ABSCHNITT 1. Bezeichnung des Stoffs bzw. des Gemischs und des Unternehmens

1.1. Produktidentifikator

Chemischer Name : Borax decahydrat , Dinatriumtetraborat dekahydrat , Natriumborat dekahydrat .

Art der Produktes : Reiner Produkt .

Reach Registrierungnummer : 01-2119490790-32

1.2. Relevante identifizierte Verwendungen des Stoffs oder Gemischs und Verwendungen von denen abgeraten wird

* Identifizierte(n) Verwendung(en) : Siehe Tabelle auf der ersten Seite des Anhangs.

* Verwendung(en) von denen abgeraten wird : Dieses Produkt ist nicht für irgendeiner anderen industriellen, gewerblichen Verwendung oder Verwendung durch den Verbraucher als in der Tabelle auf der ersten Seite des Anhangs empfohlen.
Nicht für die Verwendung in Dekorationsgegenständen, in Scherzspielen und in Spielen (gemäß Anhang XVII der Verordnung (EG) Nr. 1907/2006) (3. Flüssige Stoffe oder Gemische, die nach den Definitionen in der Richtlinie 67/548/EWG und der Richtlinie 1999/45/EG als gefährlich gelten).
Nicht für die Verwendung als Stoffe, als Bestandteile anderer Stoffe oder in Gemischen die zum Verkauf an die breite Öffentlichkeit bestimmt sind (gemäß Anhang XVII der Verordnung (EG) Nr. 1907/2006) (30. Stoffe in Anhang VI Teil 3 der Verordnung (EG) Nr. 1272/2008, die als fortpflanzungsgefährdend der Kategorie 1A oder 1B (Tabelle 3.1) oder als fortpflanzungsgefährdend der Kategorie 1 oder 2 (Tabelle 3.2) eingestuft).

1.3. Einzelheiten zum Lieferanten, der das Sicherheitsdatenblatt bereitstellt

* Firmenidentifizierung : BRENNTAG N.V. - Nijverheidslaan 38 - BE-8540 DEERLIJK
TEL: +32(0)56/77.69.44 - FAX: +32(0)56/77.57.11
E-MAIL: info@brenntag.be - Website: www.brenntag.be

BRENNTAG Nederland B.V. - Donker Duyvisweg 44 - NL-3316 BM DORDRECHT
TEL: +31(0)78/65.44.944 - FAX: +31(0)78/65.44.919
E-MAIL: info@brenntag.nl - Website: www.brenntag.nl

1.4. Notrufnummer

* Notrufnummer : Belgien : Antigifzentrum - Brüssel
TEL: +32(0)70/245.245

Die Niederlande : National Vergiftungen Information Zentrum - Bilthoven
TEL: +31(0)30/274.88.88 (Ausschließlich zum Zwecke der Unterrichtung medizinisches Personal bei akuten Intoxikationen)

ABSCHNITT 2. Mögliche Gefahren

2.1. Einstufung des Stoffs oder Gemischs

Einstufung gemäß der Richtlinie 67/548/EEG oder 1999/45/EG

Reizend (Xi; R36)
Giftig für die Fortpflanzung (Repr. Cat. 2; R60-61)

Einstufung gemäß der Verordnung (EG) Nr. 1272/2008

Augenreizung - Kategorie 2 - Achtung (Eye Irrit. 2; H319)
Reproduktionstoxizität - Fertilität - Kind im Mutterleib - Kategorie 1B - Gefahr (Repr. 1B; H360FD)

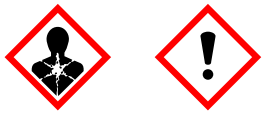
2.2. Kennzeichnungselemente

Kennzeichnung gemäß der Verordnung (EG) Nr. 1272/2008

• Gefährliches Bestandteil(en) : Borax decahydrat

ABSCHNITT 2. Mögliche Gefahren (Fortsetzung)

• Gefahren Piktogramm(e)



• Signalwort : Gefahr

• Gefahrenhinweise : H319 - Verursacht schwere Augenreizung. H360FD - Kann die Fortpflanzungsfähigkeit beeinträchtigen. Kann das Kind im Mutterleib schädigen.

• Sicherheitshinweise

- Prävention : P201 - Vor Gebrauch besondere Anweisungen einholen. P202 - Vor Handhabung sämtliche Sicherheitsratschläge lesen und verstehen. P264 - Nach Gebrauch Haut gründlich waschen. P281 - Vorgeschriebene persönliche Schutzausrüstung verwenden.
- Reaktion : P305+P351+P338 - BEI BERÜHRUNG MIT DEN AUGEN : Einige Minuten lang vorsichtig mit Wasser ausspülen. Evtl. vorhandene Kontaktlinsen entfernen, sofern leicht möglich. Weiter ausspülen. P308+P313 - Bei Exposition oder Betroffenheit : Ärztlichen Rat einholen. P337+P313 - Bei anhaltender Augenreizung : Ärztlichen Rat einholen.
- Lagerung : P405 - Unter Verschluß aufbewahren.
- Hinweise zur Entsorgung : P501 - Diesen Produkt und seinen Behälter der Problemabfallentsorgung zuführen.

2.3. Sonstige Gefahren

Physikalishe/chemische Gefahren : Die Substanz zersetzt sich bei einem Brand oder eine heiße Oberfläche, in Bildung von giftiger, ätzender un metallischer Dämpfe.

Gefahren für die Gesundheid : Dinatriumtetraborat wird in die Kandidatenliste aufgenommen (SVHC). Diese Produkte verdunstet praktisch nicht bei 20°C; als Pulver beim Sprühen gibt es schnell eine gefährliche Konzentration in der Luft.

Gefahren für die Umwelt : Produkt verursacht eine Steigerung des pH-Werts von Wasser und Boden. Dieses Produkt ist kein Substance oder enthält keine PBT oder vPvB (gemäß Anhang XIII).

Gefahren für die Sicherheit : Keine bedeutende Gefahr.

ABSCHNITT 3. Zusammensetzung/Angaben zu Bestandteilen

3.1. Stoffe

Name Komponent(en)		Gew. %	CAS nr	EINECS nr	Index nr	Reach nr	EINSTUFUNG
Borax decahydrat	:	> 99.9 %	1303-96-4	215-540-4	005-011-01-1	01-2119490790-32	Repr. Cat. 2; R60 Repr. Cat. 2; R61 Xi; R36 ---------- Eye Irrit. 2; H319 Repr. 1B; H360FD

*

Der vollständige Text von die R-Sätze und (EU)H-Hinweise is im Abschnitt 16.

Hinweis: SCL gilt
Hinweis: SVHC

ABSCHNITT 4. Erste-Hilfe-Maßnahmen

4.1. Beschreibung der Erste-Hilfe-Maßnahmen

Allgemein : Beim Zweifel oder andauernden Symptomen, immer Arzt konsultieren. Bewußtlosen Menschen nichts eingeben.

ABSCHNITT 4. Erste-Hilfe-Maßnahmen (Fortsetzung)

Erste Hilfe

- Einatmen : Opfer zur Ruhe kommen lassen, in halb-sitzender Lage bringen.
  Frische Luft zuführen.
  Bei unregelmässiger Atmung oder beim Atemstillstand, künstlich beatmen.
  Ein Arzt konsultieren.
- Hautkontakt : Verunreinigte Kleidung ablegen.
  Haut sofort gründlich mit Seife/Wasser spülen. (ev. Duschen).
  Artz konsultieren, wenn sich negative Reaktionen oder Reizungen einstellen.
- Augenkontakt : Sofort gründlich und länger (mindestens 15 Min.) mit vielem Wasser ausspülen.
  Kontaktlinsen ausnehmen.
  Augenarzt konsultieren.
- Verschlucken : KEIN ERBRECHEN HERBEIFÜHREN. Der Mund spülen mit Wasser.
  Slachtopfer viel Wasser trinken lassen.
  Ärztliche Hilfe holen.

4.2. Wichtigste akute oder verzögert auftretende Symptome und Wirkungen

Siehe Abschnitt 11.

4.3. Hinweise auf ärztliche Soforthilfe und Spezialbehandlung

Für fachliche Beratung Ärzte sollten sich an die NVCI oder die belgische Antigiftzentrum.

ABSCHNITT 5. Maßnahmen zur Brandbekämpfung

5.1. Löschmittel

Löschmittel

- Geeignete : Löschpulver , Schaum , Kohlenstoffdioxid (CO_2) , Sprühwasser .
- Nicht geeignete : Keine bekannt .

5.2. Besondere vom Stoff oder Gemisch ausgehende Gefahren

Spezielle Expositionsgefahren : Beim Feuer können giftige und metallhaltende Dämpfe freikommen.

5.3. Hinweise für die Brandbekämpfung

Schutzende Ausrüstung : In nächster Nähe des Feuers geschlossenes Atemschutzgerät verwenden und angemessene Schutzkleidung tragen.

Besondere Massnahmen : Zur Kühlung in der Nähe befindlichen Geräts Wassersprühstrahl oder -nebel verwenden. Es ist zu vermeiden, daß zur Brandlöschung verwendetes Wasser in die Umwelt gelangt.

ABSCHNITT 6. Maßnahmen bei unbeabsichtigter Freisetzung

6.1. Personenbezogene Vorsichtsmaßnahmen, Schutzausrüstungen und in Notfällen anzuwendende Verfahren

Personenbezogene Vorsichtsmaßnahmen : Sofort die Personen am angesteckten Ort räumen und gut lüften.
Einatmung des Produkt und Berührung mit den Augen, der Haut und Kleider vermeiden. Empfohlene Personenschutzausrüstung tragen. (Siehe Abschnitt 8)

6.2. Umweltschutzmaßnahmen

Umweltschutzmaßnahmen : Eindringen das Produkt in Kanalisation, öffentlichen Gewässer oder dem Boden verhindern.
Falls das Produkt in die Kanalisation oder öffentliche Gewässer gelangt, sind die Behörden zu benachrichtigen.

6.3. Methoden und Material für Rückhaltung nd Reinigung

Reinigungsmethode : Das Leckprodukt versammeln in abgeschlossenen Fässer.
Rückstände mit vielen Wasser wegspülen.

ABSCHNITT 6. Maßnahmen bei unbeabsichtigter Freisetzung (Fortsetzung)

Die Spülflüssigkeit neutralisieren mit Säure.

6.4. Verweis auf andere Abschnitte

Für persönliche Schutzmittel, siehe Abschnitt 8.
Für Behandlung das Abfallprodukt, siehe Abschnitt 13.

ABSCHNITT 7. Handhabung und Lagerung

7.1. Schutzsmaßnahmen zur sicheren Handhabung

Handhabung : VERBREITUNG VON STAUB VORBEUGEN.
STRENGE HYGIENE !
Exposition von (schwangeren) Frauen vermeiden.
Einatmung des Produktes und Berührung mit Augen, Haut und Kleider vermeiden.
Empfohlene Personenschutzausrüstung tragen. (Siehe Abschnitt 8)
Bei der Arbeit nicht essen, trinken oder rauchen.
Waschen Sie Ihre Hände, vorher und nachher, das Sie mit dem Produkt bearbeitet haben.
Notvorrichtungen für Augenspülungen und Duschen für Erste-Hilfe- Maßnahmen bei der Behandlung von Erfrierungsverletzungen sollten dort, wo eine potentielle Exposition eintreten kann, in unmittelbarer Nähe verfügbar sein.

7.2. Bedingungen zur sicheren Lagerung unter Berücksichtigung von Unverträglichkeiten

* Lagerung : Nur im gut abgeschlossenen Originalbehälter an einem gut gelüfteten und trocken Ort aufbewahren.
Alle gefährlichen Produkte müßten auf einen Leckbehälter gesetzt werden oder eingetonnt werden.
Fernhalten von : Starke Reduktionsmittel , Stärke Oxidationsmitteln , Starke Säuren .

Geeignetes Verpakkungsmaterial : Synthetischer Stoff .

* Nicht geeignetes Verpakkungsmaterial : Verschiedene Metalle .

7.3. Spezifische Endanwendungen

Für den identifizierten Verwendungen, siehe Unterabschnitt 1.2 und/oder Expositionsszenarien.

ABSCHNITT 8. Begrenzung und Überwachung der Exposition/Persönliche Schutzausrüstunge

8.1. Zu überwachende Parameter

Berufsbedingte Expositionsgrenzen : Borax decahydrat : Grenzwert (BE) : 2 mg/m³ (2011)
Borax decahydrat : Kurze Zeitwert (BE) : 6 mg/m³ (2011)

Biologischen Grenzwerte : Bei Vorliegen der Daten werden diese aufgenommen.

DNELs :
- Borax decahydrat : Arbeiter, akut - lokale Effekte, einatmen : 22,3 mg/m³
- Borax decahydrat : Arbeiter, langzeit - systemische Effekte, einatmen : 12,8 mg/m³
- Borax decahydrat : Arbeiter, langzeit - systemische Effekte, dermal : 42478 mg / Tag
- Borax decahydrat : Verbraucher, akut - lokale Effekte, einatmen : 22,3 mg/m³
- Borax decahydrat : Verbraucher, akut - systemische Effekte, oral : 1,5 mg/kg bw/ Tag
- Borax decahydrat : Verbraucher, langzeit - lokale Effekte, einatmen : 22,3 mg/m³
- Borax decahydrat : Verbraucher, langzeit - systemische Effekte, einatmen : 6,5 mg/kg bw/ Tag
- Borax decahydrat : Verbraucher, langzeit - systemische Effekte, dermal : 303,5 mg/kg bw/ Tag
- Borax decahydrat : Verbraucher, langzeit - systemische Effekte, dermal : 1,5 mg/kg bw/ Tag
- Borax decahydrat : Verbraucher, langzeit - systemische Effekte, oral : 1,5 mg/kg

ABSCHNITT 8. Begrenzung und Überwachung der Exposition/Persönliche Schutzausrüstunge

bw/ Tag

PNECs : • Borax decahydrat : Süßwasser : 1,35 mg B/l
• Borax decahydrat : Salzwasser : 1,35 mg B/l
• Borax decahydrat : Süßwassersediment : 1,8 mg B/kg
• Borax decahydrat : Salzwassersediment : 1,8 mg B/kg
• Borax decahydrat : Boden : 5,4 mg B/kg
• Borax decahydrat : Intermittierend Freisetzung : 9,1 mg B/l
• Borax decahydrat : Wasserreinigungsinstallation : 1,75 mg B/l

8.2. Begrenzung und Überwachung der Exposition

Technische Massnahmen : Ventilation , Lokale Absaugung .

Persönliche Schutzmittel

- Atemschutz : CE-Geprüfter staubfilternder Atemschutz (Filtertyp P3).
- Hautschutz : Geeignete Schutzkleidung .

* - Handschutz : Geeignete Materialien für Schutzhandschuhe (EN 374):
Die arbeitsplatzspezifische Eignung sollte mit den Schutzhandschuhherstellern abgeklärt werden.
- Material : Butylgummi
- Dicke : 0,11 mm
- Durchbruchszeit : > 8 St

- Augen-/Gesichtsschutz : Schutzbrille .

Begrenzung und Überwachung der Umweltexposition : Siehe Abschnitte 6, 7, 12 und 13.

ABSCHNITT 9. Physikalische und chemische Eigenschaften

9.1. Angaben zu den grundlegenden physikalischen und chemischen Eigenschaften

Physikalische Form (20°C)	: Kristaliner fester Stoff.
Aussicht/Farbe	: Weiß .
Geruch	: Geruchlos .
Geruchsschwelle	: Nicht anwendbar.
pH-Wert	: 9,2 (1% Lös. , 20°C)
Schmelz-/Gefrierpunkt	: 741 °C
Siedepunkt/Siedestrecke (1013 hPa)	: 1575 °C
Flammpunkt	: Nicht anwendbar.
Feuergefahr	: Nicht anwendbar.
Verdampfungsgeschwindigkeit	: Nicht anwendbar.
Explosionsgrenzen in Luft	: Nicht anwendbar.
Dampfdruck	: Nicht anwendbar.
Die relative Dichte (Wasser=1)	: 1,7
Löslichkeit in Wasser (20°C)	: 5 g/ 100 ml
Log P Oktanol/Wasser (20°C)	: 1,53 - 1,58
Zuendtemperatur	: Nicht anwendbar.
Minimum Entzündungsenergie	: Es liegen keine Angaben vor.
Zersetzungstemperatur	: 320 °C
Viskosität	: Nicht anwendbar.
Explosive Eigenschaften	: Keine chemischen Gruppen mit explosive Eigenschaften zugeordnet .
Oxidationseigenschaften	: Keine chemischen Gruppen mit oxidierenden Eigenschaften zugeordnet .

ABSCHNITT 10. Stabilität und Reaktivität

10.1. Reaktivität

Reaktivität : Reagiert heftig mit: Starke Reduktionsmittel .
Reagiert mit starke Oxidationsmitteln und starke Säuren.

10.2. Chemische Stabilität

Stabilität : Stabil unter normalen Umständen .
Bei Erhitzung: Wasserverlust => Formung von: Borax wasserfrei

10.3. Möglichkeit gefährlicher Reaktionen

Gefährliche Reaktionen : Reagiert heftig mit: Starke Reduktionsmittel (Metalhydride , Alkali Metalle).
Formung von: Brennbare Gas (Wasserstoffgaz) => Kann Explosion und Brand verursachen .

10.4. Zu vermeidenden Bedingungen

Zu vermeidenden Zuständen : Wärme .

10.5. Unverträgliche Materialien

Nicht in Verbindung bringen mit : Starke Reduktionsmittel , Stärke Oxidationsmitteln , Starke Säuren .

10.6. Gefährliche Zersetzungsprodukte

Gefährliche Zersetzungsprodukte : Wasserstoffgaz , Natriumoxyde , Borium .

ABSCHNITT 11. Toxikologische Angaben

11.1. Angaben zu toxikologischen Wirkungen

Akute Toxizität

- Einatmen : Kann eine Reizung der Atemwege bewirken.
Symptome umfassen: Schmerzlicher Kehle , Hust , Schwindel .
- Hautkontakt : Keine reizende Effekten zu erwarten.
• Borax decahydrat : LD50 (Kaninchen, Dermal) : >2000 mg/kg
- Nahrungsaufnahme : Reizend zum Mund, zur Kehle und zum Verdauungkanal
Symptome umfassen: Brandiges Gefühl , Übelkeit , Bauchkrämpfe , Durchfall , Blaue Haut .
• Borax decahydrat : LD50 (Ratte, Oral) : 6000 mg/kg

Atz-/Reizwirkung auf die Haut : Keine Effekten erwartet.

Schwere Augenschädigung/-reizung : Verursacht schwere Augenreizung.

Aspirationsgefahr : Bei höher Konzentration : Kann eine Erkrankung der Lungen verursachen.

Sensibilisierung der Atemwege/Haut : Nicht sensibel .

Karzinogenität : Nicht als karcinogen klassifiziert .

Mutagenität : Nicht als mutagen klassifiziert .

Reproduktionstoxizität : Kann die Fortpflanzungsfähigkeit beeinträchtigen. Kann das Kind im Mutterleib schädigen.
Die Niederlande : Borax decahydrat wird in die SZW-Liste aufgenommen .

Spezifische Zielorgan-Toxizität - einmaliger Exposition : Beim Menschen : Nicht für Organtoxizität klassifiziert .
Bei Tieren : Keine Effekten bekannt.

Spezifische Zielorgan-Toxizität - wiederholter Exposition : Beim Menschen : Nicht für Organtoxizität klassifiziert .
Bei Tieren : Keine Effekten bekannt.

ABSCHNITT 12. Umweltbezogene Angaben

12.1. Toxizität

ABSCHNITT 12. Umweltbezogene Angaben (Fortsetzung)

Ekotoxizität : • Borax decahydrat : CE50 (Daphnia magna, 48 St) : 133 mg B/l
• Borax decahydrat : CE50 (Alge, 72 St) : 40 mg B/l (Pseudokirchneriella subcapitata)
• Borax decahydrat : LC50 (Fisch, 96 St) : 79,7 mg B/l (Pimephales promelas)

12.2. Persistenz und Abbaubarkeit

Persistenz und Abbaubarkeit : • Borax decahydrat : Persistenz und Abbaubarkeit : Es liegen keine Angaben vor.

12.3. Bioakkumulationspotenzial

Bioakkumulation : • Borax decahydrat : Bioakkumulation : Keine Bio-Akkumulation .

12.4. Mobilität im Boden

Mobilität : • Borax decahydrat : Mobilität : Mäßig löslich im Wasser .

12.5. Ergebnisse der PBT- und vPvB-Beurteilung

Ergebnisse : • Borax decahydrat : PBT/vPvB : Nein

12.6. Andere schädliche Wirkungen

WGK-Klasse (DE) : 1 (Schwacher Wasserverschmutzer).
Wasserbeschwerlichkeit (NL) : 12
Sanierungsanspannung (NL) : C
Potenzial zur fotochemischen Ozonbildung : Es liegen keine Angaben vor.
Potenzial zum Ozonabbau : Es liegen keine Angaben vor.
Potenzial zur Störung der endokrinen Systeme : Es liegen keine Angaben vor.
Potenzial zur Erwärmung der Erdatmosphäre : Es liegen keine Angaben vor.

ABSCHNITT 13. Hinweise zur Entsorgung

13.1. Verfahren der Abfallbehandlung

Produktvernichtung : Das Produkt muss vernichtet werden gemäss der lokale und internationale Gesetzgebung, durch ein gesetzlich erkannte und spezialisierte Firma.
Europäische Abfallstoffenliste : XXXXXX - Europäischer Abfallproduktcode. Dieser Code wird auf der Grundlage von die gegenwärtigsten Anwendungen zugewiesen und kann nicht für Verunreinigungen repräsentativ sein, die am wirkungsvollen Gebrauch des Produktes entstanden wurden. Der Produzent der Vergeudung muß seinen Prozeß selbst auswerten und muß die passende überschüssige Kodierung bewilligen. Sehen Sie Entscheidung 2001/118/EG.
Behandlung der Verpakkung : Die gebrauchte Verpakkung ist ausschliesslich für die Verpakkung dieses Produktes zu benutzen.
Nach Gebrauch die Verpackung sorgfältig ausleeren und abschliessen.

ABSCHNITT 14. Angaben zum Transport

14.1. UN-Nummer

UN Nr : -

14.2. Ordnungsgemäße UN-Versandbezeichnung

ADR-Name : -
ADN-Name : -
IMDG-Name : -

ABSCHNITT 14. Angaben zum Transport (Fortsetzung)

14.3. Transportgefahrenklassen

Klasse : -

14.4. Verpackungsgruppe

Verpackungstyp : -

14.5. Umweltgefahren

Umweltgefährlich : -

Meeresschadstoff : -

14.6. Besondere Vorsichtsmaßnahmen für den Verwender

Gefahrandeutung : -

Gefahrsymbol(e) : -

EmS-N° : -

14.7. Massengutbeforderung gemäß Anhang II des MARPOL-Übereinkommens 73/78 und gemäß IBC-Code

Schiffstyp : -

Verschmutzungskategorie : -

ABSCHNITT 15. Rechtsvorschriften

15.1. Vorschriften zu Sicherheit, Gesundheits- und Umweltschutz/spezifische Rechtsvorschriften für den Stoff oder das Gemisch

Inventarisierungen : Kanadische Inventarisation (DSL): Aufgenommen im Inventarisation.
Europäische Inventarisation (EINECS): Aufgenommen im Inventarisation.
Japanische Inventarisation (ENCS): Aufgenommen im Inventarisation.
Koreanische Inventarisation (KECI): Aufgenommen im Inventarisation.
USA-Inventarisation (TSCA): Aufgenommen im Inventarisation.

NFPA-N° : 1-0-0

Einschlägigen EU Vorschrift(en) : Richtlinie 92/85/EWG des Rates vom 19. Oktober 1992 über die Durchführung von Maßnahmen zur Verbesserung der Sicherheit und des Gesundheitsschutzes von schwangeren Arbeitnehmerinnen, Wöchnerinnen und stillenden Arbeitnehmerinnen am Arbeitsplatz
Richtlinie 96/82/EG des Rates vom 9. Dezember 1996 zur Beherrschung der Gefahren bei schweren Unfällen mit gefährlichen Stoffen
Richtlinie 98/24/EG des Rates vom 7. April 1998 zum Schutz von Gesundheit und Sicherheit der Arbeitnehmer vor der Gefährdung durch chemische Arbeitsstoffe bei der Arbeit
Richtlinie 2004/37/EG des Europäischen Parlaments und des Rates vom 29. April 2004 über den Schutz der Arbeitnehmer gegen Gefährdung durch Karzinogene oder Mutagene bei der Arbeit
Entscheidung 2001/118/EG der Kommission vom 16. Januar 2001 zur Änderung der Entscheidung 2000/532/EG über ein Abfallverzeichnis
Verordnung (EG) Nr. 1272/2008 des Europäischen Parlaments und des Rates vom 16. Dezember 2008 über die Einstufung, Kennzeichnung und Verpackung von Stoffen und Gemischen, zur Änderung und Aufhebung der Richtlinien 67/548/EWG und 1999/45/EG und zur Änderung der Verordnung (EG) Nr. 1907/2006
Verordnung (EU) Nr. 453/2010 der Kommission vom 20. Mai 2010 zur Änderung der Verordnung (EG) Nr. 1907/2006 des Europäischen Parlaments und des Rates zur Registrierung, Bewertung, Zulassung und Beschränkung chemischer Stoffe (Reach)

* Die Beschränkungen in Anhang XVII der Verordnung (EG) Nr. 1907/2006 sind zu beachten.

15.2. Stoffsicherheitsbeurteilung

ABSCHNITT 15. Rechtsvorschriften (Fortsetzung)

* Eine Stoffsicherheitsbeurteilung wurde aus der Produkt durchgeführt.

ABSCHNITT 16. Sonstige Angaben

Dieses Sicherheitsdatenblatt ist aufgestellt worden gemäss der Verordnung (EU) Nr. 453/2010.
Dieses Sicherheitsblatt ist ausschliesslich bestimmt für industriel/professionel Gebrauch.

* Änderung hinsichtlich voriger Revision.

*	Änderungen	: Abschnitt 1 , Abschnitt 2 , Abschnitt 3 , Abschnitt 6 , Abschnitt 7 , Abschnitt 8 , Abschnitt 15 .
	Quelle der Daten	: Die Angaben stützen sich auf den heutigen Stand unserer Kenninnisse (Produzent(en) ,...). Sehe auch auf der Adresse: http://apps.echa.europa.eu/registered/registered-sub.aspx#search
	R-Sätz(e)	: R36 - Reizt die Augen. R60 - Kann die Fortpflanzungsfähigkeit beeinträchtigen. R61 - Kann das Kind im Mutterleib schädigen.
	(EU)H-Hinweis(e)	: H319 - Verursacht schwere Augenreizung. H360FD - Kann die Fortpflanzungsfähigkeit beeinträchtigen. Kann das Kind im Mutterleib schädigen.
*	Liste der Abkürzungen und Akronyme	: ADN (Accord européen relatif au transport international des marchandises Dangereuses par voie de Navigation intérieur) : Europäisches Übereinkommen über die internationale Beförderung gefährlicher Güter in der Binnenschifffahrt ADR (Accord européen relatif au transport international des marchandises Dangereuses par Route) : Europäisches Übereinkommen über die internationale Beförderung gefährlicher Güter auf der Straße DNEL (Derived No Effect Level) : Grenzwert, unterhalb dessen der Stoff keine Wirkung ausübt EmS (Emergency Schedule) : den ersten Code verweist auf die einschlägigen Brandklasse und den zweite code verweist auf die einschlägingen Verschütten Zeitplan IMDG (International Maritime Dangerous Goods code) : Internationalen Übereinkommens für Gefahrgutkennzeichnung für gefährliche Güter im Seeschiffsverkehr NFPA (National Fire Protection Association) oder Gefahrendiamant NVCI : National Vergiftungen Information Zentrum PBT : persistente, bioakkumulierbar und toxisch PNEC (Predicted No Effect Concentration) : Konzentration unter die Exposition gegenüber einem Stoff ohne Wirkung REACH : Registrierung, Bewertung, Zulassung und beschränkung von Chemikalien SCL (Specific Concentration Limits) : spezifische Konzentrationsgrenzwerte SVHC (Substance of Very High Concern) : besonders besorgniserregende Stoff SZW-Liste : Nicht-einschräkende Liste gifter Reproduktionssubstanzen auf die Aufzeichnungspflicht zusätzlich als auf Artikel 4.2a abgezielt Anwendung findet, zweter Absatz des Erlass über Arbeitsbedingungen vPvB : sehr persistent und sehr bioakkumulierbar WGK (Wassergefahrdungsklasse)

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Ende des Dokumentes

No.	Short title	Main User Group (SU)	Sector of Use (SU)	Product Category (PC)	Process Category (PROC)	Environmental Release Category (ERC)	Article Category (AC)	Specified
1	Manufacture of substance	3	NA	NA	1, 2, 3, 4, 8a, 8b, 9, 14, 15	1, 6a	NA	ES5510
2	Use as an intermediate	3	NA	NA	1, 2, 3, 4, 5, 8a, 8b, 9, 14, 15	1, 6a, 6b	NA	ES5315
3	Formulation & (re)packing of substances and mixtures	3	NA	NA	1, 2, 3, 4, 5, 8a, 8b, 9, 14, 15	2	NA	ES5302
4	Use as additive	22	NA	NA	21	10a, 11a	NA	ES5337
5	Use as additive	21	NA	35	NA	8a	NA	ES5479
6	Use in adhesives and sealants	3	NA	NA	1, 2, 3, 4, 5, 7, 8a, 8b, 9, 10, 13	5	NA	ES7005
7	Use in Cleaning Agents	22	NA	NA	1, 2, 3, 10, 11, 13, 19	8a, 8d	NA	ES5336
8	Use in Cleaning Agents	3	NA	NA	1, 2, 3, 4, 5, 6, 7, 8a, 8b, 9, 10, 12, 13, 18, 19, 23, 24	4	NA	ES7191
9	Use in agrochemicals	22	NA	NA	2, 5, 8a, 9, 13	8a, 8c, 8d, 8f	NA	ES5307
10	Use in building and construction work	21	NA	0, 1, 9b	NA	10a, 11a	NA	ES5342
11	Use as processing aid	3	NA	NA	1, 2, 3, 4, 5, 8a, 8b, 9, 13, 14, 15, 17, 18, 19, 22, 23, 24	4	NA	ES5311
12	Use as reactive process agent or use as catalyst	3	NA	NA	1, 2, 3, 4, 8a, 8b	1, 6a, 6b	NA	ES5300
13	Manufacture of catalysts	3	NA	NA	3, 4, 5, 8a, 8b, 9, 14	1, 3, 6a, 6b	NA	ES5395
14	Use as a process chemical	3	NA	NA	1, 2, 3, 4, 5, 8a, 8b, 9, 14, 15, 22, 23	6b	NA	ES7024
15	Use in glass	3	NA	NA	1, 2, 3,	2, 5, 6a	NA	ES5304

	production				8a, 8b, 15, 22, 23			
16	Use in nuclear power plants	3	NA	NA	1, 2, 3, 4, 5, 8b, 15	7	NA	ES7190
17	Use of abrasives	22	NA	NA	21	12a	NA	ES5303
18	Industrial formulation	3	NA	NA	1, 2, 3, 4, 5, 8a, 8b, 9, 14, 15, 22, 23, 26	3	NA	ES5309

1. Short title of Exposure Scenario 1: Manufacture of substance		
Main User Groups	SU 3: Industrial uses: Uses of substances as such or in preparations at industrial sites	
Process categories	PROC1: Use in closed process, no likelihood of exposure PROC2: Use in closed, continuous process with occasional controlled exposure PROC3: Use in closed batch process (synthesis or formulation) PROC4: Use in batch and other process (synthesis) where opportunity for exposure arises PROC8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities PROC8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities PROC9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing) PROC14: Production of preparations or articles by tabletting, compression, extrusion, pelettisation PROC15: Use as laboratory reagent	
Environmental Release Categories	ERC1: Manufacture of substances ERC6a: Industrial use resulting in manufacture of another substance (use of intermediates)	
2.1 Contributing scenario controlling environmental exposure for: ERC1, ERC6a		
Product characteristics	Concentration of the Substance in Mixture/Article	Covers percentage substance in the product up to 100 % (unless stated differently).
Amount used	Annual amount per site	100000 ton(s)/year (No water emissions ERC1, ERC6a)
Frequency and duration of use	Continuous exposure	220 days/year
Other given operational conditions affecting environmental exposure	Emission or Release Factor: Air	0,53 g/ton of product
	Emission or Release Factor: Water	0 g/ton of product
Technical conditions and measures at process level (source) to prevent release Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil Organizational measures to prevent/limit release from the site	Air	Substance specific waste air treatment:, Electrostatic precipitation, Cyclones, ceramic filters, Bag filters, Fabric filter
	Water	Substance specific waste water treatment, Ion exchange, Reverse osmosis (Degradation effectiveness: 40 - 90 %)
Conditions and measures related to sewage treatment plant	Wastewater emission controls are not applicable as there is no direct release to wastewater.	
Conditions and measures related to external treatment of waste for disposal	Waste treatment	Send back to the process
	Disposal methods	Vacuum up spillage and collect in suitable

		containers for disposal., Dispose of as hazardous waste in compliance with local and national regulations.
Conditions and measures related to external recovery of waste	Recovery Methods	There is no envisaged external recovery of waste.

2.2 Contributing scenario controlling worker exposure for: PROC1, PROC2, PROC3		
Activity	Product delivery/storage - product storage - indoor	
Product characteristics	Concentration of the Substance in Mixture/Article	Covers percentage substance in the product up to 100 % (unless stated differently).
	Physical Form (at time of use)	granules, Powder
Amount used	Amount per Shift	1000 kg
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently).	
Other operational conditions affecting workers exposure	Indoor use.	
Technical conditions and measures to control dispersion from source towards the worker	Where there are breaches in the closed system, such as pouring and removal of slag in metal production, LEV is used to control fumes.	
Organisational measures to prevent /limit releases, dispersion and exposure	Ensure operatives are trained to minimise exposures. Regular inspection and maintenance of equipment and machines.	
Conditions and measures related to personal protection, hygiene and health evaluation	Wear suitable protective clothing. Wear protective shoes. Safety glasses Safety goggles In case of dust or aerosol formation: use respiratory protection with approved filter (P2) or Particle filter:P3	

2.3 Contributing scenario controlling worker exposure for: PROC1, PROC2, PROC3, PROC4, PROC14		
Activity	Processing	
Product characteristics	Concentration of the Substance in Mixture/Article	Concentration of substance in product: 5% - 25%
	Physical Form (at time of use)	granules, Powder
Amount used	Amount per Use	1500 kg
	The amount used per worker varies from activity to activity	
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently).	
Other operational conditions affecting workers exposure	Indoor use.	
	Operation is carried out at elevated temperature (> 20°C above ambient	

	temperature).	
Technical conditions and measures to control dispersion from source towards the worker	Use closed dosing, transfer, sampling and application systems including connectors. Provide local exhaust ventilation (LEV). Discharge sacks via suitable vented charge chute. Provide a good standard of general ventilation. Natural ventilation is from doors, windows etc. Controlled ventilation means air is supplied or removed by a powered fan. Clear spills immediately. Provide extract ventilation to points where emissions occur.	
Organisational measures to prevent /limit releases, dispersion and exposure	Provide basic employee training to prevent/minimize exposures Regular inspection and maintenance of equipment and machines.	
Conditions and measures related to personal protection, hygiene and health evaluation	Wear suitable protective clothing. Wear protective shoes. Safety glasses Wear protective gloves. In case of dust or aerosol formation: use respiratory protection with approved filter (P2) or Particle filter:P3	
2.4 Contributing scenario controlling worker exposure for: PROC8a, PROC8b		
Activity	Relevant for Cleaning and Maintenance	
Product characteristics	Concentration of the Substance in Mixture/Article	Covers concentrations more than 25%
	Physical Form (at time of use)	granules, Powder
Amount used	The amount used per worker varies from activity to activity	
Other operational conditions affecting workers exposure	Indoor and outdoor use.	
Technical conditions and measures to control dispersion from source towards the worker	Provide local exhaust ventilation (LEV). Minimise exposure by partial enclosure of the operation or equipment and provide extract ventilation at openings.	
Organisational measures to prevent /limit releases, dispersion and exposure	Ensure operatives are trained to minimise exposures. Regular inspection and maintenance of equipment and machines.	
Conditions and measures related to personal protection, hygiene and health evaluation	Wear suitable protective clothing. Wear protective shoes. Safety glasses In case of dust or aerosol formation: use respiratory protection with approved filter (P2) or Particle filter:P3	
2.5 Contributing scenario controlling worker exposure for: PROC8a, PROC8b		
Activity	Off-loading substances from ships.	

Product characteristics	Concentration of the Substance in Mixture/Article	Covers percentage substance in the product up to 100 % (unless stated differently).
	Physical Form (at time of use)	granules, Powder
Amount used	Amount per Application	10000 kg
Frequency and duration of use	Frequency of use	1 - 2 days/month
	Covers daily exposures up to 8 hours (unless stated differently).	
Other operational conditions affecting workers exposure	Outdoor use.	
Technical conditions and measures to control dispersion from source towards the worker	Transfer via enclosed lines. Closed process and closed circuits where relevant and possible Use closed dosing, transfer, sampling and application systems including connectors. Provide local exhaust ventilation (LEV). Use front end loaders with air conditioned cab	
Organisational measures to prevent /limit releases, dispersion and exposure	Ensure operatives are trained to minimise exposures. Regular inspection and maintenance of equipment and machines.	
Conditions and measures related to personal protection, hygiene and health evaluation	Wear suitable protective clothing. Wear protective gloves. In case of dust or aerosol formation: use respiratory protection with approved filter (P2) or Wear air purifying half mask APF10	
	Equipment cleaning and maintenance	Wear air purifying half mask APF10 Particle filter:P2
2.6 Contributing scenario controlling worker exposure for: PROC8a, PROC8b		
Activity	Loading (including marine vessel/barge, rail/road car and IBC loading) and repacking (including drums and small packs) of substance, including its sampling, storage, unloading, distribution and associated laboratory activities.	
Product characteristics	Concentration of the Substance in Mixture/Article	Concentration of substance in product: 5% - 25%
	Physical Form (at time of use)	Solid, high dustiness, granules, Powder
Amount used	Amount per Use	25000 kg
Frequency and duration of use	Application duration	30 min
	Covers daily exposures up to 8 hours (unless stated differently).	
Other operational conditions affecting workers exposure	Outdoor use.	
	Assumes activities are at ambient temperature.	
Technical conditions and measures to control dispersion from source towards the worker	Automate activity where possible.	

Organisational measures to prevent /limit releases, dispersion and exposure	Provide basic employee training to prevent/minimize exposures Regular inspection and maintenance of equipment and machines.	
Conditions and measures related to personal protection, hygiene and health evaluation	Wear suitable protective clothing. Wear protective shoes. Safety glasses Wear respiratory protection. Particle filter:P2 or Particle filter:P3	
2.7 Contributing scenario controlling worker exposure for: PROC8a, PROC8b, PROC9		
Activity	Packaging	
Product characteristics	Concentration of the Substance in Mixture/Article	Concentration of substance in product: 5% - 25%
	Physical Form (at time of use)	granules, Powder
Amount used	The amount used per worker varies from activity to activity	
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently).	
Other operational conditions affecting workers exposure	Indoor use. Assumes activities are at ambient temperature.	
Technical conditions and measures to control dispersion from source towards the worker	Provide local exhaust ventilation (LEV). Automate activity where possible.	
Organisational measures to prevent /limit releases, dispersion and exposure	Provide basic employee training to prevent/minimize exposures Regular inspection and maintenance of equipment and machines.	
Conditions and measures related to personal protection, hygiene and health evaluation	Wear protective clothing. Safety shoes Safety glasses In the case of dust or aerosol formation use respirator with an approved filter. Particle filter:P2 or Particle filter:P3	
2.8 Contributing scenario controlling worker exposure for: PROC15		
Activity	Use of small quantities within laboratory settings, including material transfers and equipment cleaning.	
Product characteristics	Concentration of the Substance in Mixture/Article	Concentration of substance in product: 5% - 25%
	Physical Form (at time of use)	Powdered substance, granular-like
Amount used	Amount per Application	1 kg
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently).	
Technical conditions and	Handle within a fume cupboard or implement suitable equivalent methods to	

measures to control dispersion from source towards the worker	minimise exposure.
Organisational measures to prevent /limit releases, dispersion and exposure	Ensure operatives are trained to minimise exposures. Regular inspection and maintenance of equipment and machines.
Conditions and measures related to personal protection, hygiene and health evaluation	Wear a laboratory coat Safety shoes Safety glasses

3. Exposure estimation and reference to its source

Environment

METALS EUSES IT tool

Contributing Scenario	Specific conditions	Compartment	Value	Level of Exposure	RCR
ERC1, ERC6a	No water discharge to the environment	Soil	PEC	0,01mg/kg dry weight (d.w.)	0,002

Workers

PROC2, PROC4, PROC8a, PROC8b, PROC9, PROC15 MEASE PROC1, PROC2, PROC3, PROC4, PROC8a, PROC8b, PROC9, PROC14, PROC15 Advanced REACH Tool (ART model) (inhalative exposure)

Contributing Scenario	Specific conditions	Exposure routes	Level of Exposure	RCR
PROC1, PROC2, PROC3	90th percentile value, 8 hours/day, without respiratory protection	Inhalation worker exposure	0,08mg/m³	0,06
PROC2	Solid, high dustiness., during 15 mins - 1 hour	Dermal worker exposure	0,048mg/kg bw/day	< 0,001
PROC1, PROC2, PROC3, PROC4, PROC14	8 hours/day	Inhalation worker exposure	0,39 - 0,41mg/m³	0,27 - 0,28
PROC4	Solid, high dustiness., Concentration of substance in product: 5% - 25%, during <15 mins	Dermal worker exposure	0,014mg/kg bw/day	< 0,001
PROC8a, PROC8b	90th percentile value, no respiratory protection (RPE)	Inhalation worker exposure	1,33mg/m³	0,92
PROC8a	Solid, high dustiness., during 1 - 4 hours, with gloves	Dermal worker exposure	0,173mg/kg bw/day	< 0,001
PROC8a, PROC8b	90th percentile value, Crane drivers	Inhalation worker exposure	0,2mg/m³	0,14
PROC8a,	90th percentile value,	Inhalation worker	0,68mg/m³	0,47

PROC8b	Trimming ships	exposure		
PROC8a, PROC8b	90th percentile value, Driving small front end loaders in the ship	Inhalation worker exposure	1,35mg/m³	---
PROC8a, PROC8b	90th percentile value, Work in the warehouse, Air conditioned cab front end loaders	Inhalation worker exposure	0,44mg/m³	0,30
PROC8b	90th percentile value, Open-cab front end loaders, With respiratory protection	Inhalation worker exposure	0,72mg/m³	0,50
PROC8a	Crane drivers, during 1 - 4 hours, Concentration of substance in product: 5% - 25%	Dermal worker exposure	0,173mg/kg bw/day	< 0,001
PROC8a, PROC8b	Trimming ships, during 15 mins - 1 hour	Dermal worker exposure	57,6mg/kg bw/day	0,012
PROC8a, PROC8b	Driving small front end loaders in the ship, during 1 - 4 hours, Air conditioned cab front end loaders	Dermal worker exposure	0,058mg/kg bw/day	< 0,001
PROC8a, PROC8b	Work in the warehouse, Air conditioned cab front end loaders, without air conditioned cab	Dermal worker exposure	0,144mg/kg bw/day	< 0,001
PROC8a, PROC8b	90th percentile value, without respiratory protection	Inhalation worker exposure	0,37mg/m³	0,26
PROC8a, PROC8b	during 15 mins - 1 hour, with gloves, Concentration of substance in product: 5% - 25%	Dermal worker exposure	0,029mg/kg bw/day	< 0,001
PROC8a, PROC8b, PROC9	90th percentile value, With respiratory protection, Packing in big bags	Inhalation worker exposure	0,58mg/m³	0,4
PROC8a, PROC8b, PROC9	90th percentile value, Packing in 25kg sacks	Inhalation worker exposure	1mg/m³	0,69
PROC8a, PROC8b, PROC9	Packing in big bags, Packing in 25kg sacks, Solid, high dustiness., with gloves	Dermal worker exposure	0,144mg/kg bw/day	< 0,001

PROC15	---	Inhalable dust.	0,0005mg/m³	---
PROC15	90th percentile value	Inhalation worker exposure	0,0001mg/m³	---
PROC15	during 15 mins - 1 hour	Dermal worker exposure	0,014mg/kg bw/day	---

When the recommended risk management measures (RMMs) and operational conditions (OCs) are observed, exposures are not expected to exceed the predicted DNELs and the resulting risk characterisation ratios are expected to be less than 1.

4. Guidance to Downstream User to evaluate whether he works inside the boundaries set by the Exposure Scenario

Tonnage calculations have been based on boron such that no RCR exceeds 0.97, using back calculations with the relevant PNEC's when necessary. The equivalent tonnage of product handled on site should be calculated from the conversion factors detailed in the product table. For those operations that handle a combination of borate compounds, the boron equivalent of the combined tonnage cannot exceed the site tonnage value. Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures.
Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.
Only properly trained persons shall make use of scaling methods while checking whether the OC and RMM are within the boundaries set by the ES

Substance	Formula	Conversion factor for the equivalent dose of B (multiply by)
Boric acid	H_3BO_3	0,1748
Boric oxide	$B2O_3$	0,311
Disodium tetraborate anhydrous	$Na_2B_4O_7$	0,2149
Disodium tetraborate pentahydrate	$Na_2B_4O_7 \times 5H_20$	0,1484
Disodium tetraborate decahydrate	$Na_2B_4O_7 \times 10H_20$	0,1134
Disodium octoborate tetrahydrate	$Na_2B_8O_{13} \times 4H_20$	0,2096
Sodium metaborate (anhydrous)	$NaBO_2$	0,1643
Sodium metaborate (dihydrate)	$NaBO_2 \times 2H_20$	0,1062
Sodium metaborate (tetrahydrate)	$NaBO_2 \times 4H_20$	0,0784
Sodium pentaborate (anhydrous)	NaB_5O_8	0,2636
Sodium pentaborate (pentahydrate)	$NaB_5O_8 \times 5H_20$	0,1832

1. Short title of Exposure Scenario 2: Use as an intermediate		
Main User Groups	SU 3: Industrial uses: Uses of substances as such or in preparations at industrial sites	
Process categories	PROC1: Use in closed process, no likelihood of exposure PROC2: Use in closed, continuous process with occasional controlled exposure PROC3: Use in closed batch process (synthesis or formulation) PROC4: Use in batch and other process (synthesis) where opportunity for exposure arises PROC5: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact) PROC8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities PROC8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities PROC9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing) PROC14: Production of preparations or articles by tabletting, compression, extrusion, pelettisation PROC15: Use as laboratory reagent	
Environmental Release Categories	ERC1: Manufacture of substances ERC6a: Industrial use resulting in manufacture of another substance (use of intermediates) ERC6b: Industrial use of reactive processing aids	
2.1 Contributing scenario controlling environmental exposure for: ERC1, ERC6a, ERC6b		
Product characteristics	Concentration of the Substance in Mixture/Article	Covers percentage substance in the product up to 100 % (unless stated differently).
Amount used	Annual amount per site	74 ton(s)/year (Default dilution ERC6a)
	Annual amount per site	190 ton(s)/year (Dilution of 10 ERC1, ERC6a, ERC6b)
	Annual amount per site	1150 ton(s)/year (Dilution of 100 ERC1, ERC6a, ERC6b)
Frequency and duration of use	Continuous exposure	365 days/year (Default dilution ERC6a)
	Continuous exposure	300 days/year (Dilution of 10, Dilution of 100 ERC1, ERC6a, ERC6b)
Environment factors not influenced by risk management	Other data. Other information	Local freshwater dilution factor:: 10
	Other data. Other information	Local marine water dilution factor:: 100
	Dilution Factor (River)	500
Other given operational conditions affecting environmental exposure	Emission or Release Factor: Air	50000 g/ton of product (Default dilution ERC1, ERC6a, ERC6b)
	Emission or Release	20000 g/ton of product (Default dilution ERC1,

	Factor: Water	ERC6a, ERC6b)
	Emission or Release Factor: Air	36562 g/ton of product (Dilution of 10, Dilution of 100 ERC1, ERC6a, ERC6b)
	Emission or Release Factor: Water	60000 g/ton of product (Dilution of 10, Dilution of 100 ERC1, ERC6a, ERC6b)
Technical conditions and measures at process level (source) to prevent release Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil Organizational measures to prevent/limit release from the site	Air	Electrostatic precipitation, Cyclones, Treatment of air emissions by bag filters, fabric filter and wet scrubber, Ceramic & metal mash filters, PM10 particles are removed
	Water	Substance specific waste water treatment, Ion exchange, Reverse osmosis (Degradation effectiveness: 40 - 90 %)
Conditions and measures related to sewage treatment plant	Type of Sewage Treatment Plant	Municipal sewage treatment plant
	The concentration of the substance should not exceed 1,75 mg/L in the municipal STP	
Conditions and measures related to external treatment of waste for disposal	Waste treatment	Send back to the process, Substance containing waste shall be handled as hazardous waste and removed by licensed waste removal company, incinerated or recycled
	Disposal methods	Vacuum up spillage and collect in suitable containers for disposal.
2.2 Contributing scenario controlling worker exposure for: PROC1, PROC2, PROC3		
Product characteristics	Concentration of the Substance in Mixture/Article	Covers percentage substance in the product up to 100 % (unless stated differently).
	Physical Form (at time of use)	Powdered substance, granules
Amount used	Amount per Shift	1000 kg
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently).	
Other operational conditions affecting workers exposure	Indoor use.	
	Assumes activities are at ambient temperature.	
Technical conditions and measures to control dispersion from source towards the worker	Use closed dosing, transfer, sampling and application systems including connectors. Provide local exhaust ventilation (LEV). Where there are breaches in the closed system, such as pouring and removal of slag in metal production, LEV is used to control fumes.	
Organisational measures to prevent /limit releases, dispersion and exposure	Ensure operatives are trained to minimise exposures. Regular inspection and maintenance of equipment and machines.	
Conditions and measures related to personal protection, hygiene and health evaluation	Wear protective clothing. Safety shoes Safety glasses	

	In case of dust or aerosol formation: use respiratory protection with approved filter (P2) or Particle filter:P3	
2.3 Contributing scenario controlling worker exposure for: PROC1, PROC2, PROC3		
Activity	Potentially closed processing operations at elevated temperature.	
Product characteristics	Concentration of the Substance in Mixture/Article	Covers percentage substance in the product up to 100 % (unless stated differently).
	Physical Form (at time of use)	Powdered substance, granules
Amount used	The amount used per worker varies from activity to activity	
Frequency and duration of use	Frequency of use	24 hours/day
	Frequency of use	365 days/year
Other operational conditions affecting workers exposure	Indoor use.	
	The process temperatures are mainly very high, as these processes include glass making, ceramics, steel & alloy making	
Technical conditions and measures to control dispersion from source towards the worker	Worker in separate cabine without specific ventilation Use closed dosing, transfer, sampling and application systems including connectors. Where there are breaches in the closed system, such as pouring and removal of slag in metal production, LEV is used to control fumes.	
Organisational measures to prevent /limit releases, dispersion and exposure	Ensure operatives are trained to minimise exposures. Regular inspection and maintenance of equipment and machines. Workers in the risky process/areas identified should be trained a) to avoid to work without respiratory protection and b) to understand the irritating properties and, especially, the respiratory inhalation effects and c) to follow the safer procedures instructed by the employer.	
Conditions and measures related to personal protection, hygiene and health evaluation	Operatives wear overalls or heavy heat resistant clothing Wear protective gloves. Safety glasses Goggles In case of dust or aerosol formation: use respiratory protection with approved filter (P2) or Particle filter:P3 Use battery-powered air fed helmets These respirators, if worn correctly, with a good face fit, will provide sufficient protection Where tightly fitting RPE is used, the worker should be face fit tested to ensure that a good face seal can be obtained	
2.4 Contributing scenario controlling worker exposure for: PROC4, PROC5, PROC8b		
Activity	Covers reloading, mixing or compounding and associated activities in the Process Categories listed above	
Product characteristics	Concentration of the	Covers percentage substance in the product up to

	Substance in Mixture/Article	100 % (unless stated differently).
	Physical Form (at time of use)	Powdered substance, granules
Amount used	Would vary by requirements and by facility	
Frequency and duration of use	Exposure duration per day	60 min
Other operational conditions affecting workers exposure	Indoor use.	
	Assumes activities are at ambient temperature.	
Technical conditions and measures to control dispersion from source towards the worker	Automate activity where possible. Use closed dosing, transfer, sampling and application systems including connectors. Provide local exhaust ventilation (LEV). Single use bags can be opened by the use of sharp prongs at the discharge hopper. When the big bag is placed at the discharge hopper and lowered, the prongs cut into the base of the bag releasing the substance into the hopper. This removes the operator from the immediate vicinity and contributes to a reduction in exposure	
Organisational measures to prevent /limit releases, dispersion and exposure	Ensure operatives are trained to minimise exposures. Regular inspection and maintenance of equipment and machines.	
Conditions and measures related to personal protection, hygiene and health evaluation	Wear protective clothing. Wear protective gloves. Safety glasses Goggles In case of dust or aerosol formation: use respiratory protection with approved filter (P2) or Particle filter:P3 These respirators, if worn correctly, with a good face fit, will provide sufficient protection Where tightly fitting RPE is used, the worker should be face fit tested to ensure that a good face seal can be obtained	

2.5 Contributing scenario controlling worker exposure for: PROC8a, PROC8b

Activity	Equipment maintenance	
Product characteristics	Concentration of the Substance in Mixture/Article	Covers percentage substance in the product up to 100 % (unless stated differently).
	Physical Form (at time of use)	Powdered substance, granules
Amount used	Would vary by requirements and by facility	
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently).	
Other operational conditions affecting workers exposure	Indoor and outdoor use.	
Technical conditions and	Use closed dosing, transfer, sampling and application systems including	

measures to control dispersion from source towards the worker	connectors. Worker in separate cabine without specific ventilation Provide local exhaust ventilation (LEV).
Organisational measures to prevent /limit releases, dispersion and exposure	Ensure operatives are trained to minimise exposures. Regular inspection and maintenance of equipment and machines.
Conditions and measures related to personal protection, hygiene and health evaluation	Wear protective clothing. Safety shoes Safety glasses Wear protective gloves. In case of dust or aerosol formation: use respiratory protection with approved filter (P2) or Particle filter:P3

2.6 Contributing scenario controlling worker exposure for: PROC8b

Large scale

Activity	Bulk loading (including marine vessel/barge, rail/road car and IBC loading)	
Product characteristics	Concentration of the Substance in Mixture/Article	Covers percentage substance in the product up to 100 % (unless stated differently).
	Physical Form (at time of use)	Powdered substance, granular-like
Amount used	Amount per Use	40000 kg
Frequency and duration of use	Application duration	120 min
Other operational conditions affecting workers exposure	Indoor	
	Assumes activities are at ambient temperature.	
Technical conditions and measures to control dispersion from source towards the worker	Use closed dosing, transfer, sampling and application systems including connectors. Provide dust filtration for air displaced from the silo during filling. Provide local exhaust ventilation (LEV).	
Organisational measures to prevent /limit releases, dispersion and exposure	Ensure operatives are trained to minimise exposures. Regular inspection and maintenance of equipment and machines.	
Conditions and measures related to personal protection, hygiene and health evaluation	Wear protective clothing. Wear protective gloves. Safety glasses or Goggles	

2.7 Contributing scenario controlling worker exposure for: PROC9

Product characteristics	Concentration of the Substance in Mixture/Article	Concentration of substance in product: 0,11% - 8,6%
	Physical Form (at time of use)	solid, liquid, pasty

Amount used	Amount per Day	10000 kg
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently).	
Technical conditions and measures to control dispersion from source towards the worker	Automate activity where possible. Provide local exhaust ventilation (LEV).	
Organisational measures to prevent /limit releases, dispersion and exposure	Ensure operatives are trained to minimise exposures. Regular inspection and maintenance of equipment and machines.	
Conditions and measures related to personal protection, hygiene and health evaluation	Wear protective clothing. Safety shoes Safety glasses In case of dust or aerosol formation: use respiratory protection with approved filter (P2) or Particle filter:P3	
2.8 Contributing scenario controlling worker exposure for: PROC14		
Product characteristics	Concentration of the Substance in Mixture/Article	Covers percentage substance in the product up to 100 % (unless stated differently).
	Physical Form (at time of use)	Powdered substance, granules
Amount used	Would vary by requirements and by facility	
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently).	
Other operational conditions affecting workers exposure	Indoor use.	
Technical conditions and measures to control dispersion from source towards the worker	Minimise exposure by partial enclosure of the operation or equipment and provide extract ventilation at openings. Provide local exhaust ventilation (LEV).	
Organisational measures to prevent /limit releases, dispersion and exposure	Ensure operatives are trained to minimise exposures. Regular inspection and maintenance of equipment and machines.	
Conditions and measures related to personal protection, hygiene and health evaluation	Wear protective clothing. Safety shoes Safety glasses Wear protective gloves. In case of dust or aerosol formation: use respiratory protection with approved filter (P2) or Particle filter:P3	
2.9 Contributing scenario controlling worker exposure for: PROC15		
Product characteristics	Concentration of the Substance in Mixture/Article	Covers percentage substance in the product up to 100 % (unless stated differently).
	Physical Form (at time of use)	Powdered substance, granules

Amount used	Amount per Application	1 kg
Frequency and duration of use	Sometimes during the working day, only for short periods of time	
Technical conditions and measures to control dispersion from source towards the worker	Handle within a fume cupboard or implement suitable equivalent methods to minimise exposure.	
Organisational measures to prevent /limit releases, dispersion and exposure	Ensure operatives are trained to minimise exposures. Regular inspection and maintenance of equipment and machines.	
Conditions and measures related to personal protection, hygiene and health evaluation	Wear a laboratory coat Safety shoes Safety glasses Wear protective gloves.	

3. Exposure estimation and reference to its source

Environment

Estimation based on workplace measurements

Contributing Scenario	Specific conditions	Compartment	Value	Level of Exposure	RCR
ERC1, ERC6a, ERC6b	Dilution of 10	Fresh water	PEC	1956µg/L	0,969
ERC1, ERC6a, ERC6b	Dilution of 10	Soil	PEC	0,86mg/kg dry weight (d.w.)	0,158
ERC1, ERC6a, ERC6b	Dilution of 100	Fresh water	PEC	1206µg/L	0,597
ERC1, ERC6a, ERC6b	Dilution of 100	Soil	PEC	5,15mg/kg dry weight (d.w.)	0,954

Workers

PROC1, PROC2, PROC3, PROC4, PROC5, PROC8a, PROC8b, PROC9, PROC14, PROC15 Workplace measurements PROC2, PROC4, PROC8a, PROC9, PROC14 MEASE PROC8b Advanced REACH Tool (ART model)

PROC9, PROC14 Advanced REACH Tool (ART model) (inhalative exposure)

Contributing Scenario	Specific conditions	Exposure routes	Level of Exposure	RCR
PROC1, PROC2, PROC3	90th percentile value, without respiratory protection	Inhalation worker exposure	0,08mg/m³	0,06
PROC2	Solid, high dustiness., during 15 mins - 1 hour	Dermal worker exposure	0,048mg/kg bw/day	< 0,001
PROC1, PROC2, PROC3	90th percentile value, without respiratory protection	Inhalation worker exposure	0,08mg/m³	---

PROC2	Solid, high dustiness., during 15 mins - 1 hour	Dermal worker exposure	0,048mg/kg bw/day	< 0,001
PROC4, PROC5, PROC8b	90th percentile value, With respiratory protection, half mask	Inhalation worker exposure	0,2mg/m³	0,14
PROC4	Solid, high dustiness., during 15 mins - 1 hour, with local exhaust ventilation	Dermal worker exposure	4,8mg/kg bw/day	0,001
PROC8a, PROC8b	90th percentile value, no respiratory protection (RPE), Equipment maintenance	Inhalation worker exposure	1,33mg/m³	0,92
PROC8a	Equipment maintenance, during 1 - 4 hours	Dermal worker exposure	0,173mg/kg bw/day	< 0,001
PROC8b	---	Inhalation worker exposure	0,016mg/m³	0,011
PROC8b	with local exhaust ventilation, 90th percentile value	Inhalation worker exposure	0,03mg/m³	0,021
PROC2	Solid, high dustiness., during <15 mins	Dermal worker exposure	0,024mg/kg bw/day	< 0,001
PROC9	90th percentile value, solid, with local exhaust ventilation, With respiratory protection	Inhalation worker exposure	0,4mg/m³	0,28
PROC9	90th percentile value, liquid, with local exhaust ventilation	Inhalation worker exposure	0,01mg/m³	0,007
PROC9	Concentration of substance in product: 5% - 25%, Solid, high dustiness.	Dermal worker exposure	1,44mg/kg bw/day	< 0,001
PROC9	Concentration of substance in product: 5% - 25%, liquid	Dermal worker exposure	0,144mg/kg bw/day	< 0,001
PROC14	---	Inhalation worker exposure	1,3mg/m³	0,9
PROC14	90th percentile value, with local exhaust ventilation	Inhalation worker exposure	0,15mg/m³	0,10
PROC14	Solid, high dustiness.	Dermal worker exposure	2,4mg/kg bw/day	< 0,001
PROC15	90th percentile value	Inhalation worker exposure	0,16mg/m³	0,11

PROC14	Solid, high dustiness., Concentration of substance in product: 5% - 25%	Dermal worker exposure	0,014mg/kg bw/day	< 0,001

4. Guidance to Downstream User to evaluate whether he works inside the boundaries set by the Exposure Scenario

Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures.
Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.
Only properly trained persons shall make use of scaling methods while checking whether the OC and RMM are within the boundaries set by the ES
Tonnage calculations have been based on boron such that no RCR exceeds 0.97, using back calculations with the relevant PNEC's when necessary. The equivalent tonnage of product handled on site should be calculated from the conversion factors detailed in the product table. For those operations that handle a combination of borate compounds, the boron equivalent of the combined tonnage cannot exceed the site tonnage value.

Substance	Formula	Conversion factor for the equivalent dose of B (multiply by)
Boric acid	H_3BO_3	0,1748
Boric oxide	$B2O_3$	0,311
Disodium tetraborate anhydrous	$Na_2B_4O_7$	0,2149
Disodium tetraborate pentahydrate	$Na_2B_4O_7 \times 5H_20$	0,1484
Disodium tetraborate decahydrate	$Na_2B_4O_7 \times 10H_20$	0,1134
Disodium octoborate tetrahydrate	$Na_2B_8O_{13} \times 4H_20$	0,2096
Sodium metaborate (anhydrous)	$NaBO_2$	0,1643
Sodium metaborate (dihydrate)	$NaBO_2 \times 2H_20$	0,1062
Sodium metaborate (tetrahydrate)	$NaBO_2 \times 4H_20$	0,0784
Sodium pentaborate (anhydrous)	NaB_5O_8	0,2636
Sodium pentaborate (pentahydrate)	$NaB_5O_8 \times 5H_20$	0,1832

If measured data are not available, the DU may make use of an appropriate scaling tool such as MEASE (www.ebrc.de/mease.html) to estimate the associated exposure.
For further information on the assessment method, see: http://www.advancedreachtool.com

Additional good practice advice beyond the REACH Chemical Safety Assessment

Take care for general good hygiene and housekeeping.

1. Short title of Exposure Scenario 3: Formulation & (re)packing of substances and mixtures		
Main User Groups	SU 3: Industrial uses: Uses of substances as such or in preparations at industrial sites	
Process categories	PROC1: Use in closed process, no likelihood of exposure PROC2: Use in closed, continuous process with occasional controlled exposure PROC3: Use in closed batch process (synthesis or formulation) PROC4: Use in batch and other process (synthesis) where opportunity for exposure arises PROC5: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact) PROC8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities PROC8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities PROC9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing) PROC14: Production of preparations or articles by tabletting, compression, extrusion, pelettisation PROC15: Use as laboratory reagent	
Environmental Release Categories	ERC2: Formulation of preparations	
2.1 Contributing scenario controlling environmental exposure for: ERC2		
Activity	Formulation of substance in adhesives	
Product characteristics	Concentration of the Substance in Mixture/Article	Covers percentage substance in the product up to 100 % (unless stated differently).
Amount used	Annual amount per site	1000 ton(s)/year (No water emissions ERC2)
Frequency and duration of use	Continuous exposure	240 days/year
Other given operational conditions affecting environmental exposure	Emission or Release Factor: Air	50 g/ton of product
	Emission or Release Factor: Water	0 g/ton of product
Technical conditions and measures at process level (source) to prevent release Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil Organizational measures to prevent/limit release from the site	Air	Substance specific waste air treatment:, Electrostatic precipitation, Cyclones, ceramic filters, Bag filters, Fabric filter
	Water	Substance specific waste water treatment, Reverse osmosis, Ion exchange (Degradation effectiveness: 40 - 90 %)
Conditions and measures related to sewage treatment plant	Wastewater emission controls are not applicable as there is no direct release to wastewater.	
Conditions and measures related	Waste treatment	Send back to the process

to external treatment of waste for disposal	Disposal methods	Vacuum up spillage and collect in suitable containers for disposal., Dispose of as hazardous waste in compliance with local and national regulations.
Conditions and measures related to external recovery of waste	Recovery Methods	There is no envisaged external recovery of waste.

2.2 Contributing scenario controlling environmental exposure for: ERC2

Activity	Formulation of substance into detergents	
Product characteristics	Concentration of the Substance in Mixture/Article	Covers percentage substance in the product up to 100 % (unless stated differently).
Amount used	Annual amount per site	15000 ton(s)/year (No water emissions ERC2)
Frequency and duration of use	Continuous exposure	255 days/year
Environment factors not influenced by risk management	Dilution Factor (River)	500
	Dilution Factor (Coastal Areas)	100
	Other data. Other information	Local freshwater dilution factor:10
Other given operational conditions affecting environmental exposure	Emission or Release Factor: Air	200 g/ton of product
	Emission or Release Factor: Water	0 g/ton of product
Technical conditions and measures at process level (source) to prevent release Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil Organizational measures to prevent/limit release from the site	Air	Substance specific waste air treatment:, Electrostatic precipitation, Cyclones, ceramic filters, Bag filters, Fabric filter
	Water	Substance specific waste water treatment, Reverse osmosis, Ion exchange (Degradation effectiveness: 40 - 90 %)
Conditions and measures related to sewage treatment plant	Wastewater emission controls are not applicable as there is no direct release to wastewater., The concentration of the substance should not exceed 1,75 mg/L in the municipal STP	
Conditions and measures related to external treatment of waste for disposal	Waste treatment	Send back to the process
	Disposal methods	Vacuum up spillage and collect in suitable containers for disposal., Dispose of as hazardous waste in compliance with local and national regulations.

2.3 Contributing scenario controlling environmental exposure for: ERC2

Activity	Formulation, packing and re-packing of the substance and its mixtures in batch or continuous operations, including storage, materials transfers, mixing, tabletting, compression, pelletisation, extrusion, large and small scale packing,

	sampling, maintenance and associated laboratory activities.	
Product characteristics	Concentration of the Substance in Mixture/Article	Covers percentage substance in the product up to 100 % (unless stated differently).
Amount used	Annual tonnage	15000 ton(s)/year (No water emissions ERC2)
Frequency and duration of use	Continuous exposure	200 days/year
Environment factors not influenced by risk management	Dilution Factor (River)	500
	Dilution Factor (Coastal Areas)	100
	Other data. Other information	Local freshwater dilution factor:10
Other given operational conditions affecting environmental exposure	Emission or Release Factor: Air	400 g/ton of product
Technical conditions and measures at process level (source) to prevent release Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil Organizational measures to prevent/limit release from the site	Air	Substance specific waste air treatment:, Electrostatic precipitation, Cyclones, Bag filters, Fabric filter, Ceramic & metal mash filters, PM10 particles are removed
	Water	Substance specific waste water treatment, Reverse osmosis, Ion exchange (Degradation effectiveness: 40 - 90 %)
Conditions and measures related to sewage treatment plant	Not applicable as there is no release to wastewater., If sites discharge to a municipal STP the concentration of the substance should not exceed 10 mg/l in the municipal STP	
Conditions and measures related to external treatment of waste for disposal	Waste treatment	Send back to the process
	Disposal methods	Vacuum up spillage and collect in suitable containers for disposal., Dispose of as hazardous waste in compliance with local and national regulations.
2.4 Contributing scenario controlling worker exposure for: PROC1, PROC2, PROC3		
Product characteristics	Concentration of the Substance in Mixture/Article	Covers percentage substance in the product up to 100 % (unless stated differently).
	Physical Form (at time of use)	granules, Powder
Amount used	per shift:	1000 kg
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently).	
Other operational conditions affecting workers exposure	Indoor use.	
	Assumes activities are at ambient temperature.	
Technical conditions and measures to control dispersion from source towards the worker	Handle substance within a closed system. Where there are breaches in the closed system, such as pouring and removal of slag in metal production, LEV is used to control fumes.	

Organisational measures to prevent /limit releases, dispersion and exposure	Ensure operatives are trained to minimise exposures. Regular inspection and maintenance of equipment and machines.	
Conditions and measures related to personal protection, hygiene and health evaluation	Wear protective clothing. Safety shoes Safety glasses In case of dust or aerosol formation: use respiratory protection with approved filter (P2) or Particle filter:P3	

2.5 Contributing scenario controlling worker exposure for: PROC5

Activity	Handling and dilution of metalworking fluid concentrates	
Product characteristics	Concentration of the Substance in Mixture/Article	Covers concentrations up to 5,5%
	Physical Form (at time of use)	Solid in solution
Amount used	The amount used per worker varies from activity to activity	
Frequency and duration of use	Exposure duration	60 min
Other operational conditions affecting workers exposure	Indoor use.	
	Assumes activities are at ambient temperature.	
Technical conditions and measures to control dispersion from source towards the worker	Provide local exhaust ventilation (LEV). Closed and semi-closed process where appropriate Ensure that task is semi-automated or automated	
Organisational measures to prevent /limit releases, dispersion and exposure	Ensure operatives are trained to minimise exposures. Regular inspection and maintenance of equipment and machines.	
Conditions and measures related to personal protection, hygiene and health evaluation	Wear protective clothing. In case of dust or aerosol formation: use respiratory protection with approved filter (P2) or Particle filter:P3	

2.6 Contributing scenario controlling worker exposure for: PROC2, PROC3, PROC4, PROC5, PROC8b, PROC9

Activity	Formulation of substance in adhesives	
Product characteristics	Concentration of the Substance in Mixture/Article	Covers concentrations up to 1,5%
	Physical Form (at time of use)	granules, Powder, liquid
Amount used	Amount per Day	300 kg
	The amount used per worker varies from activity to activity	
Frequency and duration of use	Continuous exposure	
Other operational conditions	Indoor use.	

affecting workers exposure		
Technical conditions and measures to control dispersion from source towards the worker	Provide local exhaust ventilation (LEV). Ensure that task is semi-automated or automated	
Organisational measures to prevent /limit releases, dispersion and exposure	Workers in the risky process/areas identified should be trained a) to avoid to work without respiratory protection and b) to understand the irritating properties and, especially, the respiratory inhalation effects and c) to follow the safer procedures instructed by the employer. Regular inspection and maintenance of equipment and machines.	
Conditions and measures related to personal protection, hygiene and health evaluation	Wear protective clothing. If no adequate ventilation is available: Wear air purifying mask APF4 or Wear air purifying half mask APF10 Where tightly fitting RPE is used, the worker should be face fit tested to ensure that a good face seal can be obtained	
2.7 Contributing scenario controlling worker exposure for: PROC8a, PROC8b		
Activity	Equipment maintenance	
Product characteristics	Concentration of the Substance in Mixture/Article	Covers percentage substance in the product up to 100 % (unless stated differently).
	Physical Form (at time of use)	granules, Powder
Amount used	Would vary by requirements and by facility	
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently).	
Other operational conditions affecting workers exposure	Indoor and outdoor use.	
	Assumes activities are at ambient temperature.	
Technical conditions and measures to control dispersion from source towards the worker	Provide local exhaust ventilation (LEV). Automate activity where possible.	
Organisational measures to prevent /limit releases, dispersion and exposure	Ensure operatives are trained to minimise exposures. Regular inspection and maintenance of equipment and machines.	
Conditions and measures related to personal protection, hygiene and health evaluation	Wear protective clothing. Safety shoes Safety glasses In case of dust or aerosol formation: use respiratory protection with approved filter (P2) or Particle filter:P3	
2.8 Contributing scenario controlling worker exposure for: PROC8b		
Large scale		
Activity	Bulk loading (including marine vessel/barge, rail/road car and IBC loading)	

Product characteristics	Concentration of the Substance in Mixture/Article	Covers percentage substance in the product up to 100 % (unless stated differently).
	Physical Form (at time of use)	granules, Powder
Amount used	Amount per Use	40000 kg
Frequency and duration of use	Exposure duration	60 - 120 min
Other operational conditions affecting workers exposure	Indoor use.	
	Assumes activities are at ambient temperature.	
Technical conditions and measures to control dispersion from source towards the worker	Automate activity where possible. Provide dust filtration for air displaced from the silo during filling. Use in closed process	
Organisational measures to prevent /limit releases, dispersion and exposure	Ensure operatives are trained to minimise exposures. Regular inspection and maintenance of equipment and machines.	
Conditions and measures related to personal protection, hygiene and health evaluation	Wear protective clothing. Safety glasses Wear chemically resistant gloves. Safety goggles	

2.9 Contributing scenario controlling worker exposure for: PROC4, PROC5, PROC8b

Activity	Covers reloading, mixing or compounding and associated activities in the Process Categories listed above	
Product characteristics	Concentration of the Substance in Mixture/Article	Covers percentage substance in the product up to 100 % (unless stated differently).
	Physical Form (at time of use)	granules, Powder
Amount used	Would vary by requirements and by facility	
Frequency and duration of use	Exposure duration	60 min
Other operational conditions affecting workers exposure	Indoor use.	
	Assumes activities are at ambient temperature.	
Technical conditions and measures to control dispersion from source towards the worker	Provide local exhaust ventilation (LEV). Ensure that task is semi-automated or automated Single use bags can be opened by the use of sharp prongs at the discharge hopper. When the big bag is placed at the discharge hopper and lowered, the prongs cut into the base of the bag releasing the substance into the hopper. This removes the operator from the immediate vicinity and contributes to a reduction in exposure	
Organisational measures to prevent /limit releases, dispersion and exposure	Ensure operatives are trained to minimise exposures. Regular inspection and maintenance of equipment and machines. Workers in the risky process/areas identified should be trained a) to avoid to work without respiratory protection and b) to understand the irritating properties and, especially, the respiratory inhalation effects and c) to follow the safer procedures instructed by the employer.	
Conditions and measures related	Wear protective clothing.	

to personal protection, hygiene and health evaluation	Wear protective gloves. Safety glasses Goggles In case of dust or aerosol formation: use respiratory protection with approved filter (P2) or Particle filter:P3 These respirators, if worn correctly, with a good face fit, will provide sufficient protection Where tightly fitting RPE is used, the worker should be face fit tested to ensure that a good face seal can be obtained	

2.10 Contributing scenario controlling worker exposure for: PROC14		
Product characteristics	Concentration of the Substance in Mixture/Article	Covers percentage substance in the product up to 100 % (unless stated differently).
	Physical Form (at time of use)	granules, Powder
Amount used	The amount used per worker varies from activity to activity	
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently).	
Other operational conditions affecting workers exposure	Indoor use.	
Technical conditions and measures to control dispersion from source towards the worker	Provide local exhaust ventilation (LEV).	
Organisational measures to prevent /limit releases, dispersion and exposure	Ensure operatives are trained to minimise exposures. Regular inspection and maintenance of equipment and machines.	
Conditions and measures related to personal protection, hygiene and health evaluation	Wear protective clothing. Safety shoes Safety glasses In case of dust or aerosol formation: use respiratory protection with approved filter (P2) or Particle filter:P3	

2.11 Contributing scenario controlling worker exposure for: PROC15		
Product characteristics	Concentration of the Substance in Mixture/Article	Covers percentage substance in the product up to 100 % (unless stated differently).
	Physical Form (at time of use)	granules, Powder
Amount used	Amount per Use	1 kg
Frequency and duration of use	Several times during the working day, only for short periods of time	
Technical conditions and measures to control dispersion from source towards the worker	Handle within a fume cupboard or implement suitable equivalent methods to minimise exposure.	

Organisational measures to prevent /limit releases, dispersion and exposure	Ensure operatives are trained to minimise exposures. Regular inspection and maintenance of equipment and machines.
Conditions and measures related to personal protection, hygiene and health evaluation	Wear protective clothing. Safety shoes Safety glasses Wear protective gloves.

2.12 Contributing scenario controlling worker exposure for: PROC9

Product characteristics	Concentration of the Substance in Mixture/Article	Concentration of substance in product: 0,11% - 8,6%
	Physical Form (at time of use)	solid, liquid, pasty
Amount used	Amount per Day	10000 kg
	The amount used per worker varies from activity to activity	
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently).	
Technical conditions and measures to control dispersion from source towards the worker	Provide extraction ventilation at points where emissions occur. Automate activity where possible.	
Organisational measures to prevent /limit releases, dispersion and exposure	Ensure operatives are trained to minimise exposures. Regular inspection and maintenance of equipment and machines.	
Conditions and measures related to personal protection, hygiene and health evaluation	Wear protective clothing. Use suitable eye protection. In case of dust or aerosol formation: use respiratory protection with approved filter (P2) or Particle filter:P3	

3. Exposure estimation and reference to its source

Environment

METALS EUSES IT tool

Contributing Scenario	Specific conditions	Compartment	Value	Level of Exposure	RCR
ERC2	No water discharge to the environment	Soil	PEC	0,01mg/kg dry weight (d.w.)	0,002
ERC2	No water discharge to the environment, Detergent powders, liquid detergents	Soil	PEC	0,37mg/kg dry weight (d.w.)	0,069
ERC2	No water discharge to the environment	Soil	PEC	0,74mg/kg dry weight (d.w.)	0,137

FEICA spERC 2.1a.v1 has been used to evaluate the exposure for the environment. AISE spERC 2.1 has been used to evaluate the exposure for the environment.

Workers

PROC4, PROC5, PROC9, PROC15 Workplace measurements

PROC2, PROC4, PROC5, PROC8a, PROC8b, PROC14 MEASE

PROC9 Advanced REACH Tool (ART model)

PROC1, PROC2, PROC3, PROC8a, PROC8b, PROC9, PROC14 Advanced REACH Tool (ART model) (inhalative exposure)

Contributing Scenario	Specific conditions	Exposure routes	Level of Exposure	RCR
PROC1, PROC2, PROC3	90th percentile value, no respiratory protection (RPE)	Inhalation worker exposure	0,08mg/m³	0,06
PROC2	Solid, high dustiness., during 15 mins - 1 hour	Dermal worker exposure	0,048mg/kg bw/day	< 0,001
PROC8b	liquid, Concentration: 1%, during 15 mins - 1 hour	Dermal worker exposure	0,005mg/kg bw/day	< 0,001
PROC8a, PROC8b	90th percentile value, Equipment maintenance, no respiratory protection (RPE)	Inhalation worker exposure	1,33mg/m³	0,92
PROC8a	Equipment maintenance, during 1 - 4 hours	Dermal worker exposure	0,173mg/kg/day	< 0,001
PROC8b	Dedicated facility, Large task, with local exhaust ventilation	Inhalation worker exposure	0,03mg/m³	0,021
PROC2	Material transfers, Solid, high dustiness., during <15 mins	Dermal worker exposure	0,024mg/kg bw/day	< 0,001
PROC4, PROC5	90th percentile value, Direct discharge, small scale	Inhalation worker exposure	0,78mg/m³	0,54
PROC4	Solid, high dustiness., during 15 mins - 1 hour, small scale	Dermal worker exposure	0,48mg/kg bw/day	< 0,001
PROC4, PROC5, PROC8b	90th percentile value, Large scale, With respiratory protection, half mask	Inhalation worker exposure	0,2mg/m³	0,14
PROC4	Solid, high dustiness., Large scale	Dermal worker exposure	4,8mg/kg bw/day	< 0,001
PROC14	90th percentile value, with local exhaust ventilation	Inhalation worker exposure	0,15mg/m³	< 0,001

PROC14	Solid, high dustiness., > 4 h (half tour)	Dermal worker exposure	2,4mg/kg/day	< 0,001
PROC14	Solid, high dustiness., Concentration of substance in product: 5% - 25%, > 4 h (half tour)	Dermal worker exposure	0,014mg/kg bw/day	< 0,001
PROC15	90th percentile value, 8 hours/day	Inhalation worker exposure	0,16mg/m³	0,11
PROC9	with local exhaust ventilation, 90th percentile value	Inhalation worker exposure	0,01mg/m³	0,007
PROC9	with local exhaust ventilation, without respiratory protection	Inhalation worker exposure	0,4mg/m³	0,28
PROC9	90th percentile value, Solid, high dustiness.	Dermal worker exposure	1,44mg/m³	< 0,001
PROC9	90th percentile value, liquid	Dermal worker exposure	0,144mg/m³	< 0,001

4. Guidance to Downstream User to evaluate whether he works inside the boundaries set by the Exposure Scenario

Tonnage calculations have been based on boron such that no RCR exceeds 0.97, using back calculations with the relevant PNEC's when necessary. The equivalent tonnage of product handled on site should be calculated from the conversion factors detailed in the product table. For those operations that handle a combination of borate compounds, the boron equivalent of the combined tonnage cannot exceed the site tonnage value. Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures.
Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.
Only properly trained persons shall make use of scaling methods while checking whether the OC and RMM are within the boundaries set by the ES

Substance	Formula	Conversion factor for the equivalent dose of B (multiply by)
Boric acid	H_3BO_3	0,1748
Boric oxide	$B2O_3$	0,311
Disodium tetraborate anhydrous	$Na_2B_4O_7$	0,2149
Disodium tetraborate pentahydrate	$Na_2B_4O_7 \times 5H_20$	0,1484
Disodium tetraborate decahydrate	$Na_2B_4O_7 \times 10H_20$	0,1134
Disodium octoborate tetrahydrate	$Na_2B_8O_{13} \times 4H_20$	0,2096
Sodium metaborate (anhydrous)	$NaBO_2$	0,1643
Sodium metaborate (dihydrate)	$NaBO_2 \times 2H_20$	0,1062
Sodium metaborate (tetrahydrate)	$NaBO_2 \times 4H_20$	0,0784
Sodium pentaborate (anhydrous)	NaB_5O_8	0,2636
Sodium pentaborate (pentahydrate)	$NaB_5O_8 \times 5H_20$	0,1832

1. Short title of Exposure Scenario 4: Use as additive		
Main User Groups	SU 22: Professional uses: Public domain (administration, education, entertainment, services, craftsmen)	
Process categories	PROC21: Low energy manipulation of substances bound in materials and/or articles	
Environmental Release Categories	ERC10a: Wide dispersive outdoor use of long-life articles and materials with low release ERC11a: Wide dispersive indoor use of long-life articles and materials with low release	
2.1 Contributing scenario controlling environmental exposure for: ERC10a, ERC11a		
Product characteristics	Concentration of the Substance in Mixture/Article	Covers percentage substance in the product up to 100 % (unless stated differently).
Amount used	Amounts used in the EU (tonnes/year)	1,1 Million tonnes/year
Frequency and duration of use	Continuous exposure	365 days/year
Environment factors not influenced by risk management	Other data. Other information	Local freshwater dilution factor:: 10
Other given operational conditions affecting environmental exposure	Emission or Release Factor: Water	32000 g/ton of product
Technical conditions and measures at process level (source) to prevent release Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil Organizational measures to prevent/limit release from the site	The substance is not released during its life cycle.	
Conditions and measures related to sewage treatment plant	Type of Sewage Treatment Plant	Municipal sewage treatment plant
	Flow rate of sewage treatment plant effluent	2.000 m3/d
Conditions and measures related to external treatment of waste for disposal	Disposal methods	Dispose of waste in accordance with environmental legislation.
2.2 Contributing scenario controlling worker exposure for: PROC21		
Product characteristics	Concentration of the Substance in Mixture/Article	Concentration of substance in product: 1,5% - 3,6%
	Physical Form (at time of use)	solid

Amount used	The amount used per worker varies from activity to activity
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently).
Other operational conditions affecting workers exposure	Indoor use.
	All processes are carried out in confined areas
Technical conditions and measures to control dispersion from source towards the worker	Ensure adequate ventilation, especially in confined areas.
Organisational measures to prevent /limit releases, dispersion and exposure	Ensure operatives are trained to minimise exposures.
Conditions and measures related to personal protection, hygiene and health evaluation	Wear protective clothing. In case of dust or aerosol formation: use respiratory protection with approved filter (P2) or FFP1 mask

3. Exposure estimation and reference to its source

Environment

METALS EUSES IT tool

Contributing Scenario	Specific conditions	Compartment	Value	Level of Exposure	RCR
ERC10a, ERC11a	---	Water	PEC	1021µg/L	0,505
ERC10a, ERC11a	---	Sewage treatment plant (STP)	PEC	9644µg/L	0,964

Workers

MEASE Estimation based on workplace measurements

Contributing Scenario	Specific conditions	Exposure routes	Level of Exposure	RCR
PROC21	90th percentile value	Inhalation worker exposure	0,3mg/m³	0,21
PROC21	Concentration: 1%, Installation of cellulose insulation	Dermal worker exposure	0,99mg/m³	< 0,001
PROC21	Concentration: 1%, Cutting of plasterboard	Inhalation worker exposure	0,005mg/m³	0,0034

4. Guidance to Downstream User to evaluate whether he works inside the boundaries set by the Exposure Scenario

Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may

be necessary to define appropriate site-specific risk management measures.
Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.
Only properly trained persons shall make use of scaling methods while checking whether the OC and RMM are within the boundaries set by the ES
Tonnage calculations have been based on boron such that no RCR exceeds 0.97, using back calculations with the relevant PNEC's when necessary. The equivalent tonnage of product handled on site should be calculated from the conversion factors detailed in the product table. For those operations that handle a combination of borate compounds, the boron equivalent of the combined tonnage cannot exceed the site tonnage value.

Substance	Formula	Conversion factor for the equivalent dose of B (multiply by)
Boric acid	H_3BO_3	0,1748
Boric oxide	$B2O_3$	0,311
Disodium tetraborate anhydrous	$Na_2B_4O_7$	0,2149
Disodium tetraborate pentahydrate	$Na_2B_4O_7 \times 5H_20$	0,1484
Disodium tetraborate decahydrate	$Na_2B_4O_7 \times 10H_20$	0,1134
Disodium octoborate tetrahydrate	$Na_2B_8O_{13} \times 4H_20$	0,2096
Sodium metaborate (anhydrous)	$NaBO_2$	0,1643
Sodium metaborate (dihydrate)	$NaBO_2 \times 2H_20$	0,1062
Sodium metaborate (tetrahydrate)	$NaBO_2 \times 4H_20$	0,0784
Sodium pentaborate (anhydrous)	NaB_5O_8	0,2636
Sodium pentaborate (pentahydrate)	$NaB_5O_8 \times 5H_20$	0,1832

1. Short title of Exposure Scenario 5: Use as additive		
Main User Groups	SU 21: Consumer uses: Private households (= general public = consumers)	
Chemical product category	PC35: Washing and cleaning products (including solvent based products)	
Environmental Release Categories	ERC8a: Wide dispersive indoor use of processing aids in open systems	
2.1 Contributing scenario controlling environmental exposure for: ERC8a		
Product characteristics	Concentration of the Substance in Mixture/Article	Covers percentage substance in the product up to 100 % (unless stated differently).
Amount used	Regional use tonnage (tons/year):	93,2 ton(s)/year
	Amounts used in the EU (tonnes/year)	35000 ton(s)/year
Frequency and duration of use	Continuous exposure	365 days/year, Dispersive use.
Environment factors not influenced by risk management	Other data.Other information	Local freshwater dilution factor:: 10
Other given operational conditions affecting environmental exposure	Emission or Release Factor: Water	1000000 g/ton of product
Conditions and measures related to sewage treatment plant	Type of Sewage Treatment Plant	Municipal sewage treatment plant
	Flow rate of sewage treatment plant effluent	2.000 m3/d
	The concentration of the substance should not exceed 1,75 mg/L in the municipal STP	
2.2 Contributing scenario controlling consumer exposure for: PC35: Laundry and dish washing products		
Product characteristics	Concentration of the Substance in Mixture/Article	Covers percentage substance in the product up to 1 %.
	Physical Form (at time of use)	liquid
Frequency and duration of use	Exposure duration	10 min
	Frequency of use	10 Times per week
Human factors not influenced by risk management	Exposed skin areas	Covers skin contact area up to 1980 cm²
	Body weight	60 kg
Conditions and measures related to protection of consumer (e.g. behavioural advice, personal protection and hygiene)	Consumer Measures	Instructions addressed to the consumer via product labelling Wear suitable gloves.

3. Exposure estimation and reference to its source

Environment

Estimation based on workplace measurements

Contributing Scenario	Specific conditions	Compartment	Value	Level of Exposure	RCR
ERC8a, ERC8d	---	Sewage treatment plant (STP)	PEC	9589µg/L	0,959
ERC8a, ERC8d	---	Fresh water	PEC	1015µg/L	0,503

Consumers

Workplace measurements

Contributing Scenario	Specific conditions	Exposure routes	Level of Exposure	RCR
PC35	worst-case, Hand wash	Consumer dermal exposure	0,14mg/kg bw/day	---
PC35	worst-case, Laundry bleaching/pre-treatment	Consumer dermal exposure	5,84mg/kg bw/day	---
PC35	worst-case, Laundry regular	Consumer dermal exposure	0,58mg/kg bw/day	---

Estimated inhalative exposure value is regarded to be negligible.

4. Guidance to Downstream User to evaluate whether he works inside the boundaries set by the Exposure Scenario

For scaling see: http://www.arche-consulting.be/metal-CSA-toolbox/du-scaling tool
If measured data are not available, the DU may make use of an appropriate scaling tool such as EASE
Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures.
Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.
Only properly trained persons shall make use of scaling methods while checking whether the OC and RMM are within the boundaries set by the ES
Tonnage calculations have been based on boron such that no RCR exceeds 0.97, using back calculations with the relevant PNEC's when necessary. The equivalent tonnage of product handled on site should be calculated from the conversion factors detailed in the product table. For those operations that handle a combination of borate compounds, the boron equivalent of the combined tonnage cannot exceed the site tonnage value.

Substance	Formula	Conversion factor for the equivalent dose of B (multiply by)
Boric acid	H_3BO_3	0,1748
Boric oxide	$B2O_3$	0,311
Disodium tetraborate anhydrous	$Na_2B_4O_7$	0,2149
Disodium tetraborate pentahydrate	$Na_2B_4O_7 \times 5H_20$	0,1484
Disodium tetraborate decahydrate	$Na_2B_4O_7 \times 10H_20$	0,1134
Disodium octoborate tetrahydrate	$Na_2B_8O_{13} \times 4H_20$	0,2096
Sodium metaborate (anhydrous)	$NaBO_2$	0,1643
Sodium metaborate (dihydrate)	$NaBO_2 \times 2H_20$	0,1062
Sodium metaborate (tetrahydrate)	$NaBO_2 \times 4H_20$	0,0784
Sodium pentaborate (anhydrous)	NaB_5O_8	0,2636
Sodium pentaborate (pentahydrate)	$NaB_5O_8 \times 5H_20$	0,1832

1. Short title of Exposure Scenario 6: Use in adhesives and sealants		
Main User Groups	SU 3: Industrial uses: Uses of substances as such or in preparations at industrial sites	
Process categories	PROC1: Use in closed process, no likelihood of exposure PROC2: Use in closed, continuous process with occasional controlled exposure PROC3: Use in closed batch process (synthesis or formulation) PROC4: Use in batch and other process (synthesis) where opportunity for exposure arises PROC5: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact) PROC7: Industrial spraying PROC8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities PROC8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities PROC9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing) PROC10: Roller application or brushing PROC13: Treatment of articles by dipping and pouring	
Environmental Release Categories	ERC5: Industrial use resulting in inclusion into or onto a matrix	
2.1 Contributing scenario controlling environmental exposure for: ERC5		
Product characteristics	Concentration of the Substance in Mixture/Article	Covers percentage substance in the product up to 100 % (unless stated differently).
Amount used	Annual amount per site	7,5 ton(s)/year (Dilution of 10 ERC5)
	Annual amount per site	75 ton(s)/year (Dilution of 100 ERC5)
Frequency and duration of use	Continuous exposure	100 days/year
Environment factors not influenced by risk management	Other data. Other information	Local freshwater dilution factor:: 10
	Other data. Other information	Local marine water dilution factor:: 100
	Dilution Factor (River)	500
Other given operational conditions affecting environmental exposure	Emission or Release Factor: Air	36562 g/ton of product (Dilution of 10 ERC5)
	Emission or Release Factor: Water	500000 g/ton of product (Dilution of 10 ERC5)
	Emission or Release Factor: Air	36562 g/ton of product (Dilution of 100 ERC5)
	Emission or Release Factor: Water	500000 g/ton of product (Dilution of 100 ERC5)
	Emission or Release Factor: Air	36562 g/ton of product (Dilution of 1000 ERC5)

	Emission or Release Factor: Water	500000 g/ton of product (Dilution of 1000 ERC5)
	Emission or Release Factor: Air	36562 g/ton of product (No water emissions ERC5)
Technical conditions and measures at process level (source) to prevent release Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil Organizational measures to prevent/limit release from the site	Air	Electrostatic precipitation, Cyclones, Treatment of air emissions by bag filters, fabric filter and wet scrubber, Ceramic & metal mash filters, PM10 particles are removed
	Water	Substance specific waste water treatment, Reverse osmosis, Ion exchange (Degradation effectiveness: 40 - 90 %)
Conditions and measures related to sewage treatment plant	Type of Sewage Treatment Plant	Municipal sewage treatment plant
	The concentration of the substance should not exceed 1,75 mg/L in the municipal STP	
Conditions and measures related to external treatment of waste for disposal	Waste treatment	Send back to the process, or, Send offsite to approved hazardous waste incinerator
	Disposal methods	Vacuum up spillage and collect in suitable containers for disposal., Waste product and empty containers should be disposed of as hazardous waste in accordance with all local and national regulations.

2.2 Contributing scenario controlling environmental exposure for: ERC5

Activity	Formulation of substance in adhesives	
Product characteristics	Concentration of the Substance in Mixture/Article	Covers the percentage of the substance in the product up to 100 % (unless stated differently).
Amount used	Annual amount per site	2000 ton(s)/year
Frequency and duration of use	Continuous exposure	100 days/year
Environment factors not influenced by risk management	Other data. Other information	Local freshwater dilution factor:: 10
	Other data. Other information	Local marine water dilution factor:: 100
	Dilution Factor (River)	500
Other given operational conditions affecting environmental exposure	Emission or Release Factor: Air	9000 g/ton of product
Technical conditions and measures at process level (source) to prevent release Technical onsite conditions and measures to reduce or limit	Air	Electrostatic precipitation, Cyclones, Treatment of air emissions by bag filters, fabric filter and wet scrubber
	Water	Substance specific waste water treatment, Reverse osmosis, Ion exchange (Degradation effectiveness:

discharges, air emissions and releases to soil Organizational measures to prevent/limit release from the site		40 - 90 %)
Conditions and measures related to sewage treatment plant	Wastewater emission controls are not applicable as there is no direct release to wastewater.	
Conditions and measures related to external treatment of waste for disposal	Waste treatment	Send back to the process, or, Send offsite to approved hazardous waste incinerator
	Disposal methods	Vacuum up spillage and collect in suitable containers for disposal., Waste product and empty containers should be disposed of as hazardous waste in accordance with all local and national regulations.

2.3 Contributing scenario controlling worker exposure for: PROC1, PROC2, PROC3

Activity	Potentially closed processing operations at elevated temperature.	
Product characteristics	Concentration of the Substance in Mixture/Article	Covers percentage substance in the product up to 100 % (unless stated differently).
	Physical Form (at time of use)	Powdered substance, granules
Amount used	The amount used per worker varies from activity to activity	
Frequency and duration of use	Frequency of use	24 hours/day
	Frequency of use	365 days/year
Other operational conditions affecting workers exposure	Indoor use.	
	The process temperatures are mainly very high, as these processes include glass making, ceramics, steel & alloy making	
Technical conditions and measures to control dispersion from source towards the worker	Use in closed process, no likelihood of exposure Worker in separate cabine without specific ventilation Where there are breaches in the closed system, such as pouring and removal of slag in metal production, LEV is used to control fumes.	
Organisational measures to prevent /limit releases, dispersion and exposure	Ensure operatives are trained to minimise exposures. Regular inspection and maintenance of equipment and machines.	
Conditions and measures related to personal protection, hygiene and health evaluation	Operatives wear overalls or heavy heat resistant clothing In case of dust or aerosol formation: use respiratory protection with approved filter (P2) or Particle filter:P3 Use battery-powered air fed helmets These respirators, if worn correctly, with a good face fit, will provide sufficient protection Where tightly fitting RPE is used, the worker should be face fit tested to ensure that a good face seal can be obtained	
	Equipment cleaning and maintenance	Wear protective gloves. Safety glasses

		or Safety goggles
2.4 Contributing scenario controlling worker exposure for: PROC1, PROC2, PROC3		
Product characteristics	Concentration of the Substance in Mixture/Article	Covers percentage substance in the product up to 100 % (unless stated differently).
	Physical Form (at time of use)	Powdered substance, granules
Amount used	Amount per Shift	1000 kg
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently).	
Other operational conditions affecting workers exposure	Indoor use.	
	Assumes activities are at ambient temperature.	
Technical conditions and measures to control dispersion from source towards the worker	Use closed dosing, transfer, sampling and application systems including connectors. Where there are breaches in the closed system, such as pouring and removal of slag in metal production, LEV is used to control fumes.	
Organisational measures to prevent /limit releases, dispersion and exposure	Ensure operatives are trained to minimise exposures. Regular inspection and maintenance of equipment and machines.	
Conditions and measures related to personal protection, hygiene and health evaluation	Wear suitable protective clothing. Safety shoes Safety glasses In case of dust or aerosol formation: use respiratory protection with approved filter (P2) or Particle filter:P3	
2.5 Contributing scenario controlling worker exposure for: PROC2, PROC3, PROC4, PROC5, PROC7, PROC8b, PROC9, PROC10, PROC13		
Relevant for Adhesives		
Activity	Application	
Product characteristics	Concentration of the Substance in Mixture/Article	Covers concentrations up to 1,5%
	Physical Form (at time of use)	liquid
Amount used	Amount per Day	300 kg
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently).	
Other operational conditions affecting workers exposure	Indoor use.	
Technical conditions and measures to control dispersion from source towards the worker	Ensure that task is semi-automated or automated Provide local exhaust ventilation (LEV).	

Organisational measures to prevent /limit releases, dispersion and exposure	Ensure operatives are trained to minimise exposures. Regular inspection and maintenance of equipment and machines.	
Conditions and measures related to personal protection, hygiene and health evaluation	Wear protective clothing. Safety glasses	
2.6 Contributing scenario controlling worker exposure for: PROC4, PROC5, PROC8b		
Product characteristics	Concentration of the Substance in Mixture/Article	Covers percentage substance in the product up to 100 % (unless stated differently).
	Physical Form (at time of use)	Powdered substance, granules
Amount used	Would vary by requirements and by facility	
Frequency and duration of use	Application duration	60 min
Other operational conditions affecting workers exposure	Indoor use. Assumes activities are at ambient temperature.	
Technical conditions and measures to control dispersion from source towards the worker	Ensure that task is semi-automated or automated Provide local exhaust ventilation (LEV). Single use bags can be opened by the use of sharp prongs at the discharge hopper. When the big bag is placed at the discharge hopper and lowered, the prongs cut into the base of the bag releasing the substance into the hopper. This removes the operator from the immediate vicinity and contributes to a reduction in exposure	
Organisational measures to prevent /limit releases, dispersion and exposure	Ensure operatives are trained to minimise exposures. Regular inspection and maintenance of equipment and machines.	
Conditions and measures related to personal protection, hygiene and health evaluation	Wear protective clothing. Wear protective gloves. Safety glasses Goggles In case of dust or aerosol formation: use respiratory protection with approved filter (P2) or Particle filter:P3 These respirators, if worn correctly, with a good face fit, will provide sufficient protection Where tightly fitting RPE is used, the worker should be face fit tested to ensure that a good face seal can be obtained	
2.7 Contributing scenario controlling worker exposure for: PROC7		
Product characteristics	Concentration of the Substance in Mixture/Article	Concentration of substance in product : 0,08% - 1,1%
	Physical Form (at time of use)	solid, liquid
Amount used	The amount used per worker varies from activity to activity	

Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently).	
Other operational conditions affecting workers exposure	Indoor use.	
	Process may involve high temperature	
Organisational measures to prevent /limit releases, dispersion and exposure	Ensure operatives are trained to minimise exposures. Regular inspection and maintenance of equipment and machines.	
Conditions and measures related to personal protection, hygiene and health evaluation	Wear protective clothing. Wear protective gloves. Safety glasses or Goggles	
	Spraying/fogging by manual application	If spraying inside a kiln/furnace: Use battery-powered air fed helmets In case of dust or aerosol formation: use respiratory protection with approved filter (P2) or Particle filter:P3 If there is potential for oxygen deficiency, a suitable compressed airline should be used in conjunction with the full-face respirator to provide an independent supply of fresh air Where tightly fitting RPE is used, the worker should be face fit tested to ensure that a good face seal can be obtained
2.8 Contributing scenario controlling worker exposure for: PROC7, PROC10		
Activity	Application of enamel, Powder coating, Manual spray application (liquid products)	
Product characteristics	Concentration of the Substance in Mixture/Article	Covers concentrations up to 12,9 %
	Physical Form (at time of use)	Powdered mixture, Liquid mixture
Amount used	The amount used per worker varies from activity to activity	
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently).	
Other operational conditions affecting workers exposure	Indoor use.	
Technical conditions and measures to control dispersion from source towards the worker	Spraying	Ensure that a spraying booth is used.
Organisational measures to prevent /limit releases, dispersion and exposure	Ensure operatives are trained to minimise exposures. Regular inspection and maintenance of equipment and machines.	
Conditions and measures related to personal protection, hygiene and health evaluation	Wear protective clothing. If technical exhaust or ventilation measures are not possible or insufficient, respiratory protection must be worn. Particle filter:P2 Particle filter:P3	

	Where tightly fitting RPE is used, the worker should be face fit tested to ensure that a good face seal can be obtained	
2.9 Contributing scenario controlling worker exposure for: PROC7, PROC10		
Activity	Liquid formulation, spray application	
Product characteristics	Concentration of the Substance in Mixture/Article	Concentration of substance in product: 0,5% - 3,6%
	Physical Form (at time of use)	Liquid mixture
Amount used	The amount used per worker varies from activity to activity	
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently).	
Other operational conditions affecting workers exposure	Indoor use.	
Technical conditions and measures to control dispersion from source towards the worker	Ensure that a spraying booth is used. Provide local exhaust ventilation (LEV).	
Organisational measures to prevent /limit releases, dispersion and exposure	Provide basic employee training to prevent/minimize exposures Regular inspection and maintenance of equipment and machines.	
Conditions and measures related to personal protection, hygiene and health evaluation	Wear protective clothing. Wear chemically resistant gloves.	
	Manual Spraying	Safety glasses Wear respiratory protection. Particle filter:P2 or Particle filter:P3 Use battery-powered air fed helmets Where tightly fitting RPE is used, the worker should be face fit tested to ensure that a good face seal can be obtained
2.10 Contributing scenario controlling worker exposure for: PROC8a, PROC8b		
Activity	Equipment maintenance	
Product characteristics	Concentration of the Substance in Mixture/Article	Covers percentage substance in the product up to 100 % (unless stated differently).
	Physical Form (at time of use)	Powdered substance, granules
Amount used	Would vary by requirements and by facility	
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently).	
Other operational conditions affecting workers exposure	Indoor and outdoor use.	
Technical conditions and measures to control dispersion	Use closed dosing, transfer, sampling and application systems including connectors.	

from source towards the worker	Worker in separate cabine without specific ventilation Provide extraction ventilation at points where emissions occur.	
Organisational measures to prevent /limit releases, dispersion and exposure	Ensure operatives are trained to minimise exposures. Regular inspection and maintenance of equipment and machines.	
Conditions and measures related to personal protection, hygiene and health evaluation	Wear suitable protective clothing. Safety shoes Safety glasses In case of dust or aerosol formation: use respiratory protection with approved filter (P2) or Particle filter:P3	

2.11 Contributing scenario controlling worker exposure for: PROC8b

Large scale

Product characteristics	Concentration of the Substance in Mixture/Article	Covers percentage substance in the product up to 100 % (unless stated differently).
	Physical Form (at time of use)	Powdered substance, granules
Amount used	Amount per Application	40000 kg
Frequency and duration of use	Exposure duration	120 min
Other operational conditions affecting workers exposure	Indoor use.	
	Assumes activities are at ambient temperature.	
Technical conditions and measures to control dispersion from source towards the worker	Transport over pipes, technical barrel filling/emptying of barrel with automatic systems (suction pumps etc.) Use closed dosing, transfer, sampling and application systems including connectors. Provide dust filtration for air displaced from the silo during filling. Provide local exhaust ventilation (LEV).	
Organisational measures to prevent /limit releases, dispersion and exposure	Ensure operatives are trained to minimise exposures. Regular inspection and maintenance of equipment and machines.	
Conditions and measures related to personal protection, hygiene and health evaluation	Wear protective clothing. Wear protective gloves. Safety glasses or Goggles	

2.12 Contributing scenario controlling worker exposure for: PROC9

Product characteristics	Concentration of the Substance in Mixture/Article	Concentration of substance in product: 0,11% - 8,6%
	Physical Form (at time of use)	solid, liquid, pasty
Amount used	Amount per Day	10000 kg

Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently).
Other operational conditions affecting workers exposure	Indoor use.
Technical conditions and measures to control dispersion from source towards the worker	Automate activity where possible. Provide local exhaust ventilation (LEV).
Organisational measures to prevent /limit releases, dispersion and exposure	Ensure operatives are trained to minimise exposures. Regular inspection and maintenance of equipment and machines.
Conditions and measures related to personal protection, hygiene and health evaluation	Wear protective clothing. Safety shoes Safety glasses In case of dust or aerosol formation: use respiratory protection with approved filter (P2) or Particle filter:P3

3. Exposure estimation and reference to its source

Environment

Workplace measurements

Contributing Scenario	Specific conditions	Compartment	Value	Level of Exposure	RCR
ERC5	---	Water	PEC	1931µg/L	0,956
ERC5	---	Soil	PEC	0,04mg/kg dry weight (d.w.)	0,007

FEICA spERC 5.1a.v1 has been used to evaluate the exposure for the environment.

Workers

PROC1, PROC2, PROC3, PROC4, PROC5, PROC8a, PROC8b, PROC9 Workplace measurements
PROC2, PROC4, PROC7, PROC8a, PROC9, PROC19 MEASE
PROC7 Advanced REACH Tool (ART model)
PROC7, PROC9, PROC10, PROC13, PROC19 Advanced REACH Tool (ART model) (inhalative exposure)

Contributing Scenario	Specific conditions	Exposure routes	Level of Exposure	RCR
PROC1, PROC2, PROC3	90th percentile value	Inhalation worker exposure	0,08mg/m³	0,06
PROC2	cleaning, during 15 mins - 1 hour	Dermal worker exposure	0,048mg/kg bw/day	< 0,001
PROC1, PROC2, PROC3	without respiratory protection	Inhalation worker exposure	0,08mg/m³	0,06
PROC2	Solid, high dustiness., during 15 mins - 1 hour	Dermal worker exposure	0,048mg/kg bw/day	< 0,001

PROC7, PROC10, PROC13	Concentration of substance in product : 0% - 5%, with local exhaust ventilation, 90th percentile value	Inhalation worker exposure	0,11mg/m³	0,076
PROC7	Spraying, Concentration of substance in product : 0% - 5%	Dermal worker exposure	0,048mg/kg bw/day	0,01
PROC4, PROC5	90th percentile value, no respiratory protection (RPE), small scale	Inhalation worker exposure	0,78mg/m³	0,54
PROC4	Solid, high dustiness., during 15 mins - 1 hour, small scale	Dermal worker exposure	0,48mg/kg bw/day	< 0,001
PROC4, PROC5, PROC8b	90th percentile value, Large scale, With respiratory protection, half mask	Inhalation worker exposure	0,2mg/m³	0,14
PROC4	Solid, high dustiness., during 15 mins - 1 hour, with local exhaust ventilation	Dermal worker exposure	4,8mg/kg bw/day	0,001
PROC7, PROC19	without respiratory protection	Inhalation worker exposure	0,012mg/m³	0,008
PROC7, PROC19	Solid, high dustiness., during 15 mins - 1 hour	Dermal worker exposure	0,42mg/kg bw/day	< 0,001
PROC7	with local exhaust ventilation, With respiratory protection, liquid	Inhalation worker exposure	0,67mg/m³	0,46
PROC7	liquid, Concentration of substance in product : 0% - 5%, with local exhaust ventilation	Dermal worker exposure	0,048mg/kg bw/day	< 0,001
PROC8a, PROC8b	90th percentile value, no respiratory protection (RPE)	Inhalation worker exposure	1,33mg/m³	0,92
PROC8a	Solid, high dustiness., during 1 - 4 hours	Dermal worker exposure	0,173mg/kg bw/day	< 0,001
PROC8b	---	Inhalation worker exposure	0,016mg/m³	0,011
PROC8b	with local exhaust ventilation, 90th percentile value	Inhalation worker exposure	0,03mg/m³	0,021
PROC2	Solid, high dustiness.	Dermal worker exposure	0,024mg/kg bw/day	< 0,001

PROC9	90th percentile value, no respiratory protection (RPE), solid, with local exhaust ventilation	Inhalation worker exposure	0,4mg/m³	0,28
PROC9	90th percentile value, liquid, with local exhaust ventilation	Inhalation worker exposure	0,01mg/m³	0,007
PROC9	Solid, high dustiness., Concentration of substance in product: 5% - 25%	Dermal worker exposure	1,44mg/kg bw/day	< 0,001
PROC9	liquid, Concentration of substance in product: 5% - 25%	Dermal worker exposure	0,144mg/kg bw/day	< 0,001

4. Guidance to Downstream User to evaluate whether he works inside the boundaries set by the Exposure Scenario

Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures.
Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.
Only properly trained persons shall make use of scaling methods while checking whether the OC and RMM are within the boundaries set by the ES
Tonnage calculations have been based on boron such that no RCR exceeds 0.97, using back calculations with the relevant PNEC's when necessary. The equivalent tonnage of product handled on site should be calculated from the conversion factors detailed in the product table. For those operations that handle a combination of borate compounds, the boron equivalent of the combined tonnage cannot exceed the site tonnage value.

Substance	Formula	Conversion factor for the equivalent dose of B (multiply by)
Boric acid	H_3BO_3	0.1748
Boric oxide	$B2O_3$	0.311
Disodium tetraborate anhydrous	$Na_2B_4O_7$	0.2149
Disodium tetraborate pentahydrate	$Na_2B_4O_7 \times 5H_20$	0.1484
Disodium tetraborate decahydrate	$Na_2B_4O_7 \times 10H_20$	0.1134
Disodium octoborate tetrahydrate	$Na_2B_8O_{13} \times 4H_20$	0.2096
Sodium metaborate (anhydrous)	$NaBO_2$	0.1643
Sodium metaborate (dihydrate)	$NaBO_2 \times 2H_20$	0.1062
Sodium metaborate (tetrahydrate)	$NaBO_2 \times 4H_20$	0.0784
Sodium pentaborate (anhydrous)	NaB_5O_8	0.2636
Sodium pentaborate (pentahydrate)	$NaB_5O_8 \times 5H_20$	0.1832

If measured data are not available, the DU may make use of an appropriate scaling tool such as MEASE (www.ebrc.de/mease.html) to estimate the associated exposure.
For further information on the assessment method, see: http://www.advancedreachtool.com

Additional good practice advice beyond the REACH Chemical Safety Assessment

Take care for general good hygiene and housekeeping.

1. Short title of Exposure Scenario 7: Use in Cleaning Agents		
Main User Groups	SU 22: Professional uses: Public domain (administration, education, entertainment, services, craftsmen)	
Process categories	PROC1: Use in closed process, no likelihood of exposure PROC2: Use in closed, continuous process with occasional controlled exposure PROC3: Use in closed batch process (synthesis or formulation) PROC10: Roller application or brushing PROC11: Non industrial spraying PROC13: Treatment of articles by dipping and pouring PROC19: Hand-mixing with intimate contact and only PPE available	
Environmental Release Categories	ERC8a: Wide dispersive indoor use of processing aids in open systems ERC8d: Wide dispersive outdoor use of processing aids in open systems	
2.1 Contributing scenario controlling environmental exposure for: ERC8a, ERC8d		
Product characteristics	Concentration of the Substance in Mixture/Article	Covers percentage substance in the product up to 100 % (unless stated differently).
Amount used	Regional use tonnage (tons/year):	93,2 ton(s)/year
	Amounts used in the EU (tonnes/year)	35000 ton(s)/year (Dilution of 10 ERC8a, ERC8d)
Frequency and duration of use	Continuous exposure	365 days/year, Dispersive use.
Environment factors not influenced by risk management	Other data. Other information	Local freshwater dilution factor:: 10
Other given operational conditions affecting environmental exposure	Emission or Release Factor: Water	1000000 g/ton of product
Conditions and measures related to sewage treatment plant	Type of Sewage Treatment Plant	Municipal sewage treatment plant
	Flow rate of sewage treatment plant effluent	2.000 m3/d
	The concentration of the substance should not exceed 1,75 mg/L in the municipal STP	
2.2 Contributing scenario controlling worker exposure for: PROC1, PROC2, PROC3, PROC10, PROC11, PROC13, PROC19		
Product characteristics	Concentration of the Substance in Mixture/Article	Covers concentrations up to 0,5%
	Physical Form (at time of use)	liquid
Amount used	The amount used per worker varies from activity to activity	
Frequency and duration of use	Exposure duration per day	1 min

	Frequency of use	5 Times per day
Other operational conditions affecting workers exposure	Indoor use.	
Technical conditions and measures to control dispersion from source towards the worker	Ensure that task is semi-automated or automated	
Organisational measures to prevent /limit releases, dispersion and exposure	Regular inspection and maintenance of equipment and machines. Ensure operatives are trained to minimise exposures.	
Conditions and measures related to personal protection, hygiene and health evaluation	Use suitable eye protection. Wear protective gloves.	

2.3 Contributing scenario controlling worker exposure for: PROC11, PROC13		
Product characteristics	Concentration of the Substance in Mixture/Article	Covers concentrations up to 0,5%
	Physical Form (at time of use)	liquid
Amount used	The amount used per worker varies from activity to activity	
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently).	
Technical conditions and measures to control dispersion from source towards the worker	Use product in a well-ventilated area only. Where possible use of specific dispensers and pumps specifically designed to prevent splashes/spills/exposure to occur.	
Organisational measures to prevent /limit releases, dispersion and exposure	Ensure operatives are trained to minimise exposures.	

3. Exposure estimation and reference to its source

Environment

Workplace measurements

Contributing Scenario	Specific conditions	Compartment	Value	Level of Exposure	RCR
ERC8a, ERC8d	---	Sewage treatment plant (STP)	PEC	9589µg/L	0,959
ERC8a, ERC8d	---	Water	PEC	1015µg/L	0,503

Workers

PROC19 MEASE PROC11 Advanced REACH Tool (ART model) (inhalative exposure)

Contributing Scenario	Specific conditions	Exposure routes	Level of Exposure	RCR
PROC19	Hand wash, liquid, Concentration: 1%,	Dermal worker exposure	0,048mg/kg bw/day	< 0,001

	during 15 mins - 1 hour			
PROC11	liquid detergents, Spraying, Large scale	Inhalation worker exposure	0,01mg/m³	0,007

Inhalative exposure is regarded to be not relevant.

4. Guidance to Downstream User to evaluate whether he works inside the boundaries set by the Exposure Scenario

Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures.
Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.
Only properly trained persons shall make use of scaling methods while checking whether the OC and RMM are within the boundaries set by the ES
Tonnage calculations have been based on boron such that no RCR exceeds 0.97, using back calculations with the relevant PNEC's when necessary. The equivalent tonnage of product handled on site should be calculated from the conversion factors detailed in the product table. For those operations that handle a combination of borate compounds, the boron equivalent of the combined tonnage cannot exceed the site tonnage value.

Substance	Formula	Conversion factor for the equivalent dose of B (multiply by)
Boric acid	H_3BO_3	0,1748
Boric oxide	$B2O_3$	0,311
Disodium tetraborate anhydrous	$Na_2B_4O_7$	0,2149
Disodium tetraborate pentahydrate	$Na_2B_4O_7 \times 5H_20$	0,1484
Disodium tetraborate decahydrate	$Na_2B_4O_7 \times 10H_20$	0,1134
Disodium octoborate tetrahydrate	$Na_2B_8O_{13} \times 4H_20$	0,2096
Sodium metaborate (anhydrous)	$NaBO_2$	0,1643
Sodium metaborate (dihydrate)	$NaBO_2 \times 2H_20$	0,1062
Sodium metaborate (tetrahydrate)	$NaBO_2 \times 4H_20$	0,0784
Sodium pentaborate (anhydrous)	NaB_5O_8	0,2636
Sodium pentaborate (pentahydrate)	$NaB_5O_8 \times 5H_20$	0,1832

If measured data are not available, the DU may make use of an appropriate scaling tool such as MEASE (www.ebrc.de/mease.html) to estimate the associated exposure.
For further information on the assessment method, see: http://www.advancedreachtool.com

Additional good practice advice beyond the REACH Chemical Safety Assessment

Take care for general good hygiene and housekeeping.

1. Short title of Exposure Scenario 8: Use in Cleaning Agents		
Main User Groups	SU 3: Industrial uses: Uses of substances as such or in preparations at industrial sites	
Process categories	PROC1: Use in closed process, no likelihood of exposure PROC2: Use in closed, continuous process with occasional controlled exposure PROC3: Use in closed batch process (synthesis or formulation) PROC4: Use in batch and other process (synthesis) where opportunity for exposure arises PROC5: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact) PROC6: Calendering operations PROC7: Industrial spraying PROC8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities PROC8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities PROC9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing) PROC10: Roller application or brushing PROC12: use of blowing agents in manufacture of foam PROC13: Treatment of articles by dipping and pouring PROC18: Greasing at high energy conditions PROC19: Hand-mixing with intimate contact and only PPE available PROC23: Open processing and transfer operations with minerals/metals at elevated temperature PROC24: High (mechanical) energy work-up of substances bound in materials and/or articles	
Environmental Release Categories	ERC4: Industrial use of processing aids in processes and products, not becoming part of articles	
2.1 Contributing scenario controlling environmental exposure for: ERC4		
Product characteristics	Concentration of the Substance in Mixture/Article	Covers percentage substance in the product up to 100 % (unless stated differently).
Amount used	Regional use tonnage (tons/year):	93,2 ton(s)/year
Frequency and duration of use	Continuous exposure	365 days/year, Dispersive use.
Conditions and measures related to sewage treatment plant	Type of Sewage Treatment Plant	Municipal sewage treatment plant
	Flow rate of sewage treatment plant effluent	2.000 m3/d
	The concentration of the substance should not exceed 1,75 mg/L in the municipal STP	
2.2 Contributing scenario controlling worker exposure for: PROC1, PROC2, PROC3, PROC5, PROC6, PROC8a, PROC8b, PROC9, PROC10, PROC12, PROC13, PROC18, PROC19, PROC23,		

PROC24		
Product characteristics	Concentration of the Substance in Mixture/Article	Covers concentrations up to 2%
	Physical Form (at time of use)	liquid
Amount used	The amount used per worker varies from activity to activity	
Frequency and duration of use	Exposure duration per day	5 min
	Frequency of use	10 Times per day
Other operational conditions affecting workers exposure	Indoor use.	
Technical conditions and measures to control dispersion from source towards the worker	Ensure that task is semi-automated or automated	
Organisational measures to prevent /limit releases, dispersion and exposure	Ensure operatives are trained to minimise exposures. Regular inspection and maintenance of equipment and machines.	
Conditions and measures related to personal protection, hygiene and health evaluation	Use suitable eye protection. Wear protective gloves.	

2.3 Contributing scenario controlling worker exposure for: PROC7		
Product characteristics	Concentration of the Substance in Mixture/Article	Covers percentage substance in the product up to 1 %.
	Physical Form (at time of use)	liquid
Frequency and duration of use	Exposure duration per day	> 240 min
Conditions and measures related to personal protection, hygiene and health evaluation	Wear protective gloves.	

3. Exposure estimation and reference to its source

Environment

Estimation based on workplace measurements

Contributing Scenario	Specific conditions	Compartment	Value	Level of Exposure	RCR
ERC4	---	Sewage treatment plant (STP)	PEC	0,06mg/L	0,04
ERC4	---	Fresh water	PEC	63µg/L	0,05
ERC4	---	Fresh water	PEC	0,37mg/kg dry	0,20

		sediment		weight (d.w.)	

Workers

MEASE

Contributing Scenario	Specific conditions	Exposure routes	Level of Exposure	RCR
PROC19	Hand wash, during 15 mins - 1 hour, Concentration: 1%, with gloves	Dermal worker exposure	0,005mg/kg bw/day	---
PROC7	with gloves	Dermal worker exposure	0,002mg/kg bw/day	---

Inhalative exposure is regarded to be not relevant.

4. Guidance to Downstream User to evaluate whether he works inside the boundaries set by the Exposure Scenario

Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures.
Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.
Only properly trained persons shall make use of scaling methods while checking whether the OC and RMM are within the boundaries set by the ES
Tonnage calculations have been based on boron such that no RCR exceeds 0.97, using back calculations with the relevant PNEC's when necessary. The equivalent tonnage of product handled on site should be calculated from the conversion factors detailed in the product table. For those operations that handle a combination of borate compounds, the boron equivalent of the combined tonnage cannot exceed the site tonnage value.

Substance	Formula	Conversion factor for the equivalent dose of B (multiply by)
Boric acid	H_3BO_3	0,1748
Boric oxide	$B2O_3$	0,311
Disodium tetraborate anhydrous	$Na_2B_4O_7$	0,2149
Disodium tetraborate pentahydrate	$Na_2B_4O_7 \times 5H_20$	0,1484
Disodium tetraborate decahydrate	$Na_2B_4O_7 \times 10H_20$	0,1134
Disodium octoborate tetrahydrate	$Na_2B_8O_{13} \times 4H_20$	0,2096
Sodium metaborate (anhydrous)	$NaBO_2$	0,1643
Sodium metaborate (dihydrate)	$NaBO_2 \times 2H_20$	0,1062
Sodium metaborate (tetrahydrate)	$NaBO_2 \times 4H_20$	0,0784
Sodium pentaborate (anhydrous)	NaB_5O_8	0,2636
Sodium pentaborate (pentahydrate)	$NaB_5O_8 \times 5H_20$	0,1832

If measured data are not available, the DU may make use of an appropriate scaling tool such as MEASE (www.ebrc.de/mease.html) to estimate the associated exposure.

Additional good practice advice beyond the REACH Chemical Safety Assessment

Take care for general good hygiene and housekeeping.

1. Short title of Exposure Scenario 9: Use in agrochemicals		
Main User Groups	SU 22: Professional uses: Public domain (administration, education, entertainment, services, craftsmen)	
Process categories	PROC2: Use in closed, continuous process with occasional controlled exposure PROC5: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact) PROC8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities PROC9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing) PROC13: Treatment of articles by dipping and pouring	
Environmental Release Categories	ERC8a: Wide dispersive indoor use of processing aids in open systems ERC8c: Wide dispersive indoor use resulting in inclusion into or onto a matrix ERC8d: Wide dispersive outdoor use of processing aids in open systems ERC8f: Wide dispersive outdoor use resulting in inclusion into or onto a matrix	
2.1 Contributing scenario controlling environmental exposure for: ERC8a, ERC8c, ERC8d, ERC8f		
Product characteristics	Concentration of the Substance in Mixture/Article	Covers percentage substance in the product up to 100 % (unless stated differently).
Amount used	The quantity applied depends upon that necessary to raise the level in the soil to support the crop in question	
Frequency and duration of use	Continuous exposure	Fertilizers containing the substance are only used when there are insufficient substance levels in the soil to support crop growth. They tend not to be used in large quantities nor for long periods of time. The use of a substance containing fertiliser will depend upon the requirements of the crop being grown
Technical conditions and measures at process level (source) to prevent release Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil Organizational measures to prevent/limit release from the site	Water	There are no direct releases to adjacent surface waters, Drift should be minimized
	Soil	Used on soils which have low concentrations of the substance
Conditions and measures related to external treatment of waste for disposal	Waste treatment	Substance containing waste shall be handled as hazardous waste and removed by licensed waste removal company, incinerated or recycled
2.2 Contributing scenario controlling worker exposure for: PROC2		
Activity	Fertigation using liquid fertiliser	
Product characteristics	Concentration of the Substance in	Concentration of substance in product: 0,01 % - 36,0 %

	Mixture/Article	
	Physical Form (at time of use)	liquid
Amount used	The amount of fertiliser used at any one time will depend on the area to be fertilised, but is likely to be several tonnes	
Frequency and duration of use	The system runs constantly, with IBC's being changed over once or twice per week(PROC2)	
Technical conditions and measures to control dispersion from source towards the worker	IBC's or silos containing the liquid fertiliser should be connected to a fertigation system which automatically irrigates and fertilises plants in fields or greenhouses Use closed dosing, transfer, sampling and application systems including connectors.(PROC2)	
Organisational measures to prevent /limit releases, dispersion and exposure	Ensure operatives are trained to minimise exposures. Regular inspection and maintenance of equipment and machines.	
2.3 Contributing scenario controlling worker exposure for: PROC5, PROC8a		
Product characteristics	Concentration of the Substance in Mixture/Article	Concentration of substance in product: 0,06% - 4,5%
	Physical Form (at time of use)	granules
Amount used	The amount of fertiliser used at any one time will depend on the area to be fertilised, but is likely to be several tonnes	
Frequency and duration of use	Exposure duration per day	60 min
	Frequency of use	2 days/year
Other operational conditions affecting workers exposure	Indoor and outdoor use.	
	Assumes activities are at ambient temperature.	
Technical conditions and measures to control dispersion from source towards the worker	Provide a good standard of general ventilation. Natural ventilation is from doors, windows etc. Controlled ventilation means air is supplied or removed by a powered fan.	
Organisational measures to prevent /limit releases, dispersion and exposure	Ensure operatives are trained to minimise exposures. Regular inspection and maintenance of equipment and machines.	
Conditions and measures related to personal protection, hygiene and health evaluation	In case of dust or aerosol formation: use respiratory protection with approved filter (P2) or Particle filter:P3 These respirators, if worn correctly, with a good face fit, will provide sufficient protection Where tightly fitting RPE is used, the worker should be face fit tested to ensure that a good face seal can be obtained (Efficiency: 90 - 95 %)	
	Wear suitable protective clothing. Wear protective gloves.	
2.4 Contributing scenario controlling worker exposure for: PROC9		

Activity	Transfer of liquid foliar fertilizer	
Product characteristics	Concentration of the Substance in Mixture/Article	Concentration of substance in product: 0,01 % - 36,0 %
	Physical Form (at time of use)	Aqueous solution
Amount used	The amount of fertiliser used at any one time will depend on the area to be fertilised, but is likely to be several tonnes	
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently)., The application of liquid foliar fertiliser could be carried out using a knapsack sprayer or a tractor-pulled spraybar, If spraying using a backpack, the worker may need to refill his backpack several times during a shift, probably from a tank taken to the field, If spraying using a spray bar, the tank may need to be refilled several times during a shift.This is likely to be pumped from a tank, or may be gravity filled	
Other operational conditions affecting workers exposure	Outdoor use.	
Organisational measures to prevent /limit releases, dispersion and exposure	Ensure operatives are trained to minimise exposures. Regular inspection and maintenance of equipment and machines.	

2.5 Contributing scenario controlling worker exposure for: PROC13

Activity	Application of liquid foliar fertiliser	
Product characteristics	Concentration of the Substance in Mixture/Article	Concentration of substance in product: 0,01 % - 36,0 %
	Physical Form (at time of use)	liquid
Amount used	The amount of fertiliser used at any one time will depend on the area to be fertilised, but is likely to be several tonnes	
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently)., The application of liquid foliar fertiliser could be carried out using a knapsack sprayer or a tractor-pulled spraybar	
Other operational conditions affecting workers exposure	Outdoor use.	
Technical conditions and measures to control dispersion from source towards the worker	Use a tractor mounted spray bar with closed tractor cab and air condition	
Organisational measures to prevent /limit releases, dispersion and exposure	Ensure operatives are trained to minimise exposures. Regular inspection and maintenance of equipment and machines.	

3. Exposure estimation and reference to its source

Environment

Significant emissions to the terrestrial environment are not expected.

Workers

PROC5, PROC8a Workplace measurements
PROC8a, PROC9 MEASE
PROC5, PROC8a Advanced REACH Tool (ART model)

Contributing Scenario	Specific conditions	Exposure routes	Level of Exposure	RCR
PROC8a	---	Dermal worker exposure	0,014mg/kg bw/day	< 0,001
PROC8a	without gloves, Concentration of substance in product : 0% - 5%	Dermal worker exposure	0,019mg/kg bw/day	< 0,001
PROC5, PROC8a	no respiratory protection (RPE), Direct discharge	Inhalation worker exposure	0,09mg/m³	0,062
PROC5, PROC8a	Solid, high dustiness., (open systems)	Inhalation worker exposure	1,22mg/m³	0,84
PROC9	application as solution, Concentration of substance in product : 0% - 5%, during 15 mins - 1 hour, Material transfers	Inhalation worker exposure	0,29mg/m³	< 0,001

There is no opportunity for inhalation exposure as the fertiliser is liquid and is fed via closed system to the soil. There may be the opportunity for dermal exposure during changeover of IBCs or during bulk deliveries of liquid fertilisers, when pipework is connected and disconnected.

4. Guidance to Downstream User to evaluate whether he works inside the boundaries set by the Exposure Scenario

Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures.
Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.
Only properly trained persons shall make use of scaling methods while checking whether the OC and RMM are within the boundaries set by the ES
Tonnage calculations have been based on boron such that no RCR exceeds 0.97, using back calculations with the relevant PNEC's when necessary. The equivalent tonnage of product handled on site should be calculated from the conversion factors detailed in the product table. For those operations that handle a combination of borate compounds, the boron equivalent of the combined tonnage cannot exceed the site tonnage value.

Substance	Formula	Conversion factor for the equivalent dose of B (multiply by)
Boric acid	H_3BO_3	0.1748
Boric oxide	$B2O_3$	0.311
Disodium tetraborate anhydrous	$Na_2B_4O_7$	0.2149
Disodium tetraborate pentahydrate	$Na_2B_4O_7 \times 5H_20$	0.1484
Disodium tetraborate decahydrate	$Na_2B_4O_7 \times 10H_20$	0.1134
Disodium octoborate tetrahydrate	$Na_2B_8O_{13} \times 4H_20$	0.2096
Sodium metaborate (anhydrous)	$NaBO_2$	0.1643
Sodium metaborate (dihydrate)	$NaBO_2 \times 2H_20$	0.1062
Sodium metaborate (tetrahydrate)	$NaBO_2 \times 4H_20$	0.0784
Sodium pentaborate (anhydrous)	NaB_5O_8	0.2636
Sodium pentaborate (pentahydrate)	$NaB_5O_8 \times 5H_20$	0.1832

If measured data are not available, the DU may make use of an appropriate scaling tool such as MEASE (www.ebrc.de/mease.html) to estimate the associated exposure.
For further information on the assessment method, see: http://www.advancedreachtool.com

Additional good practice advice beyond the REACH Chemical Safety Assessment

In line with the requirements of good agricultural practice, agricultural soil should be assessed prior to application of the substance and the application rate should be adjusted according to the results of the assessment and crop requirements.

Take care for general good hygiene and housekeeping.

1. Short title of Exposure Scenario 10: Use in building and construction work		
Main User Groups	SU 21: Consumer uses: Private households (= general public = consumers)	
Chemical product category	PC0: Other products: PC1: Adhesives, sealants PC9b: Fillers, putties, plasters, modelling clay	
Environmental Release Categories	ERC10a: Wide dispersive outdoor use of long-life articles and materials with low release ERC11a: Wide dispersive indoor use of long-life articles and materials with low release	
2.1 Contributing scenario controlling environmental exposure for: ERC10a, ERC11a		
Product characteristics	Concentration of the Substance in Mixture/Article	Covers percentage substance in the product up to 100 % (unless stated differently).
Amount used	Amounts used in the EU (tonnes/year)	1,1 Million tonnes/year
Frequency and duration of use	Continuous exposure	365 days/year, Dispersive use.
Environment factors not influenced by risk management	Other data.Other information	Local freshwater dilution factor:: 10
Other given operational conditions affecting environmental exposure	Emission or Release Factor: Water	32000 g/ton of product
Technical conditions and measures at process level (source) to prevent release Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil Organizational measures to prevent/limit release from the site	Air	Air emission controls are not applicable as there is no direct release to air.
Conditions and measures related to sewage treatment plant	Type of Sewage Treatment Plant	Municipal sewage treatment plant
	Flow rate of sewage treatment plant effluent	2.000 m3/d
	If sites discharge to a municipal STP the concentration of the substance should not exceed 10 mg/l in the municipal STP	
Conditions and measures related to external treatment of waste for disposal	Disposal methods	Dispose of waste in accordance with environmental legislation.
2.2 Contributing scenario controlling consumer exposure for: PC0, AC4		
Use of substance containing construction materials		
Product characteristics	Concentration of the	Covers concentrations up to 0,15%

	Substance in Mixture/Article	
	Physical Form (at time of use)	Solid substance
Frequency and duration of use	Exposure duration per day	480 min
	Frequency of use	5 days/year
Human factors not influenced by risk management	Breathing rate	34,7 m3/day(PC0)
	Body weight	60 kg(PC0)
	Breathing rate	20 m3/day(AC4)
	Body weight	60 - 70 kg(AC4)
Other given operational conditions affecting consumers exposure	Indoor and outdoor use.	
Conditions and measures related to protection of consumer (e.g. behavioural advice, personal protection and hygiene)	Consumer Measures	Provide a good standard of general ventilation. Natural ventilation is from doors, windows etc. Controlled ventilation means air is supplied or removed by a powered fan.

2.3 Contributing scenario controlling consumer exposure for: PC0

Installation of substance containing cellulose insulation

Product characteristics	Concentration of the Substance in Mixture/Article	Covers concentrations up to 18%
Frequency and duration of use	Frequency of use	480 minutes/day
Human factors not influenced by risk management	Breathing rate	34,7 m3/day
	Body weight	60 kg

2.4 Contributing scenario controlling consumer exposure for: PC0

Use in mattresses as flame retardants

Human factors not influenced by risk management	Adults; bodyweight for adult consumers: 60 kg(PC0)	
	Body weight	20 kg(child PC0)

2.5 Contributing scenario controlling consumer exposure for: PC1, AC8

Mouthing of card board and oral contact with substance

Product characteristics	Concentration of the	Covers concentrations up to 2%

	Substance in Mixture/Article	
	Physical Form (at time of use)	Massive objects
Amount used	Amount used per event (oral exposure)	2 g
Frequency and duration of use	Occasional exposure	
Human factors not influenced by risk management	Body weight	20 kg(child PC1)

2.6 Contributing scenario controlling consumer exposure for: PC9b: Modelling clay, AC10		
Product characteristics	Concentration of the Substance in Mixture/Article	Covers concentrations up to 8%
Human factors not influenced by risk management	Body weight	20 kg
Conditions and measures related to protection of consumer (e.g. behavioural advice, personal protection and hygiene)	Consumer Measures	Limit the concentration of the substance to 5,75% Instructions addressed to the consumer via product labelling
	Consumer Measures	Instructions addressed to the consumer via product labelling

3. Exposure estimation and reference to its source

Environment

METALS EUSES IT tool

Contributing Scenario	Specific conditions	Compartment	Value	Level of Exposure	RCR
ERC10a, ERC11a	---	Water	PEC	1021 µg/L	0,505
ERC10a, ERC11a	---	Sewage treatment plant (STP)	PEC	9644 µg/L	0,964

Consumers

PC0, AC4 Workplace measurements AC4 Estimation based on workplace measurements
PC9b Other measured data PC0 Estimation based on published data
PC1 Estimation based on measured data

Contributing Scenario	Specific conditions	Exposure routes	Level of Exposure	RCR
PC0, AC4	---	Inhalable dust.	0,34mg/m³	---
PC0	60kg body weight, worst-case	Consumer inhalation exposure	1,72 .10-5 mg/m³	---
AC4	---	Consumer inhalation exposure	0,0000983mg/kg/day	---
PC0	---	Consumer inhalation exposure	0,0636mg/kg/day	---
PC0	adult	Consumer dermal exposure	1mg/kg/day	---
PC0	---	Consumer inhalation exposure	5,2 .10-6 mg/m³	---
PC0	---	Consumer oral exposure	0,0028mg/kg/day	---
PC0	children	Consumer dermal exposure	1,76mg/kg/day	---
PC1	worst-case, child	Consumer oral exposure	0,1mg/kg/day	---
PC9b	worst-case, child	Consumer oral exposure	3,87mg/kg/day	---
PC9b	worst-case, child	Consumer dermal exposure	0,00438mg/kg/day	---

Estimated dermal exposure value is regarded to be negligible. Estimated inhalative exposure value is regarded to be negligible.

4. Guidance to Downstream User to evaluate whether he works inside the boundaries set by the Exposure Scenario

Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures.
Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.
Only properly trained persons shall make use of scaling methods while checking whether the OC and RMM are within the boundaries set by the ES
Tonnage calculations have been based on boron such that no RCR exceeds 0.97, using back calculations with the relevant PNEC's when necessary. The equivalent tonnage of product handled on site should be calculated from the conversion factors detailed in the product table. For those operations that handle a combination of borate compounds, the boron equivalent of the combined tonnage cannot exceed the site tonnage value.

Substance	Formula	Conversion factor for the equivalent dose of B (multiply by)
Boric acid	H_3BO_3	0.1748
Boric oxide	$B2O_3$	0.311
Disodium tetraborate anhydrous	$Na_2B_4O_7$	0.2149
Disodium tetraborate pentahydrate	$Na_2B_4O_7 \times 5H_20$	0.1484
Disodium tetraborate decahydrate	$Na_2B_4O_7 \times 10H_20$	0.1134
Disodium octoborate tetrahydrate	$Na_2B_8O_{13} \times 4H_20$	0.2096
Sodium metaborate (anhydrous)	$NaBO_2$	0.1643
Sodium metaborate (dihydrate)	$NaBO_2 \times 2H_20$	0.1062
Sodium metaborate (tetrahydrate)	$NaBO_2 \times 4H_20$	0.0784
Sodium pentaborate (anhydrous)	NaB_5O_8	0.2636
Sodium pentaborate (pentahydrate)	$NaB_5O_8 \times 5H_20$	0.1832

The ConsExpo model has been used to estimate consumer exposures unless otherwise indicated.
Only properly trained persons shall make use of scaling methods while checking whether the OC and RMM are within the boundaries set by the ES

1. Short title of Exposure Scenario 11: Use as processing aid	
Main User Groups	SU 3: Industrial uses: Uses of substances as such or in preparations at industrial sites
Process categories	PROC1: Use in closed process, no likelihood of exposure PROC2: Use in closed, continuous process with occasional controlled exposure PROC3: Use in closed batch process (synthesis or formulation) PROC4: Use in batch and other process (synthesis) where opportunity for exposure arises PROC5: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact) PROC8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities PROC8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities PROC9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing) PROC13: Treatment of articles by dipping and pouring PROC14: Production of preparations or articles by tabletting, compression, extrusion, pelettisation PROC15: Use as laboratory reagent PROC17: Lubrication at high energy conditions and in partly open process PROC18: Greasing at high energy conditions PROC19: Hand-mixing with intimate contact and only PPE available PROC22: Potentially closed processing operations with minerals/metals at elevated temperature; industrial setting PROC23: Open processing and transfer operations with minerals/metals at elevated temperature PROC24: High (mechanical) energy work-up of substances bound in materials and/or articles
Environmental Release Categories	ERC4: Industrial use of processing aids in processes and products, not becoming part of articles

2.1 Contributing scenario controlling environmental exposure for: ERC4		
Product characteristics	Concentration of the Substance in Mixture/Article	Covers percentage substance in the product up to 100 % (unless stated differently).
Amount used	Annual site tonnage (tons/year):	14 ton(s)/year (Dilution of 10 ERC4)
	Annual site tonnage (tons/year):	140 ton(s)/year (Dilution of 100 ERC4)
	Annual site tonnage (tons/year):	1150 ton(s)/year (Dilution of 1000 ERC4)
Frequency and duration of use	Continuous exposure	365 days/year
Environment factors not influenced by risk management	Other data. Other information	Local freshwater dilution factor:: 10

	Other data. Other information	Local marine water dilution factor:: 100
	Dilution Factor (River)	500
Other given operational conditions affecting environmental exposure	Emission or Release Factor: Air	36562 g/ton of product
	Emission or Release Factor: Water	1000000 g/ton of product
Technical conditions and measures at process level (source) to prevent release Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil Organizational measures to prevent/limit release from the site	Air	Apply technical measures aiming at reducing releases to air., Electrostatic precipitation, Cyclones, Treatment of air emissions by bag filters, fabric filter and wet scrubber, Ceramic & metal mash filters, PM10 particles are removed
	Water	Substance specific waste water treatment, Ion exchange, Reverse osmosis (Degradation effectiveness: 40 - 90 %)
Conditions and measures related to sewage treatment plant	Type of Sewage Treatment Plant	Municipal sewage treatment plant
	The concentration of the substance should not exceed 1,75 mg/L in the municipal STP	
Conditions and measures related to external treatment of waste for disposal	Waste treatment	Send back to the process, Substance containing waste shall be handled as hazardous waste and removed by licensed waste removal company, incinerated or recycled
	Disposal methods	Vacuum up spillage and collect in suitable containers for disposal., Waste product and empty containers should be disposed of as hazardous waste in accordance with all local and national regulations.

2.2 Contributing scenario controlling worker exposure for: PROC1, PROC2, PROC3, PROC22, PROC23

Activity	Potentially closed processing operations at elevated temperature.	
Product characteristics	Concentration of the Substance in Mixture/Article	Covers percentage substance in the product up to 100 % (unless stated differently).
	Physical Form (at time of use)	Powdered substance, granules
Amount used	The amount used per worker varies from activity to activity	
Frequency and duration of use	Frequency of use	24 hours/day
	Frequency of use	365 days/year
Other operational conditions affecting workers exposure	Indoor use.	
	The process temperatures are mainly very high, as these processes include glass making, ceramics, steel & alloy making	

Technical conditions and measures to control dispersion from source towards the worker	Use in closed process, no likelihood of exposure Ensure that the worker is in a separated (control) room with independent air supply Where there are breaches in the closed system, such as pouring and removal of slag in metal production, LEV is used to control fumes.	
Organisational measures to prevent /limit releases, dispersion and exposure	Ensure operatives are trained to minimise exposures. Regular inspection and maintenance of equipment and machines. Workers in the risky process/areas identified should be trained a) to avoid to work without respiratory protection and b) to understand the corrosive properties and, especially, the respiratory inhalation effects and c) to follow the safety procedures instructed by the employer.	
Conditions and measures related to personal protection, hygiene and health evaluation	Equipment cleaning and maintenance	Wear protective gloves. Safety glasses or Goggles Operatives wear overalls or heavy heat resistant clothing
	In case of dust or aerosol formation: use respiratory protection with approved filter (P2) or Particle filter:P3 Use battery-powered air fed helmets These respirators, if worn correctly, with a good face fit, will provide sufficient protection	
2.3 Contributing scenario controlling worker exposure for: PROC1, PROC2, PROC2		
Product characteristics	Concentration of the Substance in Mixture/Article	Covers percentage substance in the product up to 100 % (unless stated differently).
	Physical Form (at time of use)	Powdered substance, granules
Amount used	per shift:	1000 kg
Other operational conditions affecting workers exposure	Indoor use.	
	Assumes activities are at ambient temperature.	
Technical conditions and measures to control dispersion from source towards the worker	Handle substance within a closed system. Provide extract ventilation to points where emissions occur. Where there are breaches in the closed system, such as pouring and removal of slag in metal production, LEV is used to control fumes.	
Organisational measures to prevent /limit releases, dispersion and exposure	Ensure operatives are trained to minimise exposures. Regular inspection and maintenance of equipment and machines.	
Conditions and measures related to personal protection, hygiene and health evaluation	Wear protective clothing. Safety shoes Safety glasses	
	In case of dust or aerosol formation: use respiratory protection with approved filter (P2) or Particle filter:P3	

2.4 Contributing scenario controlling worker exposure for: PROC2		
Product characteristics	Concentration of the Substance in Mixture/Article	Covers concentrations more than 25%
	Physical Form (at time of use)	Solid, high dustiness
Frequency and duration of use	Exposure duration per day	< 15 min
Conditions and measures related to personal protection, hygiene and health evaluation	Wear protective gloves.	
2.5 Contributing scenario controlling worker exposure for: PROC4		
Product characteristics	Concentration of the Substance in Mixture/Article	Covers concentrations more than 25%
	Physical Form (at time of use)	Solid, high dustiness
Frequency and duration of use	Exposure duration per day	15 - 60 min
Other operational conditions affecting workers exposure	Indoor use.	
	The process temperatures are mainly very high, as these processes include glass making, ceramics, steel & alloy making	
Technical conditions and measures to control dispersion from source towards the worker	Provide local exhaust ventilation (LEV).	
Organisational measures to prevent /limit releases, dispersion and exposure	Ensure operatives are trained to minimise exposures.	
Conditions and measures related to personal protection, hygiene and health evaluation	Wear protective gloves.	
	If technical exhaust or ventilation measures are not possible or insufficient, respiratory protection must be worn. Particle filter:P2 Particle filter:P3 Use battery-powered air fed helmets These respirators, if worn correctly, with a good face fit, will provide sufficient protection Where tightly fitting RPE is used, the worker should be face fit tested to ensure that a good face seal can be obtained	
2.6 Contributing scenario controlling worker exposure for: PROC4, PROC5, PROC8b		
Activity	Covers reloading, mixing or compounding and associated activities in the Process Categories listed above	
Product characteristics	Concentration of the Substance in Mixture/Article	Covers percentage substance in the product up to 100 % (unless stated differently).
	Physical Form (at time of	Powdered substance, granules

	use)	
Amount used	Would vary by requirements and by facility	
Frequency and duration of use	Exposure duration per day	60 min
Other operational conditions affecting workers exposure	Indoor use.	
	Assumes activities are at ambient temperature.	
Technical conditions and measures to control dispersion from source towards the worker	Local exhaust ventilation on furnaces and other work areas with potential dust generation, dust capturing and removal techniques Closed and semi-closed process where appropriate Discharge sacks via suitable vented charge chute. Automate activity where possible. Single use bags can be opened by the use of sharp prongs at the discharge hopper. When the big bag is placed at the discharge hopper and lowered, the prongs cut into the base of the bag releasing the substance into the hopper. This removes the operator from the immediate vicinity and contributes to a reduction in exposure	
Organisational measures to prevent /limit releases, dispersion and exposure	Ensure operatives are trained to minimise exposures. Regular inspection and maintenance of equipment and machines.	
Conditions and measures related to personal protection, hygiene and health evaluation	Wear protective clothing. Wear protective gloves. Safety glasses or Goggles	
	In case of dust or aerosol formation: use respiratory protection with approved filter (P2) or Particle filter:P3 These respirators, if worn correctly, with a good face fit, will provide sufficient protection Where tightly fitting RPE is used, the worker should be face fit tested to ensure that a good face seal can be obtained	
2.7 Contributing scenario controlling worker exposure for: PROC5		
Product characteristics	Concentration of the Substance in Mixture/Article	Covers concentrations up to 5,5%
	Physical Form (at time of use)	Solids in solution
Amount used	The amount used per worker varies from activity to activity	
Frequency and duration of use	Only for certain activities with the substance in solution	
Other operational conditions affecting workers exposure	Indoor use.	
	Assumes activities are at ambient temperature.	
Technical conditions and measures to control dispersion from source towards the worker	Ensure that task is semi-automated or automated	
Organisational measures to	Ensure operatives are trained to minimise exposures.	

prevent /limit releases, dispersion and exposure	Regular inspection and maintenance of equipment and machines. Replacing, where appropriated, manual processes by automated and/or closed processes. This would avoid irritating mists, sprayings and subsequent potential splashes.	
Conditions and measures related to personal protection, hygiene and health evaluation	Wear suitable protective clothing. Wear protective gloves. Safety glasses or Goggles	
2.8 Contributing scenario controlling worker exposure for: PROC8a, PROC8b		
Activity	Relevant for Cleaning and Maintenance	
Product characteristics	Concentration of the Substance in Mixture/Article	Covers percentage substance in the product up to 100 % (unless stated differently).
	Physical Form (at time of use)	Powdered substance, granules
Amount used	Would vary by requirements and by facility	
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently).	
Other operational conditions affecting workers exposure	Indoor and outdoor use.	
Technical conditions and measures to control dispersion from source towards the worker	Use closed dosing, transfer, sampling and application systems including connectors. Worker in separate cabine without specific ventilation Provide extract ventilation to points where emissions occur.	
Organisational measures to prevent /limit releases, dispersion and exposure	Ensure operatives are trained to minimise exposures. Regular inspection and maintenance of equipment and machines.	
Conditions and measures related to personal protection, hygiene and health evaluation	Wear protective clothing. Safety shoes Safety glasses Wear protective gloves.	
	In case of dust or aerosol formation: use respiratory protection with approved filter (P2) or Particle filter:P3	
2.9 Contributing scenario controlling worker exposure for: PROC8b		
Large scale		
Activity	Loading (including marine vessel/barge, rail/road car and IBC loading) and repacking (including drums and small packs) of substance, including its sampling, storage, unloading, distribution and associated laboratory activities.	
Product characteristics	Concentration of the Substance in Mixture/Article	Covers percentage substance in the product up to 100 % (unless stated differently).

	Physical Form (at time of use)	Powdered substance, granules
Amount used	Amount per Use	40000 kg
Frequency and duration of use	Exposure duration per day	60 - 120 min
Other operational conditions affecting workers exposure	Indoor use.	
	Assumes activities are at ambient temperature.	
Technical conditions and measures to control dispersion from source towards the worker	Use closed dosing, transfer, sampling and application systems including connectors. Provide dust filtration for air displaced from the silo during filling.	
Organisational measures to prevent /limit releases, dispersion and exposure	Ensure operatives are trained to minimise exposures. Regular inspection and maintenance of equipment and machines.	
Conditions and measures related to personal protection, hygiene and health evaluation	Wear suitable protective clothing. Wear protective gloves. Safety glasses or Goggles	

2.10 Contributing scenario controlling worker exposure for: PROC8b

Product characteristics	Concentration of the Substance in Mixture/Article	Covers the percentage of the substance in the product up to 100 % (unless stated differently).
	Physical Form (at time of use)	Powdered substance, granules
Amount used	Amount per Use	25 - 200 kg
Frequency and duration of use	Exposure duration	30 min
Other operational conditions affecting workers exposure	Indoor use.	
Technical conditions and measures to control dispersion from source towards the worker	Canopy hoods over the baths capture and remove steam	
Organisational measures to prevent /limit releases, dispersion and exposure	Ensure operatives are trained to minimise exposures. Regular inspection and maintenance of equipment and machines.	
Conditions and measures related to personal protection, hygiene and health evaluation	Complete suit protecting against chemicals Wear chemically resistant gloves. Safety goggles Wear face protecive shield.	
	Respiratory protection is not required but is recommended. Particle filter: the filter grade (P1 - P3) has to be established depending on work-place related limit values and the actual exposition In case of dust or aerosol formation: use respiratory protection with approved filter (P2) or Particle filter:P3	

2.11 Contributing scenario controlling worker exposure for: PROC9		
Product characteristics	Concentration of the Substance in Mixture/Article	Concentration of substance in product: 0,11% - 8,6%
	Physical Form (at time of use)	solid, liquid, pasty
Amount used	Amount per Day	10000 kg
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently).	
Other operational conditions affecting workers exposure	Indoor use.	
Technical conditions and measures to control dispersion from source towards the worker	Automate activity where possible.	
	LEV not required	
	Handling of solids	Provide local exhaust ventilation (LEV).
Organisational measures to prevent /limit releases, dispersion and exposure	Ensure operatives are trained to minimise exposures. Regular inspection and maintenance of equipment and machines.	
Conditions and measures related to personal protection, hygiene and health evaluation	Wear protective clothing. Safety shoes Safety glasses In case of dust or aerosol formation: use respiratory protection with approved filter (P2) or Particle filter:P3 Wear protective gloves.	

2.12 Contributing scenario controlling worker exposure for: PROC13		
Metal working fluids		
Product characteristics	Concentration of the Substance in Mixture/Article	Covers concentrations up to 1%
	Physical Form (at time of use)	Solids in solution
Amount used	Amount per Use	25 - 200 kg
Frequency and duration of use	Application duration	60 min
Other operational conditions affecting workers exposure	Indoor use.	
	Process temperature	60 °C
Technical conditions and measures to control dispersion from source towards the worker	Canopy hoods over the baths capture and remove steam	
Organisational measures to prevent /limit releases, dispersion and exposure	Ensure operatives are trained to minimise exposures. Regular inspection and maintenance of equipment and machines.	

Conditions and measures related to personal protection, hygiene and health evaluation	Wear chemically resistant gloves. Safety goggles or Wear face protecive shield. Complete suit protecting against chemicals	
2.13 Contributing scenario controlling worker exposure for: PROC13		
Product characteristics	Concentration of the Substance in Mixture/Article	Covers percentage substance in the product up to 1 %.
	Physical Form (at time of use)	Solid in solution
Amount used	Amount per Application	50 l
Frequency and duration of use	Exposure duration	12 min
Other operational conditions affecting workers exposure	Indoor use.	
Technical conditions and measures to control dispersion from source towards the worker	Ensure that task is semi-automated or automated	
Organisational measures to prevent /limit releases, dispersion and exposure	Ensure operatives are trained to minimise exposures.	
2.14 Contributing scenario controlling worker exposure for: PROC14		
Product characteristics	Concentration of the Substance in Mixture/Article	Covers percentage substance in the product up to 100 % (unless stated differently).
	Physical Form (at time of use)	Powdered substance, granules
Amount used	The amount used per worker varies from activity to activity	
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently).	
Other operational conditions affecting workers exposure	Indoor use.	
Technical conditions and measures to control dispersion from source towards the worker	Use closed dosing, transfer, sampling and application systems including connectors. Provide local exhaust ventilation (LEV). Provide a good standard of general ventilation. Natural ventilation is from doors, windows etc. Controlled ventilation means air is supplied or removed by a powered fan.	
Organisational measures to prevent /limit releases, dispersion and exposure	Ensure operatives are trained to minimise exposures. Regular inspection and maintenance of equipment and machines.	
Conditions and measures related to personal protection, hygiene and health evaluation	Wear protective clothing. Safety shoes Safety glasses	
	In case of dust or aerosol formation: use respiratory protection with approved	

	filter (P2) or Particle filter:P3	
2.15 Contributing scenario controlling worker exposure for: PROC15		
Product characteristics	Concentration of the Substance in Mixture/Article	Covers percentage substance in the product up to 100 % (unless stated differently).
	Physical Form (at time of use)	Powdered substance, granules
Amount used	Amount per Use	1 kg
Frequency and duration of use	Sometimes during the working day, only for short periods of time	
Technical conditions and measures to control dispersion from source towards the worker	Handle within a fume cupboard or implement suitable equivalent methods to minimise exposure.	
Organisational measures to prevent /limit releases, dispersion and exposure	Ensure operatives are trained to minimise exposures. Regular inspection and maintenance of equipment and machines.	
Conditions and measures related to personal protection, hygiene and health evaluation	Wear suitable protective clothing. Safety shoes Safety glasses Wear protective gloves.	
2.16 Contributing scenario controlling worker exposure for: PROC17, PROC24		
Product characteristics	Concentration of the Substance in Mixture/Article	Covers concentrations up to 5,5%
	Physical Form (at time of use)	Solids in solution
Amount used	The amount used per worker varies from activity to activity	
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently).	
Other operational conditions affecting workers exposure	Indoor use.	
	Process may involve high temperature	
Technical conditions and measures to control dispersion from source towards the worker	Provide local exhaust ventilation (LEV). Closed process and closed circuits where relevant and possible A switch integrated with the machine should prevent the enclosure being opened while the machine is used There should also be a time delay so that the LEV has time to remove the aerosol before the enclosure is opened	
Organisational measures to prevent /limit releases, dispersion and exposure	Replacing, where appropriated, manual processes by automated and/or closed processes. This would avoid irritating mists, sprayings and subsequent potential splashes. Ensure operatives are trained to minimise exposures. Regular inspection and maintenance of equipment and machines.	
Conditions and measures related to personal protection, hygiene and health evaluation	Wear protective clothing. Wear protective gloves. Safety glasses	

	or Safety goggles	
	In case of dust or aerosol formation: use respiratory protection with approved filter (P2) or Particle filter:P3	
2.17 Contributing scenario controlling worker exposure for: PROC18		
Product characteristics	Concentration of the Substance in Mixture/Article	Concentration of substance in product: 0% - 0,01%
	Physical Form (at time of use)	pasty
Amount used	The amount used per worker varies from activity to activity	
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently).	
Other operational conditions affecting workers exposure	Indoor use.	
	Process may involve high temperature	
Technical conditions and measures to control dispersion from source towards the worker	Provide local exhaust ventilation (LEV). Use a receptor hood for fumes/vapours. Closed and semi-closed process where appropriate There should also be a time delay so that the LEV has time to remove the aerosol before the enclosure is opened	
Organisational measures to prevent /limit releases, dispersion and exposure	Ensure operatives are trained to minimise exposures. Regular inspection and maintenance of equipment and machines.	
Conditions and measures related to personal protection, hygiene and health evaluation	Wear protective clothing. Wear protective gloves. Safety goggles or Wear face protecive shield.	
2.18 Contributing scenario controlling worker exposure for: PROC19		
Product characteristics	Concentration of the Substance in Mixture/Article	Covers percentage substance in the product up to 5 %.
	Physical Form (at time of use)	solid, liquid
Amount used	Amount per Application	50 l
Frequency and duration of use	Application duration	5 - 10 min
Other operational conditions affecting workers exposure	Indoor use.	
Technical conditions and measures to control dispersion from source towards the worker	Provide a good standard of general ventilation. Natural ventilation is from doors, windows etc. Controlled ventilation means air is supplied or removed by a powered fan.	
Organisational measures to prevent /limit releases, dispersion and exposure	Ensure operatives are trained to minimise exposures.	

3. Exposure estimation and reference to its source

Environment

Estimation based on workplace measurements

Contributing Scenario	Specific conditions	Compartment	Value	Level of Exposure	RCR
ERC4	Dilution of 10, Dilution of 100	Water	PEC	1974µg/L	0,977
ERC4	Dilution of 10	Soil	PEC	0,07mg/kg dry weight (d.w.)	0,013
ERC4	Dilution of 1000	Water	PEC	1575µg/L	0,954
ERC4	Dilution of 1000	Soil	PEC	5,15mg/kg dry weight (d.w.)	0,954
ERC4	Dilution of 100	Soil	PEC	0,63mg/kg dry weight (d.w.)	0,117

Workers

PROC1, PROC2, PROC3, PROC4, PROC5, PROC8a, PROC8b, PROC9, PROC14, PROC15, PROC17, PROC22, PROC23, PROC24 Workplace measurements

PROC2, PROC4, PROC5, PROC8a, PROC8b, PROC9, PROC10, PROC14, PROC15, PROC17, PROC19, PROC23 MEASE

PROC4, PROC8b, PROC9 Advanced REACH Tool (ART model)

PROC1, PROC14, PROC15, PROC18, PROC19 Advanced REACH Tool (ART model) (inhalative exposure)

Contributing Scenario	Specific conditions	Exposure routes	Level of Exposure	RCR
PROC1, PROC2, PROC3, PROC22, PROC23	90th percentile value, without respiratory protection, Elevated process temperature	Inhalation worker exposure	0,08mg/m³	0,06
PROC23	with local exhaust ventilation, With face shield, Elevated process temperature	Inhalation worker exposure	0,01mg/m³	0,0069
PROC2	Solid, high dustiness., during 15 mins - 1 hour, Elevated process temperature	Dermal worker exposure	0,048mg/kg bw/day	< 0,001
PROC1, PROC2, PROC3	90th percentile value	Inhalation worker exposure	0,08mg/m³	0,06
PROC2	Solid, high dustiness., during 15 mins - 1 hour	Dermal worker exposure	0,048mg/kg bw/day	< 0,001

PROC2	---	Dermal worker exposure	0,002mg/kg bw/day	---
PROC4	---	Dermal worker exposure	0,48mg/kg bw/day	---
PROC4, PROC5	90th percentile value, small scale	Inhalation worker exposure	0,78mg/m³	0,54
PROC4	Solid, high dustiness., during 15 mins - 1 hour, small scale	Dermal worker exposure	0,48mg/kg bw/day	< 0,001
PROC4, PROC5, PROC8b	90th percentile value, With respiratory protection, half mask, Large scale	Inhalation worker exposure	0,2mg/m³	0,14
PROC4	Solid, high dustiness., during 15 mins - 1 hour, with local exhaust ventilation, Large scale	Dermal worker exposure	4,8mg/kg bw/day	0,001
PROC5	during 15 mins - 1 hour, Concentration: 1%	Dermal worker exposure	0,005mg/kg bw/day	< 0,001
PROC8a, PROC8b	90th percentile value, no respiratory protection (RPE), Relevant for Cleaning and Maintenance	Inhalation worker exposure	1,33mg/m³	0,92
PROC8a	Solid, high dustiness., during 1 - 4 hours, Relevant for Cleaning and Maintenance	Dermal worker exposure	0,173mg/kg bw/day	< 0,001
PROC8b	Large scale	Inhalation worker exposure	0,016mg/m³	0,011
PROC8b	with local exhaust ventilation, 90th percentile value, Large scale	Inhalation worker exposure	0,03mg/kg bw/day	0,021
PROC2	Solid, high dustiness., during <15 mins, Large scale	Dermal worker exposure	0,024mg/kg bw/day	< 0,001
PROC8b	without respiratory protection	Inhalation worker exposure	0,78mg/m³	0,54
PROC8b	Solid, high dustiness., during 15 mins - 1 hour, Concentration of substance in product: 5% - 25%	Dermal worker exposure	0,288mg/kg bw/day	< 0,001
PROC9	with local exhaust ventilation, Small package filling, solid	Inhalation worker exposure	0,4mg/m³	0,28

PROC9	liquid, with local exhaust ventilation	Dermal worker exposure	0,01mg/m³	0,007
PROC9	Solid, high dustiness.	Dermal worker exposure	1,44mg/kg bw/day	< 0,001
PROC9	liquid	Dermal worker exposure	0,144mg/kg bw/day	< 0,001
PROC4	liquid, Concentration: 1%, during 15 mins - 1 hour, Manual, Additive premixing, Plating	Inhalation worker exposure	0,048mg/kg bw/day	< 0,001
PROC19	application as solution, Concentration: 1%, without gloves, during <15 mins	Dermal worker exposure	0,024mg/kg bw/day	< 0,001
PROC14	Measured exposure data	Inhalation worker exposure	1,3mg/m³	0,9
PROC14	90th percentile value, with local exhaust ventilation	Inhalation worker exposure	0,15mg/m³	0,10
PROC14	Solid, high dustiness.	Dermal worker exposure	2,4mg/kg bw/day	< 0,001
PROC15	90th percentile value	Inhalation worker exposure	0,16mg/m³	0,11
PROC15	Solid, high dustiness., Concentration of substance in product: 5% - 25%, without gloves	Dermal worker exposure	0,014mg/kg bw/day	< 0,001
PROC17, PROC24	90th percentile value	Inhalation worker exposure	< 0,01mg/m³	0,007
PROC17, PROC24	---	Inhalation worker exposure	0,07mg/m³	0,048
PROC17	Concentration: 1%, without gloves, liquid	Dermal worker exposure	2,4mg/kg bw/day	< 0,001
PROC18	with local exhaust ventilation	Inhalation worker exposure	0,0017mg/m³	0,0012
PROC10	during 15 mins - 1 hour, Concentration: 1%, liquid, Manual, Application	Dermal worker exposure	0,048mg/kg bw/day	< 0,001
PROC19	Powdery developer formulations, Powdery fixer formulation	Inhalation worker exposure	0,001mg/m³	< 0,001
PROC19	Solid, high dustiness., during <15 mins, Concentration of substance in product : 0% - 5%	Dermal worker exposure	0,198mg/kg bw/day	< 0,001
PROC19	application as solution,	Dermal worker exposure	0,024mg/kg bw/day	< 0,001

	Concentration of substance in product : 0% - 5%, during <15 mins			

4. Guidance to Downstream User to evaluate whether he works inside the boundaries set by the Exposure Scenario

Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures.
Predicted exposures are not expected to exceed the applicable exposure limits when the operational conditions/risk management measures given in section 2 are implemented.
Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.
Only properly trained persons shall make use of scaling methods while checking whether the OC and RMM are within the boundaries set by the ES
Tonnage calculations have been based on boron such that no RCR exceeds 0.97, using back calculations with the relevant PNEC's when necessary. The equivalent tonnage of product handled on site should be calculated from the conversion factors detailed in the product table. For those operations that handle a combination of borate compounds, the boron equivalent of the combined tonnage cannot exceed the site tonnage value.

Substance	Formula	Conversion factor for the equivalent dose of B (multiply by)
Boric acid	H_3BO_3	0,1748
Boric oxide	$B2O_3$	0,311
Disodium tetraborate anhydrous	$Na_2B_4O_7$	0,2149
Disodium tetraborate pentahydrate	$Na_2B_4O_7 \times 5H_20$	0,1484
Disodium tetraborate decahydrate	$Na_2B_4O_7 \times 10H_20$	0,1134
Disodium octoborate tetrahydrate	$Na_2B_8O_{13} \times 4H_20$	0,2096
Sodium metaborate (anhydrous)	$NaBO_2$	0,1643
Sodium metaborate (dihydrate)	$NaBO_2 \times 2H_20$	0,1062
Sodium metaborate (tetrahydrate)	$NaBO_2 \times 4H_20$	0,0784
Sodium pentaborate (anhydrous)	NaB_5O_8	0,2636
Sodium pentaborate (pentahydrate)	$NaB_5O_8 \times 5H_20$	0,1832

If measured data are not available, the DU may make use of an appropriate scaling tool such as MEASE (www.ebrc.de/mease.html) to estimate the associated exposure.
For further information on the assessment method, see: http://www.advancedreachtool.com

Additional good practice advice beyond the REACH Chemical Safety Assessment

Take care for general good hygiene and housekeeping.

1. Short title of Exposure Scenario 12: Use as reactive process agent or use as catalyst		
Main User Groups	SU 3: Industrial uses: Uses of substances as such or in preparations at industrial sites	
Process categories	PROC1: Use in closed process, no likelihood of exposure PROC2: Use in closed, continuous process with occasional controlled exposure PROC3: Use in closed batch process (synthesis or formulation) PROC4: Use in batch and other process (synthesis) where opportunity for exposure arises PROC8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities PROC8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities	
Environmental Release Categories	ERC1: Manufacture of substances ERC6a: Industrial use resulting in manufacture of another substance (use of intermediates) ERC6b: Industrial use of reactive processing aids	
2.1 Contributing scenario controlling environmental exposure for: ERC1, ERC6a, ERC6b		
Activity	Application in a closed system	
Product characteristics	Concentration of the Substance in Mixture/Article	Covers percentage substance in the product up to 1 %.
Amount used	Typical amount of one batch	3 tonnes
Frequency and duration of use	Continuous exposure	7 - 21 days/year
Environment factors not influenced by risk management	Other data. Other information	Local freshwater dilution factor:: 10
Technical conditions and measures at process level (source) to prevent release Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil Organizational measures to prevent/limit release from the site	No releases	
Conditions and measures related to sewage treatment plant	Not applicable as there is no release to wastewater.	
Conditions and measures related to external treatment of waste for disposal	Disposal methods	Solid wastes contaminated are collected into containers and sent to external waste disposal facilities
2.2 Contributing scenario controlling worker exposure for: PROC1, PROC2, PROC3, PROC4, PROC8a, PROC8b		

No exposure assessment presented for human health.

3. Exposure estimation and reference to its source

Environment

No exposure assessment presented for the environment.

Workers

no exposure expected.

4. Guidance to Downstream User to evaluate whether he works inside the boundaries set by the Exposure Scenario

Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures.
Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.
Only properly trained persons shall make use of scaling methods while checking whether the OC and RMM are within the boundaries set by the ES
Tonnage calculations have been based on boron such that no RCR exceeds 0.97, using back calculations with the relevant PNEC's when necessary. The equivalent tonnage of product handled on site should be calculated from the conversion factors detailed in the product table. For those operations that handle a combination of borate compounds, the boron equivalent of the combined tonnage cannot exceed the site tonnage value.

Substance	Formula	Conversion factor for the equivalent dose of B (multiply by)
Boric acid	H_3BO_3	0,1748
Boric oxide	$B2O_3$	0,311
Disodium tetraborate anhydrous	$Na_2B_4O_7$	0,2149
Disodium tetraborate pentahydrate	$Na_2B_4O_7 \times 5H_20$	0,1484
Disodium tetraborate decahydrate	$Na_2B_4O_7 \times 10H_20$	0,1134
Disodium octoborate tetrahydrate	$Na_2B_8O_{13} \times 4H_20$	0,2096
Sodium metaborate (anhydrous)	$NaBO_2$	0,1643
Sodium metaborate (dihydrate)	$NaBO_2 \times 2H_20$	0,1062
Sodium metaborate (tetrahydrate)	$NaBO_2 \times 4H_20$	0,0784
Sodium pentaborate (anhydrous)	NaB_5O_8	0,2636
Sodium pentaborate (pentahydrate)	$NaB_5O_8 \times 5H_20$	0,1832

If measured data are not available, the DU may make use of an appropriate scaling tool such as MEASE (www.ebrc.de/mease.html) to estimate the associated exposure.

For further information on the assessment method, see: http://www.ecetoc.org/tra

1. Short title of Exposure Scenario 13: Manufacture of catalysts		
Main User Groups	SU 3: Industrial uses: Uses of substances as such or in preparations at industrial sites	
Process categories	PROC3: Use in closed batch process (synthesis or formulation) PROC4: Use in batch and other process (synthesis) where opportunity for exposure arises PROC5: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact) PROC8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities PROC8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities PROC9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing) PROC14: Production of preparations or articles by tabletting, compression, extrusion, pelettisation	
Environmental Release Categories	ERC1: Manufacture of substances ERC3: Formulation in materials ERC6a: Industrial use resulting in manufacture of another substance (use of intermediates) ERC6b: Industrial use of reactive processing aids	
2.1 Contributing scenario controlling environmental exposure for: ERC1, ERC3, ERC6a, ERC6b		
Product characteristics	Concentration of the Substance in Mixture/Article	Covers percentage substance in the product up to 100 % (unless stated differently).
Amount used	Annual tonnage	200 ton(s)/year
Frequency and duration of use	Continuous exposure	330 days/year
Technical conditions and measures at process level (source) to prevent release Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil Organizational measures to prevent/limit release from the site	Water	No discharge of substance into waste water
Conditions and measures related to external treatment of waste for disposal	Disposal methods	Vacuum up spillage and collect in suitable containers for disposal.
2.2 Contributing scenario controlling environmental exposure for: ERC1, ERC3, ERC6a, ERC6b		
Activity	Manufacture of catalysts	
Product characteristics	Concentration of the Substance in Mixture/Article	Covers percentage substance in the product up to 100 % (unless stated differently).

Amount used	Annual amount per site	200 ton(s)/year
Frequency and duration of use	Continuous exposure	330 days/year
Environment factors not influenced by risk management	Other data. Other information	Local freshwater dilution factor:: 10
Other given operational conditions affecting environmental exposure	Emission or Release Factor: Air	2,7 g/ton of product
Technical conditions and measures at process level (source) to prevent release Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil Organizational measures to prevent/limit release from the site	Air	Treatment of air emissions by bag filters, fabric filter and wet scrubber, High efficiency particulate air filter (HEPA filter), ceramic filters
	Water	Maximize waste water reuse.
	Procedural and/or control technologies are required to minimize emissions and the resulting exposure during cleaning and maintenance procedures	
Conditions and measures related to sewage treatment plant	Type of Sewage Treatment Plant	On-site waste water treatment
Conditions and measures related to external treatment of waste for disposal	Waste treatment	Substance containing waste shall be handled as hazardous waste and removed by licensed waste removal company, incinerated or recycled
	Disposal methods	Vacuum up spillage and collect in suitable containers for disposal.
2.3 Contributing scenario controlling worker exposure for: PROC3		
Product characteristics	Concentration of the Substance in Mixture/Article	Covers percentage substance in the product up to 100 % (unless stated differently).
	Physical Form (at time of use)	Powdered substance, granules
Amount used	Amount per Shift	1000 kg
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently).	
Other operational conditions affecting workers exposure	Indoor use.	
Technical conditions and measures to control dispersion from source towards the worker	Use in closed process Where there are breaches in the closed system, such as pouring and removal of slag in metal production, LEV is used to control fumes.	
Organisational measures to prevent /limit releases, dispersion and exposure	Ensure operatives are trained to minimise exposures. Regular inspection and maintenance of equipment and machines.	
Conditions and measures related to personal protection, hygiene and health evaluation	Wear protective clothing. In case of dust or aerosol formation: use respiratory protection with approved filter (P2) or Particle filter:P3	

2.4 Contributing scenario controlling worker exposure for: PROC4, PROC5, PROC8b		
Activity	Covers reloading, mixing or compounding and associated activities in the Process Categories listed above	
Product characteristics	Concentration of the Substance in Mixture/Article	Covers percentage substance in the product up to 100 % (unless stated differently).
	Physical Form (at time of use)	Powdered substance, granules
Amount used	Would vary by requirements and by facility	
Frequency and duration of use	Exposure duration	60 min
Other operational conditions affecting workers exposure	Indoor use.	
	Assumes activities are at ambient temperature.	
Technical conditions and measures to control dispersion from source towards the worker	Use in closed process Provide extract ventilation to points where emissions occur. Single use bags can be opened by the use of sharp prongs at the discharge hopper. When the big bag is placed at the discharge hopper and lowered, the prongs cut into the base of the bag releasing the substance into the hopper. This removes the operator from the immediate vicinity and contributes to a reduction in exposure	
Organisational measures to prevent /limit releases, dispersion and exposure	Ensure operatives are trained to minimise exposures. Regular inspection and maintenance of equipment and machines.	
Conditions and measures related to personal protection, hygiene and health evaluation	Wear suitable protective clothing. In case of dust or aerosol formation: use respiratory protection with approved filter (P2) or Particle filter:P3	

2.5 Contributing scenario controlling worker exposure for: PROC8b		
Large scale		
Product characteristics	Concentration of the Substance in Mixture/Article	Covers percentage substance in the product up to 100 % (unless stated differently).
	Physical Form (at time of use)	Powdered substance, granules
Amount used	Amount per Use	40000 kg
Frequency and duration of use	Exposure duration	120 min
Other operational conditions affecting workers exposure	Indoor use.	
	Assumes activities are at ambient temperature.	
Technical conditions and measures to control dispersion from source towards the worker	Use in closed process	
Organisational measures to prevent /limit releases, dispersion	Ensure operatives are trained to minimise exposures. Regular inspection and maintenance of equipment and machines.	

and exposure		
Conditions and measures related to personal protection, hygiene and health evaluation	Wear suitable protective clothing.	
2.6 Contributing scenario controlling worker exposure for: PROC8a, PROC8b		
Activity	Relevant for Cleaning and Maintenance	
Product characteristics	Concentration of the Substance in Mixture/Article	Covers percentage substance in the product up to 100 % (unless stated differently).
	Physical Form (at time of use)	Powdered substance, granules
Amount used	Would vary by requirements and by facility	
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently).	
Other operational conditions affecting workers exposure	Indoor and outdoor use.	
Technical conditions and measures to control dispersion from source towards the worker	Worker in separate cabine without specific ventilation Provide extract ventilation to material transfer points and other openings.	
Organisational measures to prevent /limit releases, dispersion and exposure	Ensure operatives are trained to minimise exposures. Regular inspection and maintenance of equipment and machines.	
Conditions and measures related to personal protection, hygiene and health evaluation	Wear suitable protective clothing. Safety shoes Safety glasses In case of dust or aerosol formation: use respiratory protection with approved filter (P2) or Particle filter:P3	
2.7 Contributing scenario controlling worker exposure for: PROC9		
Product characteristics	Concentration of the Substance in Mixture/Article	Concentration of substance in product: 0,11% - 8,6%
	Physical Form (at time of use)	solid, liquid, pasty
Amount used	Amount per Use	10000 kg
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently).	
Technical conditions and measures to control dispersion from source towards the worker	Handling of solids	Provide local exhaust ventilation (LEV).
Organisational measures to prevent /limit releases, dispersion and exposure	Ensure operatives are trained to minimise exposures. Regular inspection and maintenance of equipment and machines.	
Conditions and measures related to personal protection, hygiene and health evaluation	Wear protective clothing. In case of dust or aerosol formation: use respiratory protection with approved filter (P2)	

	or Particle filter:P3	
2.8 Contributing scenario controlling worker exposure for: PROC14		
Product characteristics	Concentration of the Substance in Mixture/Article	Covers percentage substance in the product up to 100 % (unless stated differently).
	Physical Form (at time of use)	Powdered substance, granules
Amount used	The amount used per worker varies from activity to activity	
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently).	
Other operational conditions affecting workers exposure	Indoor use.	
Technical conditions and measures to control dispersion from source towards the worker	Handle substance within a closed system.	
Organisational measures to prevent /limit releases, dispersion and exposure	Ensure operatives are trained to minimise exposures. Regular inspection and maintenance of equipment and machines.	
Conditions and measures related to personal protection, hygiene and health evaluation	Wear suitable protective clothing. In case of dust or aerosol formation: use respiratory protection with approved filter (P2) or Particle filter:P3	

3. Exposure estimation and reference to its source

Environment

ERC1, ERC3, ERC6a, ERC6b Workplace measurements ERC1, ERC3, ERC6a, ERC6b MEASE

Contributing Scenario	Specific conditions	Compartment	Value	Level of Exposure	RCR
ERC1, ERC3, ERC6a, ERC6b	---	Soil	PEC	0,01mg/kg dry weight (d.w.)	0,001
ERC1, ERC3, ERC6a, ERC6b	---	Soil	PEC	0,01mg/kg dry weight (d.w.)	0,001

Workers

PROC1, PROC2, PROC3, PROC4, PROC5, PROC8b, PROC9, PROC14 Workplace measurements PROC2, PROC4, PROC8a, PROC8b, PROC9, PROC14 MEASE PROC8a, PROC8b, PROC9, PROC14 Advanced REACH Tool (ART model)

Contributing Scenario	Specific conditions	Exposure routes	Level of Exposure	RCR
PROC1, PROC2, PROC3	90th percentile value, no respiratory protection	Inhalation worker exposure	0,08mg/m³	0,06

	(RPE)			
PROC2	Solid, high dustiness., during 15 mins - 1 hour	Dermal worker exposure	0,048mg/kg bw/day	< 0,001
PROC4	Solid, high dustiness., during 15 mins - 1 hour	Dermal worker exposure	0,48mg/kg bw/day	< 0,001
PROC4, PROC5	90th percentile value, small scale	Inhalation worker exposure	0,78mg/m³	0,54
PROC4, PROC5, PROC8b	90th percentile value, With respiratory protection, half mask, Large scale	Inhalation worker exposure	0,2mg/m³	0,14
PROC4	Solid, high dustiness., during 15 mins - 1 hour, Large scale	Dermal worker exposure	4,8mg/kg bw/day	0,001
PROC8b	---	Inhalation worker exposure	0,016mg/m³	0,011
PROC8b	90th percentile value, with local exhaust ventilation	Dermal worker exposure	0,03mg/m³	0,021
PROC8b	Solid, high dustiness., during <15 mins	Dermal worker exposure	0,024µg/kg bw/day	< 0,001
PROC8a, PROC8b	90th percentile value, no respiratory protection (RPE)	Inhalation worker exposure	1,33mg/m³	0,92
PROC8a	Solid, high dustiness., during 1 - 4 hours	Dermal worker exposure	0,173mg/kg bw/day	< 0,001
PROC9	90th percentile value, with local exhaust ventilation, no respiratory protection (RPE)	Inhalation worker exposure	0,4mg/m³	0,28
PROC9	90th percentile value, with local exhaust ventilation	Inhalation worker exposure	0,01mg/m³	0,007
PROC9	Solid, high dustiness., Concentration of substance in product: 5% - 25%	Dermal worker exposure	1,44mg/kg bw/day	< 0,001
PROC9	application as solution, Concentration of substance in product: 5% - 25%	Dermal worker exposure	0,144mg/kg bw/day	< 0,001
PROC14	---	Inhalation worker exposure	1,3mg/m³	0,9
PROC14	with local exhaust	Inhalation worker	0,15mg/m³	0,1

	ventilation, 90th percentile value	exposure		
PROC14	Solid, high dustiness.	Dermal worker exposure	2,4mg/kg bw/day	< 0,001

4. Guidance to Downstream User to evaluate whether he works inside the boundaries set by the Exposure Scenario

If measured data are not available, the DU may make use of an appropriate scaling tool such as MEASE (www.ebrc.de/mease.html) to estimate the associated exposure.
For further information on the assessment method, see: http://www.advancedreachtool.com
Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures.
Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.
Only properly trained persons shall make use of scaling methods while checking whether the OC and RMM are within the boundaries set by the ES
Tonnage calculations have been based on boron such that no RCR exceeds 0.97, using back calculations with the relevant PNEC's when necessary. The equivalent tonnage of product handled on site should be calculated from the conversion factors detailed in the product table. For those operations that handle a combination of borate compounds, the boron equivalent of the combined tonnage cannot exceed the site tonnage value.

Substance	Formula	Conversion factor for the equivalent dose of B (multiply by)
Boric acid	H_3BO_3	0.1748
Boric oxide	$B2O_3$	0.311
Disodium tetraborate anhydrous	$Na_2B_4O_7$	0.2149
Disodium tetraborate pentahydrate	$Na_2B_4O_7 \times 5H_20$	0.1484
Disodium tetraborate decahydrate	$Na_2B_4O_7 \times 10H_20$	0.1134
Disodium octoborate tetrahydrate	$Na_2B_8O_{13} \times 4H_20$	0.2096
Sodium metaborate (anhydrous)	$NaBO_2$	0.1643
Sodium metaborate (dihydrate)	$NaBO_2 \times 2H_20$	0.1062
Sodium metaborate (tetrahydrate)	$NaBO_2 \times 4H_20$	0.0784
Sodium pentaborate (anhydrous)	NaB_5O_8	0.2636
Sodium pentaborate (pentahydrate)	$NaB_5O_8 \times 5H_20$	0.1832

1. Short title of Exposure Scenario 14: Use as a process chemical		
Main User Groups	SU 3: Industrial uses: Uses of substances as such or in preparations at industrial sites	
Process categories	PROC1: Use in closed process, no likelihood of exposure PROC2: Use in closed, continuous process with occasional controlled exposure PROC3: Use in closed batch process (synthesis or formulation) PROC4: Use in batch and other process (synthesis) where opportunity for exposure arises PROC5: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact) PROC8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities PROC8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities PROC9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing) PROC14: Production of preparations or articles by tabletting, compression, extrusion, pelettisation PROC15: Use as laboratory reagent PROC22: Potentially closed processing operations with minerals/metals at elevated temperature; industrial setting PROC23: Open processing and transfer operations with minerals/metals at elevated temperature	
Environmental Release Categories	ERC6b: Industrial use of reactive processing aids	
2.1 Contributing scenario controlling environmental exposure for: ERC6b		
Product characteristics	Concentration of the Substance in Mixture/Article	Covers percentage substance in the product up to 100 % (unless stated differently).
Amount used	Annual amount per site	29 ton(s)/year
Frequency and duration of use	Continuous exposure	358 days/year
Environment factors not influenced by risk management	Other data. Other information	Local freshwater dilution factor:: 10
	Other data. Other information	Local marine water dilution factor:: 100
	Dilution Factor (River)	500
Other given operational conditions affecting environmental exposure	Emission or Release Factor: Air	1000 g/ton of product
	Emission or Release Factor: Water	50000 g/ton of product
Technical conditions and measures at process level (source) to prevent release Technical onsite conditions and	Air	Electrostatic precipitation, Cyclones, Treatment of air emissions by bag filters, fabric filter and wet scrubber, Ceramic & metal mash filters, PM10 particles are removed

measures to reduce or limit discharges, air emissions and releases to soil Organizational measures to prevent/limit release from the site	Water	Substance specific waste water treatment, Ion exchange, Reverse osmosis (Degradation effectiveness: 40 - 90 %)
Conditions and measures related to sewage treatment plant	Type of Sewage Treatment Plant	Municipal sewage treatment plant
	The concentration of the substance should not exceed 1,75 mg/L in the municipal STP	
Conditions and measures related to external treatment of waste for disposal	Waste treatment	Send back to the process, Substance containing waste shall be handled as hazardous waste and removed by licensed waste removal company, incinerated or recycled
	Disposal methods	Vacuum up spillage and collect in suitable containers for disposal.
2.2 Contributing scenario controlling worker exposure for: PROC1, PROC2, PROC3		
Product characteristics	Concentration of the Substance in Mixture/Article	Covers percentage substance in the product up to 100 % (unless stated differently).
	Physical Form (at time of use)	Powdered substance, granules
Amount used	Amount per Shift	1000 kg
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently).	
Other operational conditions affecting workers exposure	Indoor use.	
	Assumes activities are at ambient temperature.	
Technical conditions and measures to control dispersion from source towards the worker	Use product only in closed system. Use closed dosing, transfer, sampling and application systems including connectors. Where there are breaches in the closed system, such as pouring and removal of slag in metal production, LEV is used to control fumes.	
Organisational measures to prevent /limit releases, dispersion and exposure	Ensure operatives are trained to minimise exposures. Regular inspection and maintenance of equipment and machines.	
Conditions and measures related to personal protection, hygiene and health evaluation	Wear protective clothing. Safety shoes Safety glasses In case of dust or aerosol formation: use respiratory protection with approved filter (P2) or Particle filter:P3	
2.3 Contributing scenario controlling worker exposure for: PROC1, PROC2, PROC3, PROC22, PROC23		
Activity	Potentially closed processing operations at elevated temperature.	
Product characteristics	Concentration of the Substance in	Covers percentage substance in the product up to 100 % (unless stated differently).

	Mixture/Article	
	Physical Form (at time of use)	Powdered substance, granules
Amount used	The amount used per worker varies from activity to activity	
Frequency and duration of use	Frequency of use	24 hours/day
	Frequency of use	365 days/year
Other operational conditions affecting workers exposure	Indoor use.	
	The process temperatures are mainly very high, as these processes include glass making, ceramics, steel & alloy making	
Technical conditions and measures to control dispersion from source towards the worker	Use closed dosing, transfer, sampling and application systems including connectors. Worker in separate cabine without specific ventilation Where there are breaches in the closed system, such as pouring and removal of slag in metal production, LEV is used to control fumes.	
Organisational measures to prevent /limit releases, dispersion and exposure	Ensure operatives are trained to minimise exposures. Regular inspection and maintenance of equipment and machines. Workers in the risky process/areas identified should be trained a) to avoid to work without respiratory protection and b) to understand the irritating properties and, especially, the respiratory inhalation effects and c) to follow the safer procedures instructed by the employer.	
Conditions and measures related to personal protection, hygiene and health evaluation	Operatives wear overalls or heavy heat resistant clothing In case of dust or aerosol formation: use respiratory protection with approved filter (P2) or Particle filter:P3 Use battery-powered air fed helmets These respirators, if worn correctly, with a good face fit, will provide sufficient protection Where tightly fitting RPE is used, the worker should be face fit tested to ensure that a good face seal can be obtained	
	Equipment cleaning and maintenance	Wear protective gloves. Safety glasses Safety goggles

2.4 Contributing scenario controlling worker exposure for: PROC4, PROC5, PROC8b

Activity	Covers reloading, mixing or compounding and associated activities in the Process Categories listed above	
Product characteristics	Concentration of the Substance in Mixture/Article	Covers percentage substance in the product up to 100 % (unless stated differently).
	Physical Form (at time of use)	Powdered substance, granules
Amount used	Would vary by requirements and by facility	
Frequency and duration of use	Application duration	60 min
Other operational conditions affecting workers exposure	Indoor use.	
	Assumes activities are at ambient temperature.	

Technical conditions and measures to control dispersion from source towards the worker	Automate activity where possible. Provide local exhaust ventilation (LEV). Discharge sacks via suitable vented charge chute. Single use bags can be opened by the use of sharp prongs at the discharge hopper. When the big bag is placed at the discharge hopper and lowered, the prongs cut into the base of the bag releasing the substance into the hopper. This removes the operator from the immediate vicinity and contributes to a reduction in exposure	
Organisational measures to prevent /limit releases, dispersion and exposure	Ensure operatives are trained to minimise exposures. Regular inspection and maintenance of equipment and machines.	
Conditions and measures related to personal protection, hygiene and health evaluation	Wear suitable protective clothing. Wear protective gloves. Safety glasses Safety goggles In case of dust or aerosol formation: use respiratory protection with approved filter (P2) or Particle filter:P3	
2.5 Contributing scenario controlling worker exposure for: PROC8a, PROC8b		
Activity	Equipment maintenance	
Product characteristics	Concentration of the Substance in Mixture/Article	Covers percentage substance in the product up to 100 % (unless stated differently).
	Physical Form (at time of use)	Powdered substance, granules
Amount used	Would vary by requirements and by facility	
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently).	
Other operational conditions affecting workers exposure	Indoor and outdoor use.	
Technical conditions and measures to control dispersion from source towards the worker	Use closed dosing, transfer, sampling and application systems including connectors. Worker in separate cabine without specific ventilation Provide extract ventilation to points where emissions occur.	
Organisational measures to prevent /limit releases, dispersion and exposure	Ensure operatives are trained to minimise exposures. Regular inspection and maintenance of equipment and machines.	
Conditions and measures related to personal protection, hygiene and health evaluation	Wear protective clothing. Wear protective shoes. Safety glasses In case of dust or aerosol formation: use respiratory protection with approved filter (P2) or Particle filter:P3	
2.6 Contributing scenario controlling worker exposure for: PROC8b		

Large scale

Activity	Bulk loading (including marine vessel/barge, rail/road car and IBC loading)	
Product characteristics	Concentration of the Substance in Mixture/Article	Covers percentage substance in the product up to 100 % (unless stated differently).
	Physical Form (at time of use)	Powdered substance, granules
Amount used	Amount per Application	40000 kg
Frequency and duration of use	Application duration	120 min
Other operational conditions affecting workers exposure	Indoor use.	
	Assumes activities are at ambient temperature.	
Technical conditions and measures to control dispersion from source towards the worker	Use closed dosing, transfer, sampling and application systems including connectors. Automate activity where possible. Provide dust filtration for air displaced from the silo during filling. Provide local exhaust ventilation (LEV).	
Organisational measures to prevent /limit releases, dispersion and exposure	Ensure operatives are trained to minimise exposures. Regular inspection and maintenance of equipment and machines.	
Conditions and measures related to personal protection, hygiene and health evaluation	Wear protective clothing. Wear protective gloves. Safety glasses Goggles	

2.7 Contributing scenario controlling worker exposure for: PROC9

Product characteristics	Concentration of the Substance in Mixture/Article	Concentration of substance in product: 0,11% - 8,6%
	Physical Form (at time of use)	solid, liquid, pasty
Amount used	Amount per Day	10000 kg
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently).	
Technical conditions and measures to control dispersion from source towards the worker	Automate activity where possible. Provide local exhaust ventilation (LEV).	
Organisational measures to prevent /limit releases, dispersion and exposure	Ensure operatives are trained to minimise exposures. Regular inspection and maintenance of equipment and machines.	
Conditions and measures related to personal protection, hygiene and health evaluation	Wear protective clothing. Safety shoes Safety glasses In case of dust or aerosol formation: use respiratory protection with approved filter (P2) or Particle filter:P3	

2.8 Contributing scenario controlling worker exposure for: PROC14		
Product characteristics	Concentration of the Substance in Mixture/Article	Covers percentage substance in the product up to 100 % (unless stated differently).
	Physical Form (at time of use)	Powdered substance, granules
Amount used	The amount used per worker varies from activity to activity	
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently).	
Other operational conditions affecting workers exposure	Indoor use.	
Technical conditions and measures to control dispersion from source towards the worker	Use closed dosing, transfer, sampling and application systems including connectors. Provide local exhaust ventilation (LEV).	
Organisational measures to prevent /limit releases, dispersion and exposure	Ensure operatives are trained to minimise exposures. Regular inspection and maintenance of equipment and machines.	
Conditions and measures related to personal protection, hygiene and health evaluation	Wear suitable protective clothing. Safety shoes Safety glasses In case of dust or aerosol formation: use respiratory protection with approved filter (P2) or Particle filter:P3	
2.9 Contributing scenario controlling worker exposure for: PROC15		
Product characteristics	Concentration of the Substance in Mixture/Article	Covers percentage substance in the product up to 100 % (unless stated differently).
	Physical Form (at time of use)	Powdered substance, granules
Amount used	Amount per Application	1 kg
Frequency and duration of use	Sometimes during the working day, only for short periods of time	
Technical conditions and measures to control dispersion from source towards the worker	Handle in a fume cupboard or under extract ventilation.	
Organisational measures to prevent /limit releases, dispersion and exposure	Ensure operatives are trained to minimise exposures. Regular inspection and maintenance of equipment and machines.	
Conditions and measures related to personal protection, hygiene and health evaluation	Wear a laboratory coat Safety shoes Safety glasses Wear protective gloves.	

3. Exposure estimation and reference to its source

Environment

Estimation based on workplace measurements

Contributing Scenario	Specific conditions	Compartment	Value	Level of Exposure	RCR
ERC6b	---	Fresh water	PEC	259µg/L	0,19
ERC6b	---	Fresh water sediment	PEC	1,74mg/kg	0,97
ERC6b	---	Soil	PEC	0,008mg/kg	0,001

Workers

PROC1, PROC2, PROC3, PROC8a, PROC8b, PROC9, PROC14, PROC15, PROC22, PROC23 Workplace measurements

PROC2, PROC4, PROC8a, PROC8b, PROC9, PROC14, PROC23 MEASE

PROC8b Advanced REACH Tool (ART model)

PROC1, PROC9, PROC14 Advanced REACH Tool (ART model) (inhalative exposure)

Contributing Scenario	Specific conditions	Exposure routes	Level of Exposure	RCR
PROC1, PROC2, PROC3	90th percentile value, no respiratory protection (RPE)	Inhalation worker exposure	0,08mg/m³	0,06
PROC2	Solid, high dustiness., during 15 mins - 1 hour	Dermal worker exposure	0,048mg/kg bw/day	< 0,001
PROC1, PROC2, PROC3, PROC22, PROC23	90th percentile value, no respiratory protection (RPE)	Inhalation worker exposure	0,08mg/m³	0,06
PROC23	Solid, low dustiness., during <15 mins, With face shield	Inhalation worker exposure	0,01mg/kg bw/day	0,0069
PROC2	Solid, high dustiness., during 15 mins - 1 hour	Dermal worker exposure	0,048mg/kg bw/day	< 0,001
PROC8a, PROC8b	90th percentile value, small scale	Inhalation worker exposure	0,78mg/m³	0,54
PROC4	Solid, high dustiness., during 15 mins - 1 hour	Dermal worker exposure	0,48mg/kg bw/day	< 0,001
PROC8a, PROC8b	90th percentile value, no respiratory protection (RPE)	Inhalation worker exposure	1,33mg/m³	0,92
PROC8a, PROC8b	Solid, high dustiness., during 1 - 4 hours	Dermal worker exposure	0,173mg/kg bw/day	< 0,001
PROC8b	---	Inhalation worker	0,016mg/m³	0,011

		exposure		
PROC8b	Outdoor use., with local exhaust ventilation, 90th percentile value	Inhalation worker exposure	0,03mg/m³	0,021
PROC2	Solid, high dustiness., during <15 mins	Dermal worker exposure	0,024mg/kg bw/day	< 0,001
PROC9	with local exhaust ventilation, no respiratory protection (RPE)	Inhalation worker exposure	0,4mg/m³	0,28
PROC9	90th percentile value, liquid, with local exhaust ventilation	Inhalation worker exposure	0,01mg/m³	0,007
PROC9	Solid, high dustiness., Concentration of substance in product: 5% - 25%	Dermal worker exposure	1,44mg/kg bw/day	< 0,001
PROC9	liquid, Concentration of substance in product: 5% - 25%	Dermal worker exposure	0,144mg/kg bw/day	< 0,001
PROC14	---	Inhalation worker exposure	1,3mg/m³	0,90
PROC14	90th percentile value, with local exhaust ventilation	Inhalation worker exposure	0,15mg/m³	0,10
PROC14	Solid, high dustiness.	Dermal worker exposure	2,4mg/kg bw/day	< 0,001
PROC15	90th percentile value	Inhalation worker exposure	0,16mg/m³	0,11
PROC14	Solid, high dustiness., Concentration of substance in product: 5% - 25%	Dermal worker exposure	0,014mg/kg bw/day	< 0,001

4. Guidance to Downstream User to evaluate whether he works inside the boundaries set by the Exposure Scenario

Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures.
Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.
Only properly trained persons shall make use of scaling methods while checking whether the OC and RMM are within the boundaries set by the ES
Tonnage calculations have been based on boron such that no RCR exceeds 0.97, using back calculations with the relevant PNEC's when necessary. The equivalent tonnage of product handled on site should be calculated from the conversion factors detailed in the product table. For those operations that handle a combination of borate compounds, the boron equivalent of the combined tonnage cannot exceed the site tonnage value.

Substance	Formula	Conversion factor for the equivalent dose of B (multiply by)
Boric acid	H_3BO_3	0,1748
Boric oxide	$B2O_3$	0,311
Disodium tetraborate anhydrous	$Na_2B_4O_7$	0,2149
Disodium tetraborate pentahydrate	$Na_2B_4O_7 \times 5H_20$	0,1484
Disodium tetraborate decahydrate	$Na_2B_4O_7 \times 10H_20$	0,1134
Disodium octoborate tetrahydrate	$Na_2B_8O_{13} \times 4H_20$	0,2096
Sodium metaborate (anhydrous)	$NaBO_2$	0,1643
Sodium metaborate (dihydrate)	$NaBO_2 \times 2H_20$	0,1062
Sodium metaborate (tetrahydrate)	$NaBO_2 \times 4H_20$	0,0784
Sodium pentaborate (anhydrous)	NaB_5O_8	0,2636
Sodium pentaborate (pentahydrate)	$NaB_5O_8 \times 5H_20$	0,1832

Additional good practice advice beyond the REACH Chemical Safety Assessment

Take care for general good hygiene and housekeeping.

1. Short title of Exposure Scenario 15: Use in glass production		
Main User Groups	SU 3: Industrial uses: Uses of substances as such or in preparations at industrial sites	
Process categories	PROC1: Use in closed process, no likelihood of exposure PROC2: Use in closed, continuous process with occasional controlled exposure PROC3: Use in closed batch process (synthesis or formulation) PROC8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities PROC8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities PROC15: Use as laboratory reagent PROC22: Potentially closed processing operations with minerals/metals at elevated temperature; industrial setting PROC23: Open processing and transfer operations with minerals/metals at elevated temperature	
Environmental Release Categories	ERC2: Formulation of preparations ERC5: Industrial use resulting in inclusion into or onto a matrix ERC6a: Industrial use resulting in manufacture of another substance (use of intermediates)	
2.1 Contributing scenario controlling environmental exposure for: ERC2, ERC5, ERC6a		
Activity	Glass wool production	
Product characteristics	Concentration of the Substance in Mixture/Article	Covers percentage substance in the product up to 100 % (unless stated differently).
Amount used	Annual amount per site	15000 ton(s)/year
Frequency and duration of use	Continuous exposure	365 days/year
Other given operational conditions affecting environmental exposure	Emission or Release Factor: Air	2827 g/ton of product
	Emission or Release Factor: Water	0 g/ton of product
Technical conditions and measures at process level (source) to prevent release Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil Organizational measures to prevent/limit release from the site	Air	Substance specific waste air treatment:, Electrostatic precipitation, Cyclones, ceramic filters, Bag filters, Fabric filter
	Water	Substance specific waste water treatment, Reverse osmosis, Ion exchange (Degradation effectiveness: 40 - 90 %)
Conditions and measures related to sewage treatment plant	Not applicable as there is no release to wastewater.	
Conditions and measures related to external treatment of waste for disposal	Disposal methods	Vacuum up spillage and collect in suitable containers for disposal., Prevent environmental discharge consistent with regulatory requirements.

2.2 Contributing scenario controlling environmental exposure for: ERC2, ERC5, ERC6a		
Activity	Glass made by electric melting	
Product characteristics	Concentration of the Substance in Mixture/Article	Covers the percentage of the substance in the product up to 100 % (unless stated differently).
Amount used	Annual amount per site	15000 ton(s)/year (No water emissions ERC2, ERC5, ERC6a)
Frequency and duration of use	Continuous exposure	365 days/year
Other given operational conditions affecting environmental exposure	Emission or Release Factor: Air	392 g/ton of product
	Emission or Release Factor: Water	0 g/ton of product
Technical conditions and measures at process level (source) to prevent release Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil Organizational measures to prevent/limit release from the site	Air	Substance specific waste air treatment:, Electrostatic precipitation, Cyclones, ceramic filters, Bag filters, Fabric filter (Efficiency: 64 - 99 %)
	Water	Substance specific waste water treatment, Reverse osmosis, Ion exchange (Degradation effectiveness: 40 - 90 %)
Conditions and measures related to sewage treatment plant	Not applicable as there is no release to wastewater.	
Conditions and measures related to external treatment of waste for disposal	Waste treatment	Send back to the process
	Disposal methods	Vacuum up spillage and collect in suitable containers for disposal., Prevent environmental discharge consistent with regulatory requirements.

2.3 Contributing scenario controlling environmental exposure for: ERC2, ERC5, ERC6a		
Activity	Glass with a high alkali ratio, gas melting	
Product characteristics	Concentration of the Substance in Mixture/Article	Covers percentage substance in the product up to 100 % (unless stated differently).
Amount used	Annual amount per site	5300 ton(s)/year (No water emissions ERC2, ERC5, ERC6a)
Frequency and duration of use	Continuous exposure	365 days/year
Other given operational conditions affecting environmental exposure	Emission or Release Factor: Air	10896 g/ton of product
	Emission or Release Factor: Water	0 g/ton of product
Technical conditions and measures at process level (source) to prevent release Technical onsite conditions and	Air	Substance specific waste air treatment:, Electrostatic precipitation, Cyclones, ceramic filters, Bag filters, Fabric filter (Efficiency: 85 - 99 %)

measures to reduce or limit discharges, air emissions and releases to soil Organizational measures to prevent/limit release from the site	Water	Substance specific waste water treatment, Reverse osmosis, Ion exchange (Degradation effectiveness: 40 - 90 %)
Conditions and measures related to sewage treatment plant	Not applicable as there is no release to wastewater.	
Conditions and measures related to external treatment of waste for disposal	Waste treatment	Substance containing waste shall be handled as hazardous waste and removed by licensed waste removal company, incinerated or recycled
	Disposal methods	Vacuum up spillage and collect in suitable containers for disposal., Prevent environmental discharge consistent with regulatory requirements.

2.4 Contributing scenario controlling environmental exposure for: ERC2, ERC5, ERC6a

Activity	Glass with a low alkali ratio, gas melting	
Product characteristics	Concentration of the Substance in Mixture/Article	Covers percentage substance in the product up to 100 % (unless stated differently).
Amount used	Annual amount per site	1150 ton(s)/year (No water emissions ERC2, ERC5, ERC6a)
Frequency and duration of use	Continuous exposure	365 days/year
Other given operational conditions affecting environmental exposure	Emission or Release Factor: Air	36562 g/ton of product
	Emission or Release Factor: Water	0 g/ton of product
Technical conditions and measures at process level (source) to prevent release Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil Organizational measures to prevent/limit release from the site	Air	Substance specific waste air treatment:, Electrostatic precipitation, Cyclones, ceramic filters, Bag filters, Fabric filter (Efficiency: 36 - 52 %)
	Water	Substance specific waste water treatment, Reverse osmosis, Ion exchange (Degradation effectiveness: 40 - 90 %)
Conditions and measures related to sewage treatment plant	Not applicable as there is no release to wastewater.	
Conditions and measures related to external treatment of waste for disposal	Waste treatment	Send back to the process, Treat all waste as hazardous waste, Substance containing waste shall be handled as hazardous waste and removed by licensed waste removal company, incinerated or recycled
	Disposal methods	Vacuum up spillage and collect in suitable containers for disposal., Prevent environmental discharge consistent with regulatory requirements.

2.5 Contributing scenario controlling worker exposure for: PROC8a, PROC8b

Activity	Equipment maintenance	
Product characteristics	Concentration of the Substance in Mixture/Article	Covers percentage substance in the product up to 100 % (unless stated differently).
	Physical Form (at time of use)	granules, Powder
Amount used	Would vary by requirements and by facility	
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently).	
Other operational conditions affecting workers exposure	Indoor and outdoor use.	
Technical conditions and measures to control dispersion from source towards the worker	Use closed dosing, transfer, sampling and application systems including connectors. Worker in separate cabine without specific ventilation	
Organisational measures to prevent /limit releases, dispersion and exposure	Ensure operatives are trained to minimise exposures. Regular inspection and maintenance of equipment and machines.	
Conditions and measures related to personal protection, hygiene and health evaluation	Wear protective clothing. Safety shoes Safety glasses Wear respiratory protection. Particle filter:P2 or Particle filter:P3	

2.6 Contributing scenario controlling worker exposure for: PROC8b

Large scale

Activity	Loading (including marine vessel/barge, rail/road car and IBC loading) and repacking (including drums and small packs) of substance, including its sampling, storage, unloading, distribution and associated laboratory activities.	
Product characteristics	Concentration of the Substance in Mixture/Article	Covers percentage substance in the product up to 100 % (unless stated differently).
	Physical Form (at time of use)	granules, Powder
Amount used	Amount per Use	40000 kg
Frequency and duration of use	Exposure duration	120 min
Other operational conditions affecting workers exposure	Indoor use.	
	Assumes activities are at ambient temperature.	
Technical conditions and measures to control dispersion from source towards the worker	Provide dust filtration for air displaced from the silo during filling.	
Organisational measures to prevent /limit releases, dispersion and exposure	Ensure operatives are trained to minimise exposures. Regular inspection and maintenance of equipment and machines.	

Conditions and measures related to personal protection, hygiene and health evaluation	Wear protective clothing. Safety glasses Safety goggles Wear protective gloves.	
2.7 Contributing scenario controlling worker exposure for: PROC15		
Product characteristics	Concentration of the Substance in Mixture/Article	Covers percentage substance in the product up to 100 % (unless stated differently).
	Physical Form (at time of use)	granules, Powder
Amount used	Amount per Use	1 kg
Frequency and duration of use	Several times during the working day, only for short periods of time	
Technical conditions and measures to control dispersion from source towards the worker	Handle in a fume cupboard or under extract ventilation.	
Organisational measures to prevent /limit releases, dispersion and exposure	Ensure operatives are trained to minimise exposures. Regular inspection and maintenance of equipment and machines.	
Conditions and measures related to personal protection, hygiene and health evaluation	Wear protective clothing. Safety shoes Safety glasses Wear protective gloves.	
2.8 Contributing scenario controlling worker exposure for: PROC1, PROC2, PROC3, PROC22, PROC23		
Activity	Potentially closed processing operations at elevated temperature.	
Product characteristics	Concentration of the Substance in Mixture/Article	Covers percentage substance in the product up to 100 % (unless stated differently).
	Physical Form (at time of use)	granules, Powder
Amount used	The amount used per worker varies from activity to activity	
Frequency and duration of use	Frequency of use	24 hours/day
	Frequency of use	365 days/year
Other operational conditions affecting workers exposure	Indoor use.	
	The process temperatures are mainly very high, as these processes include glass making, ceramics, steel & alloy making	
Technical conditions and measures to control dispersion from source towards the worker	Worker in separate cabine without specific ventilation Minimise exposure by partial enclosure of the operation or equipment and provide extract ventilation at openings. Where there are breaches in the closed system, such as pouring and removal of slag in metal production, LEV is used to control fumes. Use product only in closed system.	
Organisational measures to prevent /limit releases, dispersion and exposure	Ensure operatives are trained to minimise exposures. Regular inspection and maintenance of equipment and machines.	

Conditions and measures related to personal protection, hygiene and health evaluation	Wear protective clothing. Wear protective gloves. Safety glasses Safety goggles If no adequate ventilation is available: Wear respiratory protection. Particle filter:P2 or Particle filter:P3	

2.9 Contributing scenario controlling worker exposure for: PROC1, PROC2, PROC3		
Product characteristics	Concentration of the Substance in Mixture/Article	Covers percentage substance in the product up to 100 % (unless stated differently).
	Physical Form (at time of use)	granules, Powder
Amount used	Amount per Shift	1000 kg
Frequency and duration of use	Exposure duration per day	60 - 240 min
Human factors not influenced by risk management	Exposed skin surface	1980 cm²
Other operational conditions affecting workers exposure	Indoor use. Assumes activities are at ambient temperature.	
Technical conditions and measures to control dispersion from source towards the worker	Provide local exhaust ventilation (LEV). Where there are breaches in the closed system, such as pouring and removal of slag in metal production, LEV is used to control fumes.	
Organisational measures to prevent /limit releases, dispersion and exposure	Ensure operatives are trained to minimise exposures. Regular inspection and maintenance of equipment and machines.	
Conditions and measures related to personal protection, hygiene and health evaluation	Wear protective clothing. Safety shoes Safety glasses Wear respiratory protection. In case of dust or aerosol formation: use respiratory protection with approved filter (P2) or Particle filter:P3	

3. Exposure estimation and reference to its source

Environment

METALS EUSES IT tool

Contributing Scenario	Specific conditions	Compartment	Value	Level of Exposure	RCR
ERC2, ERC5, ERC6a	No water discharge to the environment,	Soil	PEC	5,20mg/kg dry weight (d.w.)	0,962

	Production of glass wool				
ERC2, ERC5, ERC6a	Glass made by electric melting, No water discharge to the environment	Soil	PEC	0,54mg/kg dry weight (d.w.)	0,100
ERC2, ERC5, ERC6a	Glass with a high alkali ratio, gas melting, No water discharge to the environment	Soil	PEC	5,25mg/kg dry weight (d.w.)	0,97
ERC2, ERC5, ERC6a	Glass with a low alkali ratio, gas melting	Soil	PEC	5,26mg/kg dry weight (d.w.)	0,97

Workers

PROC1, PROC2, PROC3, PROC8a, PROC8b, PROC15, PROC22 Workplace measurements PROC2, PROC8a, PROC14, PROC23 MEASE PROC8b Advanced REACH Tool (ART model)

Contributing Scenario	Specific conditions	Exposure routes	Level of Exposure	RCR
PROC8a, PROC8b	90th percentile value, without respiratory protection	Inhalation worker exposure	1,33mg/m³	0,92
PROC8a	Solid, high dustiness., during 1 - 4 hours	Dermal worker exposure	0,173mg/kg bw/day	< 0,001
PROC8b	Indoor use., with local exhaust ventilation, 90th percentile value	Inhalation worker exposure	0,03mg/m³	0,021
PROC2	Solid, high dustiness., during <15 mins	Dermal worker exposure	0,024mg/kg bw/day	< 0,001
PROC15	90th percentile value	Inhalation worker exposure	0,16mg/m³	0,11
PROC14	without gloves, Solid, high dustiness., Concentration of substance in product: 5% - 25%	Dermal worker exposure	0,014mg/kg bw/day	< 0,001
PROC22	without respiratory protection, 90th percentile value	Inhalation worker exposure	0,08mg/m³	0,06
PROC23	Solid, low dustiness., Concentration of substance in product : 0% - 5%, With face shield	Inhalation worker exposure	0,01mg/m³	0,0069
PROC2	Solid, high dustiness.,	Dermal worker exposure	0,048mg/kg bw/day	< 0,001

	Concentration of substance in product: 5% - 25%, during 15 mins - 1 hour			
PROC2	Solid, high dustiness., during 15 mins - 1 hour	Dermal worker exposure	0,048mg/kg/day	< 0,001
PROC1, PROC2, PROC3	90th percentile value, without respiratory protection	Inhalation worker exposure	0,08mg/m³	0,06

4. Guidance to Downstream User to evaluate whether he works inside the boundaries set by the Exposure Scenario

If measured data are not available, the DU may make use of an appropriate scaling tool such as MEASE (www.ebrc.de/mease.html) to estimate the associated exposure.
For further information on the assessment method, see: http://www.ebrc.de/mease.html
For scaling see: http://www.arche-consulting.be/metal-CSA-toolbox/du-scaling tool
Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures.
Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.
Only properly trained persons shall make use of scaling methods while checking whether the OC and RMM are within the boundaries set by the ES
Tonnage calculations have been based on boron such that no RCR exceeds 0.97, using back calculations with the relevant PNEC's when necessary. The equivalent tonnage of product handled on site should be calculated from the conversion factors detailed in the product table. For those operations that handle a combination of borate compounds, the boron equivalent of the combined tonnage cannot exceed the site tonnage value.

Substance	Formula	Conversion factor for the equivalent dose of B (multiply by)
Boric acid	H_3BO_3	0,1748
Boric oxide	$B2O_3$	0,311
Disodium tetraborate anhydrous	$Na_2B_4O_7$	0,2149
Disodium tetraborate pentahydrate	$Na_2B_4O_7 \times 5H_20$	0,1484
Disodium tetraborate decahydrate	$Na_2B_4O_7 \times 10H_20$	0,1134
Disodium octoborate tetrahydrate	$Na_2B_8O_{13} \times 4H_20$	0,2096
Sodium metaborate (anhydrous)	$NaBO_2$	0,1643
Sodium metaborate (dihydrate)	$NaBO_2 \times 2H_20$	0,1062
Sodium metaborate (tetrahydrate)	$NaBO_2 \times 4H_20$	0,0784
Sodium pentaborate (anhydrous)	NaB_5O_8	0,2636
Sodium pentaborate (pentahydrate)	$NaB_5O_8 \times 5H_20$	0,1832

1. Short title of Exposure Scenario 16: Use in nuclear power plants		
Main User Groups	SU 3: Industrial uses: Uses of substances as such or in preparations at industrial sites	
Process categories	PROC1: Use in closed process, no likelihood of exposure PROC2: Use in closed, continuous process with occasional controlled exposure PROC3: Use in closed batch process (synthesis or formulation) PROC4: Use in batch and other process (synthesis) where opportunity for exposure arises PROC5: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact) PROC8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities PROC15: Use as laboratory reagent	
Environmental Release Categories	ERC7: Industrial use of substances in closed systems	
2.1 Contributing scenario controlling environmental exposure for: ERC7		
Use in nuclear power plants without releases to water		
Product characteristics	Concentration of the Substance in Mixture/Article	Covers percentage substance in the product up to 100 % (unless stated differently).
Amount used	Annual amount per site	15000 ton(s)/year
Frequency and duration of use	Continuous exposure	75 days/year
Other given operational conditions affecting environmental exposure	Emission or Release Factor: Air	400 g/ton of product
	Emission or Release Factor: Water	0 g/ton of product
Technical conditions and measures at process level (source) to prevent release Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil Organizational measures to prevent/limit release from the site	Air	Electrostatic precipitation, Cyclones, Treatment of air emissions by bag filters, fabric filter and wet scrubber, Ceramic & metal mash filters, PM10 particles are removed
	Water	Wastewater emission controls are not applicable as there is no direct release to wastewater.
Conditions and measures related to external treatment of waste for disposal	Waste treatment	Send back to the process
	Disposal methods	Vacuum up spillage and collect in suitable containers for disposal., Waste product and empty containers should be disposed of as hazardous waste in accordance with all local and national regulations.
Conditions and measures related	Recovery Methods	There is no envisaged external recovery of waste.

to external recovery of waste		

2.2 Contributing scenario controlling environmental exposure for: ERC7

Use in nuclear power plants with releases to water after onsite treatment

Product characteristics	Concentration of the Substance in Mixture/Article	Covers percentage substance in the product up to 100 % (unless stated differently).
Amount used	Annual amount per site	13000 ton(s)/year
Frequency and duration of use	Continuous exposure	32 days/year
Environment factors not influenced by risk management	Other data. Other information	Local marine water dilution factor:1000
Other given operational conditions affecting environmental exposure	Emission or Release Factor: Air	0 g/ton of product
	Emission or Release Factor: Water	13000 kg/year
Technical conditions and measures at process level (source) to prevent release Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil Organizational measures to prevent/limit release from the site	Water	Substance specific waste water treatment
	Use of closed filling equipment	
Conditions and measures related to external treatment of waste for disposal	Waste treatment	Send back to the process
	Disposal methods	Vacuum up spillage and collect in suitable containers for disposal., Waste product and empty containers should be disposed of as hazardous waste in accordance with all local and national regulations.
Conditions and measures related to external recovery of waste	Recovery Methods	There is no envisaged external recovery of waste.

2.3 Contributing scenario controlling worker exposure for: PROC1, PROC2, PROC3

Product characteristics	Concentration of the Substance in Mixture/Article	Covers percentage substance in the product up to 100 % (unless stated differently).
	Physical Form (at time of use)	Powdered substance, granules
Amount used	Amount per Shift	1000 kg
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently).	
Other operational conditions affecting workers exposure	Indoor use.	

Technical conditions and measures to control dispersion from source towards the worker	Use closed dosing, transfer, sampling and application systems including connectors. Where there are breaches in the closed system, such as pouring and removal of slag in metal production, LEV is used to control fumes.	
Organisational measures to prevent /limit releases, dispersion and exposure	Ensure operatives are trained to minimise exposures. Regular inspection and maintenance of equipment and machines.	
Conditions and measures related to personal protection, hygiene and health evaluation	Wear protective clothing. Safety shoes Safety glasses In case of dust or aerosol formation: use respiratory protection with approved filter (P2) or Particle filter:P3	
2.4 Contributing scenario controlling worker exposure for: PROC4, PROC5, PROC8b		
Activity	Covers reloading, mixing or compounding and associated activities in the Process Categories listed above	
Product characteristics	Concentration of the Substance in Mixture/Article	Covers percentage substance in the product up to 100 % (unless stated differently).
	Physical Form (at time of use)	Powdered substance, granules
Amount used	Would vary by requirements and by facility	
Frequency and duration of use	Exposure duration per day	60 min
Other operational conditions affecting workers exposure	Indoor use. Assumes activities are at ambient temperature.	
Technical conditions and measures to control dispersion from source towards the worker	Use only semi-automated and predominantly enclosed filling lines. Provide local exhaust ventilation (LEV). Provide appropriate exhaust ventilation at machinery and at places where dust can be generated. Single use bags can be opened by the use of sharp prongs at the discharge hopper. When the big bag is placed at the discharge hopper and lowered, the prongs cut into the base of the bag releasing the substance into the hopper. This removes the operator from the immediate vicinity and contributes to a reduction in exposure	
Organisational measures to prevent /limit releases, dispersion and exposure	Ensure operatives are trained to minimise exposures. Regular inspection and maintenance of equipment and machines.	
Conditions and measures related to personal protection, hygiene and health evaluation	Wear protective clothing. Wear protective gloves. Safety glasses Safety goggles In case of dust or aerosol formation: use respiratory protection with approved filter (P2) or Particle filter:P3	

	These respirators, if worn correctly, with a good face fit, will provide sufficient protection Where tightly fitting RPE is used, the worker should be face fit tested to ensure that a good face seal can be obtained	

2.5 Contributing scenario controlling worker exposure for: PROC8b

Large scale

Activity	Bulk loading (including marine vessel/barge, rail/road car and IBC loading)	
Product characteristics	Concentration of the Substance in Mixture/Article	Covers percentage substance in the product up to 100 % (unless stated differently).
	Physical Form (at time of use)	Powdered substance, granules
Amount used	Amount per Application	40000 kg
Frequency and duration of use	Exposure duration per day	120 min
Other operational conditions affecting workers exposure	Indoor use. Assumes activities are at ambient temperature.	
Technical conditions and measures to control dispersion from source towards the worker	Use closed dosing, transfer, sampling and application systems including connectors. Provide dust filtration for air displaced from the silo during filling.	
Organisational measures to prevent /limit releases, dispersion and exposure	Ensure operatives are trained to minimise exposures. Regular inspection and maintenance of equipment and machines.	
Conditions and measures related to personal protection, hygiene and health evaluation	Wear protective clothing. Wear protective gloves. Safety glasses Safety goggles	

2.6 Contributing scenario controlling worker exposure for: PROC15

Product characteristics	Concentration of the Substance in Mixture/Article	Covers percentage substance in the product up to 100 % (unless stated differently).
	Physical Form (at time of use)	Powdered substance, granules
Amount used	Amount per Use	1 kg
Frequency and duration of use	Several times during the working day, only for short periods of time	
Technical conditions and measures to control dispersion from source towards the worker	Handle in a fume cupboard or under extract ventilation.	
Organisational measures to prevent /limit releases, dispersion and exposure	Ensure operatives are trained to minimise exposures. Regular inspection and maintenance of equipment and machines.	
Conditions and measures related to personal protection, hygiene	Wear a laboratory coat Wear protective shoes.	

and health evaluation	Safety glasses Wear protective gloves.

3. Exposure estimation and reference to its source

Environment

METALS EUSES IT tool

Contributing Scenario	Specific conditions	Compartment	Value	Level of Exposure	RCR
ERC7	Nuclear power plants, No water discharge to the environment	Soil	PEC	0,55mg/kg dry weight (d.w.)	0,10
ERC7	Nuclear power plants	Marine sediment	PEC	1,59mg/kg dry weight (d.w.)	0,88
ERC7	Nuclear power plants	Soil	PEC	0,01mg/kg dry weight (d.w.)	0,001
ERC7	Nuclear power plants	Marine water	PEC	221µg/L	0,16

Workers

PROC1, PROC2, PROC3, PROC4, PROC5, PROC8b, PROC15 Workplace measurements

PROC2, PROC4, PROC14 MEASE

PROC8b Advanced REACH Tool (ART model) (inhalative exposure)

Contributing Scenario	Specific conditions	Exposure routes	Level of Exposure	RCR
PROC1, PROC2, PROC3	90th percentile value, no respiratory protection (RPE)	Inhalation worker exposure	0,08mg/m³	0,06
PROC2	Solid, high dustiness., during 15 mins - 1 hour	Dermal worker exposure	0,048mg/kg bw/day	< 0,001
PROC4, PROC5	90th percentile value, small scale	Inhalation worker exposure	0,78mg/m³	0,54
PROC4	Solid, high dustiness., during 15 mins - 1 hour, Large scale	Dermal worker exposure	4,8mg/kg bw/day	0,001
PROC4	Solid, high dustiness., during 15 mins - 1 hour, small scale	Dermal worker exposure	0,48mg/kg bw/day	< 0,001
PROC4, PROC5, PROC8b	90th percentile value, half mask, Large scale	Inhalation worker exposure	0,2mg/m³	0,14
PROC8b	---	Inhalation worker exposure	0,016mg/m³	0,011
PROC8b	Outdoor use., with local	Inhalation worker	0,03mg/m³	0,021

	exhaust ventilation, 90th percentile value	exposure		
PROC2	Solid, high dustiness., during <15 mins	Dermal worker exposure	0,024mg/kg bw/day	< 0,001
PROC15	90th percentile value	Inhalation worker exposure	0,16mg/m³	0,11
PROC14	Solid, high dustiness., Concentration of substance in product: 5% - 25%, with local exhaust ventilation	Dermal worker exposure	0,014mg/kg bw/day	< 0,001

4. Guidance to Downstream User to evaluate whether he works inside the boundaries set by the Exposure Scenario

Additional good practice advice beyond the REACH Chemical Safety Assessment

Take care for general good hygiene and housekeeping.

1. Short title of Exposure Scenario 17: Use of abrasives		
Main User Groups	SU 22: Professional uses: Public domain (administration, education, entertainment, services, craftsmen)	
Process categories	PROC21: Low energy manipulation of substances bound in materials and/or articles	
Environmental Release Categories	ERC12a: Industrial processing of articles with abrasive techniques (low release)	
2.1 Contributing scenario controlling environmental exposure for: ERC12a		
The environmental release categories mentioned above are assumed to be the most important ones but other environmental release categories could also be possible.		
Product characteristics	Concentration of the Substance in Mixture/Article	Covers percentage substance in the product up to 100 % (unless stated differently).
Amount used	Annual tonnage	30 ton(s)/year (Dilution of 10 ERC12a)
	Annual tonnage	300 ton(s)/year (Dilution of 100 ERC12a)
	Annual tonnage	1700 ton(s)/year (No water emissions ERC12a)
Frequency and duration of use	Continuous exposure	20 days/year
Environment factors not influenced by risk management	Other data. Other information	Local freshwater dilution factor:: 10
Other given operational conditions affecting environmental exposure	Emission or Release Factor: Air	25000 g/ton of product (Dilution of 10, Dilution of 100 ERC12a)
	Emission or Release Factor: Water	25000 g/ton of product (Dilution of 10, Dilution of 100 ERC12a)
	Emission or Release Factor: Air	25000 g/ton of product (No water emissions ERC12a)
Technical conditions and measures at process level (source) to prevent release Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil Organizational measures to prevent/limit release from the site	Air	Substance specific waste air treatment:, Electrostatic precipitation, Cyclones, Treatment of air emissions by bag filters, fabric filter and wet scrubber, Ceramic & metal mash filters, PM10 particles are removed
	Water	Substance specific waste water treatment, Ion exchange, Reverse osmosis (Degradation effectiveness: 40 - 90 %)
Conditions and measures related to sewage treatment plant	Type of Sewage Treatment Plant	Municipal sewage treatment plant
	The concentration of the substance should not exceed 1,75 mg/L in the municipal STP	
Conditions and measures related to external treatment of waste for	Waste treatment	Waste are recycled into the process, Substance containing waste shall be handled as hazardous

disposal		waste and removed by licensed waste removal company, incinerated or recycled
	Disposal methods	Vacuum up spillage and collect in suitable containers for disposal.

2.2 Contributing scenario controlling worker exposure for: PROC21		
Activity	Installation of plasterboard, wood based boards and other products	
Product characteristics	Concentration of the Substance in Mixture/Article	Covers percentage substance in the product up to 1 %.
	Physical Form (at time of use)	solid
Amount used	The amount used per worker varies from activity to activity	
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently).	
Other operational conditions affecting workers exposure	Indoor use.	
Organisational measures to prevent /limit releases, dispersion and exposure	Ensure operatives are trained to minimise exposures.	
Conditions and measures related to personal protection, hygiene and health evaluation	Wear suitable protective clothing.	

3. Exposure estimation and reference to its source

Environment

Estimation based on workplace measurements

Contributing Scenario	Specific conditions	Compartment	Value	Level of Exposure	RCR
ERC12a	Dilution of 10	Fresh water	PEC	1932µg/L	0,956
ERC12a	Dilution of 10	Soil	PEC	0,10mg/kg dry weight (d.w.)	0,018
ERC12a	Dilution of 100	Fresh water	PEC	1932µg/L	0,956
ERC12a	Dilution of 100	Soil	PEC	0,92mg/kg dry weight (d.w.)	0,171
ERC12a	No water discharge to the environment	Soil	PEC	5,4mg/kg dry weight (d.w.)	0,964

Workers

MEASE

Contributing Scenario	Specific conditions	Exposure routes	Level of Exposure	RCR

PROC21	---	Dermal worker exposure	0,99mg/m³	< 0,001
PROC21	---	Inhalation worker exposure	0,005mg/m³	0,0034

4. Guidance to Downstream User to evaluate whether he works inside the boundaries set by the Exposure Scenario

Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures.
Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.
Only properly trained persons shall make use of scaling methods while checking whether the OC and RMM are within the boundaries set by the ES
Tonnage calculations have been based on boron such that no RCR exceeds 0.97, using back calculations with the relevant PNEC's when necessary. The equivalent tonnage of product handled on site should be calculated from the conversion factors detailed in the product table. For those operations that handle a combination of borate compounds, the boron equivalent of the combined tonnage cannot exceed the site tonnage value.

Substance	Formula	Conversion factor for the equivalent dose of B (multiply by)
Boric acid	H_3BO_3	0,1748
Boric oxide	$B2O_3$	0,311
Disodium tetraborate anhydrous	$Na_2B_4O_7$	0,2149
Disodium tetraborate pentahydrate	$Na_2B_4O_7 \times 5H_20$	0,1484
Disodium tetraborate decahydrate	$Na_2B_4O_7 \times 10H_20$	0,1134
Disodium octoborate tetrahydrate	$Na_2B_8O_{13} \times 4H_20$	0,2096
Sodium metaborate (anhydrous)	$NaBO_2$	0,1643
Sodium metaborate (dihydrate)	$NaBO_2 \times 2H_20$	0,1062
Sodium metaborate (tetrahydrate)	$NaBO_2 \times 4H_20$	0,0784
Sodium pentaborate (anhydrous)	NaB_5O_8	0,2636
Sodium pentaborate (pentahydrate)	$NaB_5O_8 \times 5H_20$	0,1832

If measured data are not available, the DU may make use of an appropriate scaling tool such as MEASE (www.ebrc.de/mease.html) to estimate the associated exposure.

Additional good practice advice beyond the REACH Chemical Safety Assessment

Take care for general good hygiene and housekeeping.

1. Short title of Exposure Scenario 18: Industrial formulation		
Main User Groups	SU 3: Industrial uses: Uses of substances as such or in preparations at industrial sites	
Process categories	PROC1: Use in closed process, no likelihood of exposure PROC2: Use in closed, continuous process with occasional controlled exposure PROC3: Use in closed batch process (synthesis or formulation) PROC4: Use in batch and other process (synthesis) where opportunity for exposure arises PROC5: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact) PROC8a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities PROC8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities PROC9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing) PROC14: Production of preparations or articles by tabletting, compression, extrusion, pelettisation PROC15: Use as laboratory reagent PROC22: Potentially closed processing operations with minerals/metals at elevated temperature; industrial setting PROC23: Open processing and transfer operations with minerals/metals at elevated temperature PROC26: Handling of solid inorganic substances at ambient temperature	
Environmental Release Categories	ERC3: Formulation in materials	
2.1 Contributing scenario controlling environmental exposure for: ERC3		
Product characteristics	Concentration of the Substance in Mixture/Article	Covers percentage substance in the product up to 100 % (unless stated differently).
Amount used	Annual amount per site	1150 ton(s)/year
Frequency and duration of use	Continuous exposure	100 days/year
Environment factors not influenced by risk management	Other data. Other information	Local freshwater dilution factor:: 10
Other given operational conditions affecting environmental exposure	Emission or Release Factor: Air	36562 g/ton of product
	Emission or Release Factor: Water	2000 g/ton of product
Technical conditions and measures at process level (source) to prevent release Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	Air	Required removal efficiency for air can be achieved using on-site technologies, either alone or in combination., Treatment of air emissions by bag filters, fabric filter and wet scrubber, Electrostatic precipitation, Cyclones, ceramic filters
	Water	Substance specific waste water treatment, Ion

Organizational measures to prevent/limit release from the site		exchange, Reverse osmosis (Degradation effectiveness: 40 - 90 %)
Conditions and measures related to sewage treatment plant	Type of Sewage Treatment Plant	Municipal sewage treatment plant
	The concentration of the substance should not exceed 1,75 mg/L in the municipal STP	
Conditions and measures related to external treatment of waste for disposal	Waste treatment	Send back to the process
	Disposal methods	Vacuum up spillage and collect in suitable containers for disposal., Dispose of as hazardous waste in compliance with local and national regulations.
2.2 Contributing scenario controlling worker exposure for: PROC2, PROC4		
Product characteristics	Concentration of the Substance in Mixture/Article	Covers concentrations more than 25%
	Physical Form (at time of use)	Solid, high dustiness
Amount used	The amount used per worker varies from activity to activity	
Frequency and duration of use	Exposure duration per day	60 min
Technical conditions and measures to control dispersion from source towards the worker	Provide local exhaust ventilation (LEV).(PROC4)	
Conditions and measures related to personal protection, hygiene and health evaluation	Wear protective gloves.	
	Limit the substance content in the mixture to 25 %.(PROC4)	
2.3 Contributing scenario controlling worker exposure for: PROC4, PROC5, PROC8b		
Activity	Covers reloading, mixing or compounding and associated activities in the Process Categories listed above	
Product characteristics	Concentration of the Substance in Mixture/Article	Covers percentage substance in the product up to 25 %.
	Physical Form (at time of use)	Powdered substance, granules
Amount used	Would vary by requirements and by facility	
Frequency and duration of use	Exposure duration per day	60 min
Other operational conditions affecting workers exposure	Indoor use.	
	Assumes activities are at ambient temperature.	
Technical conditions and measures to control dispersion from source towards the worker	Provide extract ventilation to points where emissions occur. Use closed dosing, transfer, sampling and application systems including connectors.	

	Single use bags can be opened by the use of sharp prongs at the discharge hopper. When the big bag is placed at the discharge hopper and lowered, the prongs cut into the base of the bag releasing the substance into the hopper. This removes the operator from the immediate vicinity and contributes to a reduction in exposure	
Organisational measures to prevent /limit releases, dispersion and exposure	Provide basic employee training to prevent/minimize exposures Regular inspection and maintenance of equipment and machines.	
Conditions and measures related to personal protection, hygiene and health evaluation	Wear suitable protective clothing. Safety shoes Safety glasses In case of dust or aerosol formation: use respiratory protection with approved filter (P2) or Particle filter:P3	
2.4 Contributing scenario controlling worker exposure for: PROC8a, PROC8b		
Activity	Equipment maintenance	
Product characteristics	Concentration of the Substance in Mixture/Article	Covers percentage substance in the product up to 100 % (unless stated differently).
	Physical Form (at time of use)	Powdered substance, granules
Amount used	Would vary by requirements and by facility	
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently).	
Other operational conditions affecting workers exposure	Indoor and outdoor use.	
Technical conditions and measures to control dispersion from source towards the worker	Worker in separate cabine without specific ventilation Provide extract ventilation to material transfer points and other openings.	
Organisational measures to prevent /limit releases, dispersion and exposure	Ensure operatives are trained to minimise exposures. Regular inspection and maintenance of equipment and machines.	
Conditions and measures related to personal protection, hygiene and health evaluation	Wear suitable protective clothing. Safety shoes Safety glasses In case of dust or aerosol formation: use respiratory protection with approved filter (P2) or Particle filter:P3	
2.5 Contributing scenario controlling worker exposure for: PROC8b		
Large scale		
Activity	Bulk loading (including marine vessel/barge, rail/road car and IBC loading)	
Product characteristics	Concentration of the Substance in	Covers percentage substance in the product up to 100 % (unless stated differently).

	Mixture/Article	
	Physical Form (at time of use)	Powdered substance, granular-like
Amount used	Amount per Use	40000 kg
Frequency and duration of use	Exposure duration	60 - 120 min
Other operational conditions affecting workers exposure	Indoor use.	
	Assumes activities are at ambient temperature.	
Technical conditions and measures to control dispersion from source towards the worker	Transport over pipes, technical barrel filling/emptying of barrel with automatic systems (suction pumps etc.) Use closed dosing, transfer, sampling and application systems including connectors. Exhaust ventilation equipped with filters. Provide dust filtration for air displaced from the silo during filling.	
Organisational measures to prevent /limit releases, dispersion and exposure	Provide basic employee training to prevent/minimize exposures Regular inspection and maintenance of equipment and machines.	
Conditions and measures related to personal protection, hygiene and health evaluation	Wear protective clothing. Wear protective gloves. Safety glasses Safety goggles	
2.6 Contributing scenario controlling worker exposure for: PROC9		
Product characteristics	Concentration of the Substance in Mixture/Article	Concentration of substance in product: 5% - 25%
	Physical Form (at time of use)	Solid, high dustiness, liquid
Frequency and duration of use	Exposure duration per day	> 240 min
Technical conditions and measures to control dispersion from source towards the worker	Provide local exhaust ventilation (LEV).	
Conditions and measures related to personal protection, hygiene and health evaluation	Wear protective gloves.	
2.7 Contributing scenario controlling worker exposure for: PROC9		
small scale		
Product characteristics	Concentration of the Substance in Mixture/Article	Covers percentage substance in the product up to 40 %
	Physical Form (at time of use)	solid, liquid, pasty
Amount used	The amount used per worker varies from activity to activity	
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently).	

Other operational conditions affecting workers exposure	Indoor use.	
Technical conditions and measures to control dispersion from source towards the worker	Automate activity where possible. Provide extract ventilation to points where emissions occur. Provide local exhaust ventilation (LEV). Provide a good standard of general ventilation. Natural ventilation is from doors, windows etc. Controlled ventilation means air is supplied or removed by a powered fan.	
Organisational measures to prevent /limit releases, dispersion and exposure	Ensure operatives are trained to minimise exposures. Regular inspection and maintenance of equipment and machines.	
2.8 Contributing scenario controlling worker exposure for: PROC14		
Product characteristics	Concentration of the Substance in Mixture/Article	Covers percentage substance in the product up to 25 %.
	Physical Form (at time of use)	Powdered substance, granular-like
Amount used	The amount used per worker varies from activity to activity	
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently).	
Other operational conditions affecting workers exposure	Indoor use.	
Technical conditions and measures to control dispersion from source towards the worker	Transfer via enclosed lines. Provide local exhaust ventilation (LEV). Provide a good standard of general ventilation. Natural ventilation is from doors, windows etc. Controlled ventilation means air is supplied or removed by a powered fan.	
Organisational measures to prevent /limit releases, dispersion and exposure	Provide basic employee training to prevent/minimize exposures Regular inspection and maintenance of equipment and machines.	
Conditions and measures related to personal protection, hygiene and health evaluation	Wear suitable protective clothing. Safety shoes Safety glasses In case of dust or aerosol formation: use respiratory protection with approved filter (P2) or Particle filter:P3	
2.9 Contributing scenario controlling worker exposure for: PROC15		
Product characteristics	Concentration of the Substance in Mixture/Article	Concentration of substance in product: 5% - 25%
	Physical Form (at time of use)	Powdered substance, granular-like
Amount used	Amount per Use	1 kg
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently).	

Technical conditions and measures to control dispersion from source towards the worker	Handle in a fume cupboard or under extract ventilation.	
Organisational measures to prevent /limit releases, dispersion and exposure	Ensure operatives are trained to minimise exposures. Regular inspection and maintenance of equipment and machines.	
Conditions and measures related to personal protection, hygiene and health evaluation	Wear suitable protective clothing. Safety shoes Safety glasses Wear protective gloves.	

2.10 Contributing scenario controlling worker exposure for: PROC1, PROC2, PROC3, PROC22, PROC23

Activity	Potentially closed processing operations at elevated temperature.	
Product characteristics	Concentration of the Substance in Mixture/Article	Covers percentage substance in the product up to 100 % (unless stated differently).
	Physical Form (at time of use)	Powdered substance, granules
Amount used	The amount used per worker varies from activity to activity	
Frequency and duration of use	Frequency of use	24 hours/day
	Frequency of use	365 days/year
Other operational conditions affecting workers exposure	Indoor use.	
	Operation is carried out at elevated temperature (> 20°C above ambient temperature).	
Technical conditions and measures to control dispersion from source towards the worker	Automate activity where possible. Provide local exhaust ventilation with enclosure of the source Where there are breaches in the closed system, such as pouring and removal of slag in metal production, LEV is used to control fumes. Worker in separate cabine without specific ventilation	
Organisational measures to prevent /limit releases, dispersion and exposure	Provide basic employee training to prevent/minimize exposures Regular inspection and maintenance of equipment and machines. Workers in the risky process/areas identified should be trained a) to avoid to work without respiratory protection and b) to understand the irritating properties and, especially, the respiratory inhalation effects and c) to follow the safer procedures instructed by the employer.	
Conditions and measures related to personal protection, hygiene and health evaluation	In case of dust or aerosol formation: use respiratory protection with approved filter (P2) or Particle filter:P3 Use battery-powered air fed helmets Operatives wear overalls or heavy heat resistant clothing	
	Equipment cleaning and maintenance	Wear protective gloves. Safety glasses Safety goggles

2.11 Contributing scenario controlling worker exposure for: PROC23

Product characteristics	Concentration of the Substance in Mixture/Article	Concentration of substance in product: 1% - 5%
	Physical Form (at time of use)	Solid, low dustiness
Frequency and duration of use	Exposure duration per day	< 15 min
Technical conditions and measures to control dispersion from source towards the worker	Provide local exhaust ventilation (LEV).	
Conditions and measures related to personal protection, hygiene and health evaluation	Wear respiratory protection. With respiratory mask APF 40	

2.12 Contributing scenario controlling worker exposure for: PROC1, PROC2, PROC3

Product characteristics	Concentration of the Substance in Mixture/Article	Covers percentage substance in the product up to 100 % (unless stated differently).
	Physical Form (at time of use)	Powdered substance, granules
Amount used	Amount per Shift	1000 kg
	The amount used per worker varies from activity to activity	
Other operational conditions affecting workers exposure	Indoor use.	
	Assumes activities are at ambient temperature.	
Technical conditions and measures to control dispersion from source towards the worker	Use closed dosing, transfer, sampling and application systems including connectors. Provide extraction ventilation at points where emissions occur. Where there are breaches in the closed system, such as pouring and removal of slag in metal production, LEV is used to control fumes.	
Organisational measures to prevent /limit releases, dispersion and exposure	Provide basic employee training to prevent/minimize exposures Regular inspection and maintenance of equipment and machines.	
Conditions and measures related to personal protection, hygiene and health evaluation	Wear suitable protective clothing. Safety shoes Safety glasses In case of dust or aerosol formation: use respiratory protection with approved filter (P2) or Particle filter:P3	

3. Exposure estimation and reference to its source

Environment

Estimation based on workplace measurements

Contributing Scenario	Specific conditions	Compartment	Value	Level of Exposure	RCR

ERC3	---	Soil	PEC	5,2mg/kg dry weight (d.w.)	0,97
ERC3	---	Water	PEC	1206µg/L	0,597
ERC3	---	Fresh water sediment	PEC	1,67mg/kg dry weight (d.w.)	0,93

Workers

PROC1, PROC2, PROC3, PROC4, PROC5, PROC8b, PROC22, PROC23 Workplace measurements
PROC2, PROC4, PROC8a, PROC9, PROC14, PROC15, PROC23 MEASE
PROC8b Advanced REACH Tool (ART model)
PROC1, PROC8a, PROC8b, PROC9, PROC14, PROC15, PROC23 Advanced REACH Tool (ART model) (inhalative exposure)

Contributing Scenario	Specific conditions	Exposure routes	Level of Exposure	RCR
PROC4	Concentrations >= 0% - <= 25%	Dermal worker exposure	0,48mg/kg bw/day	---
PROC2	---	Dermal worker exposure	0,005mg/kg bw/day	---
PROC2	---	Inhalable dust.	0,002mg/kg/day	---
PROC2	Concentrations >= 0% - <= 25%	Inhalation worker exposure	0,001mg/kg bw/day	---
PROC4, PROC5	90th percentile value, small scale	Inhalation worker exposure	0,78mg/m³	0,54
PROC4	Solid, high dustiness., during 15 mins - 1 hour, small scale	Dermal worker exposure	0,48mg/kg bw/day	< 0,001
PROC4, PROC5, PROC8b	90th percentile value, With respiratory protection, half mask	Inhalation worker exposure	0,2mg/m³	0,14
PROC4	Solid, high dustiness., during 15 mins - 1 hour, Large scale	Dermal worker exposure	4,8mg/kg bw/day	0,001
PROC8a, PROC8b	90th percentile value, no respiratory protection (RPE)	Inhalation worker exposure	1,33mg/m³	0,92
PROC8a	Solid, high dustiness., during 1 - 4 hours	Dermal worker exposure	0,173mg/kg bw/day	< 0,001
PROC8b	---	Inhalation worker exposure	0,016mg/m³	0,011
PROC8b	with local exhaust ventilation, Outdoor use., 90th percentile value	Inhalation worker exposure	0,03mg/m³	0,021
PROC2	Solid, high dustiness., <	Dermal worker exposure	0,024mg/kg bw/day	---

	15 min/day			
PROC9	Solid, high dustiness., Concentration of substance in product: 5% - 25%	Dermal worker exposure	0,144mg/kg bw/day	---
PROC9	liquid, Concentration of substance in product: 5% - 25%	Dermal worker exposure	0,014mg/kg bw/day	---
PROC9	90th percentile value	Inhalation worker exposure	0,001 - 0,4mg/m³	---
PROC9	90th percentile value, liquid	Inhalation worker exposure	0,01mg/m³	---
PROC14	90th percentile value	Inhalable dust.	7mg/m³	---
PROC14	> 4 h (half tour)	Dermal worker exposure	0,024mg/kg bw/day	---
PROC15	90th percentile value	Inhalation worker exposure	0,16mg/m³	---
PROC15	Solid, high dustiness., during 15 mins - 1 hour, with local exhaust ventilation, without gloves	Dermal worker exposure	0,014mg/kg bw/day	---
PROC1, PROC2, PROC3, PROC22, PROC23	90th percentile value, without respiratory protection	Inhalation worker exposure	0,08mg/m³	0,06
PROC23	Solid, low dustiness., Concentration of substance in product : 0% - 5%, during <15 mins	Inhalation worker exposure	0,01mg/m³	0,0069
PROC2	Solid, high dustiness., during 15 mins - 1 hour	Dermal worker exposure	0,048mg/kg bw/day	< 0,001
PROC23	With respiratory mask APF 40	Inhalation worker exposure	< 0,001mg/m³	---
PROC1, PROC2, PROC3	90th percentile value, no respiratory protection (RPE)	Inhalation worker exposure	0,08mg/m³	0,06
PROC2	cleaning, during 15 mins - 1 hour	Dermal worker exposure	0,048mg/kg bw/day	< 0,001

4. Guidance to Downstream User to evaluate whether he works inside the boundaries set by the Exposure Scenario

Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures.
Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that

risks are managed to at least equivalent levels.
Only properly trained persons shall make use of scaling methods while checking whether the OC and RMM are within the boundaries set by the ES
Tonnage calculations have been based on boron such that no RCR exceeds 0.97, using back calculations with the relevant PNEC's when necessary. The equivalent tonnage of product handled on site should be calculated from the conversion factors detailed in the product table. For those operations that handle a combination of borate compounds, the boron equivalent of the combined tonnage cannot exceed the site tonnage value.

Substance	Formula	Conversion factor for the equivalent dose of B (multiply by)
Boric acid	H_3BO_3	0,1748
Boric oxide	$B2O_3$	0,311
Disodium tetraborate anhydrous	$Na_2B_4O_7$	0,2149
Disodium tetraborate pentahydrate	$Na_2B_4O_7 \times 5H_20$	0,1484
Disodium tetraborate decahydrate	$Na_2B_4O_7 \times 10H_20$	0,1134
Disodium octoborate tetrahydrate	$Na_2B_8O_{13} \times 4H_20$	0,2096
Sodium metaborate (anhydrous)	$NaBO_2$	0,1643
Sodium metaborate (dihydrate)	$NaBO_2 \times 2H_20$	0,1062
Sodium metaborate (tetrahydrate)	$NaBO_2 \times 4H_20$	0,0784
Sodium pentaborate (anhydrous)	NaB_5O_8	0,2636
Sodium pentaborate (pentahydrate)	$NaB_5O_8 \times 5H_20$	0,1832

If measured data are not available, the DU may make use of an appropriate scaling tool such as MEASE (www.ebrc.de/mease.html) to estimate the associated exposure.
For further information on the assessment method, see: http://www.advancedreachtool.com

Additional good practice advice beyond the REACH Chemical Safety Assessment

Take care for general good hygiene and housekeeping.

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VAT number	BE0405317567	NL001375945B01
recall procedure available	Yes	
emergency number (24/365)	+32 (0)56 77 69 44	+31 (0)78 6544 944
QUALITY SYSTEMS		
ISO 9001	Yes	Yes
ISO 14001	Yes	Yes
ISO 22000	Yes	Yes
FSSC 22000	Yes	Yes
GMP+ -feed	Yes	Yes
OHSAS18001	-	Yes
ESAD	Yes	Yes
other	-	AEO