational conditions and measures
Assumes that there are no adjacent workplaces contributing to exposure of the substance.
Covers an indoor use where a basic mechanical ventilation of at least 1 ACH is provided as well as an outdoor use.
Conditions and measures related to personal protection, hygiene and health evaluation
Assumes occasional general cleaning operations at the workplace.
Wear standard safety clothing.

Other conditions affecting workers exposure
Assumes that no abrasion takes place during handling of object containing the substance.
Outdoor use

11.3. Exposure estimation and reference to its source

11.3.1. Environmental release and exposure: *Processing of articles at industrial sites with low release* (ERC 12a)

Release route	Release rate	Release estimation method
Water	0.056 kg/day	SPERC
Air	0.37 kg/day	SPERC
Soil	46.29 kg/day	SPERC

Protection target	Exposure estimate	RCR
Fresh water	0.054 mg/L (EUSES 2.1.2)	0.019
Marine water	0.00536 mg/L (EUSES 2.1.2)	< 0.01
Sewage Treatment Plant	0.028 mg/L (EUSES 2.1.2)	< 0.01
Agricultural soil	0.142 mg/kg dw (EUSES 2.1.2)	0.025
Man via environment - Inhalation (systemic effects)	0.0000609 mg/m³ (EUSES 2.1.2)	< 0.01
Man via environment - Oral	0.012 mg/kg bw/day (EUSES 2.1.2)	0.07
Man via environment - combined routes		0.07

11.3.2. Environmental release and exposure: *Use of articles at industrial sites with low release* (ERC 12c)

Release route	Release rate	Release estimation method
Water	10 kg/day	ERC
Air	10 kg/day	ERC
Soil	0 kg/day	ERC

Protection target	Exposure estimate	RCR
Fresh water	0.551 mg/L (EUSES 2.1.2)	0.19
Marine water	0.055 mg/L (EUSES 2.1.2)	0.019
Sewage Treatment Plant	4.998 mg/L (EUSES 2.1.2)	0.5
Agricultural soil	0.173 mg/kg dw (EUSES 2.1.2)	0.03
Man via environment - Inhalation (systemic effects)	0.000152 mg/m³ (EUSES 2.1.2)	< 0.01
Man via environment - Oral	0.026 mg/kg bw/day (EUSES 2.1.2)	0.155
Man via environment - combined routes		0.155

11.3.3. Worker exposure: *Handling of boron-containing articles - indoor* (PROC 21)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.001 mg/m³ (MEASE)	< 0.01
Dermal, systemic, long term	0.069 mg/kg bw/day (MEASE)	< 0.01
Combined, systemic, long term		< 0.01

11.3.4. Worker exposure: *Handling of boron-containing articles - outdoor* (PROC 21)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.001 mg/m³ (MEASE)	< 0.01
Dermal, systemic, long term	0.069 mg/kg bw/day (MEASE)	< 0.01
Combined, systemic, long term		< 0.01

11.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Guidance:
The conditions of use at downstream users' sites may differ in some way from those described in the exposure scenario. In case of differences between the description of conditions of use in the exposure scenario and your own practice it does not mean that the use is not covered. The risk may still be adequately controlled. The way in which you determine if your conditions are equivalent or lower is termed "scaling". Scaling instructions are given below.

Human health: The workers' exposure is addressed using MEASE 2.0.

Environment: Emissions to the environment are estimated using EUSES v.2.1.2 as implemented in CHESAR v3.5. Thereby, for ERC 12a the releases have been estimated on the basis of SPERC Eurometaux SPERC 12a.1.v2.1.

Scaling tool:
Please use the above indicated publicly available modelling tools for scaling.

Scaling instructions:
Scaling can be used to check whether your conditions are "equivalent" to the conditions defined in the exposure scenario. If your conditions of use differ slightly from those indicated in the respective exposure scenario you might be able to demonstrate that, under your conditions of use, the exposure levels are equivalent or lower than under the described conditions. It may be possible to demonstrate this by compensating a variation in one particular condition with a variation in other conditions.

Scalable parameters:
In the following, the key determinants which are likely to vary in the actual use situation are given to be used for scaling.

- **Workers:**
  Concentration of the substance, Duration of exposure, Level of automation, Dust suppression techniques, Extraction device, ACH, Room size, PPE.

  Remark regarding RMMs: Effectiveness is the key information related to risk management measures. You can be sure that your risk management measures are covered if their effectiveness is equal to, or higher than, what is specified in the exposure scenario.

- **Environment:**
  Daily use amount, Annual use amount, Number of emission days, Release factors, Discharge rate of STP, Receiving surface water flow rate.

Further details on scaling are provided in ECHA's Guidance for downstream users v2.1 (October 2014) as well as in ECHA's Practical Guide 13 (June 2012).

Boundaries of scaling:
RCRs not to be exceeded are described in Section 11.3.

12. ES 12: Service life (professional worker); Metal articles (AC 7)

12.1. Use descriptors

ES name: *Professional service life of metal articles*
Article category: *Metal articles (AC 7)*

Environment	
1: *Widespread use of articles with low release (indoor/outdoor)*	ERC 10a, ERC 11a
Worker	
2: *Handling of boron-containing articles - indoor*	PROC 21
3: *Handling of boron-containing articles - outdoor*	PROC 21
Exposure scenario of the uses leading to the inclusion of the substance into the article	
ES 3: Use at industrial sites; Base metals and alloys (PC 7); Manufacture of basic metals, including alloys (SU 14)	
ES 5: Use at industrial sites; Welding and soldering products, flux products (PC 38); Manufacture of fabricated metal products, except machinery and equipment (SU 15)	
ES 7: Use at industrial sites; Metal surface treatment products (PC 14); Various sectors (SU 14, SU 17)	

12.2. Conditions of use affecting exposure

12.2.1. Control of environmental exposure: *Widespread use of articles with low release (indoor/outdoor)* (ERC 10a, ERC 11a)

Conditions and measures related to biological sewage treatment plant
Municipal sewage treatment plant is assumed.
Conditions and measures related to external treatment of waste (including article waste)
Dispose of waste product or used containers according to local regulations.

12.2.2. Control of worker exposure: *Handling of boron-containing articles - indoor* (PROC 21)

Product (article) characteristics
Covers concentrations < 1 %.
Covers the use of massive objects with a very low intrinsic emission potential.
Amount used (or contained in articles), frequency and duration of use/exposure
Covers use of > 4 h/day.
Technical and organisational conditions and measures
Assumes that there are no adjacent workplaces contributing to exposure of the substance.
Covers an indoor use where a basic mechanical ventilation of at least 1 ACH is provided as well as an outdoor use.
Conditions and measures related to personal protection, hygiene and health evaluation
Assumes occasional general cleaning operations at the workplace.
Wear standard safety clothing.
Other conditions affecting workers exposure
Assumes that no abrasion takes place during handling of object containing the substance.

12.2.3. Control of worker exposure: *Handling of boron-containing articles - outdoor* (PROC 21)

Product (article) characteristics
Covers concentrations < 1 %.
Covers the use of massive objects with a very low intrinsic emission potential.
Amount used (or contained in articles), frequency and duration of use/exposure
Covers use of > 4 h/day.
Technical and organisational conditions and measures
Assumes that there are no adjacent workplaces contributing to exposure of the substance.
Covers an indoor use where a basic mechanical ventilation of at least 1 ACH is provided as well as an outdoor use.
Conditions and measures related to personal protection, hygiene and health evaluation
Assumes occasional general cleaning operations at the workplace.
Wear standard safety clothing.
Other conditions affecting workers exposure
Assumes that no abrasion takes place during handling of object containing the substance.
Outdoor use

12.3. Exposure estimation and reference to its source

12.3.1. Environmental release and exposure: *Widespread use of articles with low release (indoor/outdoor)* (ERC 10a)

Release route	**Release rate**	**Release estimation method**
Water	0.00704 kg/day	ERC
Air	0.00011 kg/day	ERC
Soil	0.00704 kg/day	ERC

Protection target	**Exposure estimate**	**RCR**
Fresh water	0.052 mg/L (EUSES 2.1.2)	0.018
Marine water	0.00512 mg/L (EUSES 2.1.2)	< 0.01
Sewage Treatment Plant	0.00352 mg/L (EUSES 2.1.2)	< 0.01
Agricultural soil	0.141 mg/kg dw (EUSES 2.1.2)	0.025
Man via environment - Inhalation (systemic effects)	0.0000000000104 mg/m³ (EUSES 2.1.2)	< 0.01
Man via environment - Oral	0.00273 mg/kg bw/day (EUSES 2.1.2)	0.016
Man via environment - combined routes		0.016

12.3.2. Worker exposure: *Handling of boron-containing articles - indoor* (PROC 21)

Route of exposure and type of effects	**Exposure estimate**	**RCR**
Inhalation, systemic, long term	0.001 mg/m³ (MEASE)	< 0.01
Dermal, systemic, long term	0.069 mg/kg bw/day (MEASE)	< 0.01
Combined, systemic, long term		< 0.01

12.3.3. Worker exposure: *Handling of boron-containing articles - outdoor* (PROC 21)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.001 mg/m³ (MEASE)	< 0.01
Dermal, systemic, long term	0.069 mg/kg bw/day (MEASE)	< 0.01
Combined, systemic, long term		< 0.01

12.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Guidance:
The conditions of use at downstream users' sites may differ in some way from those described in the exposure scenario. In case of differences between the description of conditions of use in the exposure scenario and your own practice it does not mean that the use is not covered. The risk may still be adequately controlled. The way in which you determine if your conditions are equivalent or lower is termed "scaling". Scaling instructions are given below.

Human health: The workers' exposure is addressed using MEASE 2.0.

Environment: Emissions to the environment are estimated using EUSES v.2.1.2 as implemented in CHESAR v3.5.

Scaling tool:
Please use the above indicated publicly available modelling tools for scaling.

Scaling instructions:
Scaling can be used to check whether your conditions are "equivalent" to the conditions defined in the exposure scenario. If your conditions of use differ slightly from those indicated in the respective exposure scenario you might be able to demonstrate that, under your conditions of use, the exposure levels are equivalent or lower than under the described conditions. It may be possible to demonstrate this by compensating a variation in one particular condition with a variation in other conditions.

Scalable parameters:
In the following, the key determinants which are likely to vary in the actual use situation are given to be used for scaling.

- **Workers:**
  Concentration of the substance, Duration of exposure, Level of automation, Dust suppression techniques, Extraction device, ACH, Room size, PPE.

  Remark regarding RMMs: Effectiveness is the key information related to risk management measures. You can be sure that your risk management measures are covered if their effectiveness is equal to, or higher than, what is specified in the exposure scenario.

- **Environment:**
  Release factors.

Further details on scaling are provided in ECHA's Guidance for downstream users v2.1 (October 2014) as well as in ECHA's Practical Guide 13 (June 2012).

Boundaries of scaling:
RCRs not to be exceeded are described in Section 12.3.

13. ES 13: Service life (consumers); Metal articles (AC 7)

13.1. Use descriptors

ES name: *Consumer service life of metal articles*
Article category: Metal articles (AC 7)

Environment	
1: *Widespread use of articles with low release (indoor/outdoor)*	ERC 10a, ERC 11a
Consumer	
2: *Metal articles*	AC 7
Exposure scenario of the uses leading to the inclusion of the substance into the article	
ES 3: Use at industrial sites; Base metals and alloys (PC 7); Manufacture of basic metals, including alloys (SU 14)	
ES 5: Use at industrial sites; Welding and soldering products, flux products (PC 38); Manufacture of fabricated metal products, except machinery and equipment (SU 15)	
ES 7: Use at industrial sites; Metal surface treatment products (PC 14); Various sectors (SU 14, SU 17)	

13.2. Conditions of use affecting exposure

13.2.1. Control of environmental exposure: *Widespread use of articles with low release (indoor/outdoor)* (ERC 10a, ERC 11a)

Conditions and measures related to external treatment of waste (including article waste)
Dispose of waste product or used containers according to local regulations.
Other conditions affecting environmental exposure
Municipal sewage treatment plant is assumed.

13.2.2. Control of consumer exposure: *Metal articles* (AC 7)

Product (article) characteristics
Covers concentrations up to 5.5 %
Covers the use of solid, non or low-dusty materials.
Oral exposure is considered to be not relevant.
Amount used (or contained in articles), frequency and duration of use/exposure
For each use event, covers use amounts up to 3E3 g/event
Exposure duration = 8 h/event
Covers use up to 1 events per day
Other conditions affecting consumers exposure
Assumes that potential dermal contact is limited to inside hands / one hand / palm of hands.

13.3. Exposure estimation and reference to its source

13.3.1. Environmental release and exposure: *Widespread use of articles with low release (indoor/outdoor)* (ERC 10a)

Release route	Release rate	Release estimation method
Water	0.00704 kg/day	ERC
Air	0.00011 kg/day	ERC
Soil	0.00704 kg/day	ERC

Protection target	Exposure estimate	RCR
Fresh water	0.052 mg/L (EUSES 2.1.2)	0.018
Marine water	0.00512 mg/L (EUSES 2.1.2)	< 0.01
Sewage Treatment Plant	0.00352 mg/L (EUSES 2.1.2)	< 0.01
Agricultural soil	0.141 mg/kg dw (EUSES 2.1.2)	0.025
Man via environment - Inhalation (systemic effects)	0.0000000000104 mg/m³ (EUSES 2.1.2)	< 0.01
Man via environment - Oral	0.00273 mg/kg bw/day (EUSES 2.1.2)	0.016
Man via environment - combined routes		0.016

13.3.2. Consumer exposure: *Metal articles* (AC 7)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.000025 mg/m³ (TRA Consumers 3.1)	< 0.01
Dermal, systemic, long term	3.931 mg/kg bw/day (TRA Consumers 3.1)	0.115
Oral, systemic, long term	0 mg/kg bw/day (TRA Consumers 3.1)	< 0.01
Combined, systemic, long term		0.115

13.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Guidance:
This exposure scenario for consumer users is addressed to formulators so that they can use the herein provided information in the design of consumer products. The conditions of use may differ in some way from those described in the exposure scenario. In case of differences between the description of conditions of use in the exposure scenario and the use of your products by consumers it does not mean that the use is not covered. The risk may still be adequately controlled. The way in which you determine if your conditions are equivalent or lower is termed “scaling”. Scaling instructions are given below.

Human health: The consumer exposure is estimated using TRA Consumers 3.1 as implemented in CHESAR v3.5.

Environment: Emissions to the environment are estimated using EUSES v.2.1.2 as implemented in CHESAR v3.5.

Scaling tool:
Please use the above indicated publicly available modelling tools for scaling.

Scaling instructions:
Scaling can be used to check whether the consumers’ conditions are “equivalent” to the conditions defined in the exposure scenario. If the conditions of use differ slightly from those indicated in the respective exposure scenario you might be able to demonstrate that, under your conditions of use, the exposure levels are equivalent or lower than under the described conditions. It may be possible to demonstrate this by compensating a variation in one particular condition with a variation in other conditions.

Scalable parameters:
In the following, the key determinants which are likely to vary in the actual use situation are given to be used for scaling.

- **Consumers:**
  Percentage of substance in mixture/article, Amount of product used per application, Exposure time per event.

- **Environment:**
  Release factors.

Further details on scaling are provided in ECHA’s Guidance for downstream users v2.1 (October 2014) as well as in ECHA’s Practical Guide 13 (June 2012).

Boundaries of scaling:
RCRs not to be exceeded are described in Section 13.3.