

1. Identifikace látky/směsi a společnosti/podniku**1.1 Identifikátor výrobku**

Obchodní název	Karbid vápníku
REACH registrační číslo	01-2119494719-18-0001
Chemický název (IUCLID)	calcium acetylide
Indexové číslo	006-004-00-9
Sumární vzorec	CaC ₂
Synonymy:	calcium carbide, carburo de calcio, calcium acetylide, acetylenogen, calcium dicarbide, ethyne calcium deriv.
Chemická charakteristika:	anorganická jednosložková látka

1.2 Příslušná určená použití látky nebo směsi a nedoporučená použití

Použití:	Karbid vápníku se používá jako surovina nebo meziprodukt pro výrobu acetylenu a kyanamidu vápenatého. Používá se v metalurgii pro odsíření horkých kovů ve vysoké peci, ve slévárnách železa a oceli.
Použití vyžadující pozornost:	Použití zaznamenané v minulosti pro podporu zralosti ovoce a použití do karbidových lamp (obě použití zahrnovaly vyvíjení acetylenu z karbidu vápníku). Tyto použití vyžadují pozornost a nebyly hodnoceny.

1.3 Podrobné údaje o dodavateli bezpečnostního listu

Dodavatel / výrobce	Biom s.r.o.
Sídlo	Plavnická 39, Kamenný Újezd
Telefon:	387 412 211 Provozní doba: 6.00 – 12.00; 12.30 – 14.00
Fax / e-mail:	387 412 211 / biomsro@tiscali.cz
1.4 Telefonní číslo pro naléhavé situace ČR:	Toxikologické informační středisko, Na Bojišti 1, 128 08 Praha 2, telefon nepřetržitě 224 919 293, 224 915 402, (nebo pouze ve dne 224 914 575)

2. Identifikace nebezpečnosti**2.1 Klasifikace směsi**

Směs je dle směrnice 1999/45/EHS a nařízení 1272/2008/ES klasifikována jako nebezpečná. Klasifikace látek ve směsi viz oddíl 3.

Klasifikace dle 1272/2008/ES (CLP)

Třídy, kategorie, standardní věty o nebezpečnosti

Water-react. Flam. Gas 1 / při styku s vodou uvolňuje hořlavé plyny
 H260 Při styku s vodou uvolňuje hořlavé plyny, které se mohou samovolně vznítit.
 Skin Irrit 2 / dráždivost pro kůži kat. 2
 H315 Dráždí kůži.
 Eye Dam. 1 / vážné poškození očí
 H318 Způsobuje vážné poškození očí.
 STOT SE 3 / toxicita pro specifické cílové orgány – jednorázová expozice
 H335: Může způsobit podráždění dýchacích cest.

Klasifikace dle směrnice 67/548/EHS

Písmenné označení nebezpečných vlastností, R věty

F vysoce hořlavý
 R15 Při styku s vodou uvolňuje extrémně hořlavé plyny.

Nejzávažnější nepříznivé účinky fyzikálně-chemické a účinky na zdraví člověka a životní prostředí

Při styku z vodou uvolňuje extrémně hořlavý plyn.

2.2 Prvky označení**Dle CLP:**

Signální slovo:	nebezpečí
Standardní věty nebezpečnosti	H260: Při styku s vodou uvolňuje hořlavé plyny, které se mohou samovolně vznítit H318: Způsobuje vážné poškození očí. H315: Dráždí kůži. H335: Může způsobit podráždění dýchacích cest.

Nebezpečné složky Karbid vápníku

Pokyny pro bezpečné zacházení

P280: Používejte ochranné rukavice/ochranný oděv/ochranné brýle/obličejový štít.
 P223: Chraňte před možným stykem s vodou kvůli prudké reakci a možnému náhlému vzplanutí.
 P312: Necítíte-li se dobře, volejte TOXIKOLOGICKÉ INFORMAČNÍ STŘEDISKO nebo lékaře.
 P302+P352: Při styku s kůží: omyjte velkým množstvím vody a mýdla.
 P304+P340: PŘI VDECHNUTÍ: Přeneste postiženého na čerstvý vzduch a ponechte jej v klidu v poloze usnadňující dýchání.
 P305+P351+P338: PŘI ZASAŽENÍ OČÍ: Několik minut opatrně vyplachujte vodou. Vyjměte kontaktní čočky, jsou-li nasazeny a pokud je lze vyjmout snadno. Pokračujte ve vyplachování.
 P403+P233: Skladujte na dobře větraném místě. Uchovávejte obal těsně uzavřený.

Dle 67/548/EHS

Výstražný symbol nebezpečnosti:



vysoce hořlavý

R – věty:

R 15 Při styku s vodou uvolňuje extrémně hořlavé plyny

S – věty:

S 7/8 Uchovávejte obal těsně uzavřený a suchý

S 24/25 Zamezte styku s kůží a očima

S 26 Při zasažení očí okamžitě důkladně vypláchněte vodou a vyhledejte lékařskou pomoc

S 43 V případě požáru použijte suchý prach nebo písek. Nikdy nepoužívat vodu.

3. Složení / informace o složkách

Složka	číslo CAS: Einecs: čís. index.:	Obsah v % hm.:	Klasifikace 67/548/EHS	Klasifikace 1272/2008/ES
Karbíd vápničku	75-20-7 200-848-3 006-004-00-9	75-80	F R15	Water-react. Flam. Gas 1; H260 Skin Irrit. 2; H315 Eye Dam 1 H318 STOT SE 3 H335
Oxid vápenatý	1305-78-8 215-138-9	15-20	C R34	-----
Uhlík	7440-44-0 231-153-3	0,3-8	-	-----

úplné znění R vět, H vět - viz bod 16; expoziční limity jednotlivých látek pokud jsou k dispozici – viz bod 8;

4. Pokyny pro první pomoc

4.1 Popis první pomoci: V případě nehody, nebo necítíte-li se dobře vyhledejte lékařskou pomoc.

Pokud postižený nedýchá – okamžitě zahájit umělé dýchání. Při zástavě srdce – okamžitě zahájit nepřímou masáž srdce. Při bezvědomí – uložit do stabilizované polohy na boku. Zajistěte čerstvý vzduch a omezte aktivní pohyb. Při poruchách dýchání zahájit umělé dýchání, případně podat kyslík. Vyhledejte lékaře a poskytněte informace o výrobku.

Při nadýchání:

Při styku s kůží:

Oplachujte proudem vody nejméně 15 minut. Pokožku ošetřete vhodným ochranným krémem. Vyhledejte lékaře. Při popálení roztaveným produktem okamžitě ochlazujte pokožku co nejdříve studenou vodou. Neodstraňujte oblečení přilepené k pokožce. Ihned vyhledejte lékaře.

Při zasažení očí:

Ihned promývejte proudem čisté vody po dobu minimálně 15 minut s rozevřenými očními víčky. Bezpodmínečně vyhledejte lékaře.

Při požití:

Není relevantní.

4.2 Nejdůležitější akutní opožděné symptomy a účinky

Pálení a bolesti očí, nosu, hrtanu a kůže. Dráždivý kašel, dýchavičnost. Nepředpokládají se systémové toxické účinky. Působením vody vzniká acetylen a hydroxid vápenatý. Je třeba vzít v úvahu možnost poleptání hydroxidem vápenatým (na sliznicích a vlhkých místech kůže). Zvláště ohrožena je oční rohovka. Prach dráždí oči a dýchací cesty a může způsobit poleptání kůže. Působením vody nebo vlhkosti vzniká acetylen s omamným účinkem. V tomto případě je obraz otravy daný nečistotami technického výrobku.

5. Opatření pro hašení požáru

- 5.1 Hasiva -vhodná** Suchý prášek, suchý písek, suchá zemina
- nevhodná** Voda, oxid uhličitý, pěna
- 5.2 Zvláštní nebezpečnost** Vznik nebezpečných rozkladných produktů. Výrobek samotný je nehořlavý, ale při styku s vodou a vlhkým prostředím uvolňuje extrémně hořlavý plynný acetylen a rychle tvoří výbušné směsi se vzduchem. Při hašení je nutné sledovat povětrnostní podmínky (směr a rychlost větru). Zajistit měření mezi výbušnosti. Přísně dbát bezpečnostních opatření v ochranném pásmu. Hasit pouze z velké vzdálenosti.
- 5.3 Pokyny pro hasiče:** Nezávislý dýchačcí přístroj a protichemický oděv je nutný.

6. Opatření v případě náhodného úniku

- 6.1 Opatření na ochranu osob, ochranné prostředky a nouzové postupy** Uzavřít místo nehody, uhasit otevřený oheň, odstranit všechny zdroje zapálení. Zabezpečit prostor proti vstupu nepovolaných osob. Světelné zdroje v nevýbušném provedení a nejiskřící zařízení. Používat osobní ochranné prostředky k ochraně kůže, dýchacích cest a očí. Použít respirátor proti prachu, keprový impregnovaný oblek a ochranné brýle. Pro pohotovostní personál: Použít úplnou ochranu – ochranný oděv, dýchačcí přístroj.
- 6.2 Opatření na ochranu životního prostředí** Zamezte úniku do životního prostředí. Při úniku do kanalizace nebo odpadních vod hrozí nebezpečí výbuchu, nebo vzniku omamných vzdušných směsí.
- 6.3 Metody a materiál pro omezení úniku a pro čištění** Zastavte únik, pokud je to možné. Zamezte úniku všemi dostupnými prostředky. Pokud se látka dostane do vodního toku nebo kanalizace, informujte příslušné orgány. Uniklý materiál opatrně posbírat do uzavíratelných nádob. Po navlhčení produktu se velmi rychle utvoří plynný acetylen, proto je třeba při dopravě brát v úvahu velkou tvorbu plynu v nádobě.
- 6.4 Odkaz na jiné oddíly** Informace o kontrole expozice a osobních ochranných prostředcích viz oddíl 8; informace o zneškodňování viz oddíl 13.

7. Zacházení a skladování

- 7.1 Opatření pro bezpečné zacházení** Zabránit kontaktu s vlhkostí a jakémukoli styku s vodou, aby nedošlo k prudkým reakcím a vznícení. Zpracovat pod inertním plynem. Při práci nejzte, nepijte, nekuřte a používejte předepsané osobní ochranné prostředky. Používejte předepsané osobní ochranné prostředky (viz oddíl 8).
- 7.2 Podmínky pro bezpečné skladování včetně neslučitelných látek a směsí** Skladujte v suchých, těsně uzavřených nádobách (v plechových sudech, ocelových kontejnerech). Nádoby musí být hermeticky uzavřené, aby se zabránilo průniku vzdušné vlhkosti ke karbidu. Skladujte na suchém dobře větraném místě.
- 7.3 Specifické konečné použití** -

8. Omezování expozice / osobní ochranné prostředky

- 8.1 Kontrolní parametry** dle 361/2007 Sb., ve znění pozdějších předpisů nebo 98/24/ES v platném znění
- 8.2 Limitní hodnoty expozice** karbid vápníku
- Přípustný expoziční limit není stanoven.
- oxid vápenatý
- Přípustný expoziční limit PEL: 2 mg/m³
- Nejvyšší přípustná koncentrace NPK-P: 4 mg/ m³
- Faktor přepočtu z mg/m³ na ppm (25 °C, 100 kPa): není k dispozici
- 8.2 Omezování expozice**
- 8.2.1 Vhodné technické kontroly** Větráním nebo odsáváním pracovního prostoru, je nutné zamezit či minimalizovat obsah prachu v ovzduší. Zamezte styku s kůží a sliznicemi.
- a) **Ochrana dýchacích cest** Respirátor.
- b) **Ochrana rukou** Ochranné rukavice.
- c) **Ochrana očí** Ochranné brýle.
- d) **Ochrana kůže** Ochranný oděv.
- 8.2.2 Omezování expozice životního prostředí** Postupujte v souladu se zákonem na ochranu ovzduší, vodním zákonem, zákonem o odpadech a dalšími souvisejícími předpisy. Zamezte úniku přípravku do kanalizace a životního prostředí. Hodnoty PEC viz oddíl 11.

9. Fyzikální a chemické vlastnosti**9.1 Informace o základních fyzikálních a chemických vlastnostech**

Skupenství (při 20°C)	prášek, nebo kousky nepravidelných tvarů
Barva:	tmavošedá až fialovočerná
Zápach (vůně)	po acetylénu
pH	zásadité
Teplota (rozmezí teplot) varu (°C)	2300 (101,3 kPa)
Teplota (rozmezí teplot) tání (°C)	2300 (101,3 kPa)
Teplota rozkladu (°C)	neuvádí se
Bod vzplanutí (°C)	neuvádí se
Hořlavost	nehořlavý (látka produkuje hořlavý plyn při styku s vlhkostí)
Sklon k samovznícení	nemá
Nebezpečí výbuchu	neuvádí se (látka produkuje hořlavý plyn při styku s vlhkostí)
Výbušnost	neuvádí se
Meze výbušnosti: dolní mez (% obj.)	---
Meze výbušnosti: horní mez (% obj.)	---
Tlak par (při 25 °C) (kPa)	0,1
Měrná hmotnost (g/cm ³)	2,2 - 2,7
Rozpustnost ve vodě	neuvádí se (reaguje s vodou)
Rozdělovací koeficient n-oktanol/voda	neuvádí se (anorganická látka)
Viskozita	neuvádí se
9.2 Další informace	Při styku s vodou uvolňuje acetylén
Údaje pro acetylén	
Bod vzplanutí (°C)	-17,8
Teplota vznícení (°C)	321
Výbušnost	
a) spodní mez výbušnosti	1,5 % obj. acetylénu
b) horní mez výbušnosti	82 % obj. acetylénu

10. Stálost a reaktivita

10.1 Reaktivita	Při styku s vodou prudce reaguje za vzniku vysoce hořlavého plynného acetylénu a velkého množství tepla. Reakcí 1 kg karbidu vápníku vzniká asi 300 ml plynného acetylénu. Acetylén je nestálý při teplotě okolí. Acetylén rychle utvoří se vzduchem výbušné směsi. Vznícení způsobují horké povrchy, jiskry, otevřený oheň. Velmi náchylná k výbuchu je reakce vyvolaná přidáváním karbidu vápníku do roztoku dusičnanu stříbrného. Směs peroxidu sodíku a karbidu vápníku po zahřátí exploduje reakce s mědí a mosazí vedou k tvorbě výbušných sloučenin. Reakcí s fluoridem draselným vzniká kovový draslík. Reakční produkt – acetylén tvoří se solemi některých těžkých kovů silně výbušné sloučeniny a reaguje také prudce s kyselinami.
10.2 Chemická stabilita	Stabilní v suchém prostředí. Reaguje se vzdušnou vlhkostí za vzniku hořlavého acetylénu.
10.3 Možnost nebezpečných reakcí	Viz pododdíl reaktivita.
10.4 Podmínky, kterým je třeba zabránit	Zabránit styku s vodou a s vlhkým prostředím.
10.5 Neslučitelné materiály	Voda, dusičnan stříbrný, peroxid vodíku, měď, mosaz, soli některých těžkých kovů, fluorid draselný, kyseliny – nebezpečí výbuchu.
10.6 Nebezpečné produkty rozkladu	Výbušný plynný acetylén C ₂ H ₂ , velmi toxické plyny fosfan (hydrid fosforu) PH ₃ a sulfan (sirovodík) H ₂ S.

11. Toxikologické informace**11.1 Informace o toxikologických účincích**

a) akutní toxicita	Informace o akutní toxicitě výrobku nejsou známy.
b) dráždivost	1% roztok karbidu vápníku ve vodě má pH 12,48 dráždivost pro kůži (<i>in vivo</i> zajíc): dráždí dráždivost pro oči (<i>in vivo</i> zajíc): ireversibilní leze v oku

c) žíravost	dle výsledku hodnocení pH karbidu vápníku má být tato látka hodnocena jako dráždivá.
d) senzibilizace	Informace nejsou k dispozici.
e) toxicita opakované dávky	Informace nejsou k dispozici.
f) karcinogenita	Neexistují přesvědčivé důkazy o karcinogenitě.
g) mutagenita	Neexistují přesvědčivé důkazy o mutagenitě.
h) toxicita pro reprodukci	Neexistují přesvědčivé důkazy o toxicitě pro reprodukci, vývojové toxicitě nebo teratogenitě.

DNEL: Dostatečné údaje k výpočtu DNEL nejsou k dispozici, pro charakterizaci rizika se proto indikativně používají expoziční limity pro pracovní prostředí pro hydroxid vápenatý. TWA: 5 mg/m³ (8 hodin). Expozice v oblasti tvorby prachu je maximálně 4 hodiny, takže tato hodnota může být upravena na 10 mg/m³. ČR: PEL: 2 mg/m³; NPK-P: 4 mg/m³; neměla by být překročena hodnota NPK-P.

Poznámka:

DNEL - odvozená úroveň, při které nedochází k nepříznivým účinkům (derived no-effect level); TWA- časově vážený průměr (time weighted average); PEL - přípustné expoziční limity: celosměnový časově vážený průměr (8 hodin); NPK-P - nejvyšší přípustná koncentrace (15 minutový časově vážený průměr)

12. Ekologické informace

Toxicita

Karbid vápníku se při styku s vlhkostí rychle rozkládá za vzniku acetylénu a hydroxidu vápenatého. Mimo jiné karbid vápníku obsahuje jako nečistotu oxid vápenatý, který se také hydrolyzuje na oxid vápenatý. Hydroxid vápenatý je alkalický, proto má schopnost ovlivňovat pH. Organismy vodního prostředí jsou přizpůsobivé změnám pH, pH vodního prostředí se může pohybovat od 6 v měkké vodě do 9 v tvrdé vodě. Pufrační kapacita prostředí bude neutralizovat hydroxid vápenatý vzniklý z karbidu vápníku. Acetylén je vysoce těkavý, přesto je třeba zvážit jeho vztah k ekotoxicitě. Ostatní nečistoty jsou ve velmi malých množstvích, proto nemají vliv na ekotoxicitu výrobku.

Toxicita pro ryby Údaje nejsou k dispozici.

Toxicita pro obratlovce a bezobratlé Údaje nejsou k dispozici.

Perzistence a rozložitelnost posouzení PBT/ vPvB Bioakumulační potenciál: Karbid vápníku neobsahuje složky, které mají potenciál k bioakumulaci, proto nemá PBT ani vPvB vlastnosti.

Rozložitelnost Abiotická – hydrolyzou vzniká acetylén a hydroxid vápenatý.

Mobilita v půdě Po úniku do životního prostředí reaguje s vodou nebo se vzdušnou vlhkostí za vzniku plynného acetylénu a hydroxidu vápenatého.

13. Pokyny pro odstraňování

Metody nakládání s odpady Doporučený způsob odstraňování: Nepotřebný materiál uložit do uzavřených nádob. Dodržovat platné zákony a předpisy o odpadech. Zbytky nevypouštět do kanalizace a vodních toků. Odvážet v uzavřených nádobách. Při zvlhčení se vytvoří plynný acetylén. V tomto případě odstranit zápalné zdroje a při přepravě respektovat velkou tvorbu plynů v nádobě.

Obaly Doporučený způsob odstranění znečištěných obalů: prázdné a dokonale vyprázdněné obaly je možné recyklovat. Zbytky výrobku v obalech mohou reagovat se vzdušnou vlhkostí za vzniku plynného acetylénu. V tomto případě odstranit zápalné zdroje. Přidělit odpovídající kód odpadu podle Katalogu odpadů je záležitostí původce odpadu.

14. Informace pro přepravu

ADR/RID

UN č.	1402
Identifikační číslo nebezpečnosti (Kemler kód)	423
ADR/RID třída:	4.3
Přepravní název	Karbid vápníku
Chemický název	Calcium carbide
Klasifikační kód	W2
Bezpečnostní značka	4.3





Obalová skupina	II
Limitované množství (LQ)	LQ11

Karbid vápníku

Datum vydání 04.03.2015

Verze: 1.0

Kód omezení pro tunely	(D/E)
Vyňaté množství	E2
Dopravní kategorie	2
WGK	1
Číslo celního sazebníku	284910
IMDG	
UN č.	1402
Třída	4.3
Látka znečišťující moře	ne
Přepravní název	Karbíd vápníku
Chemický název	Calcium carbide
Bezpečnostní značka	4.3
	
Obalová skupina	II
EmS číslo	F-G, S-N
Limitované množství	500 g
Zvláštní ustanovení	951
Vyňaté množství	E2
ICAO/IATA	
UN č.	1402
Třída	4.3
Přepravní název	Karbíd vápníku
Chemický název	Calcium carbide
	
Bezpečnostní značka	4.3
Obalová skupina	II
Limitované množství - pasažér	5 kg
IATA balící instrukce- pasažér	416
IATA balící instrukce -Cargo	418
IATA maximální množství	15 kg
IATA maximální množství-Cargo	50 kg

15. Informace o předpisech**15.1 Nařízení týkající se bezpečnosti, zdraví a životního prostředí/specifické právní předpisy týkající se látky nebo směsi**

Zákon č. 262/2006 Sb. (Zákoník práce) a navazující předpisy, např. vyhláška 288/2003 Sb.)

Zákon č. 309/2006 Sb., další požadavky bezpečnosti a ochrany zdraví při práci a navazující předpisy, např. nařízení vlády 361/2007 Sb.)

Zákon č. 350/2011 Sb., chemický zákon a navazující předpisy

Nařízení (ES) č. 1907/2006, o registraci, hodnocení, povolování a omezování chemických látek (REACH)

Nařízení (ES) č. 1272/2008, o klasifikaci, označování a balení chemických látek a směsí (CLP)

Směrnice 67/548/EHS, klasifikace, balení a označování nebezpečných látek (DSD)

Stupeň ohrožení pro vodu: WGK 1 – slabě ohrožuje vodu.

15.1 Posouzení chemické bezpečnosti

Hodnocení chemické bezpečnosti bylo provedeno v rámci registrace látky dle nařízení REACH

16. Další informace**Plné znění H a R vět z oddílu 2 a 3:**

H315 Dráždí kůži. H335 Může způsobit podráždění dýchacích cest. H318 Způsobuje vážné poškození očí.

H260 Při styku s vodou uvolňuje hořlavé plyny, které se mohou samovolně vznítit.

R15 Při styku s vodou uvolňuje extrémně hořlavé plyny. R34 Způsobuje poleptání

Uvedené informace se týkají pouze výše uvedeného výrobku a nemusí být platné při použití s jiným produktem nebo v jiném procesu. Informace jsou založeny na dnešním stavu našich znalostí a jsou podány v dobré víře. Nejsou zárukou vlastností výrobku a neprokazují žádný smluvní vztah. Zůstává na vlastní odpovědnosti uživatele, aby se ujistil, že informace jsou relevantní a úplné pro jeho speciální použití tohoto produktu. Uživatel je povinen dodržovat stávající zákony a předpisy.

Attachment EXPOSURE SCENARIOS / MSDS/ CALCIUM CARBIDE/

Exposure scenarios are presented for the production of calcium carbide and the two identified uses described in Section 2:

A) Use of calcium carbide in the production of acetylene and calcium cyanide.

B) Use of calcium carbide in metallurgy.

Any tonnages discussed in this document are generic and should not be taken as relating to any specific site. The scenarios and releases described in this chapter are written in accordance with the REACH Guidance and are taken mainly from or based on the following sources:

- Reference Document on Best Available Techniques (BAT) for the Manufacture of Large Volume Inorganic Chemicals.
- Information provided by calcium carbide consortium members.
- Site visits to a calcium carbide production plant and industries making use of calcium carbide.

The uses and relevant descriptor codes for each identified exposure scenario are summarised in Table 1.1.

Exposure Scenario 1 describes the production of calcium carbide.

Exposure Scenario 2 describes the milling/formulation of calcium carbide products.

Exposure Scenario 3 describes the industrial use of calcium carbide as a process material or intermediate in the production of acetylene and calcium cyanide.

Exposure Scenario 4 describes use of calcium carbide in metallurgy (use as a blast furnace hot metal desulfuriser, use as a foundry iron desulfuriser and use during steelmaking).

It should be noted that all concentrations in the soil compartment are upper limits; the significance of this is discussed in Section 10.1.

No calculation of regional releases is required, for reasons explained in Section 9.5.

Table1.1, Overview on exposure scenarios and coverage of substance life cycle

ES number	Volume (tonnes)	Consumer use			Resulting life cycle stage		Linked to Identified Use	Sector of Use (SU)	Preparation Category (PC)	Process category (PROC)	Article category (AC)
		Manufacture	Formulation	Consumer use	Service life (for articles)	Waste stage					
ES 1	300 000	x						SU 3 (main user group), SU 8 (end-use)	-	PROC 2, 8b	-
ES 2	Confidential		x					SU 3 (main user group), SU 10 (end-use)	PC 20	PROC 5, 8b	-
ES 3	Confidential			x				SU 3 (main user group), SU 8 (end-use)	PC 19	PROC 2, 8b	N/A
ES 4	Confidential			x				SU 3 (main user group), SU 14 (end-use)	PC 20	PROC 22 ¹	N/A

Notes: 1Transfer of substance from/to vessels/large containers at dedicated facilities (PROC8b) is not applicable because high levels of containment are used in automated systems.

ES 1: Production of calcium carbide

Exposure scenario

Description of activities and processes covered in the exposure scenario

This scenario covers the production of calcium carbide based on information provided by members of the calcium carbide consortium. It also includes information about risk management measures (RMM) in place during production.

A site visit to a calcium carbide production facility showed that in some respects it is a typical chemical production plant with a roof covering an essentially open area. The electrothermal process is not typical of the chemical industry, with very high electrical power consumption as a means of performing the required process. Production takes place on not less than 300 days per year, and each furnace can produce several hundred tonnes of calcium carbide per day. Once the continuous process has started, production continues until essential maintenance is required.

Due to the nature of the reaction and the hazards associated with acetylene, no water is used in the facility apart from a cooling jacket around the furnace crucible. There is no generation of wastewater in the production area. Signs saying "No water" are present throughout the facility.

Operational conditions related to frequency, duration and amount of use

Table 1.1. Duration, frequency and amount

Information type	Data field	Explanation
Used amount of substance per day	500 tonnes/day	Assumption used in the exposure assessment
Duration of exposure per day at workplace [for one worker]	>4 hours	Information provided by members of the calcium carbide consortium
Frequency of exposure at workplace [for one worker]	Once per day	
Annual amount used per site	150 000 tonnes/year	Assumption used in the exposure assessment
Emission days per site	300 days/year	Information provided by members of the calcium carbide consortium

Operational conditions and risk management measures related to product¹ characteristics

Table 1.3 shows the product characteristics. Manufacture of calcium carbide is a closed, controlled process with occasional controlled exposure. Transfer of calcium carbide to vessels or large containers takes place at dedicated facilities. Milling of calcium carbide is either carried out at a separate site or at the production sites.

Table 1.1: Characteristics of the substance

Information type	Data field	Explanation
Physical state	Solid	Formed in the liquid state at high temperature, then allowed to cool and solidify
For solids: Categorisation of dust grades	Low, medium, high	The actual size of calcium carbide supplied depends on the processing requirements of the downstream use
Purity of industrial-grade calcium carbide	80 %	Industrial-grade calcium carbide contains about 80% CaC ₂ , 15% CaO and 5% other impurities in the raw material
Risk management measures related to the design of product		See text.

Operational conditions related to available dilution capacity and characteristics of exposed

¹ "Product" includes substances, preparations and articles

humans

Table 1.4 shows the characteristics of exposed humans that are assumed for the exposure assessment.

Table 1.1. Operational conditions related to respiration and skin contact

Information type	Data field	Explanation
Respiration volume under conditions of use	10 m ³ /d	Default worker respiration rate for light activity
Room size and ventilation rate	m ³ ; exchange per hour	
Area of skin contact with the substance under conditions of use	480 cm ²	ECETOC TRA model default: PROC2 non-dispersive use, no direct handling, palms of both hands. PROC8b: wide-dispersive use, direct handling, palms of both hands.
Body weight	70 kg	Default for workers

Environmental surroundings characteristics

A dilution factor of 40 has been used, because calcium carbide production takes place at large industrial sites. This is taken from the Emission Scenario Document in part IV of the risk assessment guidance for new and existing substances. This scenario has a standard waste water treatment plant flow rate of 10 000 m³/day.

Other operational conditions of use

Releases to air

Emissions of dust can be encountered at various stages over the whole production process. The main source of dust emissions is the dust-laden furnace gas. Depending on the de-dusting system, dust emissions from the use of furnace gas are between <5 and 15 mg/Nm³. Diffuse emissions arising from the tapping of liquid CaC₂ can be reduced by a fume extraction system and waste gas treatment to a large extent.

The EU IPPC BREF document on Large Volume Inorganic Chemicals (EU BREF 2007) gives the emission factor to air, in furnace and tapping gas after the de-dusting process as <110 g/t CaC₂ and <3 mg/Nm³ respectively (common de-dusting system for tapping and furnace gas). Based on information from consortium members, a worst-case value for emissions to air is <166 g/t.

Releases of calcium carbide dust or particulates to air during manufacturing would also occur at the crushing, sieving, screening and storage stages of production. Air pollution control devices such as fabric filters and scrubbers are usually in place during these operations. The EU IPPC BREF document on Large Volume Inorganic Chemicals (EU BREF 2007) gives the emission factor to air, during the crushing of calcium carbide (after dust abatement with fabric filter) as 1 g/t calcium carbide, which is 1E-4%. Dust content and emissions is largely dependent on the method of block crushing. Final dust content of <30 g/t calcium carbide and <1 mg/m³ for crushing and packaging of calcium carbide (in drums and containers) respectively, are reported for calcium carbide production in Slovenia (EU BREF 2007).

The REACH default environmental release estimates as given in Table R.16-23 in Chapter R.16 (environmental exposure estimation) of the REACH guidance are very conservative. The estimated default release to air for production of chemicals (ERC1) is given as 5%. Such a default is not applicable to calcium carbide production, as evidenced by the BREF and the site visit made by one of the authors.

It cannot be excluded that some dust will react with water vapour resulting in acetylene losses to air. For the purpose of this assessment the worst-case emission of 166 g/tonne of dust to air has been used to estimate emissions. This is assumed to include emissions from crushing, sieving, screening and storing where these are carried out on the production site.

Releases to water

Water is primarily used for the indirect cooling of the furnace and other devices during calcium carbide manufacturing. The cooling water is not contaminated during this use (EU BREF 2007). Fabric filters are generally used for dust abatement during crushing of block calcium carbide².

Most of the calcium carbide dust generated during production and collected from off-gas, local exhaust ventilation and plant cleaning processes is reused or recycled. Some of the dust may however find its way to the wastewater stream during neutralisation in the drain. The main constituent (the carbide itself) will, however, react there therefore calcium hydroxide and acetylene could be present at low levels. The non-volatile impurities would remain and exposure to these impurities cannot be excluded. Table R.16-23 in Chapter R.16 (environmental exposure estimation) of the REACH guidance gives the default release estimate to wastewater for production of chemicals (ERC1) as 6%. This high default release estimate is not expected to be applicable to calcium carbide production, where no water is used during the actual production, apart from a cooling jacket around the reactor vessel.

As a reasonable estimate perhaps 1% of the dust emissions reach water as fugitive loss. However, this will ultimately generate acetylene and the volatility of acetylene produced is such that all of it would evaporate before the waste stream reaches a wastewater treatment plant. Release of the impurities in commercial CaC₂ could occur and the exposure of wastewater to these has been accounted for.

Emission to soil

No direct emissions to soil, although losses of dust to air followed by redeposition are included in the

² It might be important to consider the release route for CaC₂ during cleaning of fabric filters.

modelling.**Risk management measures**

Table 1.5 summarises the risk management measures in place during production of calcium carbide.

Table 1.1. Risk management measures for industrial site

Information type	Data field	Explanation
Containment and local exhaust ventilation		
Containment plus good work practice required		
Local exhaust ventilation required plus good work practise	No	
Personal protective equipment (PPE)		
Skin protection	Protective gloves and clothing are used	Information from production sites
Eye protection	Goggles are used	Information from production sites
Respiratory protection	Respirators are used	Information from production sites
others	Skin protection creams	Information from production sites
Other risk management measures related to workers		
Risk management measures related to environmental emissions from industrial sites		
Onsite pre-treatment of wastewater	No measured data	
Resulting fraction of initially applied amount in wastewater released from site to the external sewage system	1.7×10^{-6} kg/kg	
Air emission abatement	Scrubbers, Fabric filters	Information from production sites
Resulting fraction of applied amount in waste gas released to environment	1.7×10^{-6} kg/kg	Value is fraction of tonnage produced, expressed as calcium carbide, in the form of dust.
Onsite waste treatment	No measured data	
Fraction of initially applied amount sent to external waste treatment. This is the sum of direct losses from processes to waste, and the residues from onsite wastewater and waste gas treatment.	1.7×10^{-6} kg/kg	
Municipal or other type of external wastewater treatment	Yes	Generic environmental surrounding characteristics considered covers both on-site wastewater and municipal or external wastewater treatment
Effluent (of the wastewater treatment plant) discharge rate	10 000 m ³ /day discharged to wastewater treatment plant	Standard size wastewater treatment plant for highly industrial sites.
Recovery of sludge for agriculture or horticulture	Yes	The spreading of sludge is assumed in accordance with the default models, but is not believed to occur at every location.

Waste related measures

Waste generated from calcium carbide production is mainly ferrosilicon (FeSi) with CaC₂ and calcium carbide dust. CaC₂ is separated from ferrosilicon and is reused, recycled or neutralised.

Calcium Carbide dust from air emission abatement devices and cleaning operations is also reused, recycled or neutralised.

Solid waste is handled differently across production sites. Some production sites recover dust into other production streams or convert it to hydrated lime in an acetylene generator.

Solid waste from the furnace off-gas scrubbing system is sent to an approved on-site settling lagoon at some production sites, while substances from filters are treated with small amounts of water to decompose carbide and then deposited in dedicated landfills.

Exposure estimation

Workers exposure

Acute/Short term exposure

Workers at industrial sites are routinely involved with the same tasks; therefore it is more appropriate to consider long-term exposure.

Long-term exposure

Human exposure from production and industrial use, based on the known work pattern, has been estimated using the ECETOC TRA screening tool and measured data. Table 1.1. shows the REACH process categories important for human exposure assessment for the life cycle and identified uses of calcium carbide. Predictions are retained for reference.

In a typical calcium carbide production plant, molten calcium carbide from the reaction furnace is allowed to pour into iron trucks, which take around 300 kg each. These are placed under the reactor one after another on an automated rail system, and after filling they are moved into a storage area to cool, which takes around 24 hours. Due to the intense heat, workers are at least 20 m away behind screens, in full protective clothing and helmets. Additionally there is ventilation for dust and furnace gas to prevent workers from being exposed.

Deposits of powder of calcium oxide /carbide are found on the floor in the production area. These vary from 1 mm on general floor areas to 5 cm in depth around less accessible areas. Exhaust systems are used to reduce the amount of dust in the air. Worker exposure to dust can occur and is monitored. It is estimated that around 166 g of dust are generated for each tonne of carbide produced. This is a consequence of the large scale handling of solids under conditions which are open at some stages in the processing.

Measurements from a typical production site

Maximum exposure levels occur in the vicinity of the silo automatic loading. The average exposure is 5.5 mg/m³. The maximum exposure occurs when depositions of dust are swirled up during operating mode, with a measured value of 54.7 mg/m³. This operation mode works three times a day for 30 minutes and workers' exposure time is approximately 10 minutes per 30 minutes' operation.

These values are above the UK Workplace Exposure Limits (WELs) for calcium oxide therefore PPE in the form of respiratory protective equipment such as the mask FFP3 is required. Qualitative assessment indicates that use of PPE is sufficient to reduce exposure to an acceptable level. The UK WEL for calcium oxide is 2 mg/m³ and for calcium hydroxide the UK WEL is 5 mg/m³. These values are based on an 8-hour TWA reference period.

Oral exposure

Eating and drinking at the workplace is forbidden across production sites. Hence, workers' exposure via ingestion of calcium carbide is not expected.

Dermal exposure

Risk management measures used to prevent dermal exposures at most production sites include gloves, protective clothing, goggles and skin protection creams (used during crushing operations). Inappropriate use of PPE can result in skin irritation and burns.

Tier 1 dermal exposure estimates based on the ECETOC TRA workers' model have been estimated for the production of calcium carbide (PROC 2 and 8b) and milling/formulation of calcium carbide products (PROC 5). According to the ECETOC assumptions for these process categories, the exposed skin surface area (palms of both hands) is 480 cm² and LEV is assumed to be present. For

PROC 2 (use in closed, continuous process with occasional controlled exposure), non-dispersive use and no direct handling is assumed. For PROC 8b (transfer from/to large dedicated vessels), widedispersive use, direct handling and intermittent exposure is assumed.

No modifying factor (e.g. use of personal protective equipments) has been applied, except the use of local exhaust ventilation. Human health exposures during production and industrial uses of calcium carbide have been considered for the neat substance. In cases where calcium carbide is formulated during milling and formulated products are used in metallurgy, it is important to consider exposure to calcium carbide preparations and the concentration of calcium carbide in such preparation.

Inhalation exposure

A limited amount of dust is always prevalent during production. Exposure of workers via inhalation is prevented by use of respirators. Dust concentration in the work place has been measured to be in the range 1 to 5 mg/m³, with calcium carbide content of 20 to 50%, in the areas of highest dust in the plant. Duration of workers exposure to dust is reported to be for 1-4 hours per shift.

Tier 1 inhalation exposure estimates based on the ECETOC TRA workers' model have been estimated for the production of calcium carbide (PROC 2 and 8b) and milling/formulation of calcium carbide products (PROC 5).

Based on the use pattern information and fugacity banding of the ECETOC model, the availability of calcium carbide for inhalation exposures has been assumed to fall in the 'medium' fugacity band i.e. slightly dusty during production and industrial use in acetylene production; and the 'high' fugacity band i.e. highly dusty during milling; and industrial use in metallurgy and calcium cyanamide production.

No modifying factor (e.g. use of respiratory protective equipments) has been applied, except the use of local exhaust ventilation. Human health inhalation exposures during production and industrial uses of calcium carbide have been considered for the whole substance. The inhalation exposure estimate of 2.5 mg/m³ from the ECETOC TRA model for the milling process falls in the range of measured workplace dust concentrations (1 to 5 mg/m³, with 20 to 50% calcium carbide concentration) specified by members of the calcium carbide consortium.

An exposure time of 1-4 hours is should be assumed.

In cases where calcium carbide is formulated during milling and formulated products are used in metallurgy, it is important to consider exposure to calcium carbide preparations and the concentration of calcium carbide in such preparation will be required.

Table 1.6. Long-term exposure concentrations to workers

Routes of exposure	Estimated exposure concentrations		Estimated exposure concentrations		Explanation / source of measured data
	value	unit	value	unit	
Dermal exposure	0.14	mg/kg/day	-	-	ECETOC TRA model prediction for PROC 2 (production)
	0,69	mg/kg/day	-	-	ECETOC TRA model prediction for PROC 8b (production)
	0,07	mg/kg/day	-	-	ECETOC TRA model prediction for PROC 5 (milling)
Inhalation exposure	0.05	mg/m ³	0.007 ^a	mg/kg/day	ECETOC TRA model prediction for PROC 2 (production)
	0.25	mg/m ³	0.036 ^a	mg/kg/day	ECETOC TRA model prediction for PROC 8b (production)
		mg/m ³	0,36	mg/kg/day	ECETOC TRA model prediction for PROC 5 (milling)

Notes:a Calculated assuming a default bodyweight of 70 kg for workers and a default respiratory volume of 10 m³, light activity, for an 8 hour work shift.

Table 1.7. Summary of long-term exposure concentration to workers

Routes of exposure	Concentrations	Justification
Dermal local exposure (in mg/cm ²)		
Dermal systemic exposure (in mg/kg bw/d)	0,69	Worst case ECETOC TRA model prediction for PROC 8b (production)
Inhalation exposure (in mg/m ³)/8h workday ³	2,5	Worst case ECETOC TRA model prediction for PROC 5 (milling)

Consumer exposure

There is no consumer exposure from the production of calcium carbide.

Indirect exposure of humans via the environment (oral)

There is no oral exposure of humans via the environment.

Environmental exposure

Predicted Environmental Calculations (PECs) have been determined using EUSES 2.1.1. The EUSES program implements the environmental exposure models described in REACH Technical Guidance Chapter R16. Default model parameters have been used with the following exceptions:

Lowest daily flow rate to WWTP – 10 000 m³/day

Dilution factor – 40 (EU TGD Part IV, EC 2003)

Local tonnage – 500 tonnes per day

Number of days – 300 days

There is only one site in the Region.

Environmental releases

The release fractions are discussed in Section 1.1.1.5. From this, emissions to air as dust are 166 g/tonne, as calcium carbide. As discussed in Section 7 for the environment the assessment is considering the two impurities calcium cyanamide (as cyanamide) and calcium sulfide. The maximum content of calcium cyanamide in calcium carbide is 5% by weight (see Section 1.2), hence the emission factor is 8.3 g/tonne. For calcium sulfide, the maximum content is 1.3% by weight (see Section 1.2), hence the emission factor is 2.2 g/tonne.

For water, the emissions are 1% of those to air, or 1.7 g/tonne as calcium carbide. The corresponding emission factors for the two impurities are 83 mg/tonne for calcium cyanamide and 22 mg/tonne for calcium sulfide.

These factors are applied to a site producing 500 tonnes of calcium carbide per day.

No measured values for released amounts are available, so the calculated values are used in the exposure estimation. These are summarised in Table 1.8 and 1.9.

Table 1.8. Summary of the releases to the environment – cyanamide

³ air concentration at the workplace

Compartments	Release ¹ from point source (kg/d) (local exposure estimation)	Justification
Aquatic (without STP)	0,022	Release calculated based on local tonnage
Aquatic (after STP)	2.8E-03	
Air (direct + STP)		Point source release rate, direct only.
Soil (direct releases only)		None

Table 1.9. Summary of the releases to the environment – calcium sulfide

Compartments	Release ¹ from point source (kg/d) (local exposure estimation)	Justification
Aquatic (without STP)	0,011	Release calculated based on local tonnage
Aquatic (after STP)	0,011	No removal in STP
Air (direct + STP)	1,1	Point source release rate, direct only.
Soil (direct releases only)		None

Exposure concentrations in the environment

Table 1.10 summarises the exposure concentrations for cyanamide calculated using EUSES 2.1.1.

Table 1.10. Summary of exposure concentrations from production – cyanamide

STP OUTPUT	Value	Unit
Fraction of emission directed to air by STP	5.14E-06	[%]
Fraction of emission directed to water by STP	12,7	[%]
Fraction of emission directed to sludge by STP	0,037	[%]
Fraction of the emission degraded in STP	87,3	[%]
Total of fractions	100	[%]
Local indirect emission to air from STP during episode	1.13E-09	[kg.d-1]
Concentration in untreated wastewater	2.20E-03	[mg.l-1]
Concentration of chemical (total) in the STP-effluent	2.78E-04	[mg.l-1]
Concentration in effluent exceeds solubility	No	
Concentration in dry sewage sludge	2.06E-03	[mg.l-1]
PEC for micro-organisms in the STP	2.78E-04	[mg.l-1]

LOCAL CONCENTRATIONS AND DEPOSITIONS	Value	Unit
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¹ Releases converted to cyanamide basis.

¹ Releases converted to cyanamide basis.

AIR		
Concentration in air during emission episode	6.12E-04	[mg.m-3]
Annual average concentration in air, 100 m from point source	5.03E-04	[mg.m-3]
Total deposition flux during emission episode	1.10E-03	[mg.m-2.d-1]
Annual average total deposition flux	9.08E-04	[mg.m-2.d-1]
WATER SEDIMENT		
Concentration in surface water during emission episode (dissolved)	6.96E-06	[mg.l-1]
Concentration in surface water exceeds solubility	No	
Annual average concentration in surface water (dissolved)	5.72E-06	[mg.l-1]
Concentration in seawater during emission episode (dissolved)	2.20E-05	[mg.l-1]
Annual average concentration in seawater (dissolved)	1.81E-05	[mg.l-1]
SOIL, GROUNDWATER		
Concentration in agric. soil averaged over 30 days	8.91E-05	[mg.kgwwt-1]
Concentration in agric. soil averaged over 180 days	8.76E-05	[mg.kgwwt-1]
Concentration in grassland averaged over 180 days	1.40E-04	[mg.kgwwt-1]
Fraction of steady-state (agricultural soil)	[1]	-
Fraction of steady-state (grassland soil)	[1]	-
LOCAL PECS [PRODUCTION]		
AIR		
Annual average local PEC in air (total)	5.03E-04	[mg.m-3]
WATER SEDIMENT		
Local PEC in surface water during emission episode (dissolved)	6.96E-06	[mg.l-1]
Qualitative assessment might be needed (TGD Part II, 5.6)	No	
Annual average local PEC in surface water (dissolved)	5.72E-06	[mg.l-1]
Local PEC in fresh-water sediment during emission episode	6.04E-06	[mg.kgwwt-1]
Local PEC in seawater during emission episode (dissolved)	2.20E-05	[mg.l-1]
Qualitative assessment might be needed (TGD Part II, 5.6)	No	
Annual average local PEC in seawater (dissolved)	1.81E-05	[mg.l-1]
Local PEC in marine sediment during emission episode	1.91E-05	[mg.kgwwt-1]
SOIL, GROUNWATER		
Local PEC in agric. soil (total) averaged over 30 days	8.91E-05	[mg.kgwwt-1]
Local PEC in agric. soil (total) averaged over 180 days	8.76E-05	[mg.kgwwt-1]
Local PEC in grassland (total) averaged over 180 days	1.40E-04	[mg.kgwwt-1]
Local PEC in pore water of agricultural soil	4.69E-04	[mg.l-1]
Local PEC in pore water of grassland	7.49E-04	[mg.l-1]
Local PEC in groundwater under agricultural soil	4.69E-04	[mg.l-1]

Table 1.11. summarises the exposure concentrations for calcium sulfide calculated using EUSES

2.1.1.

Table 1. 11. Summary of exposure concentrations from production – calcium sulfide

STP OUTPUT	Value	Unit
Fraction of emission directed to air by STP	4.33E-10	[%]
Fraction of emission directed to water by STP	6,51	[%]
Fraction of emission directed to sludge by STP	0.0292	[%]
Fraction of the emission degraded in STP	93,5	[%]
Total of fractions	100	[%]
Local indirect emission to air from STP during episode	4.77E-14	[kg.d-1]
Concentration in untreated wastewater	1.10E-03	[mg.l-1]
Concentration of chemical (total) in the STP-effluent	7.16E-05	[mg.l-1]
Concentration in effluent exceeds solubility	No	
Concentration in dry sewage sludge	8.12E-04	[mg.l-1]
PEC for micro-organisms in the STP	7.16E-05	[mg.l-1]
LOCAL CONCENTRATIONS AND DEPOSITIONS	Value	Unit
AIR		
Concentration in air during emission episode	3.06E-04	[mg.m-3]
Annual average concentration in air, 100 m from point source	2.51E-04	[mg.m-3]
Total deposition flux during emission episode	0,011	[mg.m-2.d-1]
Annual average total deposition flux	9.01E-03	[mg.m-2.d-1]
WATER SEDIMENT		
Concentration in surface water during emission episode (dissolved)	1.79E-06	[mg.l-1]
Concentration in surface water exceeds solubility	No	
Annual average concentration in surface water (dissolved)	1.47E-06	[mg.l-1]
Concentration in seawater during emission episode (dissolved)	1.10E-05	[mg.l-1]
Annual average concentration in seawater (dissolved)	9.04E-06	[mg.l-1]
SOIL, GROUNDWATER		
Concentration in agric. soil averaged over 30 days	3.78E-05	[mg.kgwwt-1]
Concentration in agric. soil averaged over 180 days	3.78E-05	[mg.kgwwt-1]
Concentration in grassland averaged over 180 days	7.47E-05	[mg.kgwwt-1]
Fraction of steady-state (agricultural soil)	[1]	-
Fraction of steady-state (grassland soil)	[1]	-
LOCAL PECS [PRODUCTION]		
AIR		
Annual average local PEC in air (total)	2.51E-04	[mg.m-3]
WATER SEDIMENT		
Local PEC in surface water during emission episode (dissolved)	1.79E-06	[mg.l-1]
Qualitative assessment might be needed (TGD Part II, 5.6)	No	
Annual average local PEC in surface water (dissolved)	1.47E-06	[mg.l-1]
Local PEC in fresh-water sediment during emission episode	1.52E-06	[mg.kgwwt-1]
Local PEC in seawater during emission episode (dissolved)	1.10E-05	[mg.l-1]
Qualitative assessment might be needed (TGD Part II, 5.6)	No	

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Annual average local PEC in seawater (dissolved)	9.04E-06	[mg.l-1]
Local PEC in marine sediment during emission episode	9.36E-06	[mg.kgwwt-1]
SOIL, GROUNDWATER		
Local PEC in agric. soil (total) averaged over 30 days	3.78E-05	[mg.kgwwt-1]
Local PEC in agric. soil (total) averaged over 180 days	3.78E-05	[mg.kgwwt-1]
Local PEC in grassland (total) averaged over 180 days	7.47E-05	[mg.kgwwt-1]
Local PEC in pore water of agricultural soil	2.18E-04	[mg.l-1]
Local PEC in pore water of grassland	4.31E-04	[mg.l-1]
Local PEC in groundwater under agricultural soil	2.18E-04	[mg.l-1]

Exposure concentration relevant for the food chain (Secondary poisoning)

Neither of the two impurities being considered accumulates in the food chain, so the assessment of secondary poisoning is not considered further.

ES 2: Milling/formulation of calcium carbide products

Description of activities and processes covered in the exposure scenario

This scenario covers the milling of calcium carbide based on information provided by members of the calcium carbide consortium.

Due to the hazards associated with acetylene, no water is used in the facility.

Operational conditions related to frequency, duration and amount of use

Table 1.12. Duration, frequency and amount

Information type	Data field	Explanation
Used amount of substance per day	500 tonnes/day	Assumption used in the exposure assessment
Duration of exposure per day at workplace [for one worker]	>4 hours	Information provided by members of the calcium carbide consortium
Frequency of exposure at workplace [for one worker]	Once per day	
Annual amount used per site	150 000 tonnes/year	Assumption used in the exposure assessment
Emission days per site	300 days/year	Information provided by members of the calcium carbide consortium

Operational conditions and risk management measures related to product⁴ characteristics

Table 1.13. shows the product characteristics. Milling or formulation of calcium carbide is either carried out at a separate site or at the production sites (mixing of blending in batch process).

Table 1.13. Characteristics of the substance

Information type	Data field	Explanation
Physical state	Solid	Formed in the liquid state at high temperature, then allowed to cool and solidify
For solids: Categorisation of dust grades	Low, medium, high	The actual size of calcium carbide supplied depends on the processing requirements of the downstream use
Purity of industrial-grade calcium carbide	80 %	Industrial-grade calcium carbide contains about 80% CaC ₂ , 15% CaO and 5% other impurities in the raw material
Risk management measures related to the design of product		See text.

Operational conditions related to available dilution capacity and characteristics of exposed humans

Chyba! Nenašel se žádný zdroj odkazů.. shows the characteristics of exposed humans that are assumed for the exposure assessment.

⁴ Product” includes substances, preparations and articles

Table 1.14. Operational conditions related to respiration and skin contact

Information type	Data field	Explanation
Respiration volume under conditions of use	10 m ³ /d	Default worker respiration rate for light activity
Area of skin contact with the substance under conditions of use	480 cm ²	ECETOC TRA model default: PROC2 non-dispersive use, no direct handling, palms of both hands. PROC8b: wide-dispersive use, direct handling, palms of both hands.
Body weight	70 kg	Default for workers

Environmental surroundings characteristics

Standard environment assumed.

Other operational conditions of useReleases to air

Releases of calcium carbide dust or particulates to air will occur at the crushing, sieving, screening and storage stages. Air pollution control devices such as fabric filters and scrubbers are usually in place during these operations. The EU IPPC BREF document on Large Volume Inorganic Chemicals (EU BREF 2007) gives the emission factor to air, during the crushing of calcium carbide (after dust abatement with fabric filter) as 1 g/t calcium carbide, which is 1E-4%. Dust content and emissions is largely dependent on the method of block crushing.

The REACH default environmental release estimates as given in Table R.16-23 in Chapter R.16 (environmental exposure estimation) of the REACH guidance are very conservative. The estimated default release to air for formulation of preparations (ERC2) is given as 2.5%.

For the purpose of this assessment the worst-case emission of 1 g/tonne of dust to air has been used to estimate emissions. This is assumed to include emissions from crushing, sieving, screening and storing.

Releases to water

Table R.16-23 in Chapter R.16 (environmental exposure estimation) of the REACH guidance gives the default release estimate to wastewater for formulation of preparations (ERC2) as 2%. As the substance reacts with water to produce acetylene, the use of water on such sites is avoided and therefore the default factor is an over-estimate. It has been assumed that the factor for production sites (1% of the dust emissions) is also reasonable here.

Emission to soil**Risk management measures**

Table 1.15 summarises the risk management measures in place during the milling/formulation of calcium carbide.

Table 1.15. Risk management measures for industrial site

Information type	Data field	Explanation
Containment and local exhaust ventilation		
Containment plus good work practice required	No measured data	
Local exhaust ventilation required plus good work practise		
Personal protective equipment (PPE)		

Skin protection	Protective gloves and clothing are used	Company information
Eye protection	Goggles are used	Company information
Respiratory protection	Respirators are used	Company specific information
others	Skin protection creams	Company specific information
Other risk management measures related to workers		
Risk management measures related to environmental emissions from industrial sites		
Onsite pre-treatment of wastewater	No measured data	
Resulting fraction of initially applied amount in wastewater released from site to the external sewage system	1x10 ⁻⁸ kg/kg	
Air emission abatement	No measured data	
Resulting fraction of applied amount in waste gas released to environment	1.7x10 ⁻⁶ kg/kg	
Onsite waste treatment	No measured data	
Fraction of initially applied amount sent to external waste treatment. This is the sum of direct losses from processes to waste, and the residues from onsite wastewater and waste gas treatment.	1x10 ⁻⁶ kg/kg	
Municipal or other type of external wastewater treatment	Yes	Generic environmental surrounding characteristics considered covers both on-site wastewater and municipal or external wastewater treatment
Effluent (of the wastewater treatment plant) discharge rate	2 000 m ³ /d discharged to wastewater treatment plant	Default
Recovery of sludge for agriculture or horticulture	Yes	The spreading of sludge is assumed a worst-case scenario.

*Exposure estimation***Workers exposure**

Acute/Short term exposure

Workers at industrial sites are routinely involved with the same tasks; therefore it is more appropriate to consider long-term exposure.

Long-term exposure

Human exposure from milling/formulation, based on the known work pattern has been estimated using the ECETOC TRA screening tool. Exposures as measured for the production scenario may also be relevant. Therefore personal protective equipment as described for ES 1 will also be needed if the limits are exceeded locally.

An important consideration for human health exposure assessment is exposure to the impurities in calcium carbide that have been classified as harmful to human health Table 1.1 shows the REACH process categories, important for human exposure assessment, for the life cycle and identified uses of calcium carbide.

Oral exposure

Eating and drinking at the workplace is forbidden across sites. Hence, workers' exposure via ingestion of calcium carbide is not expected.

Dermal exposure

Risk management measures used to prevent dermal exposures at most sites include gloves, protective clothing, goggles and skin protection creams (used during crushing operations).

Inappropriate use of PPE can result in skin irritation and burns.

Tier 1 dermal exposure estimates based on the ECETOC TRA workers' model have been estimated for the milling/formulation of calcium carbide (PROC 5; mixing or blending in batch process).

According to the ECETOC assumptions for this process category, the exposed skin surface area (palms of both hands) is 480 cm² and LEV is assumed to be present.

No modifying factor (e.g. use of personal protective equipments) has been applied, except the use of local exhaust ventilation. Human health exposures during milling/formulation of calcium carbide have been considered for the neat substance.

Inhalation exposure

Tier 1 inhalation exposure estimates based on the ECETOC TRA workers' model have been estimated for the milling/formulation of calcium carbide (PROC 5).

In cases where calcium carbide is formulated during milling, it is important to consider exposure to calcium carbide preparations and the concentration of calcium carbide in such preparation is required.

Table 1.16. Long-term exposure concentrations to workers

Routes of exposure	Estimated exposure concentrations		Estimated exposure concentrations		Explanation / source of measured data
	value	unit	value	unit	
Dermal exposure ^a	0.07	mg/kg/day	-	-	ECETOC TRA model prediction for PROC 5 (milling)
Inhalation exposure	2,5	mg/m ³	3,8	-	Maximum value from industrial measurement

Notes: a Calculated assuming a default bodyweight of 70 kg for workers and a default respiratory volume of 10 m³, light activity, for an 8 hour work shift.

Table 1.1: Summary of long-term exposure concentration to workers

Routes of exposure	Concentrations	Justification
Dermal local exposure (in mg/cm ²)	0.01	ECETOC TRA model prediction for PROC 5 (milling)
Dermal systemic exposure ^a (in mg/kg bw/d)	0.07	ECETOC TRA model prediction for PROC 5 (milling)
Inhalation exposure ^a (in mg/m ³)/8h workday ⁵	3.6	ECETOC TRA model prediction for PROC 5 (milling)

Notes: a Calculated assuming a default bodyweight of 70 kg for workers and a default respiratory volume of 10 m³, light activity, for an 8 hour work shift.

Consumer exposure

There is no consumer exposure from the milling/formulation of calcium carbide.

Indirect exposure of humans via the environment (oral)

There is no oral exposure of humans via the environment.

Environmental exposure

Predicted Environmental Calculations (PECs) have been determined using EUSES 2.1.1. The EUSES program implements the environmental exposure models described in REACH Technical Guidance Chapter R16. Default model parameters have been used.

Local tonnage – 500 tonnes per day

Number of days – 300 days.

Environmental releases

The release fractions are discussed in Section 1.2.1.5. From this, emissions to air as dust are 1 g/tonne, as calcium carbide. As discussed in Section 7 for the environment the assessment is considering the two impurities calcium cyanamide (as cyanamide) and calcium sulfide. The maximum content of calcium cyanamide in calcium cyanamide is 5% by weight (see Section 1.2), hence the emission factor is 0.05 g/tonne. For calcium sulfide, the maximum content is 1.3% by weight (see Section 1.2), hence the emission factor is 0.013 g/tonne.

For water, the emissions are 1% of those to air, or 0.01 g/tonne as calcium carbide. The corresponding emission factors for the two impurities are 0.5 mg/tonne for calcium cyanamide and 0.13 mg/tonne for calcium sulfide.

These factors are applied to a site handling 500 tonnes of calcium carbide per day.

No measured values for released amounts are available, so the calculated values are used in the exposure estimation. These are summarised in Chyba! Nenašel sa žiaden zdroj odkazov. and

Table 1.19.

⁵ air concentration at the workplace

Table 1.18. Summary of the releases to the environment – cyanamide

Compartments	Release ¹ from point source (kg/d) (local exposure estimation)	Justification
Aquatic (without STP)	1.3E-04	Release calculated based on local tonnage
Aquatic (after STP)	1.7E-05	
Air (direct + STP)	0,013	Point source release rate, direct only.
Soil (direct releases only)		None

Table 1.19. Summary of the releases to the environment – calcium sulfide

Compartments	Release ¹ from point source (kg/d) (local exposure estimation)	Justification
Aquatic (without STP)	6.5E-05	Release calculated based on local tonnage
Aquatic (after STP)	6.5E-05	No removal in STP
Air (direct + STP)		Point source release rate, direct only.
Soil (direct releases only)	6.5E-03	None

¹ Releases converted to cyanamide basis.

¹ Releases converted to cyanamide basis.

Exposure concentration in the environment

Chyba! Nenašel sa žiaden zdroj odkazov. summarises the exposure concentrations for cyanamide calculated using EUSES 2.1.1.

Table 1.20. Summary of exposure concentrations from milling/formulation – cyanamide

STP OUTPUT	Value	Unit
Fraction of emission directed to air by STP	5.16E-06	[%]
Fraction of emission directed to water by STP	12,7	[%]
Fraction of emission directed to sludge by STP	0,037	[%]
Fraction of the emission degraded in STP	87,3	[%]
Total of fractions	100	[%]
Local indirect emission to air from STP during episode	6.70E-12	[kg.d-1]
Concentration in untreated wastewater	6.50E-05	[mg.l-1]
Concentration of chemical (total) in the STP-effluent	8.23E-06	[mg.l-1]
Concentration in effluent exceeds solubility	No	
Concentration in dry sewage sludge	6.09E-05	[mg.l-1]
PEC for micro-organisms in the STP	8.23E-06	[mg.l-1]
LOCAL CONCENTRATIONS AND DEPOSITIONS	Value	Unit
AIR		
Concentration in air during emission episode	3.61E-06	[mg.m-3]
Annual average concentration in air, 100 m from point source	2.97E-06	[mg.m-3]
Total deposition flux during emission episode	6.53E-06	[mg.m-2.d-1]
Annual average total deposition flux	5.37E-06	[mg.m-2.d-1]
WATER SEDIMENT		
Concentration in surface water during emission episode (dissolved)	8.23E-07	[mg.l-1]
Concentration in surface water exceeds solubility	No	
Annual average concentration in surface water (dissolved)	6.76E-07	[mg.l-1]
Concentration in seawater during emission episode (dissolved)	6.50E-07	[mg.l-1]
Annual average concentration in seawater (dissolved)	5.34E-07	[mg.l-1]
SOIL, GROUNDWATER		
Concentration in agric. soil averaged over 30 days	5.73E-07	[mg.kgwwt-1]
Concentration in agric. soil averaged over 180 days	5.31E-07	[mg.kgwwt-1]
Concentration in grassland averaged over 180 days	8.31E-07	[mg.kgwwt-1]
Fraction of steady-state (agricultural soil)	[1]	-
Fraction of steady-state (grassland soil)	[1]	-
LOCAL PECS [PRODUCTION]		
AIR		
Annual average local PEC in air (total)	2.97E-06	[mg.m-3]
WATER SEDIMENT		
Local PEC in surface water during emission episode (dissolved)	8.23E-07	[mg.l-1]
Qualitative assessment might be needed (TGD Part II, 5.6)	No	
Annual average local PEC in surface water (dissolved)	6.76E-07	[mg.l-1]

Local PEC in fresh-water sediment during emission episode	7.14E-07	[mg.kgwwt-1]
Local PEC in seawater during emission episode (dissolved)	6.50E-07	[mg.l-1]
Qualitative assessment might be needed (TGD Part II, 5.6)	No	
Annual average local PEC in seawater (dissolved)	5.34E-07	[mg.l-1]
Local PEC in marine sediment during emission episode	5.64E-07	[mg.kgwwt-1]
SOIL, GROUNWATER		
Local PEC in agric. soil (total) averaged over 30 days	5.73E-07	[mg.kgwwt-1]
Local PEC in agric. soil (total) averaged over 180 days	5.31E-07	[mg.kgwwt-1]
Local PEC in grassland (total) averaged over 180 days	8.31E-07	[mg.kgwwt-1]
Local PEC in pore water of agricultural soil	2.84E-06	[mg.l-1]
Local PEC in pore water of grassland	4.45E-06	[mg.l-1]
Local PEC in groundwater under agricultural soil	2.84E-06	[mg.l-1]

Table 1.21 summarises the exposure concentrations for calcium sulfide calculated using EUSES 2.1.1.

Table 1.21. Summary of exposure concentrations from milling/formulation – calcium sulfide

STP OUTPUT	Value	Unit
Fraction of emission directed to air by STP	1.25E-10	[%]
Fraction of emission directed to water by STP	6,51	[%]
Fraction of emission directed to sludge by STP	0.0292	[%]
Fraction of the emission degraded in STP	93,5	[%]
Total of fractions	100	[%]
Local indirect emission to air from STP during episode	8.15E-17	[kg.d-1]
Concentration in untreated wastewater	3.25E-05	[mg.l-1]
Concentration of chemical (total) in the STP-effluent	2.11E-06	[mg.l-1]
Concentration in effluent exceeds solubility	No	
Concentration in dry sewage sludge	2.40E-05	[mg.l-1]
PEC for micro-organisms in the STP	2.11E-06	[mg.l-1]

LOCAL CONCENTRATIONS AND DEPOSITIONS	Value	Unit
AIR		
Concentration in air during emission episode	1.83E-06	[mg.m-3]
Annual average concentration in air, 100 m from point source	1.51E-06	[mg.m-3]
Total deposition flux during emission episode	6.58E-05	[mg.m-2.d-1]
Annual average total deposition flux	5.40E-05	[mg.m-2.d-1]
WATER SEDIMENT		
Concentration in surface water during emission episode (dissolved)	2.11E-07	[mg.l-1]
Concentration in surface water exceeds solubility	No	
Annual average concentration in surface water (dissolved)	1.74E-07	[mg.l-1]
Concentration in seawater during emission episode (dissolved)	3.25E-07	[mg.l-1]
Annual average concentration in seawater (dissolved)	2.67E-07	[mg.l-1]

SOIL, GROUNDWATER		
Concentration in agric. soil averaged over 30 days	2.28E-07	[mg.kgwwt-1]
Concentration in agric. soil averaged over 180 days	2.27E-07	[mg.kgwwt-1]
Concentration in grassland averaged over 180 days	4.48E-07	[mg.kgwwt-1]
Fraction of steady-state (agricultural soil)	[1]	-
Fraction of steady-state (grassland soil)	[1]	-
LOCAL PECS [PRODUCTION]		
AIR		
Annual average local PEC in air (total)	1.51E-06	[mg.m-3]
WATER SEDIMENT		
Local PEC in surface water during emission episode (dissolved)	2.11E-07	[mg.l-1]
Qualitative assessment might be needed (TGD Part II, 5.6)	No	
Annual average local PEC in surface water (dissolved)	1.74E-07	[mg.l-1]
Local PEC in fresh-water sediment during emission episode	1.80E-07	[mg.kgwwt-1]
Local PEC in seawater during emission episode (dissolved)	3.25E-07	[mg.l-1]
Qualitative assessment might be needed (TGD Part II, 5.6)	No	
Annual average local PEC in seawater (dissolved)	2.67E-07	[mg.l-1]
Local PEC in marine sediment during emission episode	2.77E-07	[mg.kgwwt-1]
SOIL, GROUNWATER		
Local PEC in agric. soil (total) averaged over 30 days	2.28E-07	[mg.kgwwt-1]
Local PEC in agric. soil (total) averaged over 180 days	2.27E-07	[mg.kgwwt-1]
Local PEC in grassland (total) averaged over 180 days	4.48E-07	[mg.kgwwt-1]
Local PEC in pore water of agricultural soil	1.31E-06	[mg.l-1]
Local PEC in pore water of grassland	2.58E-06	[mg.l-1]
Local PEC in groundwater under agricultural soil	1.31E-06	[mg.l-1]

Exposure concentration relevant for the food chain (Secondary poisoning)

Neither of the two impurities being considered accumulates in the food chain, so the assessment of secondary poisoning is not considered further.

ES 3: Use as an intermediate in the production of acetylene and calcium cyanamide

Exposure scenario

Description of activities and processes covered in the exposure scenario

This scenario covers the use of calcium carbide in the production of acetylene, based on information provided by members of the calcium carbide consortium.
Calcium carbide is used as a process material or intermediate in the production of acetylene and calcium cyanamide. Releases can be estimated using the REACH or standard TGD defaults, once the tonnage in this use is known.
Essentially, calcium carbide is transformed to other products during industrial use. However, exposure of soil and water (via raw material, process and product handling) to the impurities in commercial CaC₂ would be expected during this use. Emissions to the environment of calcium carbide and impurities in raw materials handling are considered here. Emissions of the impurities in waste from the processes are considered to be addressed in the assessments of the production of acetylene and calcium cyanamide.

Operational conditions related to frequency, duration and amount of use

A document (EIGA 2008) calculating emissions of acetylene to air from an acetylene production plant provides information on the amounts used per day at a typical site, and the number of days worked. These are included in Table 1.22.

Table 1.22. Duration, frequency and amount

Information type	Data field	Explanation
Used amount of substance per day	10.08 tonnes	From EIGA (2008)
Duration of exposure per day at workplace [for one worker]	1 - 4 hours	Information from industry
Frequency of exposure at workplace [for one worker]	Once	Information from industry
Annual amount used per site	2520 tonnes	From EIGA (2008)
Emission days per site	250	From EIGA (2008)

Operational conditions and risk management measures related to product⁶ characteristics

Information type	Data field	Explanation
Physical state	Solid	
For solids: Categorisation of dust grades	Medium for acetylene production; high for calcium cyanamide production.	
Risk management measures related to the design of product	Calcium carbide granules are used for the acetylene production	

Operational conditions related to available dilution capacity and characteristics of exposed humans

See Table 1.4.

Environmental surroundings characteristics

⁶ Product⁶ includes substances, preparations and articles

Standard environmental characteristics are appropriate for this scenario.

Other operational conditions of use

The REACH default environmental release estimates for industrial use of intermediates (ERC6A) are:

Release to air: 5 %

Release to wastewater: 2%

Releases to air

Releases to air during production are controlled by dust or particulate matter control devices such as fabric filter, with a dust emission limit of 50 mg/m³.

Release of calcium carbide dust to air during the production of acetylene occurs when calcium carbide is charged to the acetylene generation. However, this is only applicable to an open generator system and not a closed system (EIGA 2008). Calcium carbide dust emission to air (from a cyclone) at an open generator system acetylene production plant handling 2,520 t/year of calcium carbide has been estimated as 4 kg/yr (EIGA 2008), or $4/250 = 0.016$ kg/d. This gives a release estimate of 0.00015% of calcium carbide dust to air.

Release to wastewater

Wastewater is generated from acetylene production process and will contain impurities from the calcium carbide used as well as by-products from the reaction. This is assumed to be dealt with in the CSR for acetylene production.

Release to soil

Releases to soil are assumed not to occur.

Risk management measures

See Table 1.5.

Waste related measures

Wastes are recycled into the processes.

Exposure estimation

Workers exposure

Acute/Short term exposure

Workers at industrial sites are routinely involved with the same tasks; therefore it is more appropriate to consider long-term exposure.

Long-term exposure

Exposures as measured for the production scenario may also be relevant. Therefore personal protective equipment as described for ES 1 will also be needed if the limits are exceeded locally. Duration of exposure (in the areas with the greatest dust) per personnel at most sites is reported to be for 1-4 hours per shift

Oral exposure

Eating and drinking at the workplace is forbidden across sites. Hence, workers' exposure via ingestion of Calcium Carbide is not expected.

Dermal exposure

Risk management measures used to prevent dermal exposures at most sites include gloves, protective clothing and goggles. In appropriate use of PPE can result in skin irritation and burns.

Inhalation exposure

Exposure of workers via inhalation is prevented by air exhaustion and use of respirators.

Table 1.24. Long-term exposure concentrations to workers

Routes of exposure	Estimated exposure concentrations		Estimated exposure concentrations		Explanation / source of measured data
	value	unit	value	unit	
Dermal exposure ^a	0.14	mg/kg/day	-	-	ECETOC TRA model prediction for PROC 2 (acetylene and calcium cyanamide)
Inhalation exposure	0.05	mg/m ³	-	-	ECETOC TRA model prediction for PROC 2 (acetylene)
	0,1	mg/m ³	-	-	ECETOC TRA model prediction for PROC 2 (calcium cyanamide)

Notes: a Calculated assuming a default bodyweight of 70 kg for workers and a default respiratory volume of 10 m³, light activity, for an 8 hour work shift

Table 1.25. Summary of long-term exposure concentration to workers

Routes of exposure	Concentrations	Justification
Dermal local exposure (in mg/cm ²)	0,02	ECETOC TRA model prediction for PROC 2 (acetylene and calcium cyanamide)
Dermal systemic Exposure ^a (in mg/kg bw/d)	0,14	ECETOC TRA model prediction for PROC 2 (acetylene and calcium cyanamide)
Inhalation Exposure ^a (in mg/m ³)/8h workday ⁷	0,07	ECETOC TRA model prediction for PROC 2 (acetylene)
Inhalation Exposure ^a (in mg/m ³)/8h workday ⁸	0,14	ECETOC TRA model prediction for PROC 2 (calcium cyanamide)

Notes: a Calculated assuming a default bodyweight of 70 kg for workers and a default respiratory volume of 10 m³, light activity, for an 8 hour work shift.

Table 1.26. Summary of the releases to the environment

Compartments	Release ¹ from point source (kg/d) (local exposure estimation)	Justification
Aquatic (without STP)		Not addressed here, but in acetylene CSR.
Aquatic (after STP)		Not addressed here, but in acetylene CSR.
Air (direct + STP)	8E-04 cyanamide 2.1E-04 calcium sulfide	As dust, direct.

⁷ air concentration at the workplace

⁸ air concentration at the workplace

¹ Releases converted to cyanamide basis.

Soil (direct releases only)		Not addressed here, but in acetylene CSR.
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Exposure concentrations in the environment

The only relevant emissions are to air, therefore only concentrations in air and in soil through deposition have been calculated. The results are summarised in Table 1.27.

Table 1.27. Summary of exposure concentrations from acetylene production - cyanamide

LOCAL CONCENTRATIONS AND DEPOSITIONS	Value	Unit
AIR		
Concentration in air during emission episode	9.45E-08	[mg.m-3]
Annual average concentration in air, 100 m from point source	6.47E-08	[mg.m-3]
Total deposition flux during emission episode	1.71E-07	[mg.m-2.d-1]
Annual average total deposition flux	1.17E-07	[mg.m-2.d-1]
SOIL, GROUNDWATER		
Concentration in agric. soil averaged over 30 days	1.12E-08	[mg.kgwwt-1]
Concentration in agric. soil averaged over 180 days	1.12E-08	[mg.kgwwt-1]
Concentration in grassland averaged over 180 days	1.80E-08	[mg.kgwwt-1]
Fraction of steady-state (agricultural soil)	[1]	-
Fraction of steady-state (grassland soil)	[1]	-
LOCAL PECS [PRODUCTION]		
AIR		
Annual average local PEC in air (total)	6.47E-08	[mg.m-3]
SOIL, GROUNDWATER		
Local PEC in agric. soil (total) averaged over 30 days	1.12E-08	[mg.kgwwt-1]
Local PEC in agric. soil (total) averaged over 180 days	1.80E-08	[mg.kgwwt-1]
Local PEC in grassland (total) averaged over 180 days	1.80E-08	[mg.kgwwt-1]
Local PEC in pore water of agricultural soil	6.00E-08	[mg.l-1]
Local PEC in pore water of grassland	9.63E-08	[mg.l-1]
Local PEC in groundwater under agricultural soil	6.00E-08	[mg.l-1]

The exposure concentrations from acetylene production for calcium sulfide are summarised in Table 1.28. The only relevant emissions are to air, therefore only concentrations in air and in soil through deposition have been calculated.

Table 1.28. Summary of exposure concentrations from acetylene production – calcium sulfide

LOCAL CONCENTRATIONS AND DEPOSITIONS	Value	Unit
AIR		
Concentration in air during emission episode	4.73E-08	[mg.m-3]
Annual average concentration in air, 100 m from point source	3.24E-08	[mg.m-3]
Total deposition flux during emission episode	1.69E-06	[mg.m-2.d-1]
Annual average total deposition flux	1.16E-06	[mg.m-2.d-1]
SOIL, GROUNDWATER		
Concentration in agric. soil averaged over 30 days	4.86E-09	[mg.kgwwt-1]
Concentration in agric. soil averaged over 180 days	4.86E-09	[mg.kgwwt-1]
Concentration in grassland averaged over 180 days	9.62E-09	[mg.kgwwt-1]
Fraction of steady-state (agricultural soil)	[1]	-
Fraction of steady-state (grassland soil)	[1]	-
LOCAL PECS [PRODUCTION]		
AIR		
Annual average local PEC in air (total)	3.24E-08	[mg.m-3]
SOIL, GROUNDWATER		
Local PEC in agric. soil (total) averaged over 30 days	4.86E-09	[mg.kgwwt-1]
Local PEC in agric. soil (total) averaged over 180 days	4.86E-09	[mg.kgwwt-1]
Local PEC in grassland (total) averaged over 180 days	9.62E-09	[mg.kgwwt-1]
Local PEC in pore water of agricultural soil	2.80E-08	[mg.l-1]
Local PEC in pore water of grassland	5.55E-08	[mg.l-1]
Local PEC in groundwater under agricultural soil	2.80E-08	[mg.l-1]

Exposure concentration relevant for the food chain (Secondary poisoning)

Neither of the two impurities being considered accumulates in the food chain, so the assessment of secondary poisoning is not considered further.

ES 4: Use of calcium carbide in metallurgy

Exposure scenario

The REACH default release estimates for industrial use of reactive processing aids (ERC6B) are:

Release to air: 0.1 %

Release to wastewater: 5%

These values are unrealistically high, and they may be ignored on the basis of a site visit to an iron foundry. This shows that at the worst there may be occasional losses of carbide from transfer lines, but there is no carbide/oxide dust in the area. The entire facility is free from use of water. Losses will therefore be even lower than those estimated for production of calcium carbide.

Exposures have been assessed as minimal, and less than those from production, based on site visits, and therefore do not need to be quantified.

Regional exposure concentrations

Regional concentrations cannot be added to the exposure scenario because there is no realistic way to assess regional exposure for inorganic substances. The standard models, e.g. EUSES 2.1.1 are parameterised for organic substances.

Furthermore, the ultimate degradation products in the environment are inorganic species already present in the environment at high concentration.

It is concluded that regional exposure assessment need not be performed.