

prepared in accordance with Annex II of the REACH Regulation EC 1907/2006,

Regulation (EC) 1272/2008 and Regulation (EC) 453/2010

Version: 1.0/EN		
Revision date: 2020-03-23	FRENCH COUNTRY	Printing Date: 2020-03-23
SECTION 1: IDENTIFICATION	N OF THE SUBSTANCE AND OF THE COMPANY/	UNDERTAKING
Substance name:	Calcium oxide	
Synonyms:	Lime, Burnt lime, Un-slaked lime, Building lime, C Fluxing lime, Hard burnt lime, Soft burnt lime, Peb monoxide, Quick lime, Calcined limestone.	
	Please note that this list may not be exhaustive.	
Chemical name and formula:	Calcium oxide – CaO	

Trade name: Chaux en roche, Chaux vive XCHR, Chaux vive calcique X100HR, chaux vive X100TC, chaux vive X100, chaux vive à poussière réduite, CL90-Q(R5P1), CL90-Q(R4P2), CL90-Q(R4P3).

CAS:	1305-78-8
EINECS:	215-138-9
Molecular Weight:	56.08 g/mol
REACH Registration number:	01-2119475325-36-0101

#### 1.2 Relevant identified uses of the substance and uses advised against

#### Use of the substance:

The substance is intended for the following non-exhaustive list of uses:

Building material industry, Chemical industry, Agriculture, Biocidal use, Environmental protection (e.g. flue gas treatment, waste water treatment, sludge treatment), Drinking water treatment, Feed, food and pharmaceutical industry, Civil engineering, Paper and paint industry

#### 1.2.1 Identified uses

All uses listed in table 1 of the Appendix of this SDS are identified uses.

#### 1.2.2 Uses advised against

No use identified in Table 1 of the Appendix of this SDS is advised against.

#### 1.3 Details of the supplier of the Safety Data Sheet

Name:	Européenne des Chaux et Liants
Address:	2745 Route du Bugey
	Flosailles
	38300 Saint-Savin
	France

Phone N°:

+33 4 74 28 98 90

E-mail of competent person responsible groupe@saint-hilaire-industries.fr for SDS:



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1.4 Emergency telephone number		
European Emergency N°:	112	
National centre for Prevention and Treatm Intoxications N°:	ient of ORFILA + 33 1 45 42 59 59 for	FRANCE
Emergency telephone at the company	+33 4 74 92 98 90.(8h-12h/14h-17	7h)
Available outside office hours:	🗌 Yes 🛛 No	0
SECTION 2: HAZARDS IDENTIFICATION		

2.1. Classification of the substance

2.1.1. Classification according to Regulation (EC) 1272/2008
Skin irrit. 2, H315
STOT SE 3, H335 - Route of exposure: Inhalation
Eye Dam. 1, H318

#### 2.1.2. Additional information

For full text of H-statements and R- phrases: see SECTION 16

#### 2.2. Label elements

#### 2.2.1. Labelling according to Regulation (EC) 1272/2008

Signal word: Danger

#### Hazard pictogram:



H315:	Causes skin irritation
H318:	Causes serious eye damage
H335:	May cause respiratory irritation

Precautionary statem	ents:
P102:	Keep out of reach of children
P280:	Wear protective gloves/protective clothing/eye protection/face protection
P305+P351+P338:	If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P302+P352:	IF ON SKIN: Wash with plenty of water
P310:	Immediately call a poison center or doctor/physician.
P261:	Avoid breathing dust/spray
P304+P340:	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
P501:	Dispose of contents/container in accordance with local/regional/national/ international regulation



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#### 2.3. Other hazards

The substance does not meet the criteria for PBT or vPvB substance. No other hazards identified.

#### SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

#### 3.1. Substances

#### Main constituent

CAS number	EC number	Registration	Identification	Weight %	Classification according to
		No	name	content	Regulation (EC) No 1272/2008
				(or range)	[CLP]
1305-78-8	215-138-9	01-	Calcium	X%	Eye Dam 1 H318
		2119475325-	oxyde		Skin Irrit. 2 H315
		36			STOT SE 3 (inhalation) H335

Hazardous impurities: to be disclosed if the impurity content is above the concentration limit for classification or above or equal to 1% (w/w)

#### SECTION 4: FIRST AID MEASURES

#### 4.1. Description of first aid measures

#### General notes

No known delayed effects. Consult a physician for all exposures except for minor instances.

#### Following inhalation

Move source of dust or move person to fresh air. Obtain medical attention immediately.

#### Following skin contact

Carefully and gently brush the contaminated body surfaces in order to remove all traces of product. Wash affected area immediately with plenty of water. Remove contaminated clothing. If necessary seek medical advice.

#### Following eye contact

Rinse eyes immediately with plenty of water and seek medical advice.

Following ingestion

Clean mouth with water and drink afterwards plenty of water. Do NOT induce vomiting. Obtain medical attention.

#### Self-protection of the first aid

Avoid contact with skin, eyes, and clothing – wear suitable protective equipment (see section 8). Avoid inhalation of dust – ensure that sufficient ventilation or suitable respiratory protective equipment is used, wear suitable protective equipment (see section 8).



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#### 4.2. Most important symptoms and effects, both acute and delayed

Calcium oxide is not acutely toxic via the oral, dermal, or inhalation route. The substance is classified as irritating to skin and the respiratory tract, and entails a risk of serious damage to the eye. There is no concern for adverse systemic effects because local effects (pH-effect) are the major health hazard.

4.3. Indication of any immediate medical attention and special treatment needed

Follow the advises given in section 4.1

#### SECTION 5: FIRE FIGHTING MEASURES

#### 5.1. Extinguishing media

#### 5.1.1. Suitable extinguishing media

The product is not combustible. Use a dry powder, foam or  $CO_2$  fire extinguisher to extinguish the surrounding fire. Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.

#### 5.1.2. Unsuitable extinguishing media

Do not use water. Avoid humidification.

#### 5.2. Special hazards arising from the substance or mixture

Calcium oxide reacts with water and generates heat. This may cause risk to flammable material.

#### 5.3. Advice for fire fighters

Avoid generation of dust. Use breathing apparatus. Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.

#### SECTION 6: ACCIDENTAL RELEASE MEASURES

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

#### 6.1.1. For non-emergency personnel

Ensure adequate ventilation. Keep dust levels to a minimum. Keep unprotected persons away. Avoid contact with skin, eyes, and clothing – wear suitable protective equipment (see section 8). Avoid inhalation of dust – ensure that sufficient ventilation or suitable respiratory protective equipment is used, wear suitable protective equipment (see section 8). Avoid humidification.

#### 6.1.2. For emergency responders

Keep dust levels to a minimum.

Ensure adequate ventilation.

Keep unprotected persons away.

Avoid contact with skin, eyes, and clothing - wear suitable protective equipment (see section 8).

Avoid inhalation of dust – ensure that sufficient ventilation or suitable respiratory protective equipment is used, wear suitable protective equipment (see section 8).

Avoid humidification.



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#### 6.2. Environmental precautions

Contain the spillage. Keep the material dry if possible. Cover area if possible to avoid unnecessary dust hazard. Avoid uncontrolled spills to watercourses and drains (pH increase). Any large spillage into watercourses must be alerted to the Environment Agency or other regulatory body.

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

In all cases avoid dust formation. Keep the material dry if possible. Pick up the product mechanically in a dry way. Use vacuum suction unit, or shovel into bags.

#### 6.4. Reference to other sections

For more information on exposure controls/personal protection or disposal considerations, please check section 8 and 13 and the Annex of this safety data sheet.

#### SECTION 7: HANDLING AND STORAGE

#### 7.1. Precautions for safe handling

#### 7.1.1. Protective measures

Avoid contact with skin and eyes. Wear protective equipment (refer to section 8 of this safety data sheet). Do not wear contact lenses when handling this product. It is also advisable to have individual pocket eyewash. Keep dust levels to a minimum. Minimize dust generation. Enclose dust sources, use exhaust ventilation (dust collector at handling points). Handling systems should preferably be enclosed. When handling bags usual precautions should be paid to the risks outlined in the Council Directive 90/269/EEC.

#### 7.1.2. Advice on general occupational hygiene

Avoid inhalation or ingestion and contact with skin and eyes. General occupational hygiene measures are required to ensure safe handling of the substance. These measures involve good personal and housekeeping practices (i.e. regular cleaning with suitable cleaning devices), no drinking, eating and smoking at the workplace. Shower and change clothes at end of work shift. Do not wear contaminated clothing at home.

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

The substance should be stored under dry conditions. Any contact with air and moisture should be avoided. Bulk storage should be in purpose – designed silos. Keep away from acids, significant quantities of paper, straw, and nitro compounds. Keep out of reach of children. Do not use aluminium for transport or storage if there is a risk of contact with water.

#### 7.3. Specific end use(s)

Please check the identified uses in table 1 of the Appendix of this SDS.

For more information please see the relevant exposure scenario, available via your supplier/given in the Appendix, and check section 2.1: Control of worker exposure.



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# SECTION 8: EXPOSURE CONTROLS / PERSONAL PROTECTION 8.1. Control parameters

#### Exposure limit value

Designation	VLEP 8h (mg.m³)	VLEP 8h CT (mg.m <sup>3</sup> ) a duration of 5 min	Legal basis
Calcium (Oxyde de)	2	-	En vigueur jusqu'au 30/96/2020 Indicatives limite value (circular), 1987
Calcium (Oxyde de) olveolar fraction	1	4	In force on 07/01/2020 Indicative regulatory limit values according to the decree of 06-30-2004 as modified in 2019

#### DNELs:

	Workers			
Route of exposure	Acute effect local	Acute effects systemic	Chronic effects local	Chronic effects systemic
Oral	Not required			
Inhalation	4 mg / m <sup>3</sup> (Respirable dust)	No hazard identified	1 mg / m³ (Respirable dust)	No hazard identified
Dermal	Hazard identified but no DNEL available	No hazard identified	Hazard identified but no DNEL available	No hazard identified

	Consumers			
Route of exposure	Acute effect local	Acute effects systemic	Chronic effects local	Chronic effects systemic
Oral	No exposure expected	No hazard identified	No exposure expected	No hazard identified
Inhalation	4 mg / m <sup>3</sup> (Respirable dust)	No hazard identified	1 mg / m³ (Respirable dust)	No hazard identified
Dermal	Hazard identified but no DNEL available	No hazard identified	Hazard identified but no DNEL available	No hazard identified

#### PNECs:



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Environment protection target	PNEC	Remarks
Fresh water	0.37 mg / L	
Freshwater sediments	No PNEC available	Insufficient data available
Marine water	0.24 mg / L	
Marine sediments	No PNEC available	Insufficient data available
Food (bioaccumulation)	No hazard identified	No potential for bioaccumulation
Microorganisms in sewage treatment	2.27 mg / L	
Soil (agricultural)	817.4 mg / kg soil dw	
Air	No hazard identified	

#### OELs:

8 hours limit value	1 mg/m <sup>3</sup> respirable fraction
Short-term limit value	4 mg/m <sup>3</sup> respirable fraction

According to Directive (EU) 2017/164 of 31 January 2017

#### National OELs for the substance

#### If applicable, indicate all protection notations as well as short-term limits.

#### 8.2. Exposure controls

To control potential exposures, generation of dust should be avoided. Further, appropriate protective equipment is recommended. Eye protection equipment (e.g. goggles or visors) must be worn, unless potential contact with the eye can be excluded by the nature and type of application (i.e. closed process). Additionally, face protection, protective clothing and safety shoes are required to be worn as appropriate.

Please check the relevant exposure scenario, given in the Appendix/available via your supplier.

#### 8.2.1. Appropriate engineering controls

If user operations generate dust, use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne dust levels below recommended exposure limits.

#### 8.2.2. Individual protection measures, such as personal protective equipment

#### 8.2.2.1. Eye/face protection

Do not wear contact lenses. For powders, tight fitting goggles with side shields, or wide vision full goggles. It is also advisable to have individual pocket eyewash.



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#### 8.2.2.2. Skin protection

Since calcium oxide is classified as irritating to skin, dermal exposure has to be minimised as far as technically feasible. The use of protective gloves (nitrile), protective standard working clothes fully covering skin, full length trousers, long sleeved overalls, with close fittings at openings and shoes resistant to caustics and avoiding dust penetration are required to be worn.

#### 8.2.2.3. Respiratory protection

Local ventilation to keep levels below established threshold values is recommended. A suitable particle filter mask is recommended, depending on the expected exposure levels - please check the relevant exposure scenario, given in the Appendix/available via your supplier.

#### 8.2.2.4. Thermal hazards

The substance does not represent a thermal hazard, thus special consideration is not required.

#### 8.2.3. Environmental exposure controls

All ventilation systems should be filtered before discharge to atmosphere.

Avoid releasing to the environment.

Contain the spillage. Any large spillage into watercourses must be alerted to the regulatory authority responsible for environmental protection or other regulatory body.

For detailed explanations of the risk management measures that adequately control exposure of the environment to the substance please check the relevant exposure scenario, available via your supplier. For further detailed information, please check the Appendix of this SDS.

#### SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

#### 9.1. Information on basic physical and chemical properties

Appearance:	White or off white (beige) solid material of varying sizes: Lump, granular or fine powder
Odour:	odourless
Odour threshold:	not applicable
pH:	12.3 (saturated solution at 20 °C)
Melting point:	> 450 °C (study result, EU A.1 method)
Boiling point:	not applicable (solid with a melting point > 450 °C)
Flash point:	not applicable (solid with a melting point > 450 °C)
Evaporation rate:	not applicable (solid with a melting point > 450 $^{\circ}$ C)
Flammability:	non flammable (study result, EU A.10 method)
Explosive limits:	non explosive (void of any chemical structures commonly associated with explosive properties)
Vapour pressure:	not applicable (solid with a melting point > 450 °C)
Vapour density:	not applicable
Relative density:	3.31 (study result, EU A.3 method)
Solubility in water:	1337.6 mg/L (study results, EU A.6 method)
Partition coefficient:	not applicable (inorganic substance)



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Auto ignition temperature:	no relative self-ignition temperature below 400	0 °C (study result, EU A.16 method)
Decomposition temperature:	not applicable	
Viscosity:	not applicable (solid with a melting point > 450	0 °C)
Oxidising properties:	no oxidising properties (Based on the chemica contain a surplus of oxygen or any structural g tendency to react exothermally with combustib	groups known to be correlated with a

#### 9.2. Other information

Not available

#### SECTION 10: STABILITY AND REACTIVITY

#### 10.1. Reactivity

Calcium oxide reacts exothermically with water to form Calcium dihydroxide.

#### 10.2. Chemical stability

Under normal conditions of use and storage (dry conditions), calcium oxide is stable.

#### 10.3. Possibility of hazardous reactions

Calcium oxide reacts exothermically with acids to form calcium salts.

#### 10.4. Conditions to avoid

Minimise exposure to air and moisture to avoid degradation.

#### 10.5. Incompatible materials

Calcium oxide reacts exothermically with water to form calcium dihydroxide: CaO + H<sub>2</sub>O  $\rightarrow$  Ca(OH)<sub>2</sub> + 1155 kJ/kg CaO Calcium oxide reacts exothermically with acids to form calcium salts. Calcium oxide reacts with aluminium and brass in the presence of moisture leading to the production of hydrogen: CaO + 2 AI + 7 H<sub>2</sub>O  $\rightarrow$  Ca(AI (OH)<sub>4</sub>)<sub>2</sub> + 3 H<sub>2</sub>

#### 10.6. Hazardous decomposition products

None.

Further information: calcium oxide absorbs moisture and carbon dioxide from air to form calcium carbonate, which is a common material in nature.

#### SECTION 11: TOXICOLOGICAL INFORMATION

#### Information on toxicological effects

#### a. Acute toxicity

Oral  $LD_{50} > 2000 \text{ mg/kg bw}$  (OECD 425, rat) Dermal  $LD_{50} > 2500 \text{ mg/kg bw}$  (calcium dihydroxide, OECD 402, rabbit); by read across these results are also applicable to calcium oxide, since in contact with moisture calcium hydroxide is formed.

Inhalation no data available

Calcium oxide is not acutely toxic.



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#### b. Skin corrosion/irritation

Calcium oxide is irritating to skin (in vivo, rabbit).

Calcium dihydroxide is not corrosive to skin (in vitro, OECD 431). By read across these results are also applicable to calcium oxide.

#### c. Serious eye damage/irritation

Calcium oxide entails a risk of serious damage to the eye (in vivo, rabbit).

#### d. Respiratory or skin sensitisation

No data available. Calcium oxide is considered not to be a skin sensitiser, based on the nature of the effect (pH shift) and the essential requirement of calcium for human nutrition.

#### e. Germ cell mutagenicity

Calcium dihydroxide is not genotoxic (*in vitro, OECD 471, 473 and 476*). By read across these results are also applicable to calcium oxide.

In view of the omnipresence and essentiality of Ca and of the physiological non-relevance of any pH shift induced by calcium oxide in aqueous media, CaO is obviously void of any genotoxic potential.

#### f. Carcinogenicity

Calcium (administered as Ca-lactate) is not carcinogenic (experimental result, rat). The pH effect of calcium oxide does not give rise to a carcinogenic risk. Human epidemiological data support lack of any carcinogenic potential of calcium oxide.

#### g. Reproductive toxicity

Calcium (administered as Ca-carbonate) is not toxic to reproduction (experimental result, mouse).

The pH effect does not give rise to a reproductive risk.

Human epidemiological data support lack of any potential for reproductive toxicity of calcium oxide.

Both in animal studies and human clinical studies on various calcium salts no reproductive or developmental effects were detected. Also see the Scientific Committee on Food (Section 16.6).

Thus, calcium oxide is not toxic for reproduction and/or development.

#### h. STOT-single exposure

From human data it is concluded that CaO is irritating to the respiratory tract.

As summarised and evaluated in the SCOEL recommendation (Anonymous, 2008), based on human data calcium oxide is irritating to the respiratory system.

#### i. STOT-repeated exposure

Toxicity of calcium via the oral route is addressed by upper intake levels (UL) for adults determined by the Scientific Committee on Food (SCF), being

UL = 2500 mg/d, corresponding to 36 mg/kg bw/d (70 kg person) for calcium.

Toxicity of CaO via the dermal route is not considered as relevant in view of the anticipated insignificant absorption through skin and due to local irritation as the primary health effect (pH shift).

Toxicity of CaO via inhalation (local effect, irritation of mucous membranes) is addressed by an 8-h TWA determined by the Scientific Committee on Occupational Exposure Limits (SCOEL) of 1 mg/m<sup>3</sup> respirable dust (see Section 8.1).

#### j. Aspiration hazard

Calcium oxide is not known to present an aspiration hazard.



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#### SECTION 12: ECOLOGICAL INFORMATION

#### 12.1. Toxicity

#### 12.1.1. Acute/Prolonged toxicity to fish

LC<sub>50</sub> (96h) for freshwater fish: 50.6 mg/l (calcium dihydroxide) LC<sub>50</sub> (96h) for marine water fish: 457 mg/l (calcium dihydroxide)

#### 12.1.2. Acute/Prolonged toxicity to aquatic invertebrates

EC<sub>50</sub> (48h) for freshwater invertebrates: 49.1 mg/l (calcium dihydroxide) LC<sub>50</sub> (96h) for marine water invertebrates: 158 mg/l (calcium dihydroxide)

#### 12.1.3. Acute/Prolonged toxicity to aquatic plants

EC<sub>50</sub> (72h) for freshwater algae: 184.57 mg/l (calcium dihydroxide) NOEC (72h) for freshwater algae: 48 mg/l (calcium dihydroxide)

#### 12.1.4. Toxicity to micro-organisms e.g. bacteria

At high concentration, through the rise of temperature and pH, calcium oxide is used for disinfection of sewage sludges

#### 12.1.5. Chronic toxicity to aquatic organisms

NOEC (14d) for marine water invertebrates: 32 mg/l (calcium dihydroxide)

#### 12.1.6. Toxicity to soil dwelling organisms

 $EC_{10}/LC_{10}$  or NOEC for soil macroorganisms: 2000 mg/kg soil dw (calcium dihydroxide)  $EC_{10}/LC_{10}$  or NOEC for soil microorganisms: 12000 mg/kg soil dw (calcium dihydroxide)

#### 12.1.7. Toxicity to terrestrial plants

NOEC (21d) for terrestrial plants: 1080 mg/kg (calcium dihydroxide)

#### 12.1.8. General effect

Acute pH-effect. Although this product is useful to correct water acidity, an excess of more than 1 g/l may be harmful to aquatic life. pH-value of > 12 will rapidly decrease as result of dilution and carbonation

#### 12.1.9. Further information

The results by read across are also applicable to calcium oxide, since in contact with moisture calcium hydroxide is formed

#### 12.2. Persistence and degradability

Not relevant for inorganic substances

#### 12.3. Bioaccumulative potential

Not relevant for inorganic substances

#### 12.4. Mobility in soil

Calcium oxide reacts with water and/or carbon dioxide to form respectively calcium dihydroxide and/or calcium carbonate, which are sparingly soluble, and present a low mobility in most soils.



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#### 12.5. Results of PBT and vPvB assessment

Not relevant for inorganic substances

#### 12.6. Other adverse effects

No other adverse effects are identified

#### SECTION 13: DISPOSAL CONSIDERATIONS

#### 13.1. Waste treatment methods

Disposal of calcium oxide should be in accordance with local and national legislation. Processing, use or contamination of this product may change the waste management options. Dispose of container and unused contents in accordance with applicable member state and local requirements.

The used packing is only meant for packing this product; it should not be reused for other purposes. After usage, empty the packing completely.

#### SECTION 14: TRANSPORT INFORMATION

Calcium oxide is not classified as hazardous for transport [ADR (road), RID (rail), ADN (inland waterways) and IMDG (sea)]. Calcium oxide is, however, classified as hazardous for air transport (ICAO/IATA).

#### 14.1. UN-Number

UN 1910

14.2. UN proper shipping name

Calcium oxide

14.3. Transport hazard class(es)

Class 8 (ICAO/IATA)

14.4. Packing group

Group III (ICAO/IATA)

#### 14.5. Environmental hazards

None

#### 14.6. Special precautions for user

Avoid any release of dust during transportation, by using air-tight tanks for powders and covered trucks for pebbles.

14.7. Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code

Not regulated.

#### SECTION 15: REGULATORY INFORMATION

15.1. Safety, health and environmental regulations/legislation specific for the substance Authorizations Not compulsory



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Restriction on use		None
Other regulations (	(European	The product is neither a SEVESO
Union)		substance, nor a substance harmful to the
		ozone layer, nor a persistent organic
		pollutant.
Information on nati	ional	Information on national laws German
legislation		legislation on substances dangerous for
		water VWVWS
		slightly pollutes water (WGK 1)

#### 15.2. Chemical safety assessment

A chemical safety assessment has been carried out for this substance.

#### **SECTION 16: OTHER INFORMATION**

Data are based on our latest knowledge but do not constitute a guarantee for any specific product features and do not establish a legally valid contractual relationship.

#### 16.1. Hazard Statements

- H315: Causes skin irritation
- H318: Causes serious eye damage
- H335: May cause respiratory irritation

#### 16.2. Precautionary Statements

P102:	Keep out of reach of children
P280:	Wear protective gloves/protective clothing/eye protection/face protection
P305+P351+P338:	If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P302+P352:	IF ON SKIN: Wash with plenty of water
P310:	Immediately call a poison center or doctor/physician.
P261:	Avoid breathing dust/spray
P304+P340:	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
P501:	Dispose of contents/container in accordance with local/regional/national/ international regulation

#### 16.3. Abbreviations

EC<sub>50</sub>: median effective concentration

- LC<sub>50</sub>: median lethal concentration
- LD<sub>50</sub>: median lethal dose
- NOEC: no observable effect concentration



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OEL: occupational exposure limit

PBT: persistent, bioaccumulative, toxic chemical

PNEC: predicted no-effect concentration

STEL: short-term exposure limit

TWA: time weighted average

vPvB: very persistent, very bioaccumulative chemical

#### 16.4. Key literature references

Anonymous, 2006: Tolerable upper intake levels for vitamins and minerals Scientific Committee on Food, European Food Safety Authority, ISBN: 92-9199-014-0 [SCF document]

Anonymous, 2008: Recommendation from the Scientific Committee on Occupational Exposure Limits (SCOEL) for calcium oxide (CaO) and calcium dihydroxide (Ca(OH)<sub>2</sub>), European Commission, DG Employment, Social Affairs and Equal Opportunities, SCOEL/SUM/137 February 2008

#### 16.5. Revision

#### Mention which chapters were revised and update the revision date in the header

#### **Disclaimer**

This safety data sheet (SDS) is based on the legal provisions of the REACH Regulation (EC 1907/2006; article 31 and Annex II), as amended. Its contents are intended as a guide to the appropriate precautionary handling of the material. It is the responsibility of recipients of this SDS to ensure that the information contained therein is properly read and understood by all people who may use, handle, dispose or in any way come in contact with the product. Information and instructions provided in this SDS are based on the current state of scientific and technical knowledge at the date of issue indicated. It should not be construed as any guarantee of technical performance, suitability for particular applications, and does not establish a legally valid contractual relationship. This version of the SDS supersedes all previous versions.

#### APPENDIX including Exposure Scenarios 9.1, 9.2, 9.3, 9.4, 9.5, 9.6, 9.7, 9.8, 9.9, 9.10, 9.11, 9.12, 9.13, 9.14, 9.15 and 9.16

#### **APPENDIX: EXPOSURE SCENARIOS**

The current document includes all relevant occupational and environmental exposure scenarios (ES) for the production and use of calcium oxide as required under the REACH Regulation (Regulation (EC) No 1907/2006). For the development of the ES the Regulation and the relevant REACH Guidance have been considered. For the description of the covered uses and processes, the "R.12 – Use descriptor system" guidance (Version: 2, March 2010, ECHA-2010-G-05-EN), for the description and implementation of risk management measures (RMM) the "R.13 – Risk management measures" guidance (Version: 1.1, May 2008), for the occupational exposure estimation the "R.14 – Occupational exposure estimation" guidance (Version: 2, May 2010, ECHA-2010-G-09-EN) and for the actual environmental exposure assessment the "R.16 – Environmental Exposure Assessment" (Version: 2, May 2010, ECHA-10-G-06-EN) was used.

#### Methodology used for environmental exposure assessment

The environmental exposure scenarios only address the assessment at the local scale, including municipal sewage treatment plants (STPs) or industrial waste water treatment plants (WWTPs) when applicable, for industrial and professional uses as any effects that might occur is expected to take place on a local scale.



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#### 1) Industrial uses (local scale)

The exposure and risk assessment is only relevant for the aquatic environment, when applicable including STPs/WWTPs, as emissions in the industrial stages mainly apply to (waste) water. The aquatic effect and risk assessment only deal with the effect on organisms/ecosystems due to possible pH changes related to OH<sup>-</sup> discharges. The exposure assessment for the aquatic environment only deals with the possible pH changes in STP effluent and surface water related to the OH<sup>-</sup> discharges at the local scale and is performed by assessing the resulting pH impact: the surface water pH should not increase above 9 (In general, most aquatic organisms can tolerate pH values in the range of 6-9).

Risk management measures related to the environment aim to avoid discharging calcium oxidesolutions into municipal wastewater or to surface water, in case such discharges are expected to cause significant pH changes. Regular control of the pH value during introduction into open waters is required. Discharges should be carried out such that pH changes in receiving surface waters are minimised. The effluent pH is normally measured and can be neutralised easily, as often required by national laws.

#### 2) Professional uses (local scale)

The exposure and risk assessment is only relevant for the aquatic and terrestrial environment. The aquatic effect and risk assessment is determined by the pH effect. Nevertheless, the classical risk characterisation ratio (RCR), based on PEC (predicted environmental concentration) and PNEC (predicted no effect concentration) is calculated. The professional uses on a local scale refer to applications on agricultural or urban soil. The environmental exposure is assessed based on data and a modelling tool. The modelling FOCUS/ Exposit tool is used to assess terrestrial and aquatic exposure (typically conceived for biocidal applications).

Details and scaling approach indications are reported in the specific scenarios.

#### Methodology used for occupational exposure assessment

By definition an exposure scenario (ES) has to describe under which operational conditions (OC) and risk management measure (RMMs) the substance can be handled safely. This is demonstrated if the estimated exposure level is below the respective derived no-effect level (DNEL), which is expressed in the risk characterisation ratio (RCR).

For workers, the repeated dose DNEL for inhalation as well as the acute DNEL for inhalation are based on the respective recommendations of the scientific committee on occupational exposure limits (SCOEL) being 1 mg/m<sup>3</sup> and 4 mg/m<sup>3</sup>, respectively.

In cases where neither measured data nor analogous data are available, occupational exposure is assessed with the aid of a modelling tool. At the first tier screening level, the MEASE tool (<u>http://www.ebrc.de/mease.html</u>) is used to assess inhalation exposure according to the ECHA guidance (R.14).

Since the SCOEL recommendation refers to <u>respirable dust</u> while the exposure estimates in MEASE reflect the <u>inhalable</u> fraction, an additional safety margin is inherently included in the exposure scenarios below when MEASE has been used to derive exposure estimates.

#### Methodology used for consumer exposure assessment



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By definition an ES has to describe under which conditions the substances, preparation or articles can be handled safely. In cases where neither measured data nor analogous data are available, exposure is assessed with the aid of a modelling tool.

For consumers, the repeated dose DNEL for inhalation as well as the acute DNEL for inhalation are based on the respective recommendations of the Scientific Committee on Occupational Exposure Limits (SCOEL), being 1 mg/m<sup>3</sup> and 4 mg/m<sup>3</sup>, respectively.

For inhalation exposure to powders the data, derived from van Hemmen (van Hemmen, 1992: Agricultural pesticide exposure data bases for risk assessment. Rev Environ ContamToxicol. 126: 1-85.), has been used to calculate the inhalation exposure. The inhalation exposure for consumers is estimated at 15  $\mu$ g/hr or 0.25  $\mu$ g/min. For larger tasks the inhalation exposure is expected to be higher. A factor of 10 is suggested when the product amount exceeds 2.5 kg, resulting in the inhalation exposure of 150  $\mu$ g/hr.To convert these values in mg/m<sup>3</sup> a default value of 1.25 m<sup>3</sup>/hr for the breathing volume under light working conditions will be assumed (van Hemmen, 1992) giving 12  $\mu$ g/m<sup>3</sup> for small tasks and 120  $\mu$ g/m<sup>3</sup> for larger tasks.

When the preparation or substance is applied in granular form or as tablets, reduced exposure to dust was assumed. To take this into account if data about particle size distribution and attrition of the granule are lacking, the model for powder formulations is used, assuming a reduction in dust formation by 10 % according to Becks and Falks (Manual for the authorisation of pesticides. Plant protection products. Chapter 4 Human toxicology; risk operator, worker and bystander, version 1.0., 2006).

For dermal exposure and exposure to the eye a qualitative approach has been followed, as no DNEL could be derived for this route due to the irritating properties of calcium oxide. Oral exposure was not assessed as this is not a foreseeable route of exposure regarding the uses addressed.

Since the SCOEL recommendation refers to respirable dust while the exposure estimates by the model from van Hemmen reflect the inhalable fraction, an additional safety margin is inherently included in the exposure scenarios below, i.e. the exposure estimates are very conservative.

The exposure assessment of calcium oxide professional and industrial and consumer use is performed and organized based on several scenarios. An overview of the scenarios and the coverage of substance life cycle is presented in Table 1.



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**Table 1:** Overview on exposure scenarios and coverage of substance life cycle

		Identified uses		Resultin g life cycle stage	entified Use			Process	Article	Environmental		
ES number	Exposure scenario title	Manufacture	Formulation	End use	Consumer	Service life (for articles)	Linked to Iden		Chemical Product Category (PC)	category (PROC)	categor	release category (ERC)
9.1	Manufacture and industrial uses of aqueous solutions of lime substances	x	x	x		х	1	3; 1, 2a, 2b, 4, 5, 6a, 6b, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 23, 24	1, 2, 3, 7, 8, 9a, 9b, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40	1, 2, 3, 4, 5, 7, 8a, 8b, 9, 10, 12, 13, 14, 15, 16, 17, 18, 19	5, 6, 7, 8,	1, 2, 3, 4, 5, 6a, 6b, 6c, 6d, 7, 12a, 12b, 10a, 10b, 11a, 11b
9.2	Manufacture and industrial uses of low dusty solids/powders of lime substances	x	x	x		х	2	3; 1, 2a, 2b, 4, 5, 6a, 6b, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 23, 24	1, 2, 3, 7, 8, 9a, 9b, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40	1, 2, 3, 4, 5, 6, 7, 8a, 8b, 9, 10, 13, 14, 15, 16, 17, 18, 19, 21, 22, 23, 24, 25, 26, 27a, 27b	5, 6, 7, 8,	1, 2, 3, 4, 5, 6a, 6b, 6c, 6d, 7, 12a, 12b, 10a, 10b, 11a, 11b
9.3	Manufacture and industrial uses of medium dusty solids/powders of lime substances	x	x	x		х	3	3; 1, 2a, 2b, 4, 5, 6a, 6b, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 23, 24	1, 2, 3, 7, 8, 9a, 9b, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40	1, 2, 3, 4, 5, 7, 8a, 8b, 9, 10, 13, 14, 15, 16, 17, 18, 19, 22, 23, 24, 25, 26, 27a, 27b	5, 6, 7, 8,	1, 2, 3, 4, 5, 6a, 6b, 6c, 6d, 7, 12a, 12b, 10a, 10b, 11a, 11b



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			Identifie uses		fied g life cycle stage		tified Use			Process	Article	Environmental
ES number	Exposure scenario title	Manufacture	Formulation	End use	Consumer	Service life (for articles)	en	Sector of use category (SU)	Chemical Product Category (PC)	category (PROC)	Article categor y (AC)	release category (ERC)
9.4	Manufacture and industrial uses of high dusty solids/powders of lime substances	x	x	x		х	4	3; 1, 2a, 2b, 4, 5, 6a, 6b, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 23, 24	1, 2, 3, 7, 8, 9a, 9b, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40	1, 2, 3, 4, 5, 7, 8a, 8b, 9, 10, 13, 14, 15, 16, 17, 18, 19, 22, 23, 24, 25, 26, 27a, 27b	1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 13	6c, 6d, 7, 12a, 12b,
9.5	Manufacture and industrial uses of massive objects containing lime substances	x	x	x		х	5	3; 1, 2a, 2b, 4, 5, 6a, 6b, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 23, 24	1, 2, 3, 7, 8, 9a, 9b, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40	6, 14, 21, 22, 23, 24, 25	1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 13	6c, 6d, 7, 12a, 12b,
9.6	Professional uses of aqueous solutions of lime substances		x	x		Х	6	22; 1, 5, 6a, 6b, 7, 10, 11, 12, 13, 16, 17, 18, 19, 20, 23, 24	1, 2, 3, 7, 8, 9a, 9b, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40	2, 3, 4, 5, 8a, 8b, 9, 10, 12, 13, 15, 16, 17, 18, 19	1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 13	2, 8a, 8b, 8c, 8d, 8e, 8f



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			Identified uses		ed	Resultin g life cycle stage	Identified Use			Process	Article	Environmental
ES number	Exposure scenario title	Manufacture	Formulation	End use	Consumer	Service life (for articles)	Linked to Ident	Sector of use category (SU)	Chemical Product Category (PC)	category (PROC)	categor y (AC)	release category (ERC)
9.7	Professional uses of low dusty solids/powders of lime substances		x	x		х	7	22; 1, 5, 6a, 6b, 7, 10, 11, 12, 13, 16, 17, 18, 19, 20, 23, 24	1, 2, 3, 7, 8, 9a, 9b, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40	2, 3, 4, 5, 8a, 8b, 9, 10, 13, 15, 16, 17, 18, 19, 21, 25, 26	1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 13	2, 8a, 8b, 8c, 8d, 8e, 8f
9.8	Professional uses of medium dusty solids/powders of lime substances		x	x		х	8	22; 1, 5, 6a, 6b, 7, 10, 11, 12, 13, 16, 17, 18, 19, 20, 23, 24	1, 2, 3, 7, 8, 9a, 9b, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40	2, 3, 4, 5, 8a, 8b, 9, 10, 13, 15, 16, 17, 18, 19, 25, 26	1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 13	2, 8a, 8b, 8c, 8d, 8e, 8f, 9a, 9b
9.9	Professional uses of high dusty solids/powders of lime substances		x	x		х	9	22; 1, 5, 6a, 6b, 7, 10, 11, 12, 13, 16, 17, 18, 19, 20, 23, 24	1, 2, 3, 7, 8, 9a, 9b, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40	2, 3, 4, 5, 8a, 8b, 9, 10, 13, 15, 16, 17, 18, 19, 25, 26	1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 13	2, 8a, 8b, 8c, 8d, 8e, 8f



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	Identifie uses				Identified		Resultin g life cycle stage				Process	Article	Environmental
ES number	Exposure scenario title	Manufacture	Formulation	End use	Consumer	Service life (for articles)	Linked to Identified Use	Sector of use category (SU)	Chemical Product Category (PC)	category (PROC)	categor y (AC)	release category (ERC)	
9.10	Professional use of lime substances in soil treatment		x	x			10	22	9b	5, 8b, 11, 26		2, 8a, 8b, 8c, 8d, 8e, 8f	
9.11	Professional uses of articles/container s containing lime substances			x		х	11	22; 1, 5, 6a, 6b, 7, 10, 11, 12, 13, 16, 17, 18, 19, 20, 23, 24		0, 21, 24, 25	1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 13	10a, 11a, 11b, 12a, 12b	
9.12	Consumer use of building and construction material (DIY)				х		х	21	9b, 9a			8	
9.13	Consumer use of CO <sub>2</sub> absorbent in breathing apparatuses				х		х	21	2			8	



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							lde us	entifi es	ed	Resultin g life cycle stage	entified Use			Process	Article	Environmental
ES number	Exposure scenario title	Manufacture	Formulation	End use	Consumer	Service life (for articles)	Linked to Iden	Sector of use category (SU)	Chemical Product Category (PC)	category (PROC)	categor y (AC)	release category (ERC)				
9.14	Consumer use of garden lime/fertilizer				x		Х	21	20, 12			8e				
9.15	Consumer use of lime substances as water treatment chemicals in aquaria				x		x	21	20, 37			8				
9.16	Consumer use of cosmetics containing lime substances				x		х	21	39			8				



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# ES number 9.1: Manufacture and industrial uses of aqueous solutions of lime substances

Exposure Scenario Format (1) addressing uses carried out by workers					
1. Title					
Free short title	Manufacture and industrial uses of aqueous solutions of lime substances				
Systematic title based on use descriptor	SU3, SU1, SU2a, SU2b, SU4, SU5, SU6a, SU6b, SU7, SU8, SU9, SU10, SU11, SU12, SU13, SU14, SU15, SU16, SU17, SU18, SU19, SU20, SU23, SU24 PC1, PC2, PC3, PC7, PC8, PC9a, PC9b, PC11, PC12, PC13, PC14, PC15, PC16, PC17, PC18, PC19, PC20, PC21, PC23, PC24, PC25, PC26, PC27, PC28, PC29, PC30, PC31, PC32, PC33, PC34, PC35, PC36, PC37, PC38, PC39, PC40 AC1, AC2, AC3, AC4, AC5, AC6, AC7, AC8, AC10, AC11, AC13 (appropriate PROCs and ERCs are given in Section 2 below)				
Processes, tasks and/or activities covered	Processes, tasks and/or activities cove	ered are described in Section 2 below.			
Assessment Method	The assessment of inhalation exposure is ba	sed on the exposure estimation tool MEASE.			
2. Operational con	ditions and risk management measures	5			
PROC/ERC	REACH definition	Involved tasks			
PROC 1	Use in closed process, no likelihood of exposure				
PROC 2	Use in closed, continuous process with occasional controlled exposure				
PROC 3	Use in closed batch process (synthesis or formulation)				
PROC 4	Use in batch and other process (synthesis) where opportunity for exposure arises				
PROC 5	Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact)				
PROC 7	Industrial spraying				
PROC 8a	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities				
PROC 8b	Transfer of substance or preparation (charging/ discharging) from/to vessels/large containers at dedicated facilities				
PROC 9	Transfer of substance or preparation into small containers (dedicated filling line, including weighing)	Further information is provided in the ECHA Guidance on information requirements and			
PROC 10	Roller application or brushing	chemical safety assessment, Chapter R.12: Use descriptor system (ECHA-2010-G-05-EN).			
PROC 12	Use of blowing agents in manufacture of foam				
PROC 13	Treatment of articles by dipping and pouring				
PROC 14	Production of preparations or articles by tabletting, compression, extrusion, pelletisation				
PROC 15	Use as laboratory reagent				
PROC 16	Using material as fuel sources, limited exposure to unburned product to be expected				
PROC 17	Lubrication at high energy conditions and in partly open process				
PROC 18	Greasing at high energy conditions				
PROC 19	Hand-mixing with intimate contact and only PPE available				
ERC 1-7, 12	Manufacture, formulation and all types of industrial uses				
ERC 10, 11	Wide-dispersive outdoor and indoor use of long- life articles and materials				



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#### 2.1 Control of workers exposure **Product characteristic** According to the MEASE approach, the substance-intrinsic emission potential is one of the main exposure determinants. This is reflected by an assignment of a so-called fugacity class in the MEASE tool. For operations conducted with solid substances at ambient temperature the fugacity is based on the dustiness of that substance. Whereas in hot metal operations, fugacity is temperature based, taking into account the process temperature and the melting point of the substance. As a third group, high abrasive tasks are based on the level of abrasion instead of the substance intrinsic emission potential. The spraying of aqueous solutions (PROC7 and 11) is assumed to be involved with a medium emission **Content in** PROC Used in preparation? **Emission potential** Physical form preparation PROC 7 not restricted aqueous solution medium All other applicable not restricted aqueous solution verv low PROCs Amounts used The actual tonnage handled per shift is not considered to influence the exposure as such for this scenario. Instead, the combination of the scale of operation (industrial vs. Professional) and level of containment/automation (as reflected in the PROC) is the main determinant of the process intrinsic emission potential. Frequency and duration of use/exposure PROC Duration of exposure PROC 7 ≤ 240 minutes All other applicable 480 minutes (not restricted) PROCs Human factors not influenced by risk management The shift breathing volume during all process steps reflected in the PROCs is assumed to be 10 m³/shift (8 hours). Other given operational conditions affecting workers exposure Since aqueous solutions are not used in hot-metallurgical processes, operational conditions (e.g. process temperature and process pressure) are not considered relevant for occupational exposure assessment of the conducted processes Technical conditions and measures at process level (source) to prevent release Risk management measures at the process level (e.g. containment or segregation of the emission source) are generally not required in the processes Technical conditions and measures to control dispersion from source towards the worker Localised controls Efficiency of LC PROC Level of separation Further information (according to MEASE) (LC) Any potentially required separation of workers PROC 7 local exhaust ventilation 78 % from the emission source is indicated above under "Frequency and duration of exposure". PROC 19 not applicable na A reduction of exposure duration can be achieved, for example, by the installation of ventilated (positive pressure) control rooms All other applicable not required na or by removing the PROCs worker from workplaces involved with relevant exposure Organisational measures to prevent /limit releases, dispersion and exposure Avoid inhalation or ingestion. General occupational hygiene measures are required to ensure a safe handling of the substance. These measures involve good personal and housekeeping practices (i.e. regular cleaning with suitable cleaning devices), no eating and smoking at the workplace, the wearing of standard working clothes and shoes unless otherwise stated below. Shower and change clothes at end of work shift. Do not wear contaminated clothing at home. Do not blow dust off with



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Conditions and measures related to personal protection, hygiene and health evaluation							
PROC	Specification of respiratory protective equipment (RPE)	RPE efficiency (assigned protection factor, APF)	Specification of gloves	Further personal protective equipment (PPE)			
PROC 7	FFP1 mask	APF=4	Since calcium oxide is classified as irritating to	Eye protection equipment (e.g. goggles or visors) must be worn, unless potential contact with the eye can be excluded by the nature			
All other applicable PROCs	not required na skin, the use of protective gloves is mandatory for all protection, protec						
Any RPE as defined above shall only be worn if the following principles are implemented in parallel: The duration of work (compare with "duration of exposure" above) should reflect the additional physiological stress for the worker due to the breathing resistance and mass of the RPE itself, due to the increased thermal stress by enclosing the head. In addition, it shall be considered that the worker's capability of using tools and of communicating are reduced during the wearing of RPE. For reasons as given above, the worker should therefore be (i) healthy (especially in view of medical problems that may affect the use of RPE), (ii) have suitable facial characteristics reducing leakages between face and mask (in view of scars and facial hair). The recommended devices above which rely on a tight face seal will not provide the required protection unless they fit the contours of the face properly and securely. The employer and self-employed persons have legal responsibilities for the maintenance and issue of respiratory protective devices programme including training of the workers. An overview of the APFs of different RPE (according to BS EN 529:2005) can be found in the glossary of MEASE.							
	mount per site (for point	sources) is not consider	ed to be the main detern	ninant for environmental			
exposure. Frequency and duration	n of use						
	er year) or continuous use/	release					
Environment factors no	ot influenced by risk man	agement					
Flow rate of receiving sur	rface water: 18000 m³/day						
Other given operationa	I conditions affecting en	vironmental exposure					
Effluent discharge rate: 2	2000 m³/day						
Technical onsite condit	tions and measures to re	duce or limit discharges	, air emissions and relea	ses to soil			
surface water, in case su introduction into open wa waters are minimised (e. This is also reflected in th	ures related to the environ the discharges are expected aters is required. In genera g. through neutralisation). ne description of standard an be found in the introduc	ed to cause significant pH o I discharges should be car In general most aquatic or OECD tests with aquatic c	changes. Regular control c ried out such that pH chan ganisms can tolerate pH v	of the pH value during nges in receiving surface alues in the range of 6-9.			
Conditions and measur	res related to waste						
Solid industrial waste of I	Solid industrial waste of lime should be reused or discharged to the industrial wastewater and further neutralized if needed.						



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#### 3. Exposure estimation and reference to its source **Occupational exposure** The exposure estimation tool MEASE was used for the assessment of inhalation exposure. The risk characterisation ratio (RCR) is the quotient of the refined exposure estimate and the respective DNEL (derived no-effect level) and has to be below 1 to demonstrate a safe use. For inhalation exposure, the RCR is based on the DNEL for calcium oxide of 1 mg/m3 (as respirable dust) and the respective inhalation exposure estimate derived using MEASE (as inhalable dust). Thus, the RCR includes an additional safety margin since the respirable fraction being a sub-fraction of the inhalable fraction according to EN 481. Method used for Method used for Inhalation exposure Dermal exposure PROC inhalation exposure dermal exposure estimate (RCR) estimate (RCR) assessment assessment Since calcium oxide is classified as irritating to PROC 1, 2, 3, 4, 5, 7, skin, dermal exposure has to be minimised as far < 1 mg/m<sup>3</sup> (0.001 – 8a, 8b, 9, 10, 12, 13, MEASE as technically feasible. A DNEL for dermal effects 0.66) 14, 15, 16, 17, 18, 19 has not been derived. Thus, dermal exposure is not assessed in this exposure scenario. **Environmental exposure** The environmental exposure assessment is only relevant for the aquatic environment, when applicable including STPs/WWTPs, as emissions of lime substance in the different life-cycle stages (production and use) mainly apply to (waste) water. The aquatic effect and risk assessment only deal with the effect on organisms/ecosystems due to possible pH changes related to OHdischarges, being the toxicity of Ca2+ is expected to be negligible compared to the (potential) pH effect. Only the local scale is being addressed, including municipal sewage treatment plants (STPs) or industrial waste water treatment plants (WWTPs) when applicable, both for production and industrial use as any effects that might occur would be expected to take place on a local scale. The high water solubility and very low vapour pressure indicate that lime substance will be found predominantly in water. Significant emissions or exposure to air are not expected due to the low vapour pressure of lime substance. Significant emissions or exposure to the terrestrial environment are not expected either for this exposure scenario. The exposure assessment for the aquatic environment will therefore only deal with the possible pH changes in STP effluent and surface water related to the OH- discharges at the local scale. The exposure assessment is approached by assessing the resulting pH impact: the surface water pH should not increase above 9. The production of lime substance can potentially result in an aquatic emission and locally increase the lime substance concentration and affect the pH in the aquatic environment. When the pH is not Environmental neutralised, the discharge of effluent from lime substance production sites may impact the pH in the emissions receiving water. The pH of effluents is normally measured very frequently and can be neutralised easily as often required by national laws. Exposure Waste water from lime substance production is an inorganic wastewater stream and therefore there is no biological treatment. Therefore, wastewater streams from lime substance production sites will concentration in waste water treatment normally not be treated in biological waste water treatment plants (WWTPs), but can be used for pH plant (WWTP) control of acid wastewater streams that are treated in biological WWTPs. When lime substance is emitted to surface water, sorption to particulate matter and sediment will be Exposure negligible. When lime is rejected to surface water, the pH may increase, depending on the buffer concentration in capacity of the water. The higher the buffer capacity of the water, the lower the effect on pH will be. In aquatic pelagic general the buffer capacity preventing shifts in acidity or alkalinity in natural waters is regulated by the compartment equilibrium between carbon dioxide (CO2), the bicarbonate ion (HCO3-) and the carbonate ion (CO32-) The sediment compartment is not included in this ES, because it is not considered relevant for lime Exposure concentration in substance: when lime substance is emitted to the aquatic compartment, sorption of to sediment sediments particles is negligible. Exposure The terrestrial compartment is not included in this exposure scenario, because it is not considered to concentrations in soil be relevant. and groundwater The air compartment is not included in this CSA because it is considered not relevant for lime Exposure substance: when emitted to air as an aerosol in water, lime substance is neutralised as a result of its concentration in reaction with CO2 (or other acids), into HCO3- and Ca2+. Subsequently, the salts (e.g. atmospheric calcium(bi)carbonate) are washed out from the air and thus the atmospheric emissions of neutralised compartment lime substance largely end up in soil and water. Exposure concentration Bioaccumulation in organisms is not relevant for lime substance: a risk assessment for secondary relevant for the food poisoning is therefore not required. chain (secondary poisoning



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

#### Occupational exposure

The DU works inside the boundaries set by the ES if either the proposed risk management measures as described above are met or the downstream user can demonstrate on his own that his operational conditions and implemented risk management measures are adequate. This has to be done by showing that they limit the inhalation and dermal exposure to a level below the respective DNEL (given that the processes and activities in question are covered by the PROCs listed above) as given below. If measured data are not available, the DU may make use of an appropriate scaling tool such as MEASE

(<u>www.ebrc.de/mease.html</u>) to estimate the associated exposure. The dustiness of the substance used can be determined according to the MEASE glossary. For example, substances with a dustiness less than 2.5 % according to the Rotating Drum Method (RDM) are defined as "low dusty", substances with a dustiness less than 10 % (RDM) are defined as "medium dusty" and substances with a dustiness ≥10 % are defined as "high dusty".

#### DNEL<sub>inhalation</sub>: 1 mg/m<sup>3</sup> (as respirable dust)

Important note: The DU has to be aware of the fact that apart from the long-term DNEL given above, a DNEL for acute effects exists at a level of 4 mg/m<sup>3</sup>. By demonstrating a safe use when comparing exposure estimates with the long-term DNEL, the acute DNEL is therefore also covered (according to R.14 guidance, acute exposure levels can be derived by multiplying long-term exposure estimates by a factor of 2). When using MEASE for the derivation of exposure estimates, it is noted that the exposure duration should only be reduced to half-shift as a risk management measure (leading to an exposure reduction of 40 %).

#### Environmental exposure

If a site does not comply with the conditions stipulated in the safe use ES, it is recommended to apply a tiered approach to perform a more site-specific assessment. For that assessment, the following stepwise approach is recommended.

**Tier 1**: retrieve information on effluent pH and the contribution of the lime substance on the resulting pH. Should the pH be above 9 and be predominantly attributable to lime, then further actions are required to demonstrate safe use.

**Tier 2a**: retrieve information on receiving water pH after the discharge point. The pH of the receiving water shall not exceed the value of 9. If the measures are not available, the pH in the river can be calculated as follows:

$$pHriver = Log \left[ \frac{Qeffluent * 10^{pHeffluent} + Qriverupstream * 10^{pHupstream}}{Qriverupstream + Qeffluent} \right]$$
(Eq 1)

Where:

Q effluent refers to the effluent flow (in m<sup>3</sup>/day)

Q river upstream refers to the upstream river flow (in m<sup>3</sup>/day)

pH effluent refers to the pH of the effluent

pH upstream river refers to the pH of the river upstream of the discharge point

Please note that initially, default values can be used:

- Q river upstream flows: use the 10th of existing measurements distribution or use default value of 18000  $m^3/day$
- Q effluent: use default value of 2000 m3/day
- The upstream pH is preferably a measured value. If not available, one can assume a neutral pH of 7 if this can be justified.

Such equation has to be seen as a worst case scenario, where water conditions are standard and not case specific.

**Tier 2b**: Equation 1 can be used to identify which effluent pH causes an acceptable pH level in the receiving body. In order to do so, pH of the river is set at value 9 and pH of the effluent is calculated accordingly (using default values as reported previously, if necessary). As temperature influences lime solubility, pH effluent might require to be adjusted on a case-by-case basis. Once the maximum admissible pH value in the effluent is established, it is assumed that the OH- concentrations are all dependent on lime discharge and that there is no buffer capacity conditions to consider (this is a unrealistic worst case scenario, which can be modified where information is available). Maximum load of lime that can be annually rejected without negatively affecting the pH of the receiving water is calculated assuming chemical equilibrium. OH- expressed as moles/litre are multiplied by average flow of the effluent and then divided by the molar mass of the lime substance.

**Tier 3**: measure the pH in the receiving water after the discharge point. If pH is below 9, safe use is reasonably demonstrated and the ES ends here. If pH is found to be above 9, risk management measures have to be implemented: the effluent has to undergo neutralisation, thus ensuring safe use of lime during production or use phase.



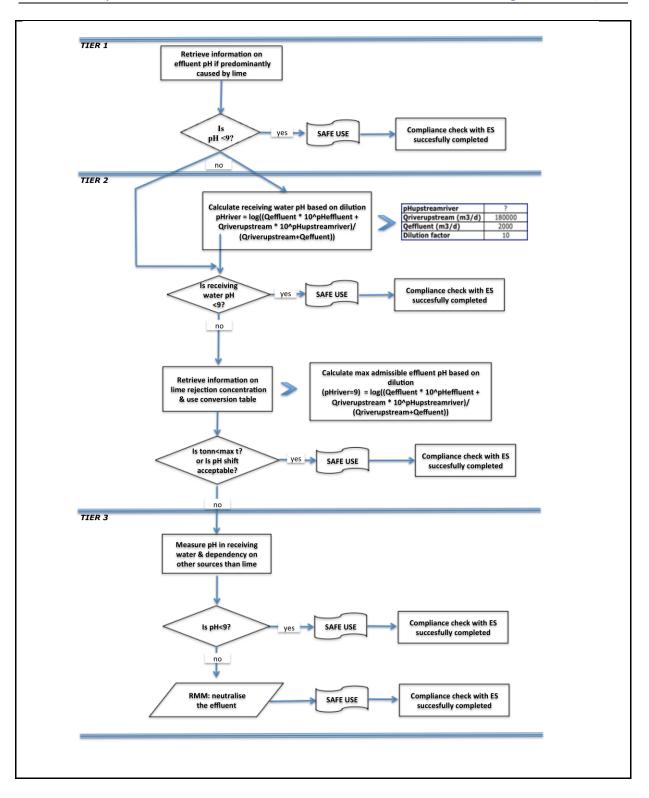
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# ES number 9.2: Manufacture and industrial uses of low dusty solids/powders of lime substances

Exposure Scenario Format (1) addressing uses carried out by workers					
1. Title					
Free short title	Manufacture and industrial uses of low dusty solids/powders of lime substances				
Systematic title based on use descriptor	SU3, SU1, SU2a, SU2b, SU4, SU5, SU6a, SU6b, SU7, SU8, SU9, SU10, SU11, SU12, SU13, SU14, SU15, SU16, SU17, SU18, SU19, SU20, SU23, SU24 PC1, PC2, PC3, PC7, PC8, PC9a, PC9b, PC11, PC12, PC13, PC14, PC15, PC16, PC17, PC18, PC19, PC20, PC21, PC23, PC24, PC25, PC26, PC27, PC28, PC29, PC30, PC31, PC32, PC33, PC34, PC35, PC36, PC37, PC38, PC39, PC40 AC1, AC2, AC3, AC4, AC5, AC6, AC7, AC8, AC10, AC11, AC13 (appropriate PROCs and ERCs are given in Section 2 below)				
Processes, tasks and/or activities covered	Processes, tasks and/or activities cove	ered are described in Section 2 below.			
Assessment Method	The assessment of inhalation exposure is ba	sed on the exposure estimation tool MEASE.			
2. Operational con	ditions and risk management measures	5			
PROC/ERC	REACH definition	Involved tasks			
PROC 1	Use in closed process, no likelihood of exposure				
PROC 2	Use in closed, continuous process with occasional controlled exposure				
PROC 3	Use in closed batch process (synthesis or formulation)				
PROC 4	Use in batch and other process (synthesis) where opportunity for exposure arises				
PROC 5	Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact)				
PROC 6	Calendering operations				
PROC 7	Industrial spraying				
PROC 8a	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities				
PROC 8b	Transfer of substance or preparation (charging/ discharging) from/to vessels/large containers at dedicated facilities	Further information is provided in the ECHA			
PROC 9	Transfer of substance or preparation into small containers (dedicated filling line, including weighing)	Guidance on information requirements and chemical safety assessment, Chapter R.12: Use descriptor system (ECHA-2010-G-05-EN).			
PROC 10	Roller application or brushing				
PROC 13	Treatment of articles by dipping and pouring				
PROC 14	Production of preparations or articles by tabletting, compression, extrusion, pelletisation				
PROC 15	Use as laboratory reagent				
PROC 16	Using material as fuel sources, limited exposure to unburned product to be expected				
PROC 17	Lubrication at high energy conditions and in partly open process				
PROC 18	Greasing at high energy conditions				
PROC 19	Hand-mixing with intimate contact and only PPE available				
PROC 21	Low energy manipulation of substances bound in materials and/or articles				
PROC 22	Potentially closed processing operations with minerals/metals at elevated temperature				



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	Industrial setting	
PROC 23	Open processing and transfer operations with minerals/metals at elevated temperature	
PROC 24	High (mechanical) energy work-up of substances bound in materials and/or articles	
PROC 25	Other hot work operations with metals	
PROC 26	Handling of solid inorganic substances at ambient temperature	
PROC 27a	Production of metal powders (hot processes)	
PROC 27b	Production of metal powders (wet processes)	
ERC 1-7, 12	Manufacture, formulation and all types of industrial uses	
ERC 10, 11	Wide-dispersive outdoor and indoor use of long- life articles and materials	

#### 2.1 Control of workers exposure

#### Product characteristic

According to the MEASE approach, the substance-intrinsic emission potential is one of the main exposure determinants. This is reflected by an assignment of a so-called fugacity class in the MEASE tool. For operations conducted with solid substances at ambient temperature the fugacity is based on the dustiness of that substance. Whereas in hot metal operations, fugacity is temperature based, taking into account the process temperature and the melting point of the substance. As a third group, high abrasive tasks are based on the level of abrasion instead of the substance intrinsic emission potential.

PROC	Used in preparation?	Content in preparation	Physical form	Emission potential
PROC 22, 23, 25, 27a	not res	stricted	solid/powder, molten	high
PROC 24	not res	stricted	solid/powder	high
All other applicable PROCs	not res	stricted	solid/powder	low
Amounts used				

The actual tonnage handled per shift is not considered to influence the exposure as such for this scenario. Instead, the combination of the scale of operation (industrial vs. Professional) and level of containment/automation (as reflected in the PROC) is the main determinant of the process intrinsic emission potential.

Frequency and duration of use/exposure

PROC	Duration of exposure
PROC 22	≤ 240 minutes
All other applicable PROCs	480 minutes (not restricted)
I have a factory wat half	encoded by state memory and

Human factors not influenced by risk management

The shift breathing volume during all process steps reflected in the PROCs is assumed to be 10 m³/shift (8 hours).

Other given operational conditions affecting workers exposure

Operational conditions like process temperature and process pressure are not considered relevant for occupational exposure assessment of the conducted processes. In process steps with considerably high temperatures (i.e. PROC 22, 23, 25), the exposure assessment in MEASE is however based on the ratio of process temperature and melting point. As the associated temperatures are expected to vary within the industry the highest ratio was taken as a worst case assumption for the exposure estimation. Thus all process temperatures are automatically covered in this exposure scenario for PROC 22, 23 and PROC 25.

Technical conditions and measures at process level (source) to prevent release

Risk management measures at the process level (e.g. containment or segregation of the emission source) are generally not required in the processes.



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Technical conditions a	nd measures to control d						
PROC	Level of separation	Localised controls (LC)	Efficiency of LC (according to MEASE)	Further information			
PROC 7, 17, 18	Any potentially required separation of workers	general ventilation	17 %	-			
PROC 19	from the emission source is indicated above under	not applicable	na	-			
PROC 22, 23, 24, 25, 26, 27a	"Frequency and duration of exposure".	local exhaust ventilation	78 %	-			
All other applicable PROCs	A reduction of exposure duration can be achieved, for example, by the installation of ventilated (positive pressure) control rooms or by removing the worker from workplaces involved with relevant exposure.	A reduction of exposure duration can be achieved, for example, by the installation of ventilated (positive pressure) control rooms or by removing the worker from workplaces involved with relevant		-			
Organisational measure	es to prevent /limit releas	ses, dispersion and expo	sure				
These measures involve eating and smoking at the Shower and change clo compressed air.							
Conditions and measur	res related to personal pr		eaith evaluation	Funth on a one on of			
PROC	Specification of respiratory protective equipment (RPE)	RPE efficiency (assigned protection factor, APF)	Specification of gloves	Further personal protective equipment (PPE)			
PROC 22, 24, 27a	FFP1 mask	APF=4		Eye protection equipment (e.g.			
		741		goggles or visors) must			
All other applicable PROCs	not required	na	Since calcium oxide is classified as irritating to skin, the use of protective gloves is mandatory for all process steps.	goggles or visors) must be worn, unless potential contact with the eye can be excluded by the nature and type of application (i.e. closed process). Additionally, face protection, protective clothing and safety shoes are required to be worn as appropriate.			
All other applicable PROCs Any RPE as defined abor (compare with "duration of resistance and mass of tl considered that the work For reasons as given abor the use of RPE), (ii) have hair). The recommended contours of the face prop The employer and self-er devices and the manage policy for a respiratory pr	not required ve shall only be worn if the of exposure" above) should he RPE itself, due to the in er's capability of using tool ove, the worker should the e suitable facial characteris devices above which rely erly and securely. mployed persons have leg- ment of their correct use in otective device programme	na following principles are in d reflect the additional physic creased thermal stress by s and of communicating a refore be (i) healthy (espec- tics reducing leakages bet on a tight face seal will no al responsibilities for the m the workplace. Therefore e including training of the v	classified as irritating to skin, the use of protective gloves is mandatory for all process steps.	goggles or visors) must be worn, unless potential contact with the eye can be excluded by the nature and type of application (i.e. closed process). Additionally, face protection, protective clothing and safety shoes are required to be worn as appropriate. e duration of work rker due to the breathing dition, it shall be ring of RPE. bblems that may affect iew of scars and facial action unless they fit the espiratory protective pournent a suitable			
All other applicable PROCs Any RPE as defined abor (compare with "duration of resistance and mass of the considered that the work For reasons as given abor the use of RPE), (ii) have hair). The recommended contours of the face prop The employer and self-er devices and the manager policy for a respiratory pr An overview of the APFs	not required ve shall only be worn if the of exposure" above) should he RPE itself, due to the in er's capability of using tool ove, the worker should the e suitable facial characteris devices above which rely erly and securely. mployed persons have leg- ment of their correct use in otective device programme	na following principles are in d reflect the additional physic creased thermal stress by s and of communicating a refore be (i) healthy (espec- tics reducing leakages bet on a tight face seal will no al responsibilities for the m the workplace. Therefore e including training of the v g to BS EN 529:2005) car	classified as irritating to skin, the use of protective gloves is mandatory for all process steps.	goggles or visors) must be worn, unless potential contact with the eye can be excluded by the nature and type of application (i.e. closed process). Additionally, face protection, protective clothing and safety shoes are required to be worn as appropriate. e duration of work rker due to the breathing dition, it shall be ring of RPE. bblems that may affect set of scars and facial action unless they fit the espiratory protective pournent a suitable			
All other applicable PROCs Any RPE as defined abor (compare with "duration of resistance and mass of the considered that the work For reasons as given abor the use of RPE), (ii) have hair). The recommended contours of the face prop The employer and self-er devices and the manager policy for a respiratory pr An overview of the APFs	not required ve shall only be worn if the of exposure" above) should he RPE itself, due to the in er's capability of using tool ove, the worker should the e suitable facial characteris devices above which rely erly and securely. mployed persons have leg- ment of their correct use in otective device programm- of different RPE (accordin	na following principles are in d reflect the additional physic creased thermal stress by s and of communicating a refore be (i) healthy (espec- tics reducing leakages bet on a tight face seal will no al responsibilities for the m the workplace. Therefore e including training of the v g to BS EN 529:2005) car	classified as irritating to skin, the use of protective gloves is mandatory for all process steps.	goggles or visors) must be worn, unless potential contact with the eye can be excluded by the nature and type of application (i.e. closed process). Additionally, face protection, protective clothing and safety shoes are required to be worn as appropriate. e duration of work rker due to the breathing dition, it shall be ring of RPE. bblems that may affect sew of scars and facial action unless they fit the espiratory protective pournent a suitable			
All other applicable PROCs Any RPE as defined abor (compare with "duration of resistance and mass of the considered that the work For reasons as given abor the use of RPE), (ii) have hair). The recommended contours of the face prop The employer and self-er devices and the manager policy for a respiratory pr An overview of the APFs <b>2.2 Control of envi</b> Amounts used	not required ve shall only be worn if the of exposure" above) should he RPE itself, due to the in er's capability of using tool ove, the worker should the e suitable facial characteris devices above which rely erly and securely. mployed persons have leg- ment of their correct use in otective device programm- of different RPE (accordin <b>ronmental exposure</b>	na following principles are in d reflect the additional physic creased thermal stress by s and of communicating a refore be (i) healthy (espec- tics reducing leakages bet on a tight face seal will no al responsibilities for the m the workplace. Therefore e including training of the w g to BS EN 529:2005) car	classified as irritating to skin, the use of protective gloves is mandatory for all process steps.	goggles or visors) must be worn, unless potential contact with the eye can be excluded by the nature and type of application (i.e. closed process). Additionally, face protection, protective clothing and safety shoes are required to be worn as appropriate. e duration of work rker due to the breathing dition, it shall be ring of RPE. oblems that may affect lew of scars and facial ection unless they fit the espiratory protective bourn a suitable			

Intermittent (< 12 time per year) or continuous use/release



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#### Environment factors not influenced by risk management

Flow rate of receiving surface water: 18000 m3/day

Other given operational conditions affecting environmental exposure

Effluent discharge rate: 2000 m<sup>3</sup>/day

Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil

Risk management measures related to the environment aim to avoid discharging lime solutions into municipal wastewater or to surface water, in case such discharges are expected to cause significant pH changes. Regular control of the pH value during introduction into open waters is required. In general discharges should be carried out such that pH changes in receiving surface waters are minimised (e.g. through neutralisation). In general most aquatic organisms can tolerate pH values in the range of 6-9. This is also reflected in the description of standard OECD tests with aquatic organisms. The justification for this risk management measure can be found in the introduction section.

Conditions and measures related to waste

Solid industrial waste of lime should be reused or discharged to the industrial wastewater and further neutralized if needed.

#### 3. Exposure estimation and reference to its source

#### **Occupational exposure**

The exposure estimation tool MEASE was used for the assessment of inhalation exposure. The risk characterisation ratio (RCR) is the quotient of the refined exposure estimate and the respective DNEL (derived no-effect level) and has to be below 1 to demonstrate a safe use. For inhalation exposure, the RCR is based on the DNEL for calcium oxide of 1 mg/m<sup>3</sup> (as respirable dust) and the respective inhalation exposure estimate derived using MEASE (as inhalable dust). Thus, the RCR includes an additional safety margin since the respirable fraction being a sub-fraction of the inhalable fraction according to EN 481.

PROC	Method used for inhalation exposure assessment	Inhalation exposure estimate (RCR)	Method used for dermal exposure assessment	Dermal exposure estimate (RCR)			
PROC 1, 2, 3, 4, 5, 6, 7, 8a, 8b, 9, 10, 13, 14, 15, 16, 17, 18, 19, 21, 22, 23, 24, 25, 26, 27a, 27b	MEASE (1 mg/m³ (0.01 – 0.83) Since calcium oxide is classified as irritating to skin, dermal exposure has to be minimised as far as technically feasible. A DNEL for dermal effects has not been derived. Thus, dermal exposure is not assessed in this exposure scenario.						
Environmental emission	ns						
as emissions of calcium of effect and risk assessment discharges, being the tox being addressed, includir when applicable, both for local scale. The high water water. Significant emission emissions or exposure to assessment for the aquat related to the OH- discha	The environmental exposure assessment is only relevant for the aquatic environment, when applicable including STPs/WWTPs, as emissions of calcium oxide in the different life-cycle stages (production and use) mainly apply to (waste) water. The aquatic effect and risk assessment only deal with the effect on organisms/ecosystems due to possible pH changes related to OH-discharges, being the toxicity of Ca2+ is expected to be negligible compared to the (potential) pH effect. Only the local scale is being addressed, including municipal sewage treatment plants (STPs) or industrial waste water treatment plants (WWTPs) when applicable, both for production and industrial use as any effects that might occur would be expected to take place on a local scale. The high water solubility and very low vapour pressure indicate that calcium oxide will be found predominantly in water. Significant emissions or exposure to air are not expected due to the low vapour pressure of calcium oxide. Significant emissions or exposure to will therefore only deal with the possible pH changes in STP effluent and surface water related to the OH- discharges at the local scale. The exposure assessment is approached by assessing the resulting pH impact: the surface water pH should not increase above 9.						
Environmental emissions	calcium oxide concentrat neutralised, the discharge receiving water. The pH o	The production of calcium oxide can potentially result in an aquatic emission and locally increase the calcium oxide concentration and affect the pH in the aquatic environment. When the pH is not neutralised, the discharge of effluent from calcium oxide production sites may impact the pH in the receiving water. The pH of effluents is normally measured very frequently and can be neutralised					
Exposure concentration in waste water treatment plant (WWTP)	easily as often required by national laws. Waste water from calcium oxide production is an inorganic wastewater stream and therefore there is no biological treatment. Therefore, wastewater streams from calcium oxide production sites will normally not be treated in biological waste water treatment plants (WWTPs), but can be used for pH control of acid wastewater streams that are treated in biological WWTPs.						
Exposure concentration in aquatic pelagic compartment	Control of acid wastewater streams that are treated in biological WWTPS. When calcium oxide is emitted to surface water, sorption to particulate matter and sediment will be negligible. When lime is rejected to surface water, the pH may increase, depending on the buffer capacity of the water. The higher the buffer capacity of the water, the lower the effect on pH will be. In general the buffer capacity preventing shifts in acidity or alkalinity in natural waters is regulated by the equilibrium between carbon dioxide (CO2), the bicarbonate ion (HCO3-) and the carbonate ion (CO32-).						
Exposure concentration in sediments	The sediment compartme		S, because it is not consic aquatic compartment, sor				



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Exposure concentrations in soil and groundwater	The terrestrial compartment is not included in this exposure scenario, because it is not considered to be relevant.				
Exposure concentration in atmospheric compartment	The air compartment is not included in this CSA because it is considered not relevant for calcium oxide: when emitted to air as an aerosol in water, calcium oxide is neutralised as a result of its reaction with CO2 (or other acids), into HCO3- and Ca2+. Subsequently, the salts (e.g. calcium(bi)carbonate) are washed out from the air and thus the atmospheric emissions of neutralised calcium oxide largely end up in soil and water.				
Exposure concentration relevant for the food chain (secondary poisoning) Bioaccumulation in organisms is not relevant for calcium oxide: a risk assessment for secondary poisoning is therefore not required.					
4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES					
Occupational exposure					
The DU works inside the boundaries set by the ES if either the proposed risk management measures as described above are met or the downstream user can demonstrate on his own that his operational conditions and implemented risk management measures are adequate. This has to be done by showing that they limit the inhalation and dermal exposure to a level below the respective DNEL (given that the processes and activities in question are covered by the PROCs listed above) as given below. 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. The dustiness of the substance used can be determined according to the MEASE glossary. For example, substances with a dustness less than 2.5 % according to the Rotating Drum Method (RDM) are defined as "low dusty", substances with a dustness less than 10 % (RDM) are defined as "medium dusty" and substances with a dustness exit ha dustness exit ha dustness with a dustness with a dustness exit has the first medium dusty".					
DNELinhalation: 1 m	g/m³ (as respirable dust)				

# Important note: The DU has to be aware of the fact that apart from the long-term DNEL given above, a DNEL for acute effects exists at a level of 4 mg/m<sup>3</sup>. By demonstrating a safe use when comparing exposure estimates with the long-term DNEL, the acute DNEL is therefore also covered (according to R.14 guidance, acute exposure levels can be derived by multiplying long-term exposure estimates by a factor of 2). When using MEASE for the derivation of exposure estimates, it is noted that the exposure duration should only be reduced to half-shift as a risk management measure (leading to an exposure reduction of 40 %).



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(Eg 1)

#### **Environmental exposure**

If a site does not comply with the conditions stipulated in the safe use ES, it is recommended to apply a tiered approach to perform a more site-specific assessment. For that assessment, the following stepwise approach is recommended.

**Tier 1**: retrieve information on effluent pH and the contribution of the calcium oxide on the resulting pH. Should the pH be above 9 and be predominantly attributable to lime, then further actions are required to demonstrate safe use.

**Tier 2a**: retrieve information on receiving water pH after the discharge point. The pH of the receiving water shall not exceed the value of 9. If the measures are not available, the pH in the river can be calculated as follows:

$$pHriver = Log\left[\frac{Qeffluent*10^{pHeffluent} + Qriverupstream*10^{pHupstream}}{Qriverupstream + Qeffluent}\right]$$

Where:

Q effluent refers to the effluent flow (in m<sup>3</sup>/day)

Q river upstream refers to the upstream river flow (in m³/day)

pH effluent refers to the pH of the effluent

pH upstream river refers to the pH of the river upstream of the discharge point

Please note that initially, default values can be used:

- Q river upstream flows: use the 10th of existing measurements distribution or use default value of 18000  $\ensuremath{m^{3/\text{day}}}$
- Q effluent: use default value of 2000 m3/day
- The upstream pH is preferably a measured value. If not available, one can assume a neutral pH of 7 if this can be justified.

Such equation has to be seen as a worst case scenario, where water conditions are standard and not case specific.

**Tier 2b**: Equation 1 can be used to identify which effluent pH causes an acceptable pH level in the receiving body. In order to do so, pH of the river is set at value 9 and pH of the effluent is calculated accordingly (using default values as reported previously, if necessary). As temperature influences lime solubility, pH effluent might require to be adjusted on a case-by-case basis. Once the maximum admissible pH value in the effluent is established, it is assumed that the OH- concentrations are all dependent on lime discharge and that there is no buffer capacity conditions to consider (this is a unrealistic worst case scenario, which can be modified where information is available). Maximum load of lime that can be annually rejected without negatively affecting the pH of the receiving water is calculated assuming chemical equilibrium. OH- expressed as moles/litre are multiplied by average flow of the effluent and then divided by the molar mass of the calculate.

**Tier 3**: measure the pH in the receiving water after the discharge point. If pH is below 9, safe use is reasonably demonstrated and the ES ends here. If pH is found to be above 9, risk management measures have to be implemented: the effluent has to undergo neutralisation, thus ensuring safe use of lime during production or use phase.



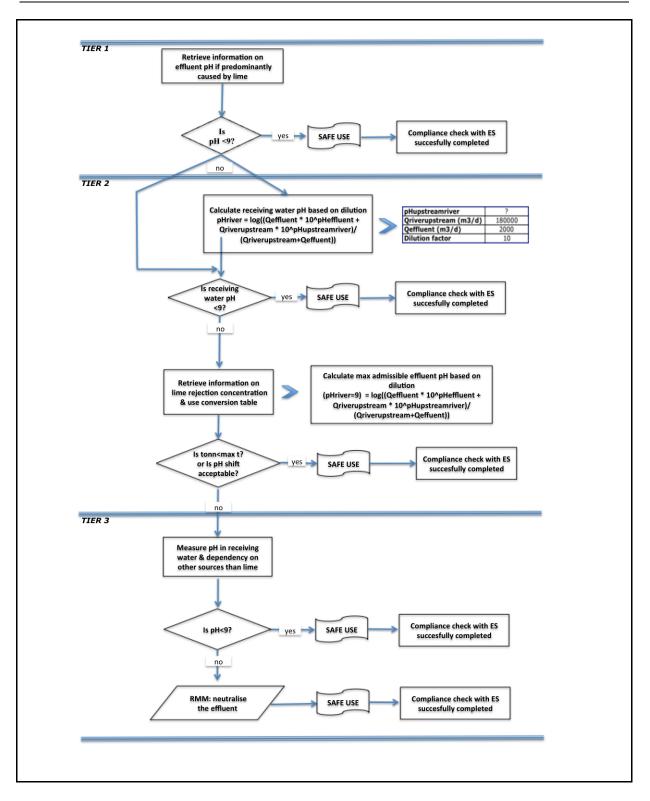
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# ES number 9.3: Manufacture and industrial uses of medium dusty solids/powders of lime substances

Exposure Scenario Format (1) addressing uses carried out by workers					
1. Title					
Free short title	Manufacture and industrial uses of medium dusty solids/powders of lime substances				
Systematic title based on use descriptor         SU3, SU1, SU2a, SU2b, SU4, SU5, SU6a, SU6b, SU7, SU8, SU9, SU10, SU11, SU12, S SU15, SU16, SU17, SU18, SU19, SU20, SU23, SU24           PC1, PC2, PC3, PC7, PC8, PC9a, PC9b, PC11, PC12, PC13, PC14, PC15, PC16, PC1 PC19, PC20, PC21, PC23, PC24, PC25, PC26, PC27, PC28, PC29, PC30, PC31, PC3 PC34, PC35, PC36, PC37, PC38, PC39, PC40 AC1, AC2, AC3, AC4, AC5, AC6, AC7, AC8, AC10, AC11, AC13 (appropriate PROCs and ERCs are given in Section 2 below)					
Processes, tasks and/or activities covered	Processes, tasks and/or activities cove	ered are described in Section 2 below.			
Assessment Method	The assessment of inhalation exposure is ba	sed on the exposure estimation tool MEASE.			
2. Operational con	ditions and risk management measures	3			
PROC/ERC	REACH definition	Involved tasks			
PROC 1	Use in closed process, no likelihood of exposure				
PROC 2	Use in closed, continuous process with occasional controlled exposure				
PROC 3	Use in closed batch process (synthesis or formulation)				
PROC 4	Use in batch and other process (synthesis) where opportunity for exposure arises				
PROC 5	Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact)				
PROC 7	Industrial spraying				
PROC 8a	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities				
PROC 8b	Transfer of substance or preparation (charging/ discharging) from/to vessels/large containers at dedicated facilities				
PROC 9	Transfer of substance or preparation into small containers (dedicated filling line, including weighing)	Further information is provided in the ECHA Guidance on information requirements and chemical safety assessment, Chapter R.12: Use			
PROC 10	Roller application or brushing	descriptor system (ECHA-2010-G-05-EN).			
PROC 13	Treatment of articles by dipping and pouring				
PROC 14	Production of preparations or articles by tabletting, compression, extrusion, pelletisation				
PROC 15	Use as laboratory reagent				
PROC 16	Using material as fuel sources, limited exposure to unburned product to be expected				
PROC 17	Lubrication at high energy conditions and in partly open process				
PROC 18	Greasing at high energy conditions				
PROC 19	Hand-mixing with intimate contact and only PPE available				
PROC 22	Potentially closed processing operations with minerals/metals at elevated temperature Industrial setting				
PROC 23	Open processing and transfer operations with minerals/metals at elevated temperature				



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PROC 24	High (mechanical) energy work-up of substances					
PROC 25	bound in materials and/or articles Other hot work operations with metals					
PROC 26	Handling of solid inorganic substances at ambient					
	temperature					
PROC 27a	Production of metal powders (hot processes)					
PROC 27b	Production of metal powders (wet processes)					
ERC 1-7, 12	Manufacture, formulation and all types of industrial uses					
ERC 10, 11	Wide-dispersive outdoor and indoor use of long- life articles and materials					
2.1 Control of workers exposure						
Product characteristic						
According to the MEASE approach, the substance-intrinsic emission potential is one of the main exposure determinants. This is reflected by an assignment of a so-called fugacity class in the MEASE tool. For operations conducted with solid substances at ambient temperature the fugacity is based on the dustiness of that substance. Whereas in hot metal operations, fugacity is temperature based, taking into account the process temperature and the melting point of the substance. As a third group, high abrasive tasks are based on the level of abrasion instead of the substance intrinsic emission potential.						
PROC	Used in preparation?	Content in preparation	Physical form	Emission potential		
PROC 22, 23, 25, 27a	not res		solid/powder, molten	high		
PROC 24	not restricted		solid/powder	high		
All other applicable PROCs	not restricted		solid/powder	medium		
Amounts used						
The actual tonnage handled per shift is not considered to influence the exposure as such for this scenario. Instead, the combination of the scale of operation (industrial vs. Professional) and level of containment/automation (as reflected in the PROC) is the main determinant of the process intrinsic emission potential.						
Frequency and duration of use/exposure						
PROC	Duration of exposure					
PROC 7, 17, 18, 19, 22	≤ 240 minutes					
All other applicable PROCs	480 minutes (not restricted)					
Human factors not influenced by risk management						
The shift breathing volume during all process steps reflected in the PROCs is assumed to be 10 m <sup>3</sup> /shift (8 hours).						
Other given operational conditions affecting workers exposure						
Operational conditions like process temperature and process pressure are not considered relevant for occupational exposure assessment of the conducted processes. In process steps with considerably high temperatures (i.e. PROC 22, 23, 25), the exposure assessment in MEASE is however based on the ratio of process temperature and melting point. As the associated temperatures are expected to vary within the industry the highest ratio was taken as a worst case assumption for the exposure estimation. Thus all process temperatures are automatically covered in this exposure scenario for PROC 22, 23 and PROC 25.						
Technical conditions and measures at process level (source) to prevent release						
Risk management measures at the process level (e.g. containment or segregation of the emission source) are generally not required in the processes.						
Technical conditions and measures to control dispersion from source towards the worker						
PROC	Level of separation	Localised controls (LC)	Efficiency of LC (according to MEASE)	Further information		
PROC 1, 2, 15, 27b	Any potentially required separation of workers	not required	na	-		
PROC 3, 13, 14	from the emission	general ventilation	17 %	-		
PROC 19	source is indicated above under	not applicable	na	-		
All other applicable PROCs	"Frequency and duration of exposure". A reduction of exposure duration can be	local exhaust ventilation	78 %	-		



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	achieved, for example, by the installation of ventilated (positive pressure) control rooms				
	or by removing the worker from workplaces				
	involved with relevant				
Organisational measure	exposure.	es, dispersion and expo	sure		
Avoid inhalation or inges These measures involve eating and smoking at t					
Conditions and measur				Eurther percend	
PROC	Specification of respiratory protective equipment (RPE)	RPE efficiency (assigned protection factor, APF)	Specification of gloves	Further personal protective equipment (PPE)	
PROC 4, 5, 7, 8a, 8b, 9, 10, 16, 17, 18, 19, 22, 24, 27a	FFP1 mask	APF=4		Eye protection equipment (e.g. goggles or visors) must	
All other applicable PROCs	not required	na	Since calcium oxide is classified as irritating to skin, the use of protective gloves is mandatory for all process steps.	be worn, unless potential contact with the eye can be excluded by the nature and type of application (i.e. closed process). Additionally, face protection, protective clothing and safety shoes are required to be worn as appropriate.	
Any RPE as defined above shall only be worn if the following principles are implemented in parallel: The duration of work (compare with "duration of exposure" above) should reflect the additional physiological stress for the worker due to the breathing resistance and mass of the RPE itself, due to the increased thermal stress by enclosing the head. In addition, it shall be considered that the worker's capability of using tools and of communicating are reduced during the wearing of RPE. For reasons as given above, the worker should therefore be (i) healthy (especially in view of medical problems that may affect the use of RPE), (ii) have suitable facial characteristics reducing leakages between face and mask (in view of scars and facial hair). The recommended devices above which rely on a tight face seal will not provide the required protection unless they fit the contours of the face properly and securely. The employer and self-employed persons have legal responsibilities for the maintenance and issue of respiratory protective devices and the management of their correct use in the workplace. Therefore, they should define and document a suitable policy for a respiratory protective device programme including training of the workers. An overview of the APFs of different RPE (according to BS EN 529:2005) can be found in the glossary of MEASE.					
2.2 Control of envi	ronmental exposure	•			
Amounts used					
The daily and annual an exposure.	The daily and annual amount per site (for point sources) is not considered to be the main determinant for environmental				
Frequency and duration of use					
Intermittent (< 12 time per year) or continuous use/release					
Environment factors not influenced by risk management					
Flow rate of receiving surface water: 18000 m <sup>3</sup> /day					
Other given operational conditions affecting environmental exposure					
Effluent discharge rate: 2000 m <sup>3</sup> /day					
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil					
Risk management measures related to the environment aim to avoid discharging lime solutions into municipal wastewater or to surface water, in case such discharges are expected to cause significant pH changes. Regular control of the pH value during introduction into open waters is required. In general discharges should be carried out such that pH changes in receiving surface waters are minimised (e.g. through neutralisation). In general most aquatic organisms can tolerate pH values in the range of 6-9. This is also reflected in the description of standard OECD tests with aquatic organisms. The justification for this risk					



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management measure can be found in the introduction section.

#### Conditions and measures related to waste

Solid industrial waste of lime should be reused or discharged to the industrial wastewater and further neutralized if needed.

#### 3. Exposure estimation and reference to its source

Occupational exposure

The exposure estimation tool MEASE was used for the assessment of inhalation exposure. The risk characterisation ratio (RCR) is the quotient of the refined exposure estimate and the respective DNEL (derived no-effect level) and has to be below 1 to demonstrate a safe use. For inhalation exposure, the RCR is based on the DNEL for calcium oxide of 1 mg/m<sup>3</sup> (as respirable dust) and the respective inhalation exposure estimate derived using MEASE (as inhalable dust). Thus, the RCR includes an additional safety margin since the respirable fraction being a sub-fraction of the inhalable fraction according to EN 481.

PROC	Method used for inhalation exposure assessment	Inhalation exposure estimate (RCR)	Method used for dermal exposure assessment	Dermal exposure estimate (RCR)
PROC 1, 2, 3, 4, 5, 7, 8a, 8b, 9, 10, 13, 14, 15, 16, 17, 18, 19, 22, 23, 24, 25, 26, 27a, 27b	MEASE	< 1 mg/m³ (0.01 – 0.88)	skin, dermal exposure ha as technically feasible. A has not been derived. T	classified as irritating to as to be minimised as far DNEL for dermal effects hus, dermal exposure is exposure scenario.

#### Environmental emissions

The environmental exposure assessment is only relevant for the aquatic environment, when applicable including STPs/WWTPs, as emissions of calcium oxide in the different life-cycle stages (production and use) mainly apply to (waste) water. The aquatic effect and risk assessment only deal with the effect on organisms/ecosystems due to possible pH changes related to OH-discharges, being the toxicity of Ca2+ is expected to be negligible compared to the (potential) pH effect. Only the local scale is being addressed, including municipal sewage treatment plants (STPs) or industrial waste water treatment plants (WWTPs) when applicable, both for production and industrial use as any effects that might occur would be expected to take place on a local scale. The high water solubility and very low vapour pressure indicate that calcium oxide will be found predominantly in water. Significant emissions or exposure to air are not expected due to the low vapour pressure of calcium oxide. Significant emissions or exposure to air are not expected either for this exposure scenario. The exposure assessment for the aquatic environment will therefore only deal with the possible pH changes in STP effluent and surface water related to the OH- discharges at the local scale. The exposure assessment is approached by assessing the resulting pH impact: the surface water pH should not increase above 9.

the surface water pri she	did not increase above 9.
Environmental emissions	The production of calcium oxide can potentially result in an aquatic emission and locally increase the calcium oxide concentration and affect the pH in the aquatic environment. When the pH is not neutralised, the discharge of effluent from calcium oxide production sites may impact the pH in the receiving water. The pH of effluents is normally measured very frequently and can be neutralised easily as often required by national laws.
Exposure concentration in waste water treatment plant (WWTP)	Waste water from calcium oxide production is an inorganic wastewater stream and therefore there is no biological treatment. Therefore, wastewater streams from calcium oxide production sites will normally not be treated in biological waste water treatment plants (WWTPs), but can be used for pH control of acid wastewater streams that are treated in biological WWTPs.
Exposure concentration in aquatic pelagic compartment	When calcium oxide is emitted to surface water, sorption to particulate matter and sediment will be negligible. When lime is rejected to surface water, the pH may increase, depending on the buffer capacity of the water. The higher the buffer capacity of the water, the lower the effect on pH will be. In general the buffer capacity preventing shifts in acidity or alkalinity in natural waters is regulated by the equilibrium between carbon dioxide (CO2), the bicarbonate ion (HCO3-) and the carbonate ion (CO32–).
Exposure concentration in sediments	The sediment compartment is not included in this ES, because it is not considered relevant for calcium oxide: when calcium oxide is emitted to the aquatic compartment, sorption of to sediment particles is negligible.
Exposure concentrations in soil and groundwater	The terrestrial compartment is not included in this exposure scenario, because it is not considered to be relevant.
Exposure concentration in atmospheric compartment	The air compartment is not included in this CSA because it is considered not relevant for calcium oxide: when emitted to air as an aerosol in water, calcium oxide is neutralised as a result of its reaction with CO2 (or other acids), into HCO3- and Ca2+. Subsequently, the salts (e.g. calcium(bi)carbonate) are washed out from the air and thus the atmospheric emissions of neutralised calcium oxide largely end up in soil and water.



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Exposure concentration relevant for the food chain (secondary poisoning)	Bioaccumulation in organisms is not relevant for calcium oxide: a risk assessment for secondary poisoning is therefore not required.				
4. Guidance to DU	to evaluate whether he works inside the boundaries set by the ES				
Occupational exposure					
met or the downstream u measures are adequate. respective DNEL (given t measured data are not a ( <u>www.ebrc.de/mease.htm</u> according to the MEASE Method (RDM) are define	boundaries set by the ES if either the proposed risk management measures as described above are iser can demonstrate on his own that his operational conditions and implemented risk management. This has to be done by showing that they limit the inhalation and dermal exposure to a level below the that the processes and activities in question are covered by the PROCs listed above) as given below. If vailable, the DU may make use of an appropriate scaling tool such as MEASE n!) to estimate the associated exposure. The dustiness of the substance used can be determined glossary. For example, substances with a dustiness less than 2.5 % according to the Rotating Drum ed as "low dusty", substances with a dustiness less than 10 % (RDM) are defined as "medium dusty" ustiness ≥10 % are defined as "high dusty".				
DNEL <sub>inhalation</sub> : 1 m	g/m <sup>3</sup> (as respirable dust)				
exists at a level of 4 mg/r acute DNEL is therefore term exposure estimates	has to be aware of the fact that apart from the long-term DNEL given above, a DNEL for acute effects m <sup>3</sup> . By demonstrating a safe use when comparing exposure estimates with the long-term DNEL, the also covered (according to R.14 guidance, acute exposure levels can be derived by multiplying long- by a factor of 2). When using MEASE for the derivation of exposure estimates, it is noted that the donly be reduced to half-shift as a risk management measure (leading to an exposure reduction of				
Environmental exposu	re				
	with the conditions stipulated in the safe use ES, it is recommended to apply a tiered approach to ific assessment. For that assessment, the following stepwise approach is recommended.				
	on on effluent pH and the contribution of the calcium oxide on the resulting pH. Should the pH be above attributable to lime, then further actions are required to demonstrate safe use.				
	ion on receiving water pH after the discharge point. The pH of the receiving water shall not exceed the es are not available, the pH in the river can be calculated as follows:				
$pHriver = Log \boxed{Qe}$	$\frac{effluent * 10^{pHeffluent} + Qriverupstream * 10^{pHupstream}}{Qriverupstream + Qeffluent}$				
	Qriverupstream + Qeffluent				
	Eq 1)				
Where:					
	rs to the effluent flow (in m³/day)				
	am refers to the upstream river flow (in m³/day)				
	ers to the pH of the effluent iver refers to the pH of the river upstream of the discharge point				
	at initially, default values can be used:				
	ver upstream flows: use the 10th of existing measurements distribution or use default value of 18000				
• Q ef	fluent: use default value of 2000 m³/day				
	• The upstream pH is preferably a measured value. If not available, one can assume a neutral pH of 7 if this can be justified.				
Such equation has to be	seen as a worst case scenario, where water conditions are standard and not case specific.				
<b>Tier 2b</b> : Equation 1 can be used to identify which effluent pH causes an acceptable pH level in the receiving body. In order to do so, pH of the river is set at value 9 and pH of the effluent is calculated accordingly (using default values as reported previously, if necessary). As temperature influences lime solubility, pH effluent might require to be adjusted on a case-by-case basis. Once the maximum admissible pH value in the effluent is established, it is assumed that the OH- concentrations are all dependent on lime discharge and that there is no buffer capacity conditions to consider (this is a unrealistic worst case scenario, which can be modified where information is available). Maximum load of lime that can be annually rejected without negatively affecting the pH of the receiving water is calculated assuming chemical equilibrium. OH- expressed as moles/litre are multiplied by average flow					



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of the effluent and then divided by the molar mass of the calcium oxide.

**Tier 3**: measure the pH in the receiving water after the discharge point. If pH is below 9, safe use is reasonably demonstrated and the ES ends here. If pH is found to be above 9, risk management measures have to be implemented: the effluent has to undergo neutralisation, thus ensuring safe use of lime during production or use phase.

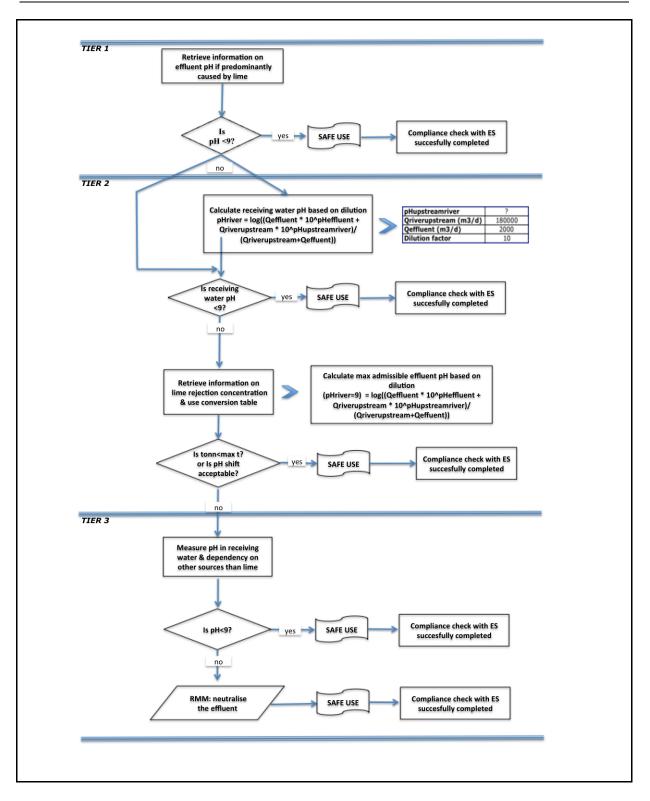


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# ES number 9.4: Manufacture and industrial uses of high dusty solids/powders of lime substances

Exposure Scenario	ד Format (1) addressing uses carried סנ	ut by workers		
1. Title				
Free short title	Manufacture and industrial uses of high dusty solids/powders of lime substances			
Systematic title based on use descriptor	SU3, SU1, SU2a, SU2b, SU4, SU5, SU6a, SU6b, SU7, SU8, SU9, SU10, SU11, SU12, SU13, SU14, SU15, SU16, SU17, SU18, SU19, SU20, SU23, SU24 PC1, PC2, PC3, PC7, PC8, PC9a, PC9b, PC11, PC12, PC13, PC14, PC15, PC16, PC17, PC18, PC19, PC20, PC21, PC23, PC24, PC25, PC26, PC27, PC28, PC29, PC30, PC31, PC32, PC33, PC34, PC35, PC36, PC37, PC38, PC39, PC40 AC1, AC2, AC3, AC4, AC5, AC6, AC7, AC8, AC10, AC11, AC13 (appropriate PROCs and ERCs are given in Section 2 below)			
Processes, tasks and/or activities covered	Processes, tasks and/or activities cove	ered are described in Section 2 below.		
Assessment Method	The assessment of inhalation exposure is ba	sed on the exposure estimation tool MEASE.		
2. Operational con	ditions and risk management measures	5		
PROC/ERC	REACH definition	Involved tasks		
PROC 1	Use in closed process, no likelihood of exposure			
PROC 2	Use in closed, continuous process with occasional controlled exposure			
PROC 3	Use in closed batch process (synthesis or formulation)			
PROC 4	Use in batch and other process (synthesis) where opportunity for exposure arises			
PROC 5	Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact)			
PROC 7	Industrial spraying			
PROC 8a	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities			
PROC 8b	Transfer of substance or preparation (charging/ discharging) from/to vessels/large containers at dedicated facilities			
PROC 9	Transfer of substance or preparation into small containers (dedicated filling line, including weighing)	Further information is provided in the ECHA Guidance on information requirements and chemical safety assessment, Chapter R.12: Use		
PROC 10	Roller application or brushing	descriptor system (ECHA-2010-G-05-EN).		
PROC 13	Treatment of articles by dipping and pouring			
PROC 14	Production of preparations or articles by tabletting, compression, extrusion, pelletisation			
PROC 15	Use as laboratory reagent			
PROC 16	Using material as fuel sources, limited exposure to unburned product to be expected			
PROC 17	Lubrication at high energy conditions and in partly open process			
PROC 18	Greasing at high energy conditions			
PROC 19	Hand-mixing with intimate contact and only PPE available			
PROC 22	Potentially closed processing operations with minerals/metals at elevated temperature Industrial setting			
PROC 23	Open processing and transfer operations with minerals/metals at elevated temperature			



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	<b></b>				
PROC 24	High (mechanical) energ bound in materia				
PROC 25	Other hot work ope	rations with metals			
PROC 26	Handling of solid inorgan tempe				
PROC 27a	Production of metal po	wders (hot processes)			
PROC 27b	Production of metal po	wders (wet processes)			
ERC 1-7, 12	Manufacture, formula industri				
ERC 10, 11	Wide-dispersive outdoor life articles a	and indoor use of long-			
2.1 Control of worl					
Product characteristic					
reflected by an assignme ambient temperature the temperature based, takin	approach, the substance- ent of a so-called fugacity c fugacity is based on the du g into account the process I on the level of abrasion in	lass in the MEASE tool. For ustiness of that substance. temperature and the melt	or operations conducted w Whereas in hot metal ope ing point of the substance.	ith solid substances at erations, fugacity is	
PROC	Used in preparation? Content in preparation Physical form Emission potential				
PROC 22, 23, 25, 27a	not restricted solid/powder, high				
All other applicable PROCs	not restricted solid/powder high				
Amounts used					
combination of the scale	lled per shift is not conside of operation (industrial vs. minant of the process intrir	Professional) and level of			
Frequency and duration	n of use/exposure				
PROC		Duration of	f exposure		
PROC 7, 8a, 17, 18, 19, 22		≤ 240 n	ninutes		
All other applicable PROCs	480 minutes (not restricted)				
Human factors not influenced by risk management					
The shift breathing volume during all process steps reflected in the PROCs is assumed to be 10 m³/shift (8 hours).					
Other given operational conditions affecting workers exposure					
Operational conditions like process temperature and process pressure are not considered relevant for occupational exposure assessment of the conducted processes. In process steps with considerably high temperatures (i.e. PROC 22, 23, 25), the exposure assessment in MEASE is however based on the ratio of process temperature and melting point. As the associated temperatures are expected to vary within the industry the highest ratio was taken as a worst case assumption for the exposure estimation. Thus all process temperatures are automatically covered in this exposure scenario for PROC 22, 23 and PROC 25.					
Technical conditions and	nd measures at process	evel (source) to prevent	release		

Risk management measures at the process level (e.g. containment or segregation of the emission source) are generally not required in the processes.



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Technical conditions and measures to control dispersion from source towards the worker					
PROC	Level of separation	Localised controls (LC)	Efficiency of LC (according to MEASE)	Further information	
PROC 1	Any potentially required	not required	na	-	
PROC 2, 3	separation of workers	general ventilation	17 %	-	
PROC 7	from the emission source is indicated	integrated local exhaust ventilation	84 %	-	
PROC 19	above under	not applicable	na	-	
All other applicable PROCs	"Frequency and duration of exposure". A reduction of exposure duration can be achieved, for example, by the installation of ventilated (positive pressure) control rooms or by removing the worker from workplaces involved with relevant exposure.	local exhaust ventilation	78 %	-	
Organisational measure	es to prevent /limit releas	ses, dispersion and expo	osure		
Avoid inhalation or ingestion. General occupational hygiene measures are required to ensure a safe handling of the substance. These measures involve good personal and housekeeping practices (i.e. regular cleaning with suitable cleaning devices), no eating and smoking at the workplace, the wearing of standard working clothes and shoes unless otherwise stated below. Shower and change clothes at end of work shift. Do not wear contaminated clothing at home. Do not blow dust off with compressed air. Conditions and measures related to personal protection, hygiene and health evaluation					
PROC	Specification of respiratory protective equipment (RPE)	RPE efficiency (assigned protection factor, APF)	Specification of gloves	Further personal protective equipment (PPE)	
PROC 1, 2, 3, 23, 25, 27b	not required	na		Eye protection equipment (e.g.	
PROC 4, 5, 7, 8a, 8b, 9, 17, 18,	FFP2 mask	APF=10		goggles or visors) must be worn, unless	
PROC 10, 13, 14, 15, 16, 22, 24, 26, 27a	FFP1 mask	APF=4	Since calcium oxide is classified as irritating to	potential contact with the eye can be	
PROC 19	FFP3 mask	APF=20	skin, the use of protective gloves is mandatory for all process steps.	excluded by the nature and type of application (i.e. closed process). Additionally, face protection, protective clothing and safety shoes are required to be worn as appropriate.	
Any RPE as defined above shall only be worn if the following principles are implemented in parallel: The duration of work (compare with "duration of exposure" above) should reflect the additional physiological stress for the worker due to the breathing resistance and mass of the RPE itself, due to the increased thermal stress by enclosing the head. In addition, it shall be considered that the worker's capability of using tools and of communicating are reduced during the wearing of RPE. For reasons as given above, the worker should therefore be (i) healthy (especially in view of medical problems that may affect the use of RPE), (ii) have suitable facial characteristics reducing leakages between face and mask (in view of scars and facial hair). The recommended devices above which rely on a tight face seal will not provide the required protection unless they fit the contours of the face properly and securely. The employer and self-employed persons have legal responsibilities for the maintenance and issue of respiratory protective devices and their correct use in the workplace. Therefore, they should define and document a suitable policy for a respiratory protective device programme including training of the workers. An overview of the APFs of different RPE (according to BS EN 529:2005) can be found in the glossary of MEASE.					
	2.2 Control of environmental exposure				
Amounts used					
The daily and annual an exposure.	The daily and annual amount per site (for point sources) is not considered to be the main determinant for environmental				
Frequency and duration of use					
Intermittent (< 12 time per year) or continuous use/release					



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#### Environment factors not influenced by risk management

Flow rate of receiving surface water: 18000 m³/day

Other given operational conditions affecting environmental exposure

Effluent discharge rate: 2000 m<sup>3</sup>/day

Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil

Risk management measures related to the environment aim to avoid discharging lime solutions into municipal wastewater or to surface water, in case such discharges are expected to cause significant pH changes. Regular control of the pH value during introduction into open waters is required. In general discharges should be carried out such that pH changes in receiving surface waters are minimised (e.g. through neutralisation). In general most aquatic organisms can tolerate pH values in the range of 6-9. This is also reflected in the description of standard OECD tests with aquatic organisms. The justification for this risk management measure can be found in the introduction section.

Conditions and measures related to waste

Solid industrial waste of lime should be reused or discharged to the industrial wastewater and further neutralized if needed.

#### 3. Exposure estimation and reference to its source

#### Occupational exposure

The exposure estimation tool MEASE was used for the assessment of inhalation exposure. The risk characterisation ratio (RCR) is the quotient of the refined exposure estimate and the respective DNEL (derived no-effect level) and has to be below 1 to demonstrate a safe use. For inhalation exposure, the RCR is based on the DNEL for calcium oxide of 1 mg/m<sup>3</sup> (as respirable dust) and the respective inhalation exposure estimate derived using MEASE (as inhalable dust). Thus, the RCR includes an additional safety margin since the respirable fraction being a sub-fraction of the inhalable fraction according to EN 481.

PROC	Method used for inhalation exposure assessment	Inhalation exposure estimate (RCR)	Method used for dermal exposure assessment	Dermal exposure estimate (RCR)
PROC 1, 2, 3, 4, 5, 7, 8a, 8b, 9, 10, 13, 14, 15, 16, 17, 18, 19, 22, 23, 24, 25, 26, 27a, 27b	MEASE	<1 mg/m³ (0.01 – 0.96)	Since calcium oxide is classified as irritating to skin, dermal exposure has to be minimised as fa as technically feasible. A DNEL for dermal effect has not been derived. Thus, dermal exposure is not assessed in this exposure scenario.	

#### **Environmental emissions**

The environmental exposure assessment is only relevant for the aquatic environment, when applicable including STPs/WWTPs, as emissions of calcium oxide in the different life-cycle stages (production and use) mainly apply to (waste) water. The aquatic effect and risk assessment only deal with the effect on organisms/ecosystems due to possible pH changes related to OH-discharges, being the toxicity of Ca2+ is expected to be negligible compared to the (potential) pH effect. Only the local scale is being addressed, including municipal sewage treatment plants (STPs) or industrial waste water treatment plants (WWTPs) when applicable, both for production and industrial use as any effects that might occur would be expected to take place on a local scale. The high water solubility and very low vapour pressure indicate that calcium oxide will be found predominantly in water. Significant emissions or exposure to air are not expected due to the low vapour pressure of calcium oxide. Significant emissions or exposure to the terrestrial environment are not expected either for this exposure scenario. The exposure assessment for the aquatic environment will therefore only deal with the possible pH changes in STP effluent and surface water related to the OH- discharges at the local scale. The exposure assessment is approached by assessing the resulting pH impact: the surface water of pH changes in STP effluent and surface water the surface water of pH changes in STP effluent and surface water the surface water of pH changes in STP effluent and surface water the surface water of pH changes in STP effluent and surface water the surface water of pH changes in STP effluent and surface water the surface water of pH changes in STP effluent and surface water of the surface water of pH changes in STP effluent and surface water as a surface water of pH changes in STP effluent and surface water of the surface water of pH changes in STP effluent and surface water is approached by assessing the resulting pH impact: the surface water of pH c

Environmental emissions	The production of calcium oxide can potentially result in an aquatic emission and locally increase the calcium oxide concentration and affect the pH in the aquatic environment. When the pH is not neutralised, the discharge of effluent from calcium oxide production sites may impact the pH in the receiving water. The pH of effluents is normally measured very frequently and can be neutralised
	easily as often required by national laws.
Exposure	Waste water from calcium oxide production is an inorganic wastewater stream and therefore there is
concentration in	no biological treatment. Therefore, wastewater streams from calcium oxide production sites will
waste water treatment	normally not be treated in biological waste water treatment plants (WWTPs), but can be used for pH
plant (WWTP)	control of acid wastewater streams that are treated in biological WWTPs.
	When calcium oxide is emitted to surface water, sorption to particulate matter and sediment will be
Exposure	negligible. When lime is rejected to surface water, the pH may increase, depending on the buffer
concentration in	capacity of the water. The higher the buffer capacity of the water, the lower the effect on pH will be. In
aquatic pelagic	general the buffer capacity preventing shifts in acidity or alkalinity in natural waters is regulated by the
compartment	equilibrium between carbon dioxide (CO2), the bicarbonate ion (HCO3-) and the carbonate ion
	(CO32-).
Exposure	The sediment compartment is not included in this ES, because it is not considered relevant for
concentration in	calcium oxide: when calcium oxide is emitted to the aquatic compartment, sorption of to sediment
sediments	particles is negligible.



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Exposure concentrations in soil and groundwater	The terrestrial compartment is not included in this exposure scenario, because it is not considered to be relevant.				
Exposure concentration in atmospheric compartment	The air compartment is not included in this CSA because it is considered not relevant for calcium oxide: when emitted to air as an aerosol in water, calcium oxide is neutralised as a result of its reaction with CO2 (or other acids), into HCO3- and Ca2+. Subsequently, the salts (e.g. calcium(bi)carbonate) are washed out from the air and thus the atmospheric emissions of neutralised calcium oxide largely end up in soil and water.				
Exposure concentration relevant for the food chain (secondary poisoning)					
4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES					
Occupational exposure					
met or the downstream u measures are adequate. respective DNEL (given t measured data are not a (www.ebrc.de/mease.htm according to the MEASE Method (RDM) are define	boundaries set by the ES if either the proposed risk management measures as described above are iser can demonstrate on his own that his operational conditions and implemented risk management. This has to be done by showing that they limit the inhalation and dermal exposure to a level below the that the processes and activities in question are covered by the PROCs listed above) as given below. If vailable, the DU may make use of an appropriate scaling tool such as MEASE ni) to estimate the associated exposure. The dustiness of the substance used can be determined glossary. For example, substances with a dustiness less than 2.5 % according to the Rotating Drum ed as "low dusty", substances with a dustiness less than 10 % (RDM) are defined as "medium dusty" ustiness ≥10 % are defined as "high dusty".				
DNEL <sub>inhalation</sub> : 1 mg/m <sup>3</sup> (as respirable dust)					

Important note: The DU has to be aware of the fact that apart from the long-term DNEL given above, a DNEL for acute effects exists at a level of 4 mg/m<sup>3</sup>. By demonstrating a safe use when comparing exposure estimates with the long-term DNEL, the acute DNEL is therefore also covered (according to R.14 guidance, acute exposure levels can be derived by multiplying long-term exposure estimates by a factor of 2). When using MEASE for the derivation of exposure estimates, it is noted that the exposure duration should only be reduced to half-shift as a risk management measure (leading to an exposure reduction of 40 %).



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#### Environmental exposure

If a site does not comply with the conditions stipulated in the safe use ES, it is recommended to apply a tiered approach to perform a more site-specific assessment. For that assessment, the following stepwise approach is recommended.

**Tier 1**: retrieve information on effluent pH and the contribution of the calcium oxide on the resulting pH. Should the pH be above 9 and be predominantly attributable to lime, then further actions are required to demonstrate safe use.

**Tier 2a**: retrieve information on receiving water pH after the discharge point. The pH of the receiving water shall not exceed the value of 9. If the measures are not available, the pH in the river can be calculated as follows:

$$pHriver = Log \left[ \frac{Qeffluent * 10^{pHeffluent} + Qriverupstream * 10^{pHupstream}}{Qriverupstream + Qeffluent} \right]$$
(Eq 1)

Where:

Q effluent refers to the effluent flow (in m<sup>3</sup>/day)

Q river upstream refers to the upstream river flow (in m³/day)

pH effluent refers to the pH of the effluent

pH upstream river refers to the pH of the river upstream of the discharge point

Please note that initially, default values can be used:

- Q river upstream flows: use the 10th of existing measurements distribution or use default value of 18000  $\ensuremath{m^{3/day}}$
- Q effluent: use default value of 2000 m³/day
- The upstream pH is preferably a measured value. If not available, one can assume a neutral pH of 7 if this can be justified.

Such equation has to be seen as a worst case scenario, where water conditions are standard and not case specific.

**Tier 2b**: Equation 1 can be used to identify which effluent pH causes an acceptable pH level in the receiving body. In order to do so, pH of the river is set at value 9 and pH of the effluent is calculated accordingly (using default values as reported previously, if necessary). As temperature influences lime solubility, pH effluent might require to be adjusted on a case-by-case basis. Once the maximum admissible pH value in the effluent is established, it is assumed that the OH- concentrations are all dependent on lime discharge and that there is no buffer capacity conditions to consider (this is a unrealistic worst case scenario, which can be modified where information is available). Maximum load of lime that can be annually rejected without negatively affecting the pH of the receiving water is calculated assuming chemical equilibrium. OH- expressed as moles/litre are multiplied by average flow of the effluent and then divided by the molar mass of the calcium oxide.

**Tier 3**: measure the pH in the receiving water after the discharge point. If pH is below 9, safe use is reasonably demonstrated and the ES ends here. If pH is found to be above 9, risk management measures have to be implemented: the effluent has to undergo neutralisation, thus ensuring safe use of lime during production or use phase.

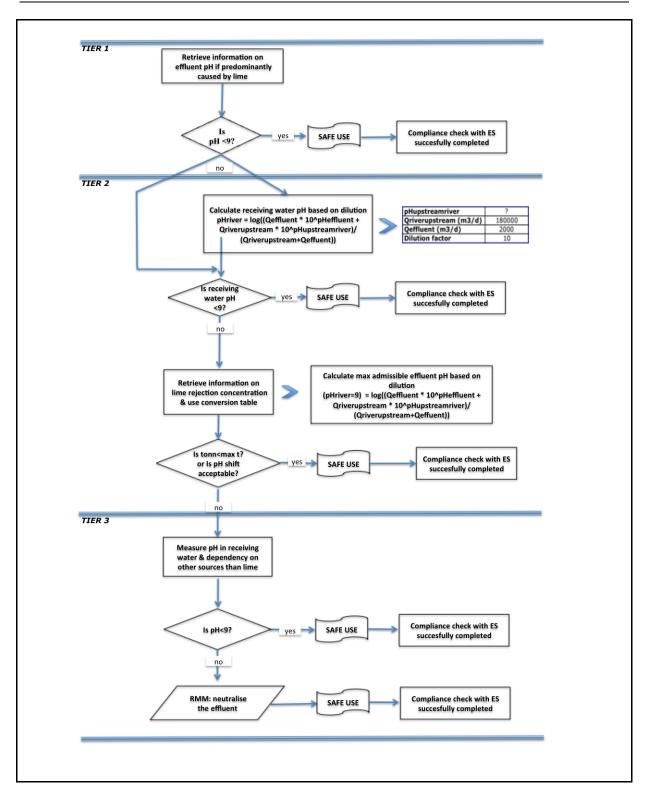


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# ES number 9.5: Manufacture and industrial uses of massive objects containing lime substances

Exposure Scenario	Format (1) address	ing uses carried ou	ıt by workers		
1. Title					
Free short title	Manufacture and industrial uses of massive objects containing lime substances				
Systematic title based on use descriptor	SU3, SU1, SU2a, SU2b, SU4, SU5, SU6a, SU6b, SU7, SU8, SU9, SU10, SU11, SU12, SU13, SU14, SU15, SU16, SU17, SU18, SU19, SU20, SU23, SU24 PC1, PC2, PC3, PC7, PC8, PC9a, PC9b, PC11, PC12, PC13, PC14, PC15, PC16, PC17, PC18, PC19, PC20, PC21, PC23, PC24, PC25, PC26, PC27, PC28, PC29, PC30, PC31, PC32, PC33, PC34, PC35, PC36, PC37, PC38, PC39, PC40 AC1, AC2, AC3, AC4, AC5, AC6, AC7, AC8, AC10, AC11, AC13 (appropriate PROCs and ERCs are given in Section 2 below)				
Processes, tasks and/or activities covered	Processes, t	asks and/or activities cove	ered are described in Sect	ion 2 below.	
Assessment Method	The assessment of	inhalation exposure is ba	sed on the exposure estim	ation tool MEASE.	
2. Operational con	ditions and risk mar	nagement measures	5		
PROC/ERC	REACH d	lefinition	Involve	d tasks	
PROC 6	Calendering	operations			
PROC 14	Production of prepar tabletting, compression,	extrusion, pelletisation	Further information is provided in the ECHA Guidance on information requirements and		
PROC 21	Low energy manipulation materials an				
PROC 22	Potentially closed proc minerals/metals at e Industria	levated temperature			
PROC 23	Open processing and to minerals/metals at e		chemical safety assessment, Chapter R.12: Use descriptor system (ECHA-2010-G-05-EN).		
PROC 24	High (mechanical) energy bound in materia	y work-up of substances			
PROC 25	Other hot work operations with metals				
ERC 1-7, 12	Manufacture, formula industri	al uses			
ERC 10, 11	Wide-dispersive outdoor and indoor use of long- life articles and materials				
2.1 Control of work	ers exposure				
Product characteristic					
According to the MEASE approach, the substance-intrinsic emission potential is one of the main exposure determinants. This is reflected by an assignment of a so-called fugacity class in the MEASE tool. For operations conducted with solid substances at ambient temperature the fugacity is based on the dustiness of that substance. Whereas in hot metal operations, fugacity is temperature based, taking into account the process temperature and the melting point of the substance. As a third group, high abrasive tasks are based on the level of abrasion instead of the substance intrinsic emission potential.					
PROC	Used in preparation? Content in preparation		Physical form	Emission potential	
PROC 22, 23,25	not res	tricted	massive objects, molten	high	
PROC 24	not restricted		massive objects	high	
All other applicable PROCs	not res	tricted	massive objects	very low	
Amounts used					
The actual tonnage handled per shift is not considered to influence the exposure as such for this scenario. Instead, the combination of the scale of operation (industrial vs. Professional) and level of containment/automation (as reflected in the PROC) is the main determinant of the process intrinsic emission potential.					



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Frequency and duration of use/exposure						
PROC		Duration of exposure				
PROC 22	≤ 240 minutes					
All other applicable PROCs		480 minutes (	not restricted)			
Human factors not influ	lenced by risk managem	ent				
The shift breathing volun	ne during all process steps	reflected in the PROCs is	assumed to be 10 m <sup>3</sup> /shif	t (8 hours).		
Other given operationa	I conditions affecting wo	rkers exposure				
assessment of the conductive exposure assessment in temperatures are expect estimation. Thus all processimation and the set of the s	ke process temperature an ucted processes. In process MEASE is however based ed to vary within the indust ess temperatures are auto <b>nd measures at process</b> ures at the process level	s steps with considerably I on the ratio of process ter try the highest ratio was ta matically covered in this e level (source) to prevent	high temperatures (i.e. PR mperature and melting poi ken as a worst case assur xposure scenario for PRO release	OC 22, 23, 25), the nt. As the associated nption for the exposure C 22, 23 and PROC 25.		
required in the processes						
		Localised controls	Efficiency of LC			
PROC	Level of separation	(LC)	(according to MEASE)	Further information		
PROC 6, 14, 21	Any potentially required separation of workers	not required	na	-		
PROC 22, 23, 24, 25              for the emission source is indicated above under "Frequency and duration of exposure duration can be achieved, for example, by the installation of ventilated (positive pressure) control rooms or by removing the worker from workplaces involved with relevant exposure.               local exhaust ventilation 78 %						
Organisational measur	es to prevent /limit releas	ses, dispersion and expo	osure			
These measures involve eating and smoking at th	tion. General occupational good personal and housel e workplace, the wearing o hes at end of work shift. Do	keeping practices (i.e. regu	ular cleaning with suitable s and shoes unless otherw	cleaning devices), no rise stated below.		



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Conditions and measur	es related to personal pr	otection, hygiene and he	ealth evaluation		
PROC	Specification of respiratory protective equipment (RPE)	RPE efficiency (assigned protection factor, APF)	Specification of gloves	Further personal protective equipment (PPE)	
PROC 22	FFP1 mask	APF=4	Since calcium oxide is classified as irritating to	Eye protection equipment (e.g. goggles or visors) must be worn, unless potential contact with the eye can be	
All other applicable PROCs	not required	na	skin, the use of protective gloves is mandatory for all process steps.	excluded by the nature and type of application (i.e. closed process). Additionally, face protection, protective clothing and safety shoes are required to be worn as appropriate.	
Any RPE as defined above shall only be worn if the following principles are implemented in parallel: The duration of work (compare with "duration of exposure" above) should reflect the additional physiological stress for the worker due to the breathing resistance and mass of the RPE itself, due to the increased thermal stress by enclosing the head. In addition, it shall be considered that the worker's capability of using tools and of communicating are reduced during the wearing of RPE. For reasons as given above, the worker should therefore be (i) healthy (especially in view of medical problems that may affect the use of RPE), (ii) have suitable facial characteristics reducing leakages between face and mask (in view of scars and facial hair). The recommended devices above which rely on a tight face seal will not provide the required protection unless they fit the contours of the face properly and securely. The employer and self-employed persons have legal responsibilities for the maintenance and issue of respiratory protective devices and the workplace. Therefore, they should define and document a suitable policy for a respiratory protective device programme including training of the workers. An overview of the APFs of different RPE (according to BS EN 529:2005) can be found in the glossary of MEASE.					
2.2 Control of envi	ronmental exposure	<b>;</b>			
Amounts used					
The daily and annual a exposure.	mount per site (for point	sources) is not considered	ed to be the main deterr	ninant for environmental	
Frequency and duration	n of use				
Intermittent (< 12 time pe	er year) or continuous use/	release			
Environment factors no	ot influenced by risk man	agement			
Flow rate of receiving sur	rface water: 18000 m³/day				
Other given operationa	I conditions affecting en	vironmental exposure			
Effluent discharge rate: 2	2000 m³/day				
Technical onsite condit	Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil				
surface water, in case su introduction into open wa waters are minimised (e. This is also reflected in th	Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil Risk management measures related to the environment aim to avoid discharging lime solutions into municipal wastewater or to surface water, in case such discharges are expected to cause significant pH changes. Regular control of the pH value during introduction into open waters is required. In general discharges should be carried out such that pH changes in receiving surface waters are minimised (e.g. through neutralisation). In general most aquatic organisms can tolerate pH values in the range of 6-9. This is also reflected in the description of standard OECD tests with aquatic organisms. The justification for this risk management measure can be found in the introduction section.				
Conditions and measur	res related to waste				
Solid industrial waste of I	ime should be reused or d	ischarged to the industrial	wastewater and further ne	eutralized if needed.	



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#### 3. Exposure estimation and reference to its source **Occupational exposure** The exposure estimation tool MEASE was used for the assessment of inhalation exposure. The risk characterisation ratio (RCR) is the quotient of the refined exposure estimate and the respective DNEL (derived no-effect level) and has to be below 1 to demonstrate a safe use. For inhalation exposure, the RCR is based on the DNEL for calcium oxide of 1 mg/m3 (as respirable dust) and the respective inhalation exposure estimate derived using MEASE (as inhalable dust). Thus, the RCR includes an additional safety margin since the respirable fraction being a sub-fraction of the inhalable fraction according to EN 481. Method used for Method used for Inhalation exposure Dermal exposure PROC inhalation exposure dermal exposure estimate (RCR) estimate (RCR) assessment assessment Since calcium oxide is classified as irritating to skin, dermal exposure has to be minimised as far PROC 6, 14, 21, 22, MEASE $< 1 \text{ mg/m}^3 (0.01 - 0.44)$ as technically feasible. A DNEL for dermal effects 23, 24, 25 has not been derived. Thus, dermal exposure is not assessed in this exposure scenario. **Environmental emissions** The environmental exposure assessment is only relevant for the aquatic environment, when applicable including STPs/WWTPs, as emissions of calcium oxide in the different life-cycle stages (production and use) mainly apply to (waste) water. The aquatic effect and risk assessment only deal with the effect on organisms/ecosystems due to possible pH changes related to OHdischarges, being the toxicity of Ca2+ is expected to be negligible compared to the (potential) pH effect. Only the local scale is being addressed, including municipal sewage treatment plants (STPs) or industrial waste water treatment plants (WWTPs) when applicable, both for production and industrial use as any effects that might occur would be expected to take place on a local scale. The high water solubility and very low vapour pressure indicate that calcium oxide will be found predominantly in water. Significant emissions or exposure to air are not expected due to the low vapour pressure of calcium oxide. Significant emissions or exposure to the terrestrial environment are not expected either for this exposure scenario. The exposure assessment for the aquatic environment will therefore only deal with the possible pH changes in STP effluent and surface water related to the OH- discharges at the local scale. The exposure assessment is approached by assessing the resulting pH impact: the surface water pH should not increase above 9. The production of calcium oxide can potentially result in an aquatic emission and locally increase the calcium oxide concentration and affect the pH in the aquatic environment. When the pH is not Environmental neutralised, the discharge of effluent from calcium oxide production sites may impact the pH in the emissions receiving water. The pH of effluents is normally measured very frequently and can be neutralised easily as often required by national laws. Exposure Waste water from calcium oxide production is an inorganic wastewater stream and therefore there is concentration in no biological treatment. Therefore, wastewater streams from calcium oxide production sites will waste water treatment normally not be treated in biological waste water treatment plants (WWTPs), but can be used for pH plant (WWTP) control of acid wastewater streams that are treated in biological WWTPs. When calcium oxide is emitted to surface water, sorption to particulate matter and sediment will be negligible. When lime is rejected to surface water, the pH may increase, depending on the buffer Exposure concentration in capacity of the water. The higher the buffer capacity of the water, the lower the effect on pH will be. In aquatic pelagic general the buffer capacity preventing shifts in acidity or alkalinity in natural waters is regulated by the equilibrium between carbon dioxide (CO2), the bicarbonate ion (HCO3-) and the carbonate ion compartment (CO32-) The sediment compartment is not included in this ES, because it is not considered relevant for Exposure concentration in calcium oxide: when calcium oxide is emitted to the aquatic compartment, sorption of to sediment sediments particles is negligible. Exposure The terrestrial compartment is not included in this exposure scenario, because it is not considered to concentrations in soil be relevant. and groundwater The air compartment is not included in this CSA because it is considered not relevant for calcium Exposure oxide: when emitted to air as an aerosol in water, calcium oxide is neutralised as a result of its concentration in reaction with CO2 (or other acids), into HCO3- and Ca2+. Subsequently, the salts (e.g. atmospheric calcium(bi)carbonate) are washed out from the air and thus the atmospheric emissions of neutralised compartment calcium oxide largely end up in soil and water. Exposure concentration Bioaccumulation in organisms is not relevant for calcium oxide: a risk assessment for secondary relevant for the food poisoning is therefore not required. chain (secondary poisoning)



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

#### Occupational exposure

The DU works inside the boundaries set by the ES if either the proposed risk management measures as described above are met or the downstream user can demonstrate on his own that his operational conditions and implemented risk management measures are adequate. This has to be done by showing that they limit the inhalation and dermal exposure to a level below the respective DNEL (given that the processes and activities in question are covered by the PROCs listed above) as given below. If measured data are not available, the DU may make use of an appropriate scaling tool such as MEASE

(<u>www.ebrc.de/mease.html</u>) to estimate the associated exposure. The dustiness of the substance used can be determined according to the MEASE glossary. For example, substances with a dustiness less than 2.5 % according to the Rotating Drum Method (RDM) are defined as "low dusty", substances with a dustiness less than 10 % (RDM) are defined as "medium dusty" and substances with a dustiness ≥10 % are defined as "high dusty".

#### DNEL<sub>inhalation</sub>: 1 mg/m<sup>3</sup> (as respirable dust)

Important note: The DU has to be aware of the fact that apart from the long-term DNEL given above, a DNEL for acute effects exists at a level of 4 mg/m<sup>3</sup>. By demonstrating a safe use when comparing exposure estimates with the long-term DNEL, the acute DNEL is therefore also covered (according to R.14 guidance, acute exposure levels can be derived by multiplying long-term exposure estimates by a factor of 2). When using MEASE for the derivation of exposure estimates, it is noted that the exposure duration should only be reduced to half-shift as a risk management measure (leading to an exposure reduction of 40 %).

#### Environmental exposure

If a site does not comply with the conditions stipulated in the safe use ES, it is recommended to apply a tiered approach to perform a more site-specific assessment. For that assessment, the following stepwise approach is recommended.

**Tier 1**: retrieve information on effluent pH and the contribution of the calcium oxide on the resulting pH. Should the pH be above 9 and be predominantly attributable to lime, then further actions are required to demonstrate safe use.

**Tier 2a**: retrieve information on receiving water pH after the discharge point. The pH of the receiving water shall not exceed the value of 9. If the measures are not available, the pH in the river can be calculated as follows:

$$pHriver = Log \left[ \frac{Qeffluent * 10^{pHeffluent} + Qriverupstream * 10^{pHupstream}}{Qriverupstream + Qeffluent} \right]$$
(Eq 1)

Where:

Q effluent refers to the effluent flow (in m³/day)

Q river upstream refers to the upstream river flow (in m<sup>3</sup>/day)

pH effluent refers to the pH of the effluent

pH upstream river refers to the pH of the river upstream of the discharge point

Please note that initially, default values can be used:

- Q river upstream flows: use the 10th of existing measurements distribution or use default value of 18000  $\ensuremath{m^3/day}$
- Q effluent: use default value of 2000 m3/day
- The upstream pH is preferably a measured value. If not available, one can assume a neutral pH of 7 if this can be justified.

Such equation has to be seen as a worst case scenario, where water conditions are standard and not case specific.

**Tier 2b**: Equation 1 can be used to identify which effluent pH causes an acceptable pH level in the receiving body. In order to do so, pH of the river is set at value 9 and pH of the effluent is calculated accordingly (using default values as reported previously, if necessary). As temperature influences lime solubility, pH effluent might require to be adjusted on a case-by-case basis. Once the maximum admissible pH value in the effluent is established, it is assumed that the OH- concentrations are all dependent on lime discharge and that there is no buffer capacity conditions to consider (this is a unrealistic worst case scenario, which can be modified where information is available). Maximum load of lime that can be annually rejected without negatively affecting the pH of the receiving water is calculated assuming chemical equilibrium. OH- expressed as moles/litre are multiplied by average flow of the effluent and then divided by the molar mass of the calcium oxide.

**Tier 3**: measure the pH in the receiving water after the discharge point. If pH is below 9, safe use is reasonably demonstrated and the ES ends here. If pH is found to be above 9, risk management measures have to be implemented: the effluent has to undergo neutralisation, thus ensuring safe use of lime during production or use phase.

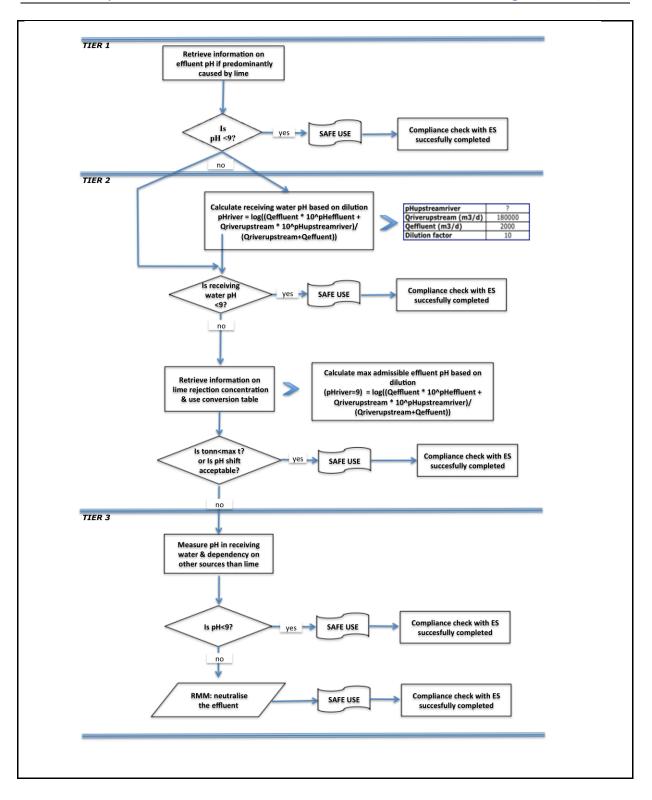


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# ES number 9.6: Professional uses of aqueous solutions of lime substances

Exposure Scenario Format (1) addressing uses carried out by workers					
1. Title					
Free short title	Professional uses of aqueous solutions of lime substances				
Systematic title based on use descriptor	SU22, SU1, SU5, SU6a, SU6b, SU7, SU10, SU11, SU12, SU13, SU16, SU17, SU18, SU19, SU20, SU23, SU24 PC1, PC2, PC3, PC7, PC8, PC9a, PC9b, PC11, PC12, PC13, PC14, PC15, PC16, PC17, PC18, PC19, PC20, PC21, PC23, PC24, PC25, PC26, PC27, PC28, PC29, PC30, PC31, PC32, PC33, PC34, PC35, PC36, PC37, PC39, PC40 AC1, AC2, AC3, AC4, AC5, AC6, AC7, AC8, AC10, AC11, AC13 (appropriate PROCs and ERCs are given in Section 2 below)				
Processes, tasks and/or activities covered	Processes, tasks and/or activities cove	ered are described in Section 2 below.			
Assessment Method		d on the exposure estimation tool MEASE. The sased on FOCUS-Exposit.			
2. Operational con	ditions and risk management measures	5			
PROC/ERC	REACH definition	Involved tasks			
PROC 2	Use in closed, continuous process with occasional controlled exposure				
PROC 3	Use in closed batch process (synthesis or formulation)				
PROC 4	Use in batch and other process (synthesis) where opportunity for exposure arises				
PROC 5	Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact)				
PROC 8a	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities				
PROC 8b	Transfer of substance or preparation (charging/ discharging) from/to vessels/large containers at dedicated facilities				
PROC 9	Transfer of substance or preparation into small containers (dedicated filling line, including weighing)	Further information is provided in the ECHA Guidance on information requirements and chemical safety assessment, Chapter R.12: Use			
PROC 10	Roller application or brushing	descriptor system (ECHA-2010-G-05-EN).			
PROC 11	Non industrial spraying				
PROC 12	Use of blowing agents in manufacture of foam				
PROC 13	Treatment of articles by dipping and pouring				
PROC 15	Use as laboratory reagent				
PROC 16	Using material as fuel sources, limited exposure to unburned product to be expected				
PROC 17	Lubrication at high energy conditions and in partly open process				
PROC 18	Greasing at high energy conditions				
PROC 19	Hand-mixing with intimate contact and only PPE available				
ERC2, ERC8a, ERC8b, ERC8c, ERC8d, ERC8e, ERC8f	Wide dispersive indoor and outdoor use of reactive substances or processing aids in open systems	Calcium oxide is applied in numerous cases of wide dispersive uses: agricultural, forestry, fish and shrimps farming, soil treatment and environmental protection.			



### prepared in accordance with Regulation EC 1907/2006 and Regulation (EC)

#### 1272/2008, as amended

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2.1 Control of work	kers exposure					
Product characteristic						
reflected by an assignme ambient temperature the temperature based, takin abrasive tasks are based	nt of a so-called fugacity of fugacity is based on the d g into account the process	lass in the MEASE tool. F ustiness of that substance temperature and the melt istead of the substance in	I is one of the main expose or operations conducted w Whereas in hot metal ope ting point of the substance trinsic emission potential.	ith solid substances at erations, fugacity is . As a third group, high		
PROC	Use in preparation	Content in preparation	Physical form	Emission potential		
All applicable PROCs	not res	tricted	aqueous solution	very low		
Amounts used						
combination of the scale		professional) and level of	ure as such for this scenar containment/automation (a			
Frequency and duration	n of use/exposure					
PROC		Duration o	f exposure			
PROC 11		≤ 240 r	minutes			
All other applicable PROCs		480 minutes (	not restricted)			
Human factors not influ	enced by risk managem	ent				
The shift breathing volum	e during all process steps	reflected in the PROCs is	assumed to be 10 m <sup>3</sup> /shift	t (8 hours).		
Other given operational	l conditions affecting wo	rkers exposure				
			rational conditions (e.g. p essment of the conducted			
Technical conditions ar	nd measures at process	level (source) to prevent	release			
Risk management meas required in the processes	•	(e.g. containment or segr	regation of the emission s	ource) are generally no		
Technical conditions ar	nd measures to control d	ispersion from source to	owards the worker			
PROC	Level of separation	Localised controls (LC)	Efficiency of LC (according to MEASE)	Further information		
PROC 19	Separation of workers from the emission	not applicable	na	-		
All other applicable PROCs	source is generally not required in the not required na - conducted processes.					
Organisational measure	es to prevent /limit releas	es, dispersion and expo	osure			
These measures involve eating and smoking at the	good personal and housel e workplace, the wearing o	keeping practices (i.e. regulation of standard working clothes	quired to ensure a safe har ular cleaning with suitable s and shoes unless otherw lothing at home. Do not blo	cleaning devices), no ise stated below.		



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PROC	Specification of respiratory protective equipment (RPE)	RPE efficiency (assigned protection factor, APF)	Specification of gloves	Further personal protective equipment (PPE)
PROC 11	FFP3 mask	APF=20		Eye protection equipment (e.g. goggles or visors) mus be worn, unless
PROC 17	FFP1 mask	APF=4	Since calcium oxide is classified as irritating to skin, the use of protective gloves is mandatory for all	potential contact with the eye can be excluded by the nature and type of application (i.e. closed process).
All other applicable PROCs	not required	na	process steps.	Additionally, face protection, protective clothing and safety shoes are required to be worn as appropriate
devices and the manage	mont of their correct use in	the workplace Therefore		ogument o guitable
policy for a respiratory p An overview of the APFs 2.2 Control of env Product characteristic	rotective device programm s of different RPE (accordir ironmental exposure s se estimate based on data Quan	e including training of the ving to BS EN 529:2005) car <b>e - only relevant for</b> from dust measurements in tity of dust m3 (in mg) <b>3</b> 7 11	Wind speed: - 3.5 m/s - 6 m/s - 3.5 m/s - 3.5 m/s - 5 m/s - 3.5 m/s - 6 m/s - 3.5 m/s	of MEASE.
policy for a respiratory p An overview of the APFs 2.2 Control of env Product characteristic	rotective device programm s of different RPE (accordir ironmental exposure s se estimate based on data to Quan per 120 100 80 60 40 20 0 1	e including training of the vag to BS EN 529:2005) car <b>a</b> - only relevant for from dust measurements in tity of dust m3 (in mg) <b>3</b> 7 11	Wind speed: Wind speed: - 3.5 m/s - 6 m/s - 3.5 m/s	of MEASE.
policy for a respiratory p An overview of the APFs 2.2 Control of env Product characteristic Drift: 1% (very worst-cas	rotective device programm s of different RPE (accordir ironmental exposure s se estimate based on data to Quan per 120 100 80 60 40 20 0 1	e including training of the ving to BS EN 529:2005) car <b>e - only relevant for</b> from dust measurements in tity of dust m3 (in mg) <b>3</b> 7 11	Wind speed: Wind speed: - 3.5 m/s - 6 m/s - 3.5 m/s	of MEASE.
policy for a respiratory p An overview of the APFs 2.2 Control of env Product characteristic	rotective device programm s of different RPE (accordir ironmental exposure s se estimate based on data to Quan per 120 100 80 60 40 20 0 1	e including training of the vag to BS EN 529:2005) car <b>a</b> - only relevant for from dust measurements in tity of dust m3 (in mg) <b>3</b> 7 11	Wind speed: Wind speed: - 3.5 m/s - 6 m/s - 3.5 m/s	of MEASE.



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Environment factors not influenced by risk management

Volume of surface water: 300 L/m<sup>2</sup>

Field surface area: 1 ha

Other given operational conditions affecting environmental exposure

Outdoor use of products Soil mixing depth: 20 cm

Technical conditions and measures at process level (source) to prevent release

There are no direct releases to adjacent surface waters.

Technical conditions and measures to reduce or limit discharges, air emissions and releases to soil

Drift should be minimised.

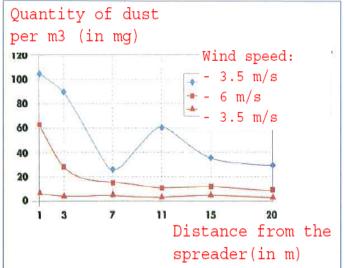
Organizational measures to prevent/limit release from site

In line with the requirements for good agricultural practice, agricultural soil should be analysed prior to application of lime and the application rate should be adjusted according to the results of the analysis.

2.2 Control of environmental exposure – only relevant for urban soil treatment

**Product characteristics** 

Drift: 1% (very worst-case estimate based on data from dust measurements in air as a function of the distance from application)



180,000 kg/ha

(Figure taken from: Laudet, A. et al., 1999)

Amounts used

CaO

Frequency and duration of use

1 day/year and only once in a lifetime; Multiple applications during the year are allowed, provided the total yearly amount of 180,000 kg/ha (CaO) is not exceeded

Environment factors not influenced by risk management

Field surface area: 1 ha

Other given operational conditions affecting environmental exposure

Outdoor use of products

Soil mixing depth: 20 cm

Technical conditions and measures at process level (source) to prevent release

Lime is only applied onto the soil in the technosphere zone before road construction. There are no direct releases to adjacent surface waters.



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#### Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil Drift should be minimised. 3. Exposure estimation and reference to its source **Occupational exposure** The exposure estimation tool MEASE was used for the assessment of inhalation exposure. The risk characterisation ratio (RCR) is the quotient of the refined exposure estimate and the respective DNEL (derived no-effect level) and has to be below 1 to demonstrate a safe use. For inhalation exposure, the RCR is based on the DNEL for calcium oxide of 1 mg/m3 (as respirable dust) and the respective inhalation exposure estimate derived using MEASE (as inhalable dust). Thus, the RCR includes an additional safety margin since the respirable fraction being a sub-fraction of the inhalable fraction according to EN 481. Method used for Method used for Inhalation exposure Dermal exposure PROC dermal exposure inhalation exposure estimate (RCR) estimate (RCR) assessment assessment Since calcium oxide is classified as irritating to PROC 2, 3, 4, 5, 8a, skin, dermal exposure has to be minimised as far < 1 mg/m³ (<0.001 – 8b, 9, 10, 11, 12, 13, MEASE as technically feasible. A DNEL for dermal effects 0.6) 15, 16, 17, 18, 19 has not been derived. Thus, dermal exposure is not assessed in this exposure scenario. Environmental exposure for agricultural soil protection The PEC calculation for soil and surface water was based on the FOCUS soil group (FOCUS, 1996) and on the "draft guidance on the calculation of predicted environmental concentration values (PEC) of plant protection products for soil, ground water, surface water and sediment (Kloskowksi et al., 1999). The FOCUS/EXPOSIT modelling tool is preferred to the EUSES as it is more appropriate for agricultural-like application as in this case where parameter as the drift needs to be included in the modelling. FOCUS is a model typically developed for biocidal applications and was further elaborated on the basis of the German EXPOSIT 1.0 model, where parameters such as drifts can be improved according to collected data: once applied on the soil, calcium oxide can indeed migrate then towards surface waters, via drift Environmental See amounts used emissions Exposure concentration in Not relevant for agricultural soil protection waste water treatment plant (WWTP) Exposure Substance PEC (ug/L) PNEC (ug/L) RCR concentration in aquatic pelagic CaO 5.66 370 0.015 compartment As described above, no exposure of surface water nor sediment to lime is expected. Further, in Exposure natural waters the hydroxide ions react with HCO3- to form water and CO32-. CO32- forms CaCO3 concentration in by reacting with Ca2+. The calcium carbonate precipitates and deposits on the sediment. Calcium sediments carbonate is of low solubility and a constituent of natural soils Exposure Substance PEC (mg/L) PNEC (mg/L) RCR concentrations in soil 500 0.61 CaO 816 and groundwater Exposure concentration in This point is not relevant. Calcium oxide is not volatile. The vapour pressures is below 10<sup>-5</sup> Pa. atmospheric compartment Exposure concentration This point is not relevant because calcium oxides can be considered to be omnipresent and essential relevant for the food in the environment. The uses covered do not significantly influence the distribution of the constituents chain (secondary (Ca2+ and OH-) in the environment. poisoning)



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#### Environmental exposure for urban soil treatment

The urban soil treatment scenario is based on a road border scenario. At the special road border technical meeting (Ispra, September 5, 2003), EU Member States and industry agreed on a definition for a "road technosphere". The road technosphere can be defined as "the engineered environment that carries the geotechnical functions of the road in connection with its structure, operation and maintenance including the installations to ensure road safety and manage run off. This technosphere, which includes the hard and soft shoulder at the edge of the carriageway, is vertically dictated by the groundwater watertable. The road authority has responsibility for this road technosphere including road safety, road support, prevention of pollution and water management". The road technosphere was therefore excluded as assessment endpoint for risk assessment for the purpose of the existing/new substances regulations. The target zone is the zone beyond the technosphere, to which the environmental risk assessment applies.

The PEC calculation for soil was based on the FOCUS soil group (FOCUS, 1996) and on the "draft guidance on the calculation of predicted environmental concentration values (PEC) of plant protection products for soil, ground water, surface water and sediment (Kloskowksi et al., 1999). The FOCUS/EXPOSIT modelling tool is preferred to the EUSES as it is more appropriate for agricultural-like application as in this case where parameter as the drift needs to be included in the modelling. FOCUS is a model typically developed for biocidal applications and was further elaborated on the basis of the German EXPOSIT 1.0 model, where parameters such as drifts can be improved according to collected data.

where parameters such a	as units can be improved a	coolding to collected data.				
Environmental emissions	See amounts used					
Exposure concentration in waste water treatment plant (WWTP)	Not relevant for road border scenario					
Exposure concentration in aquatic pelagic compartment	Not relevant for road border scenario					
Exposure concentration in sediments	Not relevant for road border scenario					
Exposure concentrations in soil	Substance	PEC (mg/L)	PNEC (mg/L)	RCR		
and groundwater	CaO	529	816	0.65		
Exposure concentration in atmospheric compartment	This point is not relevant. Calcium oxide is not volatile. The vapour pressures is below 10 <sup>-5</sup> Pa.					
Exposure concentration relevant for the food chain (secondary poisoning)	This point is not relevant because calcium can be considered to be omnipresent and essential in the environment. The uses covered do not significantly influence the distribution of the constituents (Ca <sup>2+</sup> and OH <sup>-</sup> ) in the environment.					
Environmental exposure for other uses						
The operational protection or u	antitative environmental ex al conditions and risk man rban soil treatment redient and chemically bou	agement measures are les	ss stringent than those ou	-		

 Lime is an ingredient and chemically bound into a matrix. Releases are negligible and insufficient to cause a pH-shift in soil, wastewater or surface water

• Lime is specifically used to release CO2-free breathable air, upon reaction with CO2. Such applications only relates to the air compartment, where the lime properties are exploited

Neutralisation/pH-shift is the intended use and there are no additional impacts beyond those desired.



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

The DU works inside the boundaries set by the ES if either the proposed risk management measures as described above are met or the downstream user can demonstrate on his own that his operational conditions and implemented risk management measures are adequate. This has to be done by showing that they limit the inhalation and dermal exposure to a level below the respective DNEL (given that the processes and activities in question are covered by the PROCs listed above) as given below. If measured data are not available, the DU may make use of an appropriate scaling tool such as MEASE (<u>www.ebrc.de/mease.html</u>) to estimate the associated exposure. The dustiness less than 2.5 % according to the Rotating Drum Method (RDM) are defined as "low dusty", substances with a dustiness less than 10 % (RDM) are defined as "medium dusty" and substances with a dustiness less than 10 % (RDM) are defined as "medium dusty".

#### DNEL<sub>inhalation</sub>: 1 mg/m<sup>3</sup> (as respirable dust)

Important note: The DU has to be aware of the fact that apart from the long-term DNEL given above, a DNEL for acute effects exists at a level of 4 mg/m<sup>3</sup>. By demonstrating a safe use when comparing exposure estimates with the long-term DNEL, the acute DNEL is therefore also covered (according to R.14 guidance, acute exposure levels can be derived by multiplying long-term exposure estimates by a factor of 2). When using MEASE for the derivation of exposure estimates, it is noted that the exposure duration should only be reduced to half-shift as a risk management measure (leading to an exposure reduction of 40 %).



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# ES number 9.7: Professional uses of low dusty solids/powders of lime substances

Exposure Scenario Format (1) addressing uses carried out by workers					
1. Title	1. Title				
Free short title	Professional uses of low dusty so	olids/powders of lime substances			
Systematic title based on use descriptor	SU22, SU1, SU5, SU6a, SU6b, SU7, SU10, SU11, SU12, SU13, SU16, SU17, SU18, SU19, SU20, SU23, SU24 PC1, PC2, PC3, PC7, PC8, PC9a, PC9b, PC11, PC12, PC13, PC14, PC15, PC16, PC17, PC18, PC19, PC20, PC21, PC23, PC24, PC25, PC26, PC27, PC28, PC29, PC30, PC31, PC32, PC33, PC34, PC35, PC36, PC37, PC39, PC40 AC1, AC2, AC3, AC4, AC5, AC6, AC7, AC8, AC10, AC11, AC13 (appropriate PROCs and ERCs are given in Section 2 below)				
Processes, tasks and/or activities covered	Processes, tasks and/or activities cove	ered are described in Section 2 below.			
Assessment Method	The assessment of inhalation exposure is base environmental assessment is				
2. Operational con	ditions and risk management measures	5			
PROC/ERC	REACH definition	Involved tasks			
PROC 2	Use in closed, continuous process with occasional controlled exposure				
PROC 3	Use in closed batch process (synthesis or formulation)				
PROC 4	Use in batch and other process (synthesis) where opportunity for exposure arises				
PROC 5	Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact)				
PROC 8a	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities				
PROC 8b	Transfer of substance or preparation (charging/ discharging) from/to vessels/large containers at dedicated facilities				
PROC 9	Transfer of substance or preparation into small containers (dedicated filling line, including weighing)				
PROC 10	Roller application or brushing	Further information is provided in the ECHA			
PROC 11	Non industrial spraying	Guidance on information requirements and chemical safety assessment, Chapter R.12: Use			
PROC 13	Treatment of articles by dipping and pouring	descriptor system (ECHA-2010-G-05-EN).			
PROC 15	Use as laboratory reagent				
PROC 16	Using material as fuel sources, limited exposure to unburned product to be expected				
PROC 17	Lubrication at high energy conditions and in partly open process				
PROC 18	Greasing at high energy conditions				
PROC 19	Hand-mixing with intimate contact and only PPE available				
PROC 21	Low energy manipulation of substances bound in materials and/or articles				
PROC 25	Other hot work operations with metals				
PROC 26	Handling of solid inorganic substances at ambient temperature				
ERC2, ERC8a, ERC8b, ERC8c, ERC8d, ERC8e, ERC8f	Wide dispersive indoor and outdoor use of reactive substances or processing aids in open systems				



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compressed air.

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2.1 Control of work	ers exposure				
Product characteristic					
According to the MEASE approach, the substance-intrinsic emission potential is one of the main exposure determinants. This is reflected by an assignment of a so-called fugacity class in the MEASE tool. For operations conducted with solid substances at ambient temperature the fugacity is based on the dustiness of that substance. Whereas in hot metal operations, fugacity is temperature based, taking into account the process temperature and the melting point of the substance. As a third group, high abrasive tasks are based on the level of abrasion instead of the substance intrinsic emission potential.					
PROC	Use in preparation	Content in preparation	Physical form	Emission potential	
PROC 25	not restricted solid/powder, high				
All other applicable PROCs	not res	tricted	solid/powder	low	
Amounts used					
combination of the scale		professional) and level of	ure as such for this scenar containment/automation (a		
Frequency and duration	n of use/exposure				
PROC		Duration o	f exposure		
PROC 17		≤ 240 n	ninutes		
All other applicable PROCs		480 minutes (	not restricted)		
Human factors not influ	enced by risk managem	ent			
The shift breathing volum	e during all process steps	reflected in the PROCs is	assumed to be 10 m <sup>3</sup> /shift	t (8 hours).	
· · ·	l conditions affecting wo	· · · · · · · · · · · · · · · · · · ·			
assessment of the condu exposure assessment in temperatures are expected	cted processes. In process MEASE is however based ed to vary within the indust	s steps with considerably h on the ratio of process ter ry the highest ratio was ta	t considered relevant for o nigh temperatures (i.e. PR mperature and melting poir ken as a worst case assun xposure scenario for PROC	OC 22, 23, 25), the nt. As the associated nption for the exposure	
	nd measures at process				
Risk management measurequired in the processes	•	e.g. containment or segreg	ation of the emission sourc	ce) are generally not	
Technical conditions an	nd measures to control d	ispersion from source to			
PROC	Level of separation	Localised controls (LC)	Efficiency of LC (according to MEASE)	Further information	
PROC 19	Any potentially required separation of workers from the emission source is indicated above under "Frequency and duration of exposure".	not applicable	na	-	
All other applicable PROCs All other applicable pressure) control rooms or by removing the worker from workplaces involved with relevant exposure. Areduction of exposure duration cof exposure achieved, for example, by the installation of ventilated (positive pressure) control rooms or by removing the worker from workplaces involved with relevant exposure.					
Organisational measure	es to prevent /limit releas	es, dispersion and expo	osure		
These measures involve eating and smoking at the	good personal and housel e workplace, the wearing c	keeping practices (i.e. regulation of standard working clothes	quired to ensure a safe har Jar cleaning with suitable o s and shoes unless otherw lothing at home. Do not blo	cleaning devices), no ise stated below.	



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PROC	Specification of respiratory protective equipment (RPE)	RPE efficiency (assigned protection factor, APF)	Specification of gloves	Further personal protective equipment (PPE)
PROC 4, 5, 11, 26	FFP1 mask	APF=4		Eye protection
PROC 16, 17, 18, 25	FFP2 mask	APF=10		equipment (e.g.
				goggles or visors) mus be worn, unless
			Since calcium oxide is	potential contact with
			classified as irritating to	the eye can be
			skin, the use of	excluded by the nature
All other applicable			protective gloves is	and type of application
PROCs	not required	na	mandatory for all	(i.e. closed process).
			process steps.	Additionally, face protection, protective
				clothing and safety
				shoes are required to
				be worn as appropriate
the use of RPE), (ii) have hair). The recommended contours of the face prop The employer and self-e devices and the manage	mployed persons have leg ment of their correct use ir	stics reducing leakages bet on a tight face seal will no al responsibilities for the m the workplace. Therefore e including training of the w	tween face and mask (in v t provide the required prot naintenance and issue of ro , they should define and d workers.	iew of scars and facial ection unless they fit the espiratory protective
An overview of the APFs 2.2 Control of envi	of different RPE (accordin		be found in the glossary	
An overview of the APFs 2.2 Control of envi Product characteristics	of different RPE (accordin	e – only relevant for	a be found in the glossary of agricultural soil pro	otection
An overview of the APFs 2.2 Control of envi Product characteristics	s of different RPE (accordin ironmental exposure s se estimate based on data	e – only relevant for	a be found in the glossary of agricultural soil pro	otection
An overview of the APFs 2.2 Control of envi Product characteristics	s of different RPE (accordin ironmental exposure s se estimate based on data Quan	from dust measurements in tity of dust	a be found in the glossary of agricultural soil pro	otection
An overview of the APFs 2.2 Control of envi Product characteristics	s of different RPE (accordin ironmental exposure s se estimate based on data Quan per	e – only relevant for	n be found in the glossary of agricultural soil pro	otection
An overview of the APFs 2.2 Control of envi Product characteristics	s of different RPE (accordin ironmental exposure s se estimate based on data Quan	from dust measurements in tity of dust	agricultural soil pro agricultural soil pro n air as a function of the di Wind speed:	otection
An overview of the APFs 2.2 Control of envi Product characteristics	s of different RPE (accordin ironmental exposure s se estimate based on data Quan per	from dust measurements in tity of dust	wind speed:	otection
An overview of the APFs 2.2 Control of envi Product characteristics	s of different RPE (accordin ironmental exposure s se estimate based on data Quan per 120	from dust measurements in tity of dust	agricultural soil pro agricultural soil pro n air as a function of the di Wind speed:	otection
An overview of the APFs 2.2 Control of envi Product characteristics	s of different RPE (accordin ironmental exposure s se estimate based on data Quan per 120 100 80	from dust measurements in tity of dust	wind speed:	otection
An overview of the APFs 2.2 Control of envi Product characteristics	s of different RPE (accordin ironmental exposure s se estimate based on data Quan per 120 100	from dust measurements in tity of dust	Wind speed: - 3.5 m/s - 6 m/s	otection
An overview of the APFs 2.2 Control of envi Product characteristics	s of different RPE (accordin ironmental exposure s se estimate based on data Quan per 120 100 80	from dust measurements in tity of dust	Wind speed: - 3.5 m/s - 6 m/s	otection
An overview of the APFs 2.2 Control of envi Product characteristics	s of different RPE (accordin ronmental exposure s se estimate based on data Quan per 120 100 80 60 40	from dust measurements in tity of dust	Wind speed: - 3.5 m/s - 6 m/s	otection
An overview of the APFs 2.2 Control of envi Product characteristics	s of different RPE (accordin ironmental exposure s s se estimate based on data Quan per 120 100 80 60	from dust measurements in tity of dust	Wind speed: - 3.5 m/s - 6 m/s	otection
An overview of the APFs 2.2 Control of envi Product characteristics	s of different RPE (accordin ronmental exposure s se estimate based on data Quan per 120 100 80 60 40	from dust measurements in tity of dust m3 (in mg)	Wind speed: - 3.5 m/s - 3.5 m/s - 3.5 m/s - 3.5 m/s	otection
An overview of the APFs 2.2 Control of envi Product characteristics	s of different RPE (accordin ronmental exposure s se estimate based on data Quan per 120 100 80 60 40 20	from dust measurements in tity of dust m3 (in mg)	Wind speed: - 3.5 m/s - 3.5 m/s	otection
An overview of the APFs 2.2 Control of envi Product characteristics	s of different RPE (accordin ronmental exposure s se estimate based on data Quan per 120 100 80 60 40 20	from dust measurements in tity of dust m3 (in mg)	Wind speed: - 3.5 m/s - 3.5 m/s - 3.5 m/s - 3.5 m/s	otection istance from application)
An overview of the APFs 2.2 Control of envi Product characteristics	s of different RPE (accordin ronmental exposure s se estimate based on data Quan per 120 100 80 60 40 20	from dust measurements in tity of dust m3 (in mg) 3 7 11	Wind speed: - 3.5 m/s - 3.5 m/s	istance from application)
An overview of the APFs 2.2 Control of envi Product characteristics	s of different RPE (accordin ironmental exposure s se estimate based on data Quan per 120 100 80 60 40 20 0 1	from dust measurements in tity of dust m3 (in mg) 3 7 11	Wind speed: Wind speed: - 3.5 m/s - 6 m/s - 3.5 m/s - 3.5 m/s Distance from spreader(in m	istance from application)
An overview of the APFs 2.2 Control of envi Product characteristics	s of different RPE (accordin ironmental exposure s se estimate based on data Quan per 120 100 80 60 40 20 0 1	From dust measurements in tity of dust m3 (in mg) 3 7 11	Wind speed: Wind speed: - 3.5 m/s - 6 m/s - 3.5 m/s - 3.5 m/s Distance from spreader(in m	istance from application)
An overview of the APFs 2.2 Control of envi Product characteristics Drift: 1% (very worst-cas	s of different RPE (accordin ironmental exposure s se estimate based on data Quan per 120 100 80 60 40 20 0 1	From dust measurements in tity of dust m3 (in mg) 3 7 11	Wind speed: - 3.5 m/s - 6 m/s - 3.5 m/s - 15 20 Distance from spreader(in m 1999)	istance from application)



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Environment factors not influenced by risk management

Volume of surface water: 300 L/m<sup>2</sup>

Field surface area: 1 ha

Other given operational conditions affecting environmental exposure

Outdoor use of products Soil mixing depth: 20 cm

Technical conditions and measures at process level (source) to prevent release

There are no direct releases to adjacent surface waters.

Technical conditions and measures to reduce or limit discharges, air emissions and releases to soil

Drift should be minimised.

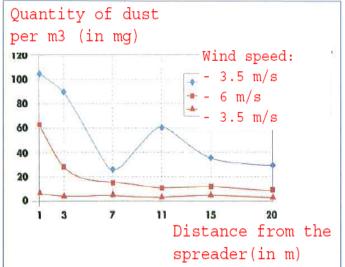
Organizational measures to prevent/limit release from site

In line with the requirements for good agricultural practice, agricultural soil should be analysed prior to application of lime and the application rate should be adjusted according to the results of the analysis.

2.2 Control of environmental exposure – only relevant for urban soil treatment

**Product characteristics** 

Drift: 1% (very worst-case estimate based on data from dust measurements in air as a function of the distance from application)



180,000 kg/ha

(Figure taken from: Laudet, A. et al., 1999)

Amounts used

CaO

Frequency and duration of use

1 day/year and only once in a lifetime. Multiple applications during the year are allowed, provided the total yearly amount of 180,000 kg/ha is not exceeded (CaO)

Environment factors not influenced by risk management

Field surface area: 1 ha

Other given operational conditions affecting environmental exposure

Outdoor use of products

Soil mixing depth: 20 cm

Technical conditions and measures at process level (source) to prevent release

Lime is only applied onto the soil in the technosphere zone before road construction. There are no direct releases to adjacent surface waters.



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#### Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil Drift should be minimised. 3. Exposure estimation and reference to its source **Occupational exposure** The exposure estimation tool MEASE was used for the assessment of inhalation exposure. The risk characterisation ratio (RCR) is the quotient of the refined exposure estimate and the respective DNEL (derived no-effect level) and has to be below 1 to demonstrate a safe use. For inhalation exposure, the RCR is based on the DNEL for calcium oxide of 1 mg/m3 (as respirable dust) and the respective inhalation exposure estimate derived using MEASE (as inhalable dust). Thus, the RCR includes an additional safety margin since the respirable fraction being a sub-fraction of the inhalable fraction according to EN 481. Method used for Method used for Inhalation exposure Dermal exposure PROC dermal exposure inhalation exposure estimate (RCR) estimate (RCR) assessment assessment Since calcium oxide is classified as irritating to PROC 2, 3, 4, 5, 8a, skin, dermal exposure has to be minimised as far 8b, 9, 10, 11, 13, 15, MEASE < 1 mg/m<sup>3</sup> (0.01 - 0.75) as technically feasible. A DNEL for dermal effects 16, 17, 18, 19, 21, 25, has not been derived. Thus, dermal exposure is 26 not assessed in this exposure scenario. Environmental exposure for agricultural soil protection The PEC calculation for soil and surface water was based on the FOCUS soil group (FOCUS, 1996) and on the "draft guidance on the calculation of predicted environmental concentration values (PEC) of plant protection products for soil, ground water, surface water and sediment (Kloskowksi et al., 1999). The FOCUS/EXPOSIT modelling tool is preferred to the EUSES as it is more appropriate for agricultural-like application as in this case where parameter as the drift needs to be included in the modelling. FOCUS is a model typically developed for biocidal applications and was further elaborated on the basis of the German EXPOSIT 1.0 model, where parameters such as drifts can be improved according to collected data: once applied on the soil, calcium oxide can indeed migrate then towards surface waters, via drift Environmental See amounts used emissions Exposure concentration in Not relevant for agricultural soil protection waste water treatment plant (WWTP) Exposure Substance PEC (ug/L) PNEC (ug/L) RCR concentration in aquatic pelagic CaO 5.66 370 0.015 compartment As described above, no exposure of surface water nor sediment to lime is expected. Further, in Exposure natural waters the hydroxide ions react with HCO3- to form water and CO32-. CO32- forms CaCO3 by concentration in reacting with Ca2+. The calcium carbonate precipitates and deposits on the sediment. Calcium sediments carbonate is of low solubility and a constituent of natural soils. Exposure Substance PEC (mg/L) PNEC (mg/L) RCR concentrations in soil 500 CaO 816 0.61 and groundwater Exposure concentration in This point is not relevant. Calcium oxide is not volatile. The vapour pressures is below 10<sup>-5</sup> Pa. atmospheric compartment Exposure concentration This point is not relevant because calcium can be considered to be omnipresent and essential in the relevant for the food environment. The uses covered do not significantly influence the distribution of the constituents (Ca2+ chain (secondary and OH<sup>-</sup>) in the environment. poisoning)



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#### Environmental exposure for urban soil treatment

The urban soil treatment scenario is based on a road border scenario. At the special road border technical meeting (Ispra, September 5, 2003), EU Member States and industry agreed on a definition for a "road technosphere". The road technosphere can be defined as "the engineered environment that carries the geotechnical functions of the road in connection with its structure, operation and maintenance including the installations to ensure road safety and manage run off. This technosphere, which includes the hard and soft shoulder at the edge of the carriageway, is vertically dictated by the groundwater watertable. The road authority has responsibility for this road technosphere included as assessment endpoint for risk assessment for the purpose of the existing/new substances regulations. The target zone is the zone beyond the technosphere, to which the environmental risk assessment applies.

The PEC calculation for soil was based on the FOCUS soil group (FOCUS, 1996) and on the "draft guidance on the calculation of predicted environmental concentration values (PEC) of plant protection products for soil, ground water, surface water and sediment (Kloskowksi et al., 1999). The FOCUS/EXPOSIT modelling tool is preferred to the EUSES as it is more appropriate for agricultural-like application as in this case where parameter as the drift needs to be included in the modelling. FOCUS is a model typically developed for biocidal applications and was further elaborated on the basis of the German EXPOSIT 1.0 model, where parameters such as drifts can be improved according to collected data.

where parameters such a	as units can be improved a	coolding to concetted data.				
Environmental emissions	See amounts used					
Exposure concentration in waste water treatment plant (WWTP)	Not relevant for road border scenario					
Exposure concentration in aquatic pelagic compartment	Not relevant for road border scenario					
Exposure concentration in sediments	Not relevant for road border scenario					
Exposure concentrations in soil	Substance	PEC (mg/L)	PNEC (mg/L)	RCR		
and groundwater	CaO	529	816	0.65		
Exposure concentration in atmospheric compartment	This point is not relevant. Calcium oxide is not volatile. The vapour pressures is below 10 <sup>-5</sup> Pa.					
Exposure concentration relevant for the food chain (secondary poisoning)	This point is not relevant because calcium can be considered to be omnipresent and essential in the environment. The uses covered do not significantly influence the distribution of the constituents (Ca <sup>2+</sup> and OH <sup>-</sup> ) in the environment.					
Environmental exposure for other uses						
The operational protection or u	antitative environmental ex al conditions and risk man rban soil treatment redient and chemically bou	agement measures are les	ss stringent than those ou	-		

 Lime is an ingredient and chemically bound into a matrix. Releases are negligible and insufficient to cause a pH-shift in soil, wastewater or surface water

• Lime is specifically used to release CO2-free breathable air, upon reaction with CO2. Such applications only relates to the air compartment, where the lime properties are exploited

Neutralisation/pH-shift is the intended use and there are no additional impacts beyond those desired.



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

The DU works inside the boundaries set by the ES if either the proposed risk management measures as described above are met or the downstream user can demonstrate on his own that his operational conditions and implemented risk management measures are adequate. This has to be done by showing that they limit the inhalation and dermal exposure to a level below the respective DNEL (given that the processes and activities in question are covered by the PROCs listed above) as given below. If measured data are not available, the DU may make use of an appropriate scaling tool such as MEASE (<u>www.ebrc.de/mease.html</u>) to estimate the associated exposure. The dustiness less than 2.5 % according to the Rotating Drum Method (RDM) are defined as "low dusty", substances with a dustiness less than 10 % (RDM) are defined as "medium dusty" and substances with a dustiness vith a dusty".

#### DNEL<sub>inhalation</sub>: 1 mg/m<sup>3</sup> (as respirable dust)

Important note: The DU has to be aware of the fact that apart from the long-term DNEL given above, a DNEL for acute effects exists at a level of 4 mg/m<sup>3</sup>. By demonstrating a safe use when comparing exposure estimates with the long-term DNEL, the acute DNEL is therefore also covered (according to R.14 guidance, acute exposure levels can be derived by multiplying long-term exposure estimates by a factor of 2). When using MEASE for the derivation of exposure estimates, it is noted that the exposure duration should only be reduced to half-shift as a risk management measure (leading to an exposure reduction of 40 %).



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# ES number 9.8: Professional uses of medium dusty solids/powders of lime substances

Exposure Scenario	ד Format (1) addressing uses carried סנ	ut by workers			
1. Title					
Free short title	Professional uses of medium dusty solids/powders of lime substances				
Systematic title based on use descriptor	SU22, SU1, SU5, SU6a, SU6b, SU7, SU10, SU11, SU12, SU13, SU16, SU17, SU18, SU19, SU20, SU23, SU24 PC1, PC2, PC3, PC7, PC8, PC9a, PC9b, PC11, PC12, PC13, PC14, PC15, PC16, PC17, PC18, PC19, PC20, PC21, PC23, PC24, PC25, PC26, PC27, PC28, PC29, PC30, PC31, PC32, PC33, PC34, PC35, PC36, PC37, PC39, PC40 AC1, AC2, AC3, AC4, AC5, AC6, AC7, AC8, AC10, AC11, AC13 (appropriate PROCs and ERCs are given in Section 2 below)				
Processes, tasks and/or activities covered	Processes, tasks and/or activities cove	ered are described in Section 2 below.			
Assessment Method		d on the exposure estimation tool MEASE. The s based on FOCUS-Exposit.			
2. Operational con	ditions and risk management measures	5			
PROC/ERC	REACH definition	Involved tasks			
PROC 2	Use in closed, continuous process with occasional controlled exposure				
PROC 3	Use in closed batch process (synthesis or formulation)				
PROC 4	Use in batch and other process (synthesis) where opportunity for exposure arises				
PROC 5	Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact)				
PROC 8a	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities				
PROC 8b	Transfer of substance or preparation (charging/ discharging) from/to vessels/large containers at dedicated facilities				
PROC 9	Transfer of substance or preparation into small containers (dedicated filling line, including weighing)				
PROC 10	Roller application or brushing	Further information is provided in the ECHA Guidance on information requirements and			
PROC 11	Non industrial spraying	chemical safety assessment, Chapter R.12: Use descriptor system (ECHA-2010-G-05-EN).			
PROC 13	Treatment of articles by dipping and pouring				
PROC 15	Use as laboratory reagent				
PROC 16	Using material as fuel sources, limited exposure to unburned product to be expected				
PROC 17	Lubrication at high energy conditions and in partly open process				
PROC 18	Greasing at high energy conditions				
PROC 19	Hand-mixing with intimate contact and only PPE available				
PROC 25	Other hot work operations with metals				
PROC 26	Handling of solid inorganic substances at ambient temperature				
ERC2, ERC8a, ERC8b, ERC8c, ERC8d, ERC8e, ERC8f	Wide dispersive indoor and outdoor use of reactive substances or processing aids in open systems				



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2.1 Control of work	kers exposure					
Product characteristic						
reflected by an assignme ambient temperature the temperature based, takin	ent of a so-called fugacity of fugacity is based on the d	lass in the MEASE tool. F ustiness of that substance temperature and the melt	I is one of the main expose or operations conducted w . Whereas in hot metal ope ting point of the substance. trinsic emission potential.	ith solid substances at erations, fugacity is		
PROC	Use in preparation Content in preparation Physical form Emission potential					
PROC 25	not res	stricted	solid/powder, molten	high		
All other applicable PROCs	not res	stricted	solid/powder	medium		
Amounts used						
combination of the scale		professional) and level of	ure as such for this scenar containment/automation (a			
Frequency and duration	n of use/exposure					
PROC		Duration o	f exposure			
PROC 11, 16, 17, 18, 19		≤ 240 r	ninutes			
All other applicable PROCs		480 minutes (	not restricted)			
Human factors not influ	enced by risk managem	ent				
The shift breathing volum	ne during all process steps	reflected in the PROCs is	assumed to be 10 m3/shift	t (8 hours).		
Other given operationa	I conditions affecting wo	rkers exposure				
assessment of the condu exposure assessment in temperatures are expected	icted processes. In proces MEASE is however based ed to vary within the indust	s steps with considerably h on the ratio of process ter try the highest ratio was ta	t considered relevant for o nigh temperatures (i.e. PR mperature and melting poir ken as a worst case assur kposure scenario for PRO0	OC 22, 23, 25), the nt. As the associated nption for the exposure		
Technical conditions a	nd measures at process	level (source) to prevent	release			
Risk management meas required in the processes		(e.g. containment or segr	regation of the emission s	ource) are generally not		
Technical conditions a	nd measures to control d	lispersion from source to	owards the worker			
PROC	Level of separation	Localised controls (LC)	Efficiency of LC (according to MEASE)	Further information		
PROC 11, 16	Any potentially required separation of workers from the emission	generic local exhaust ventilation	72 %	-		
PROC 17, 18	source is indicated above under	integrated local exhaust ventilation	87 %	-		
PROC 19	"Frequency and duration of exposure".	"Frequency and duration of exposure". not applicable na -				
All other applicable PROCs	A reduction of exposure duration can be achieved, for example, by the installation of ventilated (positive pressure) control rooms or by removing the worker from workplaces involved with relevant exposure.	not required	na	-		



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#### Organisational measures to prevent /limit releases, dispersion and exposure

Avoid inhalation or ingestion. General occupational hygiene measures are required to ensure a safe handling of the substance. These measures involve good personal and housekeeping practices (i.e. regular cleaning with suitable cleaning devices), no eating and smoking at the workplace, the wearing of standard working clothes and shoes unless otherwise stated below. Shower and change clothes at end of work shift. Do not wear contaminated clothing at home. Do not blow dust off with compressed air.

Conditions and measures related to personal protection, hygiene and health evaluation

PROC	Specification of respiratory protective equipment (RPE)	RPE efficiency (assigned protection factor, APF)	Specification of gloves	Further personal protective equipment (PPE)
PROC 2, 3, 16, 19	FFP1 mask	APF=4	Since calcium oxide is classified as irritating to skin, the use of protective gloves is mandatory for all process steps.	Eye protection equipment (e.g.
PROC 4, 5, 8a, 8b, 9, 10, 13, 17, 18, 25, 26	FFP2 mask	APF=10		goggles or visors) must be worn, unless potential contact with the eye can be excluded by the nature and type of application (i.e. closed process). Additionally, face protection, protective clothing and safety shoes are required to be worn as appropriate.
PROC 11	FFP1 mask	APF=10		
PROC 15	not required	na		

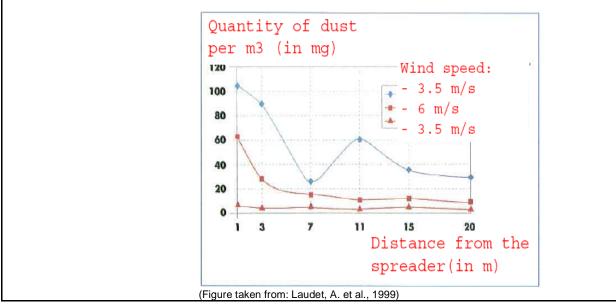
Any RPE as defined above shall only be worn if the following principles are implemented in parallel: The duration of work (compare with "duration of exposure" above) should reflect the additional physiological stress for the worker due to the breathing resistance and mass of the RPE itself, due to the increased thermal stress by enclosing the head. In addition, it shall be considered that the worker's capability of using tools and of communicating are reduced during the wearing of RPE. For reasons as given above, the worker should therefore be (i) healthy (especially in view of medical problems that may affect the use of RPE), (ii) have suitable facial characteristics reducing leakages between face and mask (in view of scars and facial hair). The recommended devices above which rely on a tight face seal will not provide the required protection unless they fit the contours of the face properly and securely.

The employer and self-employed persons have legal responsibilities for the maintenance and issue of respiratory protective devices and the management of their correct use in the workplace. Therefore, they should define and document a suitable policy for a respiratory protective device programme including training of the workers. An overview of the APFs of different RPE (according to BS EN 529:2005) can be found in the glossary of MEASE.

2.2 Control of environmental exposure – only relevant for agricultural soil protection

#### Product characteristics

Drift: 1% (very worst-case estimate based on data from dust measurements in air as a function of the distance from application)





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Amounts used				
CaO	1,700 kg/ha			
Frequency and duration of use				
1 day/year (one application per year) Multiple applications during the year are allowed, provided the total yearly amount of 1,700 kg/ha is not exceeded (CaO)				
Environment factors not influenced by risk management				
Volume of surface water: 300 L/m <sup>2</sup> Field surface area: 1 ha				
Other given operational conditions affecting environmental exposure				
Outdoor use of products Soil mixing depth: 20 cm				
Technical conditions and measures at process level (source) to prevent release				
There are no direct releases to adjacent surface waters.				
Technical conditions and measures to reduce or limit discharges, air emissions and releases to soil				
Drift should be minimised.				
Organizational measures to prevent/limit release from site				
In line with the requirements for good agricultural practice, agricultural soil should be analysed prior to application of lime and the application rate should be adjusted according to the results of the analysis.				
2.2 Control of environmental exposure – only relevant for urban soil treatment				
Product characteristics				
	d on data from dust measurements in air as a function of the distance from application) Quantity of dust per m3 (in mg) <sup>120</sup> <sup>120</sup> <sup>120</sup> <sup>120</sup> <sup>120</sup> <sup>120</sup> <sup>120</sup> <sup>120</sup> <sup>120</sup> <sup>120</sup> <sup>120</sup> <sup>120</sup> <sup>120</sup> <sup>120</sup> <sup>120</sup> <sup>120</sup> <sup>120</sup> <sup>120</sup> <sup>120</sup> <sup>120</sup> <sup>120</sup> <sup>120</sup> <sup>120</sup> <sup>120</sup> <sup>120</sup> <sup>120</sup> <sup>120</sup> <sup>120</sup> <sup>120</sup> <sup>120</sup> <sup>120</sup> <sup>120</sup> <sup>120</sup> <sup>120</sup> <sup>120</sup> <sup>120</sup> <sup>120</sup> <sup>120</sup> <sup>120</sup> <sup>120</sup> <sup>120</sup> <sup>120</sup> <sup>120</sup> <sup>120</sup> <sup>120</sup> <sup>120</sup> <sup>120</sup> <sup>120</sup> <sup>120</sup> <sup>120</sup> <sup>120</sup> <sup>120</sup> <sup>120</sup> <sup>120</sup> <sup>120</sup> <sup>120</sup> <sup>120</sup> <sup>120</sup> <sup>120</sup> <sup>120</sup> <sup>120</sup> <sup>120</sup> <sup>120</sup> <sup>120</sup> <sup>120</sup> <sup>120</sup> <sup>120</sup> <sup>120</sup> <sup>120</sup> <sup>121</sup> <sup>121</sup> <sup>125</sup> <sup>200</sup> <sup>125</sup> <sup>121</sup> <sup>125</sup> <sup>200</sup> <sup>125</sup> <sup>121</sup> <sup>125</sup> <sup>200</sup> <sup>125</sup> <sup>121</sup> <sup>125</sup> <sup>200</sup> <sup>125</sup> <sup>120</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup> <sup>125</sup>			
	(Figure taken from: Laudet, A. et al., 1999)			
Amounts used				
CaO	180,000 kg/ha			
Frequency and duration of use				
1 day/year and only once in a lifetime. Multiple applications during the year are allowed, provided the total yearly amount of 180,000 kg/ha is not exceeded (CaO)				
Environment factors not influenced by risk management				
Field surface area: 1 ha				



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# Other given operational conditions affecting environmental exposure Outdoor use of products

Soil mixing depth: 20 cm

Technical conditions and measures at process level (source) to prevent release

Lime is only applied onto the soil in the technosphere zone before road construction. There are no direct releases to adjacent surface waters.

Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil

Drift should be minimised.

3. Exposure estimation and reference to its source

#### **Occupational exposure**

The exposure estimation tool MEASE was used for the assessment of inhalation exposure. The risk characterisation ratio (RCR) is the quotient of the refined exposure estimate and the respective DNEL (derived no-effect level) and has to be below 1 to demonstrate a safe use. For inhalation exposure, the RCR is based on the DNEL for calcium oxide of 1 mg/m<sup>3</sup> (as respirable dust) and the respective inhalation exposure estimate derived using MEASE (as inhalable dust). Thus, the RCR includes an additional safety margin since the respirable fraction being a sub-fraction of the inhalable fraction according to EN 481.

PROC	Method used for inhalation exposure assessment	Inhalation exposure estimate (RCR)	Method used for dermal exposure assessment	Dermal exposure estimate (RCR)
PROC 2, 3, 4, 5, 8a, 8b, 9, 10, 11, 13, 15, 16, 17, 18, 19, 25, 26	MEASE	< 1 mg/m³ (0.25 – 0.825)	skin, dermal exposure ha as technically feasible. A has not been derived. T	classified as irritating to as to be minimised as far DNEL for dermal effects hus, dermal exposure is exposure scenario.

#### Environmental exposure for agricultural soil protection

The PEC calculation for soil and surface water was based on the FOCUS soil group (FOCUS, 1996) and on the "draft guidance on the calculation of predicted environmental concentration values (PEC) of plant protection products for soil, ground water, surface water and sediment (Kloskowksi et al., 1999). The FOCUS/EXPOSIT modelling tool is preferred to the EUSES as it is more appropriate for agricultural-like application as in this case where parameter as the drift needs to be included in the modelling. FOCUS is a model typically developed for biocidal applications and was further elaborated on the basis of the German EXPOSIT 1.0 model, where parameters such as drifts can be improved according to collected data: once applied on the basis of the soil, calcium oxide can indeed migrate then towards surface waters with drift.

the soil, calcium oxide ca	in indeed migrate then tow	ards surface waters, via dr	nit.		
Environmental emissions	See amounts used				
Exposure concentration in waste water treatment plant (WWTP)	Not relevant for agricultur	al soil protection			
Exposure	Substance	PEC (ug/L)	PNEC (ug/L)	RCR	
concentration in aquatic pelagic compartment	CaO	5.66	370	0.015	
Exposure concentration in sediments	As described above, no exposure of surface water nor sediment to lime is expected. Further, in natural waters the hydroxide ions react with HCO3- to form water and CO32 CO32- forms CaCO3 by reacting with Ca2+. The calcium carbonate precipitates and deposits on the sediment. Calcium carbonate is of low solubility and a constituent of natural soils.				
Exposure	Substance	PEC (mg/L)	PNEC (mg/L)	RCR	
concentrations in soil and groundwater	CaO	500	816	0.61	
Exposure concentration in atmospheric compartment	This point is not relevant.	Calcium oxide is not volat	ile. The vapour pressures	is below 10 <sup>-5</sup> Pa.	
Exposure concentration relevant for the food chain (secondary poisoning)		overed do not significantly	onsidered to be omniprese influence the distribution c		



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#### Environmental exposure for urban soil treatment

The urban soil treatment scenario is based on a road border scenario. At the special road border technical meeting (Ispra, September 5, 2003), EU Member States and industry agreed on a definition for a "road technosphere". The road technosphere can be defined as "the engineered environment that carries the geotechnical functions of the road in connection with its structure, operation and maintenance including the installations to ensure road safety and manage run off. This technosphere, which includes the hard and soft shoulder at the edge of the carriageway, is vertically dictated by the groundwater watertable. The road authority has responsibility for this road technosphere including road safety, road support, prevention of pollution and water management". The road technosphere was therefore excluded as assessment endpoint for risk assessment for the purpose of the existing/new substances regulations. The target zone is the zone beyond the technosphere, to which the environmental risk assessment applies.

The PEC calculation for soil was based on the FOCUS soil group (FOCUS, 1996) and on the "draft guidance on the calculation of predicted environmental concentration values (PEC) of plant protection products for soil, ground water, surface water and sediment (Kloskowksi et al., 1999). The FOCUS/EXPOSIT modelling tool is preferred to the EUSES as it is more appropriate for agricultural-like application as in this case where parameter as the drift needs to be included in the modelling. FOCUS is a model typically developed for biocidal applications and was further elaborated on the basis of the German EXPOSIT 1.0 model, where parameters such as drifts can be improved according to collected data.

where parameters such a	as units can be improved a	coolding to conceted data.				
Environmental emissions	See amounts used	See amounts used				
Exposure concentration in waste water treatment	Not relevant for road border scenario					
plant (WWTP) Exposure concentration in aquatic pelagic compartment	Not relevant for road border scenario					
Exposure concentration in sediments	Not relevant for road border scenario					
Exposure	Substance PEC (mg/L) PNEC (mg/L) RCR					
concentrations in soil and groundwater	CaO 529 816 0.65					
Exposure concentration in atmospheric compartment	This point is not relevant. Calcium oxide is not volatile. The vapour pressures is below $10^{-5}$ Pa.					
Exposure concentration relevant for the food chain (secondary poisoning)	This point is not relevant because calcium can be considered to be omnipresent and essential in the environment. The uses covered do not significantly influence the distribution of the constituents (Ca <sup>2+</sup> and OH <sup>-</sup> ) in the environment.					
Environmental exposu	re for other uses					
<ul> <li>The operation protection or u</li> <li>Lime is an ing</li> </ul>	rban soil treatment	agement measures are les	ied because ss stringent than those outli s are negligible and insuffici	Ū.		

in soil, wastewater or surface water
Lime is specifically used to release CO2-free breathable air, upon reaction with CO2. Such applications only relates to the air compartment, where the lime properties are exploited

Neutralisation/pH-shift is the intended use and there are no additional impacts beyond those desired.



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

The DU works inside the boundaries set by the ES if either the proposed risk management measures as described above are met or the downstream user can demonstrate on his own that his operational conditions and implemented risk management measures are adequate. This has to be done by showing that they limit the inhalation and dermal exposure to a level below the respective DNEL (given that the processes and activities in question are covered by the PROCs listed above) as given below. If measured data are not available, the DU may make use of an appropriate scaling tool such as MEASE (<u>www.ebrc.de/mease.html</u>) to estimate the associated exposure. The dustiness less than 2.5 % according to the Rotating Drum Method (RDM) are defined as "low dusty", substances with a dustiness less than 10 % (RDM) are defined as "medium dusty" and substances with a dustiness vith a dusty".

#### DNEL<sub>inhalation</sub>: 1 mg/m<sup>3</sup> (as respirable dust)

Important note: The DU has to be aware of the fact that apart from the long-term DNEL given above, a DNEL for acute effects exists at a level of 4 mg/m<sup>3</sup>. By demonstrating a safe use when comparing exposure estimates with the long-term DNEL, the acute DNEL is therefore also covered (according to R.14 guidance, acute exposure levels can be derived by multiplying long-term exposure estimates by a factor of 2). When using MEASE for the derivation of exposure estimates, it is noted that the exposure duration should only be reduced to half-shift as a risk management measure (leading to an exposure reduction of 40 %).



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# ES number 9.9: Professional uses of high dusty solids/powders of lime substances

<b>Exposure Scenario</b>	Format (1) addressing uses carried ou	ut by workers			
1. Title					
Free short title	Professional uses of high dusty solids/powders of lime substances				
Systematic title based on use descriptor	SU22, SU1, SU5, SU6a, SU6b, SU7, SU10, SU11, SU12, SU13, SU16, SU17, SU18, SU19, SU20, SU23, SU24 PC1, PC2, PC3, PC7, PC8, PC9a, PC9b, PC11, PC12, PC13, PC14, PC15, PC16, PC17, PC18, PC19, PC20, PC21, PC23, PC24, PC25, PC26, PC27, PC28, PC29, PC30, PC31, PC32, PC33, PC34, PC35, PC36, PC37, PC39, PC40 AC1, AC2, AC3, AC4, AC5, AC6, AC7, AC8, AC10, AC11, AC13 (appropriate PROCs and ERCs are given in Section 2 below)				
Processes, tasks and/or activities covered		ered are described in Section 2 below.			
Assessment Method		ed on the exposure estimation tool MEASE. The s based on FOCUS-Exposit.			
2. Operational con	ditions and risk management measures	S			
PROC/ERC	REACH definition	Involved tasks			
PROC 2	Use in closed, continuous process with occasional controlled exposure				
PROC 3	Use in closed batch process (synthesis or formulation)				
PROC 4	Use in batch and other process (synthesis) where opportunity for exposure arises				
PROC 5	Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact)				
PROC 8a	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities				
PROC 8b	Transfer of substance or preparation (charging/ discharging) from/to vessels/large containers at dedicated facilities				
PROC 9	Transfer of substance or preparation into small containers (dedicated filling line, including weighing)	Further information is provided in the FOUN			
PROC 10	Roller application or brushing	Further information is provided in the ECHA Guidance on information requirements and			
PROC 11	Non industrial spraying	chemical safety assessment, Chapter R.12: Use descriptor system (ECHA-2010-G-05-EN).			
PROC 13	Treatment of articles by dipping and pouring	, , ,			
PROC 15	Use as laboratory reagent				
PROC 16	Using material as fuel sources, limited exposure to unburned product to be expected				
PROC 17	Lubrication at high energy conditions and in partly open process				
PROC 18	Greasing at high energy conditions				
PROC 19	Hand-mixing with intimate contact and only PPE available				
PROC 25	Other hot work operations with metals				
PROC 26	Handling of solid inorganic substances at ambient temperature				
ERC2, ERC8a, ERC8b, ERC8c, ERC8d, ERC8e, ERC8f	Wide dispersive indoor and outdoor use of reactive substances or processing aids in open systems				



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reflected by an assignme	ent of a so-called fugacity c	lass in the MEASE tool. F	l is one of the main exposu or operations conducted w	ith solid substances at		
temperature based, takin		temperature and the melt stead of the substance int	. Whereas in hot metal ope ing point of the substance rinsic emission potential.			
PROC	Use in preparation Content in preparation Physical form Emission potential					
All applicable PROCs	not res	tricted	solid/powder	high		
Amounts used						
combination of the scale		professional) and level of	ure as such for this scenar containment/automation (a			
Frequency and duration	n of use/exposure					
PROC		Duration o	f exposure			
PROC 4, 5, 8a, 8b, 9, 10, 16, 17, 18, 19, 26		≤ 240 r	ninutes			
PROC 11		≤ 60 m	ninutes			
All other applicable PROCs		480 minutes (	not restricted)			
Human factors not influ	enced by risk managem	ent				
The shift breathing volum	ne during all process steps	reflected in the PROCs is	assumed to be 10 m <sup>3</sup> /shift	t (8 hours).		
Other given operationa	I conditions affecting wo	rkers exposure				
assessment of the condu exposure assessment in temperatures are expect estimation. Thus all proc	icted processes. In process MEASE is however based ed to vary within the indust	s steps with considerably h on the ratio of process ter ry the highest ratio was tal matically covered in this ex	t considered relevant for o nigh temperatures (i.e. PR mperature and melting poir ken as a worst case assun xposure scenario for PROC release	OC 22, 23, 25), the nt. As the associated nption for the exposure		
Risk management measurequired in the processes		e.g. containment or segreg	ation of the emission source	ce) are generally not		
Technical conditions a	nd measures to control d	ispersion from source to	owards the worker			
PROC	Level of separation	Localised controls (LC)	Efficiency of LC (according to MEASE)	Further information		
PROC 4, 5, 8a, 8b, 9, 11, 16, 26	Any potentially required separation of workers from the emission	generic local exhaust ventilation	72 %	-		
PROC 17, 18	source is indicated above under	integrated local exhaust ventilation	87 %	-		
PROC 19	"Frequency and duration of exposure". A reduction of exposure duration can be					
All other applicable PROCs achieved, for example, by the installation of ventilated (positive pressure) control rooms or by removing the worker from workplaces involved with relevant exposure. achieved, for example, by the installation of ventilated (positive pressure) control rooms or by removing the worker from workplaces						
Organisational measure	es to prevent /limit releas	ses, dispersion and expo	osure			
These measures involve eating and smoking at th	good personal and housel e workplace, the wearing c	keeping practices (i.e. regu	quired to ensure a safe har ular cleaning with suitable of s and shoes unless otherw lothing at home. Do not blo	cleaning devices), no ise stated below.		

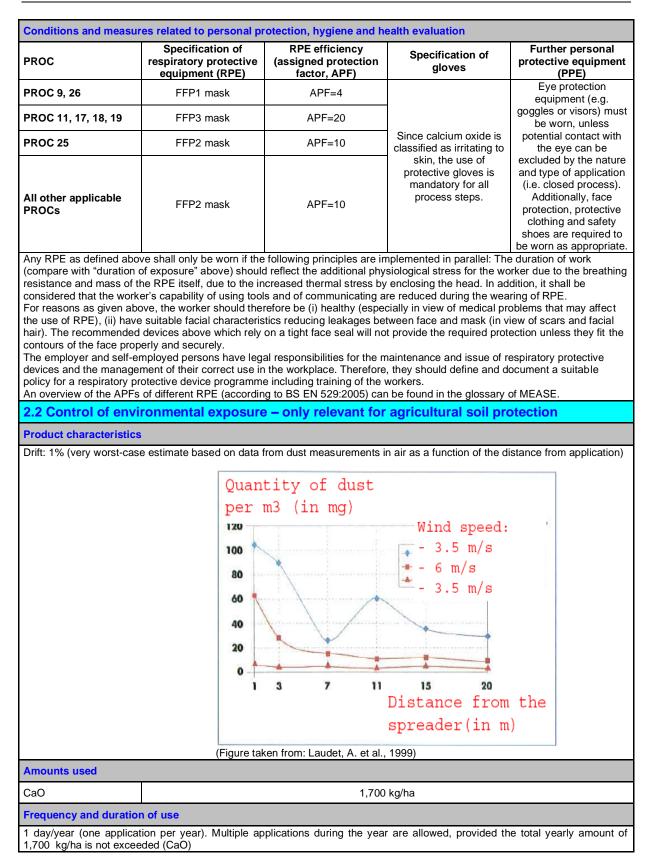


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Environment factors not influenced by risk management

Volume of surface water: 300 L/m2

Field surface area: 1 ha

Other given operational conditions affecting environmental exposure

Outdoor use of products Soil mixing depth: 20 cm

Technical conditions and measures at process level (source) to prevent release

There are no direct releases to adjacent surface waters.

Technical conditions and measures to reduce or limit discharges, air emissions and releases to soil

Drift should be minimised.

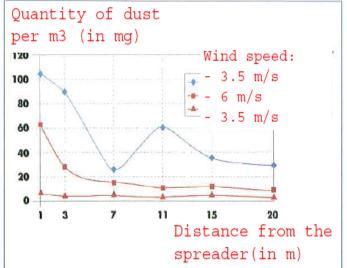
Organizational measures to prevent/limit release from site

In line with the requirements for good agricultural practice, agricultural soil should be analysed prior to application of lime and the application rate should be adjusted according to the results of the analysis.

2.2 Control of environmental exposure – only relevant for urban soil treatment

**Product characteristics** 

Drift: 1% (very worst-case estimate based on data from dust measurements in air as a function of the distance from application)



180,000 kg/ha

(Figure taken from: Laudet, A. et al., 1999)

Amounts used

CaO

Frequency and duration of use

1 day/year and only once in a lifetime. Multiple applications during the year are allowed, provided the total yearly amount of 180,000 kg/ha is not exceeded (CaO)

Environment factors not influenced by risk management

Field surface area: 1 ha

Other given operational conditions affecting environmental exposure

Outdoor use of products

Soil mixing depth: 20 cm

Technical conditions and measures at process level (source) to prevent release

Lime is only applied onto the soil in the technosphere zone before road construction. There are no direct releases to adjacent surface waters.



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#### Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil Drift should be minimised. 3. Exposure estimation and reference to its source **Occupational exposure** The exposure estimation tool MEASE was used for the assessment of inhalation exposure. The risk characterisation ratio (RCR) is the quotient of the refined exposure estimate and the respective DNEL (derived no-effect level) and has to be below 1 to demonstrate a safe use. For inhalation exposure, the RCR is based on the DNEL for calcium oxide of 1 mg/m3 (as respirable dust) and the respective inhalation exposure estimate derived using MEASE (as inhalable dust). Thus, the RCR includes an additional safety margin since the respirable fraction being a sub-fraction of the inhalable fraction according to EN 481. Method used for Method used for Inhalation exposure Dermal exposure PROC dermal exposure inhalation exposure estimate (RCR) estimate (RCR) assessment assessment Since calcium oxide is classified as irritating to PROC 2, 3, 4, 5, 8a, skin, dermal exposure has to be minimised as far 8b, 9, 10, 11, 13, 15, MEASE <1 mg/m<sup>3</sup> (0.5 - 0.825) as technically feasible. A DNEL for dermal effects 16, 17, 18, 19, 25, 26 has not been derived. Thus, dermal exposure is not assessed in this exposure scenario. Environmental exposure for agricultural soil protection The PEC calculation for soil and surface water was based on the FOCUS soil group (FOCUS, 1996) and on the "draft guidance on the calculation of predicted environmental concentration values (PEC) of plant protection products for soil, ground water, surface water and sediment (Kloskowksi et al., 1999). The FOCUS/EXPOSIT modelling tool is preferred to the EUSES as it is more appropriate for agricultural-like application as in this case where parameter as the drift needs to be included in the modelling. FOCUS is a model typically developed for biocidal applications and was further elaborated on the basis of the German EXPOSIT 1.0 model, where parameters such as drifts can be improved according to collected data: once applied on the soil, calcium oxide can indeed migrate then towards surface waters, via drift Environmental See amounts used emissions Exposure concentration in Not relevant for agricultural soil protection waste water treatment plant (WWTP) Exposure Substance PEC (ug/L) PNEC (ug/L) RCR concentration in aquatic pelagic CaO 5.66 370 0.015 compartment As described above, no exposure of surface water nor sediment to lime is expected. Further, in Exposure natural waters the hydroxide ions react with HCO3- to form water and CO32-. CO32- forms CaCO3 by concentration in reacting with Ca2+. The calcium carbonate precipitates and deposits on the sediment. Calcium sediments carbonate is of low solubility and a constituent of natural soils. Exposure Substance PEC (mg/L) PNEC (mg/L) RCR concentrations in soil 500 0.61 CaO 816 and groundwater Exposure concentration in This point is not relevant. Calcium oxide is not volatile. The vapour pressures is below 10<sup>-5</sup> Pa. atmospheric compartment Exposure concentration This point is not relevant because calcium can be considered to be omnipresent and essential in the relevant for the food environment. The uses covered do not significantly influence the distribution of the constituents (Ca2+ chain (secondary and OH<sup>-</sup>) in the environment. poisoning)



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#### Environmental exposure for urban soil treatment

The urban soil treatment scenario is based on a road border scenario. At the special road border technical meeting (Ispra, September 5, 2003), EU Member States and industry agreed on a definition for a "road technosphere". The road technosphere can be defined as "the engineered environment that carries the geotechnical functions of the road in connection with its structure, operation and maintenance including the installations to ensure road safety and manage run off. This technosphere, which includes the hard and soft shoulder at the edge of the carriageway, is vertically dictated by the groundwater watertable. The road authority has responsibility for this road technosphere including road safety, road support, prevention of pollution and water management". The road technosphere was therefore excluded as assessment endpoint for risk assessment for the purpose of the existing/new substances regulations. The target zone is the zone beyond the technosphere, to which the environmental risk assessment applies.

The PEC calculation for soil was based on the FOCUS soil group (FOCUS, 1996) and on the "draft guidance on the calculation of predicted environmental concentration values (PEC) of plant protection products for soil, ground water, surface water and sediment (Kloskowksi et al., 1999). The FOCUS/EXPOSIT modelling tool is preferred to the EUSES as it is more appropriate for agricultural-like application as in this case where parameter as the drift needs to be included in the modelling. FOCUS is a model typically developed for biocidal applications and was further elaborated on the basis of the German EXPOSIT 1.0 model, where parameters such as drifts can be improved according to collected data.

where parameters such as units can be improved according to collected data.						
Environmental emissions	See amounts used	See amounts used				
Exposure concentration in waste water treatment plant (WWTP)	Not relevant for road border scenario					
Exposure concentration in aquatic pelagic compartment	Not relevant for road border scenario					
Exposure concentration in sediments	Not relevant for road border scenario					
Exposure concentrations in soil	Substance PEC (mg/L) PNEC (mg/L) RCR					
and groundwater	CaO					
Exposure concentration in atmospheric compartment	This point is not relevant. Calcium oxide is not volatile. The vapour pressures is below 10 <sup>-5</sup> Pa.					
Exposure concentration relevant for the food chain (secondary poisoning)	····· · ···· · ···· · ···· · ··· · ···· ·					
Environmental exposure for other uses						
<ul> <li>The operational protection or u</li> </ul>	antitative environmental ex al conditions and risk man rban soil treatment redient and chemically bou		ss stringent than those ou	Ũ		

• Lime is an ingredient and chemically bound into a matrix. Releases are negligible and insufficient to cause a pH-shift in soil, wastewater or surface water

• Lime is specifically used to release CO2-free breathable air, upon reaction with CO2. Such applications only relates to the air compartment, where the lime properties are exploited

• Neutralisation/pH-shift is the intended use and there are no additional impacts beyond those desired.



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

The DU works inside the boundaries set by the ES if either the proposed risk management measures as described above are met or the downstream user can demonstrate on his own that his operational conditions and implemented risk management measures are adequate. This has to be done by showing that they limit the inhalation and dermal exposure to a level below the respective DNEL (given that the processes and activities in question are covered by the PROCs listed above) as given below. If measured data are not available, the DU may make use of an appropriate scaling tool such as MEASE (<u>www.ebrc.de/mease.html</u>) to estimate the associated exposure. The dustiness less than 2.5 % according to the Rotating Drum Method (RDM) are defined as "low dusty", substances with a dustiness less than 10 % (RDM) are defined as "medium dusty" and substances with a dustiness vith a dusty".

#### DNEL<sub>inhalation</sub>: 1 mg/m<sup>3</sup> (as respirable dust)

Important note: The DU has to be aware of the fact that apart from the long-term DNEL given above, a DNEL for acute effects exists at a level of 4 mg/m<sup>3</sup>. By demonstrating a safe use when comparing exposure estimates with the long-term DNEL, the acute DNEL is therefore also covered (according to R.14 guidance, acute exposure levels can be derived by multiplying long-term exposure estimates by a factor of 2). When using MEASE for the derivation of exposure estimates, it is noted that the exposure duration should only be reduced to half-shift as a risk management measure (leading to an exposure reduction of 40 %).



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# ES number 9.10: Professional use of lime substances in soil treatment

	o Format (1) address	sing uses carried οι	it by workers		
1. Title					
Free short title	I	Professional use of lime su	ubstances in soil treatment	t	
Systematic title based on use descriptor	SU22 (appropriate PROCs and ERCs are given in Section 2 below)				
Processes, tasks and/or activities covered	Processes, tasks and/or activities covered are described in Section 2 below.				
Assessment Method	The assessment of inhalation exposure is based on measured data and on the exposure estimation tool MEASE. The environmental assessment is based on FOCUS-Exposit.				
2. Operational con	ditions and risk mar	nagement measures	5		
Task/ERC	REACH d	lefinition	Involve	d tasks	
Milling	PRC	)C 5			
Loading of spreader	PROC 8b,	PROC 26		calcium oxides for soil ment.	
Application to soil (spreading)	PRO	C 11			
ERC2, ERC8a, ERC8b, ERC8c, ERC8d, ERC8e, ERC8f	Wide dispersive indoor and outdoor use of reactive substances or processing aids in open systems Calcium oxide is applied in numerous case wide dispersive uses: agricultural, forestry, and shrimps farming, soil treatment and environmental protection.			gricultural, forestry, fish g, soil treatment and	
2.1 Control of work	kers exposure			÷	
Product characteristic					
According to the MEASE reflected by an assignme ambient temperature the temperature based, takin	approach, the substance- nt of a so-called fugacity c fugacity is based on the d g into account the process on the level of abrasion in	lass in the MEASE tool. F ustiness of that substance temperature and the melt	or operations conducted w . Whereas in hot metal op ing point of the substance	rith solid substances at erations, fugacity is	
According to the MEASE reflected by an assignme ambient temperature the temperature based, takin	nt of a so-called fugacity c fugacity is based on the du g into account the process	lass in the MEASE tool. F ustiness of that substance temperature and the melt	or operations conducted w . Whereas in hot metal op ing point of the substance	rith solid substances at erations, fugacity is	
According to the MEASE reflected by an assignme ambient temperature the temperature based, takin abrasive tasks are based	nt of a so-called fugacity c fugacity is based on the du g into account the process on the level of abrasion in	lass in the MEASE tool. F ustiness of that substance temperature and the melt istead of the substance int Content in preparation	or operations conducted w . Whereas in hot metal op- ting point of the substance trinsic emission potential.	rith solid substances at erations, fugacity is . As a third group, high	
According to the MEASE reflected by an assignme ambient temperature the temperature based, takin abrasive tasks are based Task Milling Loading of spreader	nt of a so-called fugacity c fugacity is based on the du g into account the process on the level of abrasion in Use in preparation	lass in the MEASE tool. Fustiness of that substance temperature and the melt istead of the substance int Content in preparation	or operations conducted w . Whereas in hot metal op- ing point of the substance trinsic emission potential. Physical form	rith solid substances at erations, fugacity is . As a third group, high Emission potential	
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According to the MEASE reflected by an assignme ambient temperature the temperature based, takin abrasive tasks are based Task Milling Loading of spreader Application to soil (spreading) Amounts used The actual tonnage hand combination of the scale PROC) is the main determ	nt of a so-called fugacity c fugacity is based on the de g into account the process on the level of abrasion in Use in preparation not res not res not res led per shift is not conside of operation (industrial vs. minant of the process intrin	lass in the MEASE tool. F- ustiness of that substance temperature and the melt istead of the substance int Content in preparation tricted tricted tricted red to influence the expos professional) and level of	or operations conducted w . Whereas in hot metal op- ing point of the substance trinsic emission potential. Physical form solid/powder solid/powder solid/powder ure as such for this scenar containment/automation (	rith solid substances at erations, fugacity is . As a third group, high Emission potential high high high	
According to the MEASE reflected by an assignme ambient temperature the temperature based, takin abrasive tasks are based Task Milling Loading of spreader Application to soil (spreading) Amounts used The actual tonnage hand combination of the scale PROC) is the main detern Frequency and duration Task	nt of a so-called fugacity c fugacity is based on the de g into account the process on the level of abrasion in Use in preparation not res not res not res led per shift is not conside of operation (industrial vs. minant of the process intrin	lass in the MEASE tool. F- ustiness of that substance temperature and the melt istead of the substance int <b>Content in</b> preparation tricted tricted tricted tricted tricted tricted	or operations conducted w . Whereas in hot metal op- ing point of the substance trinsic emission potential. Physical form solid/powder solid/powder solid/powder ure as such for this scenar containment/automation ( f exposure	rith solid substances at erations, fugacity is . As a third group, high Emission potential high high high	
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According to the MEASE reflected by an assignme ambient temperature the temperature based, takin abrasive tasks are based Task Milling Loading of spreader Application to soil (spreading) Amounts used The actual tonnage hand combination of the scale PROC) is the main detern Frequency and duration Task Milling Loading of spreader Application to soil (spreading)	nt of a so-called fugacity c fugacity is based on the de g into account the process on the level of abrasion in Use in preparation not res not res not res led per shift is not conside of operation (industrial vs. minant of the process intrin	lass in the MEASE tool. F- ustiness of that substance temperature and the melt istead of the substance int <b>Content in</b> preparation tricted tricted tricted tricted tricted <b>Duration o</b> 240 m 240 m	or operations conducted w . Whereas in hot metal op- ing point of the substance trinsic emission potential. Physical form solid/powder solid/powder solid/powder ure as such for this scenar containment/automation ( f exposure inutes	rith solid substances at erations, fugacity is . As a third group, high Emission potential high high high	



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Other given operational conditions affecting workers exposure

Operational conditions (e.g. process temperature and process pressure) are not considered relevant for occupational exposure assessment of the conducted processes.

Technical conditions and measures at process level (source) to prevent release

Risk management measures at the process level (e.g. containment or segregation of the emission source) are generally not required in the processes.

Technical conditions and measures to control dispersion from source towards the worker

Task	Level of separation	Localised controls (LC)	Efficiency of LC	Further information
Milling	Separation of workers is generally not	not required	na	-
Loading of spreader	required in the conducted processes.	not required	na	-
Application to soil (spreading)	During application the worker is sitting in the cabin of the spreader	Cabin with filtered air supply	99%	-

Organisational measures to prevent /limit releases, dispersion and exposure

Avoid inhalation or ingestion. General occupational hygiene measures are required to ensure a safe handling of the substance. These measures involve good personal and housekeeping practices (i.e. regular cleaning with suitable cleaning devices), no eating and smoking at the workplace, the wearing of standard working clothes and shoes unless otherwise stated below. Shower and change clothes at end of work shift. Do not wear contaminated clothing at home. Do not blow dust off with compressed air.

Conditions and measures related to personal protection, hygiene and health evaluation

contaitions and measures related to personal prototion, hygiene and neutrin evaluation				
Task	Specification of respiratory protective equipment (RPE)	RPE efficiency (assigned protection factor, APF)	Specification of gloves	Further personal protective equipment (PPE)
Milling	FFP3 mask	APF=20		Eye protection equipment (e.g. goggles or visors) must be worn, unless
Loading of spreader	FFP3 mask	APF=20	Since calcium oxide is classified as irritating to skin, the use of protective gloves is mandatory for all	potential contact with the eye can be excluded by the nature and type of application (i.e. closed process).
Application to soil (spreading)	not required	na	process steps.	Additionally, face protection, protective clothing and safety shoes are required to be worn as appropriate.

Any RPE as defined above shall only be worn if the following principles are implemented in parallel: The duration of work (compare with "duration of exposure" above) should reflect the additional physiological stress for the worker due to the breathing resistance and mass of the RPE itself, due to the increased thermal stress by enclosing the head. In addition, it shall be considered that the worker's capability of using tools and of communicating are reduced during the wearing of RPE. For reasons as given above, the worker should therefore be (i) healthy (especially in view of medical problems that may affect the use of RPE), (ii) have suitable facial characteristics reducing leakages between face and mask (in view of scars and facial hair). The recommended devices above which rely on a tight face seal will not provide the required protection unless they fit the contours of the face properly and securely.

The employer and self-employed persons have legal responsibilities for the maintenance and issue of respiratory protective devices and the management of their correct use in the workplace. Therefore, they should define and document a suitable policy for a respiratory protective device programme including training of the workers.

An overview of the APFs of different RPE (according to BS EN 529:2005) can be found in the glossary of MEASE.



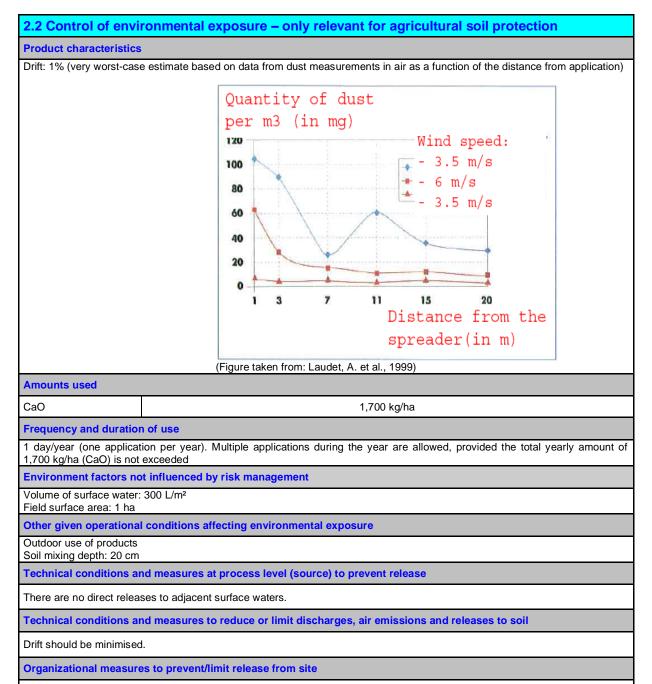
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In line with the requirements for good agricultural practice, agricultural soil should be analysed prior to application of lime and the application rate should be adjusted according to the results of the analysis.



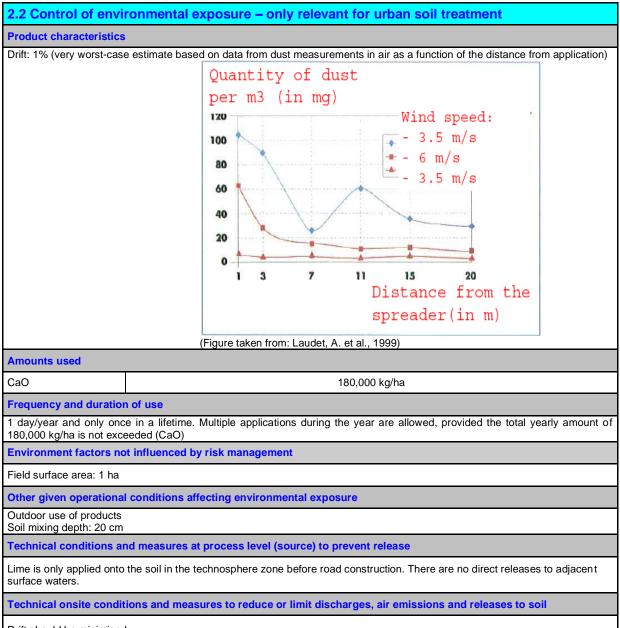
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Drift should be minimised.



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#### 3. Exposure estimation and reference to its source

#### Occupational exposure

Measured data and modelled exposure estimates (MEASE) were used for the assessment of inhalation exposure. The risk characterisation ratio (RCR) is the quotient of the refined exposure estimate and the respective DNEL (derived no-effect level) and has to be below 1 to demonstrate a safe use. For inhalation exposure, the RCR is based on the DNEL for calcium oxide of 1 mg/m<sup>3</sup> (as respirable dust).

Task	Method used for inhalation exposure assessment	Inhalation exposure estimate (RCR)	Method used for dermal exposure assessment	Dermal exposure estimate (RCR)
Milling	MEASE	0.488 mg/m³ (0.48)		classified as irritating to
Loading of spreader	MEASE (PROC 8b)	0.488 mg/m³ (0.48)	<ul> <li>skin, dermal exposure has to be minimised a as technically feasible. A DNEL for dermal ef</li> </ul>	
Application to soil (spreading)	measured data	0.880 mg/m³ (0.88)	has not been derived. T not assessed in this	

#### Environmental exposure for agricultural soil protection

The PEC calculation for soil and surface water was based on the FOCUS soil group (FOCUS, 1996) and on the "draft guidance on the calculation of predicted environmental concentration values (PEC) of plant protection products for soil, ground water, surface water and sediment (Kloskowksi et al., 1999). The FOCUS/EXPOSIT modelling tool is preferred to the EUSES as it is more appropriate for agricultural-like application as in this case where parameter as the drift needs to be included in the modelling. FOCUS is a model typically developed for biocidal applications and was further elaborated on the basis of the German EXPOSIT 1.0 model, where parameters such as drifts can be improved according to collected data: once applied on the soil, calcium oxide can indeed migrate then towards surface waters, via drift.

the soli, calcium oxide ca	in indeed migrate then tow	alus sullace waters, via ui	nt.		
Environmental emissions	See amounts used				
Exposure concentration in waste water treatment plant (WWTP)	Not relevant for agricultural soil protection				
Exposure	Substance	PEC (ug/L)	PNEC (ug/L)	RCR	
concentration in aquatic pelagic compartment	CaO	5.66	370	0.015	
Exposure concentration in sediments	As described above, no exposure of surface water nor sediment to lime is expected. Further, in natural waters the hydroxide ions react with HCO3- to form water and CO32 CO32- forms CaCO3 by reacting with Ca2+. The calcium carbonate precipitates and deposits on the sediment. Calcium carbonate is of low solubility and a constituent of natural soils.				
Exposure	Substance	PEC (mg/L)	PNEC (mg/L)	RCR	
concentrations in soil and groundwater	CaO	500	816	0.61	
Exposure concentration in atmospheric compartment	This point is not relevant. Calcium oxide is not volatile. The vapour pressures is below 10 <sup>-5</sup> Pa.				
Exposure concentration relevant for the food chain (secondary poisoning)		overed do not significantly	onsidered to be omniprese influence the distribution o		

#### Environmental exposure for urban soil treatment

The urban soil treatment scenario is based on a road border scenario. At the special road border technical meeting (Ispra, September 5, 2003), EU Member States and industry agreed on a definition for a "road technosphere". The road technosphere can be defined as "the engineered environment that carries the geotechnical functions of the road in connection with its structure, operation and maintenance including the installations to ensure road safety and manage run off. This technosphere, which includes the hard and soft shoulder at the edge of the carriageway, is vertically dictated by the groundwater watertable. The road authority has responsibility for this road technosphere including road safety, road support, prevention of pollution and water management". The road technosphere was therefore excluded as assessment endpoint for risk assessment for the purpose of the existing/new substances regulations. The target zone is the zone beyond the technosphere, to which the environmental risk assessment applies.

The PEC calculation for soil was based on the FOCUS soil group (FOCUS, 1996) and on the "draft guidance on the calculation of predicted environmental concentration values (PEC) of plant protection products for soil, ground water, surface water and sediment (Kloskowksi et al., 1999). The FOCUS/EXPOSIT modelling tool is preferred to the EUSES as it is more appropriate for agricultural-like application as in this case where parameter as the drift needs to be included in the modelling. FOCUS is a model typically developed for biocidal applications and was further elaborated on the basis of the German EXPOSIT 1.0 model, where parameters such as drifts can be improved according to collected data.



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Environmental emissions	See amounts used						
Exposure concentration in waste water treatment plant (WWTP)	Not relevant for road border scenario						
Exposure concentration in aquatic pelagic compartment	Not relevant for road border scenario						
Exposure concentration in sediments	Not relevant for road bor	Not relevant for road border scenario					
Exposure	Substance	PEC (mg/L)	PNEC (mg/L)	RCR			
concentrations in soil and groundwater	CaO	529	816	0.65			
Exposure concentration in atmospheric compartment	This point is not relevant	. Calcium oxide is not vola	tile. The vapour pressures is	s below 10 <sup>-5</sup> Pa.			
Exposure concentration relevant for the food chain (secondary poisoning)		covered do not significantly	considered to be omnipreser / influence the distribution of				
Environmental exposur	e for other uses						
<ul> <li>The operational protection or u</li> <li>Lime is an inguin soil, wastew</li> <li>Lime is specified the air compariant</li> </ul>	al conditions and risk man rban soil treatment redient and chemically bou ater or surface water cally used to release CO2- tment, where the lime prop	und into a matrix. Release -free breathable air, upon perties are exploited	rried because ess stringent than those outli es are negligible and insuffic reaction with CO2. Such app nal impacts beyond those de	ient to cause a pH-shift plications only relates to			
4. Guidance to DU	to evaluate whethe	r he works inside th	he boundaries set by t	the ES			
met or the downstream u measures are adequate. respective DNEL (given t measured data are not a (www.ebrc.de/mease.htm according to the MEASE Method (RDM) are define and substances with a du	ser can demonstrate on h This has to be done by sh that the processes and act vailable, the DU may make n]) to estimate the associa glossary. For example, su ed as "low dusty", substan ustiness ≥10 % are defined	is own that his operationa howing that they limit the ir tivities in question are cove e use of an appropriate so ted exposure. The dustines ubstances with a dustiness ices with a dustiness less to d as "high dusty".	management measures as of l conditions and implemented halation and dermal exposu ered by the PROCs listed ab aling tool such as MEASE as of the substance used ca b less than 2.5 % according to than 10 % (RDM) are defined	d risk management re to a level below the ove) as given below. If n be determined o the Rotating Drum			
	0 ( 1	,					
exists at a level of 4 mg/r	d as "low dusty", substances with a dustiness less than 10 % (RDM) are defined as "medium dusty" stiness ≥10 % are defined as "high dusty". g/m <sup>3</sup> (as respirable dust) as to be aware of the fact that apart from the long-term DNEL given above, a DNEL for acute effects h <sup>3</sup> . By demonstrating a safe use when comparing exposure estimates with the long-term DNEL, the hlso covered (according to R.14 guidance, acute exposure levels can be derived by multiplying long-						

40 %).



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# ES number 9.11: Professional uses of articles/containers containing lime substances

1. Title						
Free short title	Profess	ional uses of articles/cont	ainers containing lime sub	stances		
			I, SU12, SU13, SU16, SU17, SU18, SU19, SU20,			
Systematic title based		SU23,	SU24			
on use descriptor			6, AC7, AC8, AC10, AC11, s are given in Section 2 be			
Processes, tasks and/or activities covered			ered are described in Sect	,		
Assessment Method	The assessment of inhalation exposure is based on the exposure estimation tool MEASE.					
2. Operational con	ditions and risk mai	nagement measures	5			
PROC/ERC	REACH o	lefinition	Involve	d tasks		
PROC 0	Other p			containing calcium		
PROC 0	(PROC 21 (low emissio exposure e		breathing	CO <sub>2</sub> absorbents (e.g. apparatus)		
PROC 21	Low energy manipulatior materials an		Handling of substances b			
PROC 24	High (mechanical) energ	y work-up of substances		hanical cutting		
PROC 25	bound in materia Other hot work ope			-		
110023			Welding, soldering Calcium oxide bound into or onto articles and			
ERC10, ERC11, ERC 12	Wide dispersive indoor a life articles and mate		materials such as: wooden and plastic construction and building materials (e.g. gutters, drains), flooring, furniture, toys, leather products, paper and cardboard products (magazines, books, news paper and packaging paper), electronic equipment (casing)			
2.1 Control of work	kers exposure					
Product characteristic						
reflected by an assignme ambient temperature the temperature based, takin	approach, the substance- nt of a so-called fugacity c fugacity is based on the d g into account the process on the level of abrasion in	lass in the MEASE tool. F ustiness of that substance temperature and the melt ustead of the substance int	or operations conducted w . Whereas in hot metal ope ing point of the substance	rith solid substances at erations, fugacity is		
PROC	Used in preparation?	Content in preparation	Physical form	Emission potential		
PROC 0	not restricted		massive objects (pellets), low potential for dust formation due to abrasion during previous filling and handling activities of pellets, not during use of breathing apparatus	low (worst case assumption as no inhalation exposure is assumed during the use of the breathing apparatus due to the very low abrasive potential)		
PROC 21	not res	tricted	massive objects	very low		
PROC 24, 25	not res	tricted	massive objects	high		
Amounts used						
combination of the scale	led per shift is not conside of operation (industrial vs. minant of the process intrir	professional) and level of				



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Frequency and duration	n of use/exposure							
PROC			Duration o	f exposure				
PROC 0			onal exposure to	ninutes o calcium oxide is concerned, the actual wearing structions of the actual breathing apparatus)				
PROC 21	480 minutes (not restricted)							
PROC 24, 25		≤ 240 minutes						
Human factors not influ	uenced by risk managem	ent						
The shift breathing volum	ne during all process steps	reflected in	n the PROCs is	assumed to be 10 m <sup>3</sup> /shif	t (8 hours).			
Other given operationa	I conditions affecting wo	orkers expo	osure					
assessment of the condu exposure assessment in temperatures are expect estimation. Thus all proc	ke process temperature an ucted processes. In proces MEASE is however based ed to vary within the indust ess temperatures are auto nd measures at process	s steps with I on the rational try the high matically co	n considerably h o of process tel est ratio was ta overed in this e	high temperatures (i.e. PR mperature and melting poi ken as a worst case assur xposure scenario for PRO	OC 22, 23, 25), the nt. As the associated nption for the exposure			
Risk management measurequired in the processes	ures at the process level (e	e.g. contain	ment or segreg	ation of the emission sour	ce) are generally not			
	nd measures to control c	lispersion	from source to	owards the worker				
PROC	Level of separation		Localised controls (LC)	Efficiency of LC (according to MEASE)	Further information			
PROC 0, 21, 24, 25	Any potentially required s of workers from the en source is indicated abo "Frequency and dura exposure". A reduct exposure duration c achieved, for example installation of ventilated pressure) control room removing the worke workplaces involved with exposure.	mission ve under tion of ion of an be , by the (positive ns or by r from	not required	na	-			
Organisational measure	es to prevent /limit releas	ses, disper	sion and expo	osure	I			
These measures involve eating and smoking at th Shower and change cloth compressed air.	tion. General occupational good personal and house e workplace, the wearing o hes at end of work shift. Do	keeping pra of standard o not wear o	actices (i.e. regu working clothes contaminated c	lar cleaning with suitable s and shoes unless otherw lothing at home. Do not blo	cleaning devices), no vise stated below.			
Conditions and measur	Specification of	-	efficiency		Further personal			
PROC	respiratory protective equipment (RPE)	(assigne	d protection or, APF)	Specification of gloves	protective equipment (PPE)			
PROC 0, 21	not required		na		Eye protection equipment (e.g. goggles or visors) mus			
PROC 24, 25	FFP1 mask		PF=4	Since calcium oxide is classified as irritating to skin, the use of protective gloves is mandatory for all process steps.	be worn, unless potential contact with the eye can be excluded by the nature and type of application (i.e. closed process). Additionally, face protection, protective clothing and safety shoes are required to be worn as appropriate			
(compare with "duration of	ve shall only be worn if the of exposure" above) should he RPE itself, due to the ir	d reflect the	additional phy	siological stress for the wo	orker due to the breathin			



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considered that the worker's capability of using tools and of communicating are reduced during the wearing of RPE. For reasons as given above, the worker should therefore be (i) healthy (especially in view of medical problems that may affect the use of RPE), (ii) have suitable facial characteristics reducing leakages between face and mask (in view of scars and facial hair). The recommended devices above which rely on a tight face seal will not provide the required protection unless they fit the contours of the face properly and securely.

The employer and self-employed persons have legal responsibilities for the maintenance and issue of respiratory protective devices and the management of their correct use in the workplace. Therefore, they should define and document a suitable policy for a respiratory protective device programme including training of the workers.

An overview of the APFs of different RPE (according to BS EN 529:2005) can be found in the glossary of MEASE.

#### 2.2 Control of environmental exposure

**Product characteristics** 

Lime is chemically bound into/onto a matrix with very low release potential

#### 3. Exposure estimation and reference to its source

#### **Occupational exposure**

The exposure estimation tool MEASE was used for the assessment of inhalation exposure. The risk characterisation ratio (RCR) is the quotient of the refined exposure estimate and the respective DNEL (derived no-effect level) and has to be below 1 to demonstrate a safe use. For inhalation exposure, the RCR is based on the DNEL for calcium oxide of 1 mg/m<sup>3</sup> (as respirable dust) and the respective inhalation exposure estimate derived using MEASE (as inhalable dust). Thus, the RCR includes an additional safety margin since the respirable fraction being a sub-fraction of the inhalable fraction according to EN 481.

PROC	Method used for inhalation exposure assessment	Inhalation exposure estimate (RCR)	Method used for dermal exposure assessment	Dermal exposure estimate (RCR)
PROC 0	MEASE (PROC 21)	0.5 mg/m³ (0.5)	Since calcium oxide is	classified as irritating to
PROC 21	MEASE	0.05 mg/m³ (0.05)	skin, dermal exposure ha	as to be minimised as far
PROC 24	MEASE	0.825 mg/m³ (0.825)	as technically feasible. A DNEL for dermal et has not been derived. Thus, dermal exposu	
PROC 25	MEASE	0.6 mg/m³ (0.6)	not assessed in this	exposure scenario.

#### Environmental exposure

Lime is an ingredient and is chemically bound into a matrix: there is no intended release of lime during normal and reasonable foreseeable conditions of use. Releases are negligible and insufficient to cause a pH-shift in soil, wastewater or surface water.

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

The DU works inside the boundaries set by the ES if either the proposed risk management measures as described above are met or the downstream user can demonstrate on his own that his operational conditions and implemented risk management measures are adequate. This has to be done by showing that they limit the inhalation and dermal exposure to a level below the respective DNEL (given that the processes and activities in question are covered by the PROCs listed above) as given below. If measured data are not available, the DU may make use of an appropriate scaling tool such as MEASE

(<u>www.ebrc.de/mease.html</u>) to estimate the associated exposure. The dustiness of the substance used can be determined according to the MEASE glossary. For example, substances with a dustiness less than 2.5 % according to the Rotating Drum Method (RDM) are defined as "low dusty", substances with a dustiness less than 10 % (RDM) are defined as "medium dusty" and substances with a dustiness ≥10 % are defined as "high dusty".

#### DNEL<sub>inhalation</sub>: 1 mg/m<sup>3</sup> (as respirable dust)

Important note: The DU has to be aware of the fact that apart from the long-term DNEL given above, a DNEL for acute effects exists at a level of 4 mg/m<sup>3</sup>. By demonstrating a safe use when comparing exposure estimates with the long-term DNEL, the acute DNEL is therefore also covered (according to R.14 guidance, acute exposure levels can be derived by multiplying long-term exposure estimates by a factor of 2). When using MEASE for the derivation of exposure estimates, it is noted that the exposure duration should only be reduced to half-shift as a risk management measure (leading to an exposure reduction of 40 %).



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# ES number 9.12: Consumer use of building and construction material (DIY – do it yourself)

Exposure Scenario	Forma	t (2) addı	ressing	uses carried out by	consum	ers		
1. Title								
Free short title			Consu	Consumer use of building and construction material				
Systematic title based	1 on use							
descriptor				PC9a, PC9b, ERC8c, E		-		
Processes, tasks acti	ivities co	overed	Applica	ng (mixing and filling) of ation of liquid, pasty lime	powder fori preparatio	mulations ns.		
				health:				
Assessment Method*			as exp Dutch	A qualitative assessment has been performed for oral and dermal exposure as well as exposure to the eye. Inhalation exposure to dust has been assessed by the Dutch model (van Hemmen, 1992). Environment:A qualitative justification assessment is provided.				
2. Operational co	nditior	is and ri						
RMM				ated risk management n		e in place.		
Descripti			on of ac	tivity referring to artic	le categori	es (AC) and envi	ronmental release	
PC/ERC categorie					<b>.</b> .			
				g of powder containing I	ime substar	nces.		
				plaster, putty or slurry				
		Post-appl	ication e	xposure.		•		
		Wide disp	ersive in	door use resulting in ind	clusion into	or onto a matrix		
EPC so ad so of Wide disp			ersive o	utdoor use of processin	g aids in op	en systems		
				utdoor use of reactive s				
		Wide disp	ersive o	utdoor use resulting in i	nclusion inte	o or onto a matrix		
2.1 Control of cor	nsume	rs expos	sure					
Product characteristic								
Description of the		entration	of the	Physical state of	Dustine	ss (if relevant)	Packaging design	
preparation		ance in th		the preparation	Duotinio		i donaging doorgi	
proparation		ration		and propulation				
Lime substance	100 %			Solid, powder	High me	edium and low,	Bulk in bags of up to	
Plaster, Mortar	20-40			Solid, powder		ng on the kind of	35 kg.	
r laster, mortar	20 40	/0		Cond, powder	lime sub		ee ng.	
						e value from		
						sheet see		
						section 9.0.3)		
Plaster, Mortar	20-40	%		Pasty	-		-	
Putty, filler	30-55			Pasty, highly	-		In tubes or buckets	
r atty, mor	00 00	/0		viscous, thick liquid				
Pre-mixed lime wash	~30%			Solid, powder	High - lo	M/	Bulk in bags of up to	
paint	-3070					ve value from	35 kg.	
punt						sheet see	00 kg.	
					section 9			
Lime wash paint/milk	~ 30 9	%		Milk of lime	-		-	
of lime preparation	00			preparation				
Amounts used	1				1		1	
Description of the		Amoun	t used r	per event				
preparation		Anoun	. uocu p					
<b>E</b> <sup>11</sup> <i>u</i>		250 a	1 kg po	wder (2:1 powder water				
Filler, putty						v dependent on th	ne depth and size of the	
			be filled					
Plaster/lime wash paint				ing on the size of the ro	m wall to l	he treated		
Floor/wall equalizer				ing on the size of the ro				
	on of up				un, wan tu i			
Frequency and duration Description of task	on or us	erexposur		on of oxnocure per eve	nt.	froquency of a	vonte	
Description of task			Duratio	on of exposure per eve		frequency of e	vents	
Mixing and loading of li	me conta	aining		in (DIY <sup>1</sup> -fact sheet, RIV		0/	4 a b a a 4)	
powder.		3	•	er 2.4.2 Mixing and loadi	ng of	2/year (DIY <sup>1</sup> fac	t sneet)	
•			powde	rs)				
Application of lime plas		or	Severa	I minutes - hours		2/year (DIY <sup>1</sup> fac	t sheet)	
slurry to the walls or ce	iling					.,		



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Human factors not influenced by risk management							
Description of the	Populati	ion exposed	Breathing rat	e	Exposed body part		Corresponding skin
task	- A -ll4	-	1.25 m <sup>3</sup> /hr		Light of both bondo		area [cm <sup>2</sup> ]
Handling of powder	Adult		1.25 m³/nr	r Half of both hands			430 (DIY <sup>1</sup> fact sheet)
Application of liquid, pasty lime	Adult		NR		Hands and forearms		1900 (DIY <sup>1</sup> fact sheet)
preparations.	Adult		INK				1900 (DIF fact sheet)
Other given operationa	al conditio	ns affecting co	ansumers expo	SUITA			
Description of the task	Indoor/outdo		volume	Δir	exchange rate		
Handling of powder		indoor	01		ersonal space, small		hr <sup>-1</sup> (unspecified room)
rianaling of powder					ound the user)	0.0	
Application of liquid, pas	tv lime	indoor		NR		NR	
preparations.	.,						
Conditions and measu	res relate	d to informatio	n and behaviou	ral advid	ce to consumers		
In order to avoid health of						hich a	apply to professional
workplaces:							
	lothing sh	pes and gloves i	mmediately				
erienige net e	0.	0			aug affactiva alvia proto	otion	producto which chould
					ous effective skin protect, cleansing and care).		
		a care product.	LION PIAN (SKIN P	lotection	i, clearising and care).	Clear	se the skin thoroughly
Conditions and measu			rotection and h	vaiono			
In order to avoid health of					protective measures w	hich s	apply to professional
workplaces:	amaye Di		npiy with the sai	ne sinci	protective measures wi		
	na or mixin	a building mater	ials during dem	nolition or	caulking and above a	ll dur	ing overhead work, wear
		ell as face masks			caulking and, above a	in, uur	ing overhead work, wear
	0		• •		an facilitate burns. Whe	n wo	rking in a wet
					r. Wear gauntlet gloves		
					nich permeates the wor		
2.2 Control of envi	-	-			•	U	
Product characteristics			<u> </u>				
Not relevant for exposure		ent					
Amounts used*	0 00000000						
Not relevant for exposure	e assessm	ent					
Frequency and duratio							
Not relevant for exposure		ent					
Environment factors no			nagement				
Default river flow and dil			lagement				
Other given operationa		ns affecting en	vironmental ex	nosure			
Indoor							
Direct discharge to the w	vastewater	is avoided.					
Conditions and measu			sewage treatmo	ent plant			
Default size of municipal						_	
Conditions and measu							
Not relevant for exposure							
Conditions and measu			ecovery of was	e			
Not relevant for exposure							
3. Exposure estim			to its sourc	e			
The risk characterisation					estimate and the room	activo	DNEL (derived po-
effect level) and is given							
substances of 4 mg/m <sup>3</sup> (	as respiral	ble dust) and the	respective inha	alation ex	nosure estimate (as inf	halahl	le dust) Thus the RCR
includes an additional sa							
Since limes are classifie							
exposure to the eve.			,				



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Human exposure		
Handling of powder		Method used comments
Route of exposure Oral	Exposure estimate	Method used, comments
Urai	-	Qualitative assessment
Dermal	small task: 0.1 µg/cm <sup>2</sup>	Oral exposure does not occur as part of the intended product use. Qualitative assessment
Dermai	(-)	If risk reduction measures are taken into account no human exposure is
	large task: 1 µg/cm <sup>2</sup> (-)	expected. However, dermal contact to dust from loading of lime substances or
		direct contact to the lime cannot be excluded if no protective gloves are worn
		during application. This may occasionally result in mild irritation easily avoided
		by prompt rinsing with water.
		Quantitative assessment
		The constant rate model of ConsExpo has been used. The contact rate to dust
		formed while pouring powder has been taken from the DIY <sup>1</sup> -fact sheet (RIVM report 320104007).
Eye	Dust	Qualitative assessment
		If risk reduction measures are taken into account no human exposure is
		expected. Dust from loading of the lime substances cannot be excluded if no
		protective goggles are used. Prompt rinsing with water and seeking medical
	<b>A H H H H H H H H H H</b>	advice after accidental exposure is advisable.
Inhalation	Small task: 12 µg/m <sup>3</sup>	Quantitative assessment
	(0.003) Large task: 120 µg/m <sup>3</sup>	Dust formation while pouring the powder is addressed by using the dutch model (van Hemmen, 1992, as described in section 9.0.3.1 above).
	(0.03)	
Application of liquid	l, pasty lime preparations	
Route of exposure	Exposure estimate	Method used, comments
Oral	-	Qualitative assessment
		Oral exposure does not occur as part of the intended product use.
Dermal	Splashes	Qualitative assessment
		If risk reduction measures are taken into account no human exposure is
		expected. However, splashes on the skin cannot be excluded if no protective
		gloves are worn during the application. Splashes may occasionally result in
<b>F</b>	Calachas	mild irritation easily avoided by immediate rinsing of the hands with water.
Eye	Splashes	Qualitative assessment If appropriate goggles are worn no exposure to the eyes needs to be
		expected. However, splashes into the eyes cannot be excluded if no protective
		goggles are worn during the application of liquid or pasty lime preparations,
		especially during overhead work. Prompt rinsing with water and seeking
		medical advice after accidental exposure is advisable.
Inhalation	-	Qualitative assessment
		Not expected, as the vapour pressure of limes in water is low and generation
		of mists or aerosols does not take place.
Post-application exp		
		ueous lime preparation will quickly convert to calcium carbonate with carbon
dioxide from the atmo		
		ment to avoid discharging lime solutions directly into municipal wastewater, the
		Iteration avoid discharging lime solutions directly into municipal wastewater, the iteration and therefore, there is no exposure to the
nH of the influent of a		
biological activity. The	e influent of a municipal wa	stewater treatment plant is often neutralized anyway and lime may even be
biological activity. The used beneficially for p	e influent of a municipal wa bH control of acid wastewat	



prepared in accordance with Regulation EC 1907/2006 and Regulation (EC)

1272/2008, as amended

Version: 1.0/EN

**Revision date: September 2019** 

Printing Date: March 23, 2020

# ES number 9.13: Consumer use of $CO_2$ absorbent in breathing apparatuses

	cenario I	Format (2) addi	ressing	uses carried out by	consume	ers		
1. Title								
Free short tit	le			Consumer use of CO2	absorbent	in breathing appa	ratuses	
		on use descripto	r	SU21, PC2, ERC8b				
Processes, ta	asks activ	ities covered		Filling of the formulatio	n into the c	artridge		
				Use of closed circuit br	eathing ap	paratuses		
				Cleaning of equipment				
Assessment	Method*			Human health				
							ral and dermal exposure.	
				The inhalation exposur Hemmen, 1992).	e has beer	assessed by the	Dutch model (Van	
				Environment				
				A qualitative justificatio	n accacem	ent is provided		
2 Oporati	ional co	nditions an	d rick	management me				
							199() is added which	
RMM				ar form. Furthermore, a				
will further reduce the dustiness of t reacting with CO <sub>2</sub> to form the carbo				e breathing	cycle calcium un	nyuroxide will be quickly		
PC/ERC				o article categories (AC	C) and env	ironmental relea	se categories (FRC)	
PC 2							ie as CO <sub>2</sub> absorbent. The	
				sorbent and CO <sub>2</sub> will qu				
							re-breathed again, after	
		of oxygen.	-				-	
				orbent will be discarded		use and refilled b	efore each dive.	
ERC 8b				g in inclusion into or onto	o a matrix			
2.1 Contro	ol of co	nsumers ex	posur	e				
Product char								
Description of	of the	Concentration		Physical state of	Dustine	ss (if relevant)	Packaging design	
preparation		substance in th	ie	the preparation				
<u> </u>		preparation			Very low dustiness		15 101	
CO <sub>2</sub> absorben	IT	78 - 84%		Solid, granular			4.5, 18 kg canister	
		Depending on the application the r			(reduction by 10 % compared to powder)			
		component has	nam			nation cannot		
		different additive	s					
		A specific amou			be ruled out during the filling of the scrubber			
		water is always	added		cartridge			
		(14-18%).						
"Used" CO <sub>2</sub> at	osorbent	~ 20%		Solid, granular		dustiness	1-3 kg in breathing	
					(reduction by 10 %		apparatus	
•		l			compare	d to powder)		
Amounts use		preathing apparatu	10	1-3 kg depending on th	e kind of b	reathing apparet	IC	
		n of use/exposur				cauling apparatu		
Description of				on of exposure per eve	nt	frequency of e	vents	
Filling of the fo				3 min per filling, in sum			ve (up to 4 times)	
cartridge							, ,	
Use of closed	circuit brea	athing	1-2 h			Up to 4 dives a	day	
apparatus				-				
Cleaning and	emptying c	of equipment	< 15 m			After each dive	(up to 4 times)	
		uenced by risk m				11	0	
Description of	of the	Population exp	osed	Breathing rate	Exposed	d body part	Corresponding skin	
task Filling of the		adult		1.25 m <sup>3</sup> /hr (light	hands		area [cm²] 840	
formulation int	to the	auun		working activity)	nanus		(REACH guidance	
cartridge							R.15, men)	
Use of closed	circuit	1			-		-	
breathing app								
Cleaning and		1			hands		840	
of equipment					1		(REACH guidance	
							R.15, men)	
				onsumers exposure				
Description of	of the task	Indoo	or/outdo	or Room	volume	Air	exchange rate	



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Filling of the formulati	on into the	NR	NR	NR	
cartridge					
Use of closed circuit b	preathing	-	-	-	
apparatus					
Cleaning and emptyir	ng of	NR	NR	NR	
equipment					
			ehavioural advice to cor	sumers	
		lothing. Do not breathe			
		avoid the soda lime to	dry out.		
Keep out of reach of o					
Wash thoroughly afte		immodiately with planty	of water and seek medica		
Do not mix with acids		inimediately with plenty	of water and seek medica	i advice.	
		e breathing apparatus t	to assure a proper use of t	ne breathing apparatus	
Conditions and mea	sures relate	d to personal protection	on and hygiene	te breathing apparatus.	
				half mask (mask type FFP2 acc. to EN	J
149).	goggies and	protective clothes durin	ig handling. Ose a filtering		•
	onvironm	ental exposure			
		ental exposure			
Product characteris					
Not relevant for expos	sure assessm	ent			
Amounts used*		1			
Not relevant for expos		ent			
Frequency and dura					
Not relevant for expos		ced by risk manageme			
Default river flow and		ed by risk manageme	int		
		no offecting environm	ontal expecture		
Indoor		ns affecting environm			
	sures related	d to municipal sewage	troatmont plant		
			and sludge treatment techr	ique	
			nt of waste for disposal		
Not relevant for expos					
		d to external recovery	of wasto		
			of waste		
Not relevant for expos	sure assessm	ent			
Not relevant for expose 3. Exposure es	sure assessm stimation	ent and reference to	o its source		
Not relevant for expos 3. Exposure es The risk characterisat	sure assessm stimation ion ratio (RCI	ent and reference to R) is the quotient of the	o its source refined exposure estimate	and the respective DNEL (derived no	-
Not relevant for expose 3. Exposure es The risk characterisat effect level) and is given the risk characterisat	sure assessm stimation ion ratio (RCI ren in parenth	ent and reference to R) is the quotient of the eses below. For inhalat	<b>D its source</b> refined exposure estimate ion exposure, the RCR is	based on the acute DNEL for lime	
Not relevant for expose 3. Exposure est The risk characterisat effect level) and is giv substances of 4 mg/m	sure assessm stimation tion ratio (RCI ven in parenth n <sup>3</sup> (as respirat	ent and reference to R) is the quotient of the eses below. For inhalat ble dust) and the respec	D its source refined exposure estimate tion exposure, the RCR is ctive inhalation exposure e	based on the acute DNEL for lime stimate (as inhalable dust). Thus, the l	RCR
Not relevant for expose 3. Exposure est The risk characterisat effect level) and is giv substances of 4 mg/m includes an additiona	sure assessm timation tion ratio (RCI ven in parenth n <sup>3</sup> (as respirat I safety margi	ent and reference to R) is the quotient of the eses below. For inhalat ble dust) and the respec n since the respirable fr	D its source refined exposure estimate tion exposure, the RCR is ctive inhalation exposure e raction is a sub-fraction of	based on the acute DNEL for lime stimate (as inhalable dust). Thus, the l the inhalable fraction according to EN	RCR 481.
Not relevant for expose 3. Exposure est The risk characterisat effect level) and is giv substances of 4 mg/m includes an additiona	sure assessm timation ion ratio (RCI ven in parenth 1 <sup>3</sup> (as respirat I safety margi s are classifie	ent and reference to R) is the quotient of the eses below. For inhalat ble dust) and the respect n since the respirable fr as irritating to skin, and	D its source refined exposure estimate tion exposure, the RCR is ctive inhalation exposure e raction is a sub-fraction of	based on the acute DNEL for lime stimate (as inhalable dust). Thus, the l	RCR 481.
Not relevant for expose 3. Exposure est The risk characterisat effect level) and is giv substances of 4 mg/n includes an additiona Since lime substance exposure and exposu Due to the very speci	sure assessm timation ion ratio (RCI ven in parenth <sup>13</sup> (as respirat I safety margi s are classifie re to the eye. alised kind of	ent and reference to R) is the quotient of the eses below. For inhalat ble dust) and the respec n since the respirable fr d as irritating to skin, and consumers (divers fillin	D its source refined exposure estimate tion exposure, the RCR is tive inhalation exposure e raction is a sub-fraction of nd eyes a qualitative asse	based on the acute DNEL for lime stimate (as inhalable dust). Thus, the l the inhalable fraction according to EN	RCR 481. I
Not relevant for expose 3. Exposure est The risk characterisat effect level) and is giv substances of 4 mg/n includes an additiona Since lime substance exposure and exposu	sure assessm timation ion ratio (RCI ven in parenth <sup>13</sup> (as respirat I safety margi s are classifie re to the eye. alised kind of	ent and reference to R) is the quotient of the eses below. For inhalat ble dust) and the respec n since the respirable fr d as irritating to skin, and consumers (divers fillin	D its source refined exposure estimate tion exposure, the RCR is tive inhalation exposure e raction is a sub-fraction of nd eyes a qualitative asse	based on the acute DNEL for lime stimate (as inhalable dust). Thus, the l the inhalable fraction according to EN ssment has been performed for derma	RCR 481. I
Not relevant for expose 3. Exposure est The risk characterisat effect level) and is giv substances of 4 mg/n includes an additiona Since lime substance exposure and exposu Due to the very speci	sure assessm timation ion ratio (RCI ven in parenth <sup>13</sup> (as respirat I safety margi s are classifie re to the eye. alised kind of	ent and reference to R) is the quotient of the eses below. For inhalat ble dust) and the respec n since the respirable fr d as irritating to skin, and consumers (divers fillin	D its source refined exposure estimate tion exposure, the RCR is tive inhalation exposure e raction is a sub-fraction of nd eyes a qualitative asse	based on the acute DNEL for lime stimate (as inhalable dust). Thus, the l the inhalable fraction according to EN ssment has been performed for derma	RCR 481. I
Not relevant for expose 3. Exposure est The risk characterisat effect level) and is giv substances of 4 mg/m includes an additiona Since lime substance exposure and exposu Due to the very speci- taken into account to Human exposure Filling of the formula	sure assessm timation ion ratio (RCI ven in parenth 1 <sup>3</sup> (as respirat 1 safety margi s are classifie re to the eye. alised kind of reduce expos	ent and reference to R) is the quotient of the eses below. For inhalat ole dust) and the respec n since the respirable fr id as irritating to skin, and consumers (divers filling ture e cartridge	D its source refined exposure estimate ion exposure, the RCR is trive inhalation exposure e raction is a sub-fraction of nd eyes a qualitative asse g their own CO <sub>2</sub> scrubber)	based on the acute DNEL for lime stimate (as inhalable dust). Thus, the l the inhalable fraction according to EN ssment has been performed for derma it can be assumed that instructions wi	RCR 481. I
Not relevant for expose 3. Exposure est The risk characterisat effect level) and is giv substances of 4 mg/m includes an additiona Since lime substance exposure and exposu Due to the very speci taken into account to Human exposure	sure assessm timation ion ratio (RCI ven in parenth 1 <sup>3</sup> (as respirat 1 safety margi s are classifie re to the eye. alised kind of reduce expos	ent and reference to R) is the quotient of the eses below. For inhalat ole dust) and the respec n since the respirable fr id as irritating to skin, and consumers (divers filling ture e cartridge	D its source refined exposure estimate ion exposure, the RCR is stive inhalation exposure e raction is a sub-fraction of nd eyes a qualitative asse g their own CO <sub>2</sub> scrubber) Method used, comm	based on the acute DNEL for lime stimate (as inhalable dust). Thus, the f the inhalable fraction according to EN soment has been performed for derma it can be assumed that instructions wi	RCR 481. I
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Not relevant for expose 3. Exposure est The risk characterisat effect level) and is giv substances of 4 mg/m includes an additiona Since lime substance exposure and exposu Due to the very speci- taken into account to Human exposure Filling of the formula Route of exposure Oral	sure assessm timation ion ratio (RCI een in parenth <sup>3</sup> (as respirat I safety margi s are classifie re to the eye. alised kind of reduce expos ation into the Exposure e	ent and reference to R) is the quotient of the eses below. For inhalat ole dust) and the respec n since the respirable fr id as irritating to skin, and consumers (divers filling ture e cartridge	D its source         refined exposure estimate         ion exposure, the RCR is         ctive inhalation exposure estimate         raction is a sub-fraction of         nd eyes a qualitative asses         ig their own CO2 scrubber)         Method used, comme         Qualitative assessmer         Oral exposure does not         Qualitative assessmer         If risk reduction measu         exposure is expected.         loading of granular soo         cannot be excluded if         application. This may	based on the acute DNEL for lime stimate (as inhalable dust). Thus, the f the inhalable fraction according to EN ssment has been performed for derma it can be assumed that instructions with the action of the instructions with ents t t occur as part of the intended product t res are taken into account no human However, dermal contact to dust from la lime or direct contact to the granules to protective gloves are worn during poccasionally result in mild irritation eas	RCR 481. I ill be t use.
Not relevant for expos 3. Exposure es The risk characterisat effect level) and is giv substances of 4 mg/m includes an additiona Since lime substance exposure and exposu Due to the very speci taken into account to Human exposure Filling of the formula Route of exposure Oral Dermal	sure assessm timation ion ratio (RCI ren in parenth n <sup>3</sup> (as respirat I safety margi s are classifie re to the eye. alised kind of reduce expos ation into the Exposure e	ent and reference to R) is the quotient of the eses below. For inhalat ole dust) and the respec n since the respirable fr id as irritating to skin, and consumers (divers filling ture e cartridge	D its source         refined exposure estimate         ion exposure, the RCR is         stive inhalation exposure e         raction is a sub-fraction of         nd eyes a qualitative asses         ig their own CO2 scrubber)         Method used, comm         Qualitative assessmer         Oral exposure does not         Qualitative assessmer         If risk reduction measu         exposure is expected.         loading of granular soc         cannot be excluded if         application. This may         avoided by prompt rins	based on the acute DNEL for lime stimate (as inhalable dust). Thus, the f the inhalable fraction according to EN ssment has been performed for derma it can be assumed that instructions with t can be assumed that instructions with t account as part of the intended product t res are taken into account no human However, dermal contact to dust from la lime or direct contact to the granules to protective gloves are worn during baccasionally result in mild irritation eas ing with water.	RCR 481. I ill be t use.
Not relevant for expose 3. Exposure est The risk characterisat effect level) and is giv substances of 4 mg/m includes an additiona Since lime substance exposure and exposu Due to the very speci- taken into account to Human exposure Filling of the formula Route of exposure Oral	sure assessm timation ion ratio (RCI een in parenth <sup>3</sup> (as respirat I safety margi s are classifie re to the eye. alised kind of reduce expos ation into the Exposure e	ent and reference to R) is the quotient of the eses below. For inhalat ole dust) and the respec n since the respirable fr id as irritating to skin, and consumers (divers filling ture e cartridge	D its source         refined exposure estimate         ion exposure, the RCR is         stive inhalation exposure e         raction is a sub-fraction of         nd eyes a qualitative asses         ig their own CO2 scrubber)         Method used, comm         Qualitative assessmer         Oral exposure does not         Qualitative assessmer         If risk reduction measu         exposure is expected.         loading of granular soc         cannot be excluded if         application. This may         avoided by prompt rins	based on the acute DNEL for lime stimate (as inhalable dust). Thus, the f the inhalable fraction according to EN soment has been performed for derma it can be assumed that instructions with t can be assumed that instructions with t t occur as part of the intended product t res are taken into account no human However, dermal contact to dust from la lime or direct contact to the granules to protective gloves are worn during pocasionally result in mild irritation eas ing with water.	RCR 481. I ill be t use.
Not relevant for expos 3. Exposure es The risk characterisat effect level) and is giv substances of 4 mg/m includes an additiona Since lime substance exposure and exposu Due to the very speci taken into account to Human exposure Filling of the formula Route of exposure Oral Dermal	sure assessm timation ion ratio (RCI ren in parenth n <sup>3</sup> (as respirat I safety margi s are classifie re to the eye. alised kind of reduce expos ation into the Exposure e	ent and reference to R) is the quotient of the eses below. For inhalat ole dust) and the respec n since the respirable fr id as irritating to skin, and consumers (divers filling ture e cartridge	D its SOURCE refined exposure estimate tion exposure, the RCR is ctive inhalation exposure e raction is a sub-fraction of nd eyes a qualitative asses g their own CO <sub>2</sub> scrubber) Method used, comm Qualitative assessmer Oral exposure does no Qualitative assessmer If risk reduction measu exposure is expected. loading of granular soo cannot be excluded if application. This may avoided by prompt rins Qualitative assessmer If risk reduction measu	based on the acute DNEL for lime stimate (as inhalable dust). Thus, the f the inhalable fraction according to EN ssment has been performed for derma it can be assumed that instructions with t can be assumed that instructions with t account as part of the intended product t res are taken into account no human However, dermal contact to dust from la lime or direct contact to the granules to protective gloves are worn during baccasionally result in mild irritation eas ing with water.	RCR 481. I III be t use. s
Not relevant for expos 3. Exposure es The risk characterisat effect level) and is giv substances of 4 mg/m includes an additiona Since lime substance exposure and exposu Due to the very speci taken into account to Human exposure Filling of the formula Route of exposure Oral Dermal	sure assessm timation ion ratio (RCI ren in parenth n <sup>3</sup> (as respirat I safety margi s are classifie re to the eye. alised kind of reduce expos ation into the Exposure e	ent and reference to R) is the quotient of the eses below. For inhalat ole dust) and the respec n since the respirable fr id as irritating to skin, and consumers (divers filling ture e cartridge	D its source refined exposure estimate tion exposure, the RCR is ctive inhalation exposure e raction is a sub-fraction of nd eyes a qualitative asses g their own CO <sub>2</sub> scrubber) Method used, comm Qualitative assessmer Oral exposure does no Qualitative assessmer If risk reduction measu exposure is expected. loading of granular soo cannot be excluded if application. This may avoided by prompt rins Qualitative assessmer If risk reduction measu exposure is expected.	based on the acute DNEL for lime stimate (as inhalable dust). Thus, the f the inhalable fraction according to EN ssment has been performed for derma it can be assumed that instructions with at can be assumed that instructions with t account as part of the intended product t res are taken into account no human However, dermal contact to dust from la lime or direct contact to the granules to protective gloves are worn during becasionally result in mild irritation eas ing with water. t res are taken into account no human Dust from loading of the granular soda nal, therefore eye exposure will be min	RCR 481. I III be t use. s ily
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Not relevant for expos 3. Exposure es The risk characterisat effect level) and is giv substances of 4 mg/m includes an additiona Since lime substance exposure and exposu Due to the very speci taken into account to Human exposure Filling of the formula Route of exposure Oral Dermal	sure assessm timation ion ratio (RCI ren in parenth n <sup>3</sup> (as respirat I safety margi s are classifie re to the eye. alised kind of reduce expose ation into the Exposure of - Dust	ent and reference to and reference to eses below. For inhalat ble dust) and the respect n since the respirable fr ad as irritating to skin, and consumers (divers fillin ture cartridge estimate	Dits source           refined exposure estimate tion exposure, the RCR is ctive inhalation exposure e raction is a sub-fraction of nd eyes a qualitative asses g their own CO <sub>2</sub> scrubber)           Method used, comm           Qualitative assessmer Oral exposure does not Qualitative assessmer If risk reduction measu exposure is expected. loading of granular soor cannot be excluded if application. This may avoided by prompt rins Qualitative assessmer If risk reduction measu exposure is expected. is expected to be mini even without protectiv/ water and seeking me advisable.	based on the acute DNEL for lime stimate (as inhalable dust). Thus, the f the inhalable fraction according to EN ssment has been performed for derma it can be assumed that instructions with taxing the action of the intended product t res are taken into account no human However, dermal contact to dust from la lime or direct contact to the granules to protective gloves are worn during pocasionally result in mild irritation eas ing with water. t res are taken into account no human Dust from loading of the granular soda mal, therefore eye exposure will be mir e goggles. Nevertheless, prompt rinsin dical advice after accidental exposure	RCR 481. I III be t use. s ily a lime himal g with
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Not relevant for expos 3. Exposure es The risk characterisat effect level) and is giv substances of 4 mg/n includes an additiona Since lime substance exposure and exposu Due to the very speci taken into account to Human exposure Filling of the formula Route of exposure Oral Dermal	sure assessm timation ion ratio (RCI ren in parenth n <sup>3</sup> (as respirat I safety margi s are classifie re to the eye. alised kind of reduce expose ation into the Exposure of - - Dust Small task:	ent and reference to and reference to eses below. For inhalat ble dust) and the respect n since the respirable fr ad as irritating to skin, and consumers (divers fillin ture cartridge estimate	D its source         refined exposure estimate         ion exposure, the RCR is         ctive inhalation exposure estimate         raction is a sub-fraction of         nd eyes a qualitative asses         g their own CO2 scrubber)         Method used, comm         Qualitative assessmer         Oral exposure does not         Qualitative assessmer         If risk reduction measu         exposure is expected.         loading of granular soo         cannot be excluded if         application. This may         avoided by prompt rins         Qualitative assessmer         If risk reduction measu         exposure is expected.         loading of granular soo         cannot be excluded if         application. This may         avoided by prompt rins         Qualitative assessmer         If risk reduction measu         exposure is expected.         is expected to be minil         even without protective         water and seeking me         advisable.         Quantitative assessmer	based on the acute DNEL for lime stimate (as inhalable dust). Thus, the f the inhalable fraction according to EN ssment has been performed for derma it can be assumed that instructions with t can be assumed that instructions with t t occur as part of the intended product t res are taken into account no human However, dermal contact to dust from la lime or direct contact to the granules to protective gloves are worn during occasionally result in mild irritation eas ing with water. t res are taken into account no human Dust from loading of the granular soda nal, therefore eye exposure will be mir e goggles. Nevertheless, prompt rinsin dical advice after accidental exposure	RCR 481. I III be t use. s ily s a lime himal g with is
Not relevant for expos 3. Exposure es The risk characterisat effect level) and is giv substances of 4 mg/n includes an additiona Since lime substance exposure and exposu Due to the very speci taken into account to Human exposure Filling of the formula Route of exposure Oral Dermal	sure assessm timation ion ratio (RCI ren in parenth n <sup>3</sup> (as respirat I safety margi s are classifie re to the eye. alised kind of reduce expose ation into the Exposure of - - Dust Small task:	ent and reference to and reference to a is the quotient of the eses below. For inhalat ble dust) and the respect n since the respirable fr ad as irritating to skin, and consumers (divers filling acconsumers (divers filling cartridge estimate 1.2 µg/m³ (3 × 10 <sup>-4</sup> )	D its SOURCE refined exposure estimate tion exposure, the RCR is ctive inhalation exposure e raction is a sub-fraction of nd eyes a qualitative asses g their own CO <sub>2</sub> scrubber) Method used, comm Qualitative assessmer Oral exposure does no Qualitative assessmer If risk reduction measu exposure is expected. loading of granular so cannot be excluded if application. This may avoided by prompt rims Qualitative assessmer If risk reduction measu exposure is expected. loading of granular so cannot be excluded if application. This may avoided by prompt rims Qualitative assessmer If risk reduction measu exposure is expected. is expected to be mini even without protectiv water and seeking me advisable. Quantitative assessmer Dust formation while p the dutch model (van	based on the acute DNEL for lime stimate (as inhalable dust). Thus, the f the inhalable fraction according to EN ssment has been performed for derma it can be assumed that instructions with t can be assumed that instructions with t toccur as part of the intended product t res are taken into account no human However, dermal contact to dust from la lime or direct contact to the granules to protective gloves are worn during pocasionally result in mild irritation eas ing with water. t res are taken into account no human Dust from loading of the granular soda nal, therefore eye exposure will be mir e goggles. Nevertheless, prompt rinsin dical advice after accidental exposure int puring the powder is addressed by usi-	RCR 481. I III be t use. s ily s a lime himal g with is ng n
Not relevant for expos 3. Exposure es The risk characterisat effect level) and is giv substances of 4 mg/n includes an additiona Since lime substance exposure and exposu Due to the very speci taken into account to Human exposure Filling of the formula Route of exposure Oral Dermal	sure assessm timation ion ratio (RCI ren in parenth n <sup>3</sup> (as respirat I safety margi s are classifie re to the eye. alised kind of reduce expose ation into the Exposure of - - Dust Small task:	ent and reference to and reference to a is the quotient of the eses below. For inhalat ble dust) and the respect n since the respirable fr ad as irritating to skin, and consumers (divers filling acconsumers (divers filling cartridge estimate 1.2 µg/m³ (3 × 10 <sup>-4</sup> )	D its SOURCE refined exposure estimate tion exposure, the RCR is ctive inhalation exposure e raction is a sub-fraction of nd eyes a qualitative asses g their own CO <sub>2</sub> scrubber) Method used, comm Qualitative assessmer Oral exposure does no Qualitative assessmer If risk reduction measu exposure is expected. loading of granular so cannot be excluded if application. This may avoided by prompt rims Qualitative assessmer If risk reduction measu exposure is expected. loading of granular so cannot be excluded if application. This may avoided by prompt rims Qualitative assessmer If risk reduction measu exposure is expected. is expected to be mini even without protectiv water and seeking me advisable. Quantitative assessmer Dust formation while p the dutch model (van	based on the acute DNEL for lime stimate (as inhalable dust). Thus, the f the inhalable fraction according to EN ssment has been performed for derma it can be assumed that instructions with t can be assumed that instructions with t t occur as part of the intended product t res are taken into account no human However, dermal contact to dust from la lime or direct contact to the granules to protective gloves are worn during occasionally result in mild irritation eas ing with water. t res are taken into account no human Dust from loading of the granular soda nal, therefore eye exposure will be mir e goggles. Nevertheless, prompt rinsin dical advice after accidental exposure	RCR 481. I III be t use. s ily s a lime himal g with is ng n



## prepared in accordance with Regulation EC 1907/2006 and Regulation (EC)

### 1272/2008, as amended

Version: 1.0/EN

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Use of closed circui	t breathing apparatus	
Route of exposure	Exposure estimate	Method used, comments
Oral	-	Qualitative assessment
		Oral exposure does not occur as part of the intended product use.
Dermal	-	Qualitative assessment
		Due to the product characteristics, it can be concluded that dermal
		exposure to the absorbent in breathing apparatuses is non-
		existent.
Eye	-	Qualitative assessment
		Due to the product characteristics, it can be concluded that eye
		exposure to the absorbent in breathing apparatuses is non-
		existent.
Inhalation	negligible	Qualitative assessment
		Instructional advice is provided to remove any dust before
		finishing the assembly of the scrubber. Divers filling their own CO <sub>2</sub>
		scrubber represent a specific subpopulation within consumers.
		Proper use of equipment and materials is in their own interest;
		hence it can be assumed that instructions will be taken into
		account.
		Due to the product characteristics and the instructional advices
		given, it can be concluded that inhalation exposure to the
		absorbent during the use of the breathing apparatus is negligible.
Cleaning and empty	• • •	
Route of exposure	Exposure estimate	Method used, comments
Oral	-	Qualitative assessment
		Oral exposure does not occur as part of the intended product use.
Dermal	Dust and splashes	Qualitative assessment
		If risk reduction measures are taken into account no human
		exposure is expected. However, dermal contact to dust from
		emptying granular soda lime or direct contact to the granules
		cannot be excluded if no protective gloves are worn during
		cleaning. Furthermore, during the cleaning of the cartridge with
		water contact to moistened soda lime may occur. This may
		occasionally result in mild irritation easily avoided by immediate rinsing of with water.
Eye	Dust and splashes	Qualitative assessment
суе	Dust and splasnes	If risk reduction measures are taken into account no human
		exposure is expected. However, contact to dust from emptying
		granular soda limes or during the cleaning of the cartridge with
		water contact to moisten soda limes may occur in very rare
		occasions. Prompt rinsing with water and seeking medical advice
		after accidental exposure is advisable.
Inhalation	Small task: 0.3 µg/m³ (7.5 × 10 <sup>-5</sup> )	Quantitative assessment
minulation	Large task: $3 \mu g/m^3$ (7.5 × 10 <sup>-4</sup> )	Dust formation while pouring the powder is addressed by using
		the Dutch model (van Hemmen, 1992, as described in section
		9.0.3.1 above) and applying a dust reduction factor of 10 for the
		granular form and a factor of 4 to account for the reduced amount
		of lime in the "used" absorbent.
Environmental expo	sure	
		is expected to be negligible. The influent of a municipal wastewater
		ven be used beneficially for pH control of acid wastewater streams
		fluent of the municipal treatment plant is circum neutral, the pH
		ments, such as surface water, sediment and terrestrial compartment.
impact is negligible of	and receiving environmental company	anome, even de surdee water, seament and terrestrial compartment.



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# ES number 9.14: Consumer use of garden lime/fertilizer

European Operation Format (0) address size					1				
Exposure Scenario Format (2) addressing			g uses carried	l out by	consum	ers			
1. Title									
Free short title				Consumer use	e of garde	en lime/ferti	ilizer		
Systematic title based	on use	descripte	or	SU21, PC20, F	SU21, PC20, PC12, ERC8e				
Processes, tasks activ				Manual applica	ation of g	arden lime	, fertilizer		
				Post-application	on exposi	ure			
Assessment Method*				Human health					
									oral and dermal exposure
									posure has been
			assessed by the	he Dutch	model (vai	n Hemmen,	1992	).	
				Environment					
				A qualitative ju			ent is provid	led.	
2. Operational conditions and risk ma				anagement n	neasur	es			
RMM				ated risk manag					
PC/ERC	Description of ac categories (ERC			to articl	e categori	es (AC) and	d env	rironmental release	
PC 20					ime bv sł	novel/hand	(worst case	e) and	soil incorporation.
Post-application e					(	,			
PC 12		Surface s	preading	g of the garden I	ime by sh	novel/ hand	d (worst cas	e) an	d soil incorporation.
				exposure to play					•
ERC 8e Wide dispersive of							n open syste	ems	
2.1 Control of consumers exposure									
Product characteristic									
Description of the		entration	of the	Physical state	e of	Dustines	s (if releva	nt)	Packaging design
preparation	subst	ance in th	he	the preparation					
	prepa	aration							
Garden lime	100 %	/ 0		Solid, powder		High dusty			Bulk in bags or
									containers of 5, 10 and
								25 kg	
Fertilizer	Up to	20 %		Solid, granular Low du		Low dust			Bulk in bags or
								containers of 5, 10 and	
				<u> </u>				25 kg	
Amounts used							· · ·		
Description of the prep	baratior	1					e of information		
Garden lime							ation and direction of use		
Fertilizer				100g /m² (up to	0 1Kg/m²	(compost)	) Inform	ation	and direction of use
Frequency and duration Description of the task	n of us	e/exposu					f	wanay of avanta	
				on of exposure	e per eve	nt	frequency of events 1 tasks per year		
Manual application				s-hours ding on the size of the treated		i tasks per year			
			area	ung on the size		ealeu			
Post-application				ddlers playing or	n araee /I	FΡΔ	Relevant for up to 7 days after		to 7 days after
				ure factors hand		//	application		to r duyo uno
Human factors not infl	uenced	bv risk n					Sppilouion		
Description of the		lation exp		Breathing rat	e	Exposed	body part		Corresponding skin
task				j	-				area [cm <sup>2</sup> ]
Manual application	Adult			1.25 m <sup>3</sup> /hr		Hands ar	nd forearms		1900 (DIY fact sheet)
Post-application		Toddlers		NR		NR			NR
Other given operationa			ecting c	onsumers expo	osure				•
Description of the task			or/outdo			volume		Air	exchange rate
		outdo	or		1 m³ (p	ersonal spa	ace, small	NR	
Manual application	Manual application outdoor			area aroun		ound the u	ser)		
			et-application		NR			NR	
Post-application		outdo						NR	
Post-application Conditions and measu		ated to inf	ormatio		ural advi				
Post-application		ated to inf	ormatio		ural advi				FP2 acc. to EN 149).
Post-application Conditions and measu Do not get in eyes, on sl Keep container closed a	kin, or o nd out d	n clothing of reach of	<b>ormatio</b> . Do not f childrer	breathe dust. Us n.	ural advi se a filter	ing half ma	ask (mask ty		FP2 acc. to EN 149).
Post-application Conditions and measu Do not get in eyes, on sl Keep container closed a In case of contact with e	kin, or o nd out o yes, rin:	n clothing of reach of se immed	<b>ormatio</b> . Do not f childrer	breathe dust. Us n.	ural advi se a filter	ing half ma	ask (mask ty		FP2 acc. to EN 149).
Post-application Conditions and measu Do not get in eyes, on sl Keep container closed a In case of contact with e Wash thoroughly after h	kin, or o nd out o yes, rin: andling.	n clothing of reach of se immed	ormatio . Do not f children iately wit	breathe dust. Us n. h plenty of wate	ural advi se a filter r and see	ing half ma ek medical	ask (mask ty		FP2 acc. to EN 149).
Post-application Conditions and measu Do not get in eyes, on sl Keep container closed a In case of contact with e Wash thoroughly after h Do not mix with acids ar	kin, or o nd out o yes, rin: andling. id alway	ated to inf in clothing of reach of se immed vs add lime	ormatio . Do not f childrer iately wit es to wat	breathe dust. Us n. h plenty of wate ter and not wate	ural advi se a filter r and see r to limes	ing half ma ek medical s.	ask (mask ty advice.	pe Fl	
Post-application Conditions and measu Do not get in eyes, on sl Keep container closed a In case of contact with e Wash thoroughly after h	kin, or o nd out o yes, rins andling. Id alway len lime	ated to inf in clothing of reach of se immed /s add lime or fertilize	ormatio . Do not f children iately wit es to wat er into th	breathe dust. Us n. h plenty of wate ter and not wate e soil with subse	ural advi se a filter r and see r to limes equent wa	ing half ma ek medical s.	ask (mask ty advice.	pe Fl	

Wear suitable gloves, goggles and protection clothes.



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2.2 Control of e	nvironmental exposur	e	
Product characterist	ics .		
		from dust measurem	ents in air as a function of the distance from application)
Amounts used			
Amount used	Ca(OH)2	2,244 kg/ha	In professional agricultural soil protection, it is
	CaO	1,700 kg/ha	recommended not to exceed 1700 kg CaO/ha or
	CaO.MgO	1,478 kg/ha	the corresponding amount of 2244 kg
	CaCO3.MgO	2,149 kg/ha	$Ca(OH)_2/ha$ . This rate is three times the amount
			needed to compensate the annual losses of lime
	Ca(OH)2.MgO Natural hydraulic lime	1,774 kg/ha 2,420 kg/ha	by leaching. For this reason, the value of 1700 kg
	Natural hydraulic lime	2,420 kg/na	CaO/ha or the corresponding amount of 2244 kg
			Ca(OH) <sub>2</sub> /ha is used in this dossier as the basis
			for the risk assessment. The amount used for the
			other lime variants can be calculated based on
			their composition and the molecular weight.
Frequency and dura	tion of use		
		lications during the ve	ear are allowed, provided the total yearly amount of 1,700
kg/ha is not exceeded			are allowed, provided the total yearly allound of 1,700
	not influenced by risk man	agement	
Not relevant for expos		lagement	
		vironmontel everes	
	nal conditions affecting en	vironmental exposi	
Outdoor use of produc			
Soil mixing depth: 20			
	s and measures at process		event release
	leases to adjacent surface wa		
<b>Technical conditions</b>	s and measures to reduce o	r limit discharges, a	air emissions and releases to soil
Drift should be minimi	sed.		
Conditions and mea	sures related to municipal	sewage treatment p	lant
Not relevant for expos			
	sures related to external tr	eatment of waste for	or disposal
Not relevant for expos			
	sures related to external re	covery of waste	
Not relevant for expos	sure assessment		
		to ite course	
<b>5.</b> Exposure est	imation and reference	to its source	
The risk characterisa	tion ratio (RCR) is the quotier	it of the refined expos	sure estimate and the respective DNEL (derived no-
			, the RCR is based on the long-term DNEL for lime
			n exposure estimate (as inhalable dust). Thus, the RCR
includes an additiona	I safety margin since the resp	pirable fraction is a su	b-fraction of the inhalable fraction according to EN 481.
		skin and eyes a qua	litative assessment has been performed for dermal
exposure and exposu	ire to the eye.		
Human exposure			
Manual application			
Route of	Exposure estimate	Method u	sed, comments
exposure			
Oral	-		assessment
			sure does not occur as part of the intended product use.
Dermal	Dust, powder		assessment
			ction measures are taken into account no human
			s expected. However, dermal contact to dust from
		application	of lime substances or by direct contact to the limes
		cannot be	excluded if no protective gloves are worn during
		cannot be application	n. Due to the relatively long application time, skin irritation
		cannot be application would be	n. Due to the relatively long application time, skin irritation expected. This can easily be avoided by immediate
		cannot be application would be rinsing wit	n. Due to the relatively long application time, skin irritation expected. This can easily be avoided by immediate h water. It would be assumed that consumers who had
		cannot be application would be rinsing wit experience	n. Due to the relatively long application time, skin irritation expected. This can easily be avoided by immediate h water. It would be assumed that consumers who had e of skin irritation will protect themselves. Therefore, any
		cannot be application would be rinsing wit experience occurring	n. Due to the relatively long application time, skin irritation expected. This can easily be avoided by immediate h water. It would be assumed that consumers who had e of skin irritation will protect themselves. Therefore, any skin irritation, which will be reversible, can be assumed
		cannot be application would be rinsing wit experience occurring to be non-	n. Due to the relatively long application time, skin irritation expected. This can easily be avoided by immediate h water. It would be assumed that consumers who had e of skin irritation will protect themselves. Therefore, any skin irritation, which will be reversible, can be assumed recurring.
Еуе	Dust	cannot be application would be rinsing wit experience occurring to be non- Qualitative	<ul> <li>Due to the relatively long application time, skin irritation expected. This can easily be avoided by immediate h water. It would be assumed that consumers who had e of skin irritation will protect themselves. Therefore, any skin irritation, which will be reversible, can be assumed recurring.</li> <li>assessment</li> </ul>
Eye	Dust	cannot be application would be rinsing wit experience occurring to be non- Qualitative If risk redu	<ul> <li>Due to the relatively long application time, skin irritation expected. This can easily be avoided by immediate</li> <li>h water. It would be assumed that consumers who had</li> <li>e of skin irritation will protect themselves. Therefore, any skin irritation, which will be reversible, can be assumed recurring.</li> <li>e assessment</li> <li>action measures are taken into account no human</li> </ul>
Еуе	Dust	cannot be application would be rinsing wit experienc occurring to be non- Qualitative If risk redu exposure	<ul> <li>Due to the relatively long application time, skin irritation expected. This can easily be avoided by immediate</li> <li>h water. It would be assumed that consumers who had</li> <li>e of skin irritation will protect themselves. Therefore, any skin irritation, which will be reversible, can be assumed recurring.</li> <li>e assessment</li> <li>interform are taken into account no human</li> <li>is expected. Dust from surfacing with lime cannot be</li> </ul>
Еуе	Dust	cannot be application would be rinsing wit experienc occurring to be non- Qualitative If risk redu exposure excluded i	<ul> <li>Due to the relatively long application time, skin irritation expected. This can easily be avoided by immediate h water. It would be assumed that consumers who had e of skin irritation will protect themselves. Therefore, any skin irritation, which will be reversible, can be assumed recurring.</li> <li>assessment citize assumed that account no human is expected. Dust from surfacing with lime cannot be f no protective goggles are used. Prompt rinsing with</li> </ul>
Еуе	Dust	cannot be application would be rinsing wit experienc occurring to be non- Qualitative If risk redu exposure excluded i	<ul> <li>Due to the relatively long application time, skin irritation expected. This can easily be avoided by immediate h water. It would be assumed that consumers who had e of skin irritation will protect themselves. Therefore, any skin irritation, which will be reversible, can be assumed recurring.</li> <li>assessment iction measures are taken into account no human s expected. Dust from surfacing with lime cannot be f no protective goggles are used. Prompt rinsing with seeking medical advice after accidental exposure is</li> </ul>



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Inhalation (garden	Small task: $12 \mu g/m^3 (0.0012)$	Quantitative assessment
lime)	Large task: 120 µg/m <sup>3</sup> (0.012)	No model describing the application of powders by shovel/hand is
		available, therefore, read-across from the dust formation model
		while pouring powders has been used as a worst case. Dust formation while pouring the powder is addressed by using the
		dutch model (van Hemmen, 1992, as described in section 9.0.3.1
		above).
Inhalation	Small task: 0.24 µg/m <sup>3</sup> (2.4 * 10 <sup>-4</sup> )	Quantitative assessment
(fertilizer)	Large task: $2.4 \ \mu g/m^3 (0.0024)$	No model describing the application of powders by shovel/hand is
(		available, therefore, read across from the dust formation model
		while pouring powders has been used as a worst case.
		Dust formation while pouring the powder is addressed by using the
		dutch model (van Hemmen, 1992, as described in section 9.0.3.1
		above) and applying a dust reduction factor of 10 for the granular
		form and a factor of 5 to account for the reduced amount of limes
		in fertilizer.
Post-application		
0		w called CRD) post-application exposure need to be addressed for
		sed to treat lawns and plants grown in private gardens. In this case
		soon after treatment, needs to be assessed. The US EPA model
		private gardens (e.g. lawns) by toddlers crawling on the treated area
anu also via the ora	I route through hand-to-mouth activities	ö.
Garden lime or ferti	lizer including lime is used to treat acidi	c soil. Therefore, after application to the soil and subsequent watering
		eutralized. Exposure to lime substances will be negligible within a
short time after app		
Environmental exp		
No quantitative envi	ironmental exposure assessment is car	ried out because the operational conditions and risk management

No quantitative environmental exposure assessment is carried out because the operational conditions and risk management measures for consumer use are less stringent than those outlined for professional agricultural soil protection. Moreover, the neutralisation/pH-effect is the intended and desired effect in the soil compartment. Releases to wastewater are not expected.



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# ES number 9.15: Consumer use of lime substances as water treatment chemicals

Exposure Scenario Format (2) addressing uses carried out by consumers									
	onna		essing	uses carried out by	Jonsuill				
1. Title				Concurrent	oubotere -		ant chomicala		
Free short title Systematic title based on use descriptor			Consumer use of lime substances as water treatment chemicals						
Processes, tasks activities covered			SU21, PC20, PC37, ERC8b Loading, filling or re-filling of solid formulations into container/preparation of lime milk						
Assessment Method*			Application of lime milk Human health:	to water					
			A qualitative assessment has been performed for oral and dermal exposure as well as for exposure of the eye. Dust exposure has been assessed by the Dutch model (van Hemmen, 1992). Environment: A qualitative justification assessment is provided.						
2. Operational co	onditi	ions and	d risk	management me	asures				
RMM									
			tivity referring to articl	integrated risk management measures are in place. A tivity referring to article categories (AC) and environmental release					
PC 20/37 Filling and re-filling Transfer of lime su		y g (transfer of lime substances (solid)) of lime reactor for water treatment. ubstances (solid) into container for further application. ion of lime milk to water.							
ERC 8b				door use of reactive sub		open systems			
2.1 Control of co	nsur								
Product characteristic				-					
Description of the	Cond	entration	of the	Physical state of	Dustine	ss (if relevant)	Packaging design		
preparation		tance in th aration	e	the preparation					
Water treatment chemical	Up to 100 %			Solid, fine powder	high dustiness (indicative value from DIY fact sheet see section 9.0.3)		Bulk in bags or buckets/containers.		
Water treatment chemical	Up to 99 %			Solid, granular of different size (D50 value 0.7 D50 value 1.75 D50 value 3.08)	low dustiness (reduction by 10% compared to powder)		Bulk-tank lorry or in "Big Bags" or in sacks		
Amounts used									
Description of the prep					Amount used per event				
Water treatment chemical in lime reactor for aquaria		or	depending on the size of the water reactor to be filled (~ 100g /L)						
Water treatment chemical in lime reactor for drinking water			depending on the size of the water reactor to be filled (~up to 1.2 kg/L)						
Lime milk for further appl				~ 20 g / 5L					
Frequency and duration of use/exposure									
Preparation of lime milk (loading, filling 1.33 m and refilling) (DIY-fa		on of exposure per event in ct sheet, RIVM, Chapter 2.4.2 and loading of powders)		frequency of events 1 task/month 1task/week					
				1 tasks/ month					
Human factors not influenced by risk management									
Description of the task	Population exposed		Breathing rate	Exposed body part		Corresponding skin area [cm²]			
Preparation of lime milk (loading, filling and refilling)	adult			1.25 m³/hr	Half of both hands		430 (RIVM report 320104007)		
Dropwise application of lime milk to water	to water		NR	Hands		860 (RIVM report 320104007)			
Other given operationa					_				
Description of the task		Indoc	r/outdo	or Room	volume	Air	exchange rate		



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Preparation of lime m	ilk (loading,	Indoor/outdoor		1 m <sup>3</sup> (personal space, small	0.6 hr <sup>-1</sup> (unspecified room
filling and refilling)				area around the user)	indoor)
Dropwise application	of lime milk	indoor		NR	NR
to water	sures relator	to information and bob	aviou	ral advice to consumers	
		lothing. Do not breathe du			
Keep container close			101		
Use only with adequa					
		immediately with plenty of	water	and seek medical advice.	
Wash thoroughly afte					
Do not mix with acids	and always a	dd limes to water and not	t water	to limes.	
		d to personal protection			
			menn	g half mask (mask type FFP2 a	3C. 10 EN 149).
		ental exposure			
Product characteris		o			
Not relevant for expose Amounts used*	sure assessm	ent			
Not relevant for expos		ent			
Frequency and dura					
Not relevant for expos		ent			
		ced by risk management			
Default river flow and					
	onal conditio	ns affecting environmer	ntal ex	posure	
Indoor					
		d to municipal sewage tr			
		ystem/treatment plant and			
		d to external treatment of	of was	ste for disposal	
Not relevant for expos		d to external recovery o	fwae		
Not relevant for expos			u wasi	le	
		and reference to i	ite e	ourco	
				exposure estimate and the respe	active DNEL (derived pe
				sure, the RCR is based on the a	
				alation exposure estimate (as inf	
				a sub-fraction of the inhalable f	
			eyes a	a qualitative assessment has be	en performed for dermal
exposure and exposu	re to the eye.		_		
Human exposure		. \			
Preparation of lime Route of exposure	Exposure e		Moth	nod used, comments	
Oral	-	stimate		itative assessment	
ora				exposure does not occur as par	t of the intended product use.
Dermal (powder)	small task: (	0.1 µg/cm² (-)		itative assessment	•
u ,	large task: ?	1 µg/cm² (-)	If ris	reduction measures are taken	into account no human
				sure is expected. However, der	
				ng of limes or direct contact to t	
				rotective gloves are worn during	
				sionally result in mild irritation e	asily avoided by prompt
				ntitative assessment	
				constant rate model of ConsExp	oo has been used. The contact
				to dust formed while pouring por	
				fact sheet (RIVM report 320104	
	Duet			sure estimate will be even lowe	r.
Eye	Dust			itative assessment reduction measures are taken	into account no human
				sure is expected. Dust from loa	
				ided if no protective goggles are	
				r and seeking medical advice af	
				sable.	
Inhalation (powder)		12 µg/m³ (0.003)		ntitative assessment	
	Large task:	120 µg/m³ (0.03)		formation while pouring the pow	
				Dutch model (van Hemmen, 199	2, as described in section
L			9.0.3	8.1 above).	



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Inhalation	Small task: 1.2 µg/m <sup>3</sup> (0.0003)	Quantitative assessment
(granules)	Large task: 12 µg/m <sup>3</sup> (0.003)	Dust formation while pouring the powder is addressed by using
		the Dutch model (van Hemmen, 1992 as described in section
		9.0.3.1 above) and applying a dust reduction factor of 10 for the
		granular form.
Dropwise applicatio	n of lime milk to water	
Route of exposure	Exposure estimate	Method used, comments
Oral	-	Qualitative assessment
		Oral exposure does not occur as part of the intended product use.
Dermal	Droplets or splashes	Qualitative assessment
		If risk reduction measures are taken into account no human
		exposure is expected. However, splashes on the skin cannot be
		excluded if no protective gloves are worn during application.
		Splashes may occasionally result in mild irritation easily avoided
		by immediate rinsing of the hands in water.
Eye	Droplets or splashes	Qualitative assessment
		If risk reduction measures are taken into account no human
		exposure is expected. However, splashes into the eyes cannot be
		excluded if no protective goggles are worn during the application.
		However, it is rare for eye irritation to occur as a result of
		exposure to a clear solution of calcium hydroxide (lime water) and
		mild irritation can easily be avoided by immediate rinsing of the
		eyes with water.
Inhalation	-	Qualitative assessment
		Not expected, as the vapour pressure of limes in water is low and
		generation of mists or aerosols does not take place.
Environmental expo	sure	
The pH impact due to	use of lime in cosmetics is expected	d to be negligible. The influent of a municipal wastewater treatment
plant is often neutraliz	zed anyway and lime may even be u	sed beneficially for pH control of acid wastewater streams that are

treated in biological WWTPs. Since the pH of the influent of the municipal treatment plant is circum neutral, the pH impact is negligible on the receiving environmental compartments, such as surface water, sediment and terrestrial compartment.



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# ES number 9.15: Consumer use of cosmetics containing lime substances

Exposure Scenario Forma	at (2) addressing	uses carried out by consumers		
1. Title				
Free short title		Consumer use of cosmetics containing limes		
Systematic title based on use descriptor		SU21, PC39, ERC8a		
Processes, tasks activities covered		-		
Assessment Method*		Human health: According to Article 14(5) (b) of regulation (EC) 1907/2006 risks to human health need not be considered for substances included in cosmetic products within the scope of Directive 76/768/EC. Environment A qualitative justification assessment is provided.		
2. Operational condition	ns and risk ma	nagement measures		
ERC 8a				
	2.1 Control of consumers exposure			
Product characteristic				
	on hoolth from this	use does not need to be considered.		
Amounts used	an boolth from this	use does not need to be considered.		
Frequency and duration of us				
		use does not need to be considered.		
Human factors not influenced		use does not need to be considered.		
Other given operational cond		use does not need to be considered.		
		and behavioural advice to consumers		
		use does not need to be considered.		
Conditions and measures relation				
		use does not need to be considered.		
2.2 Control of environm	iental exposure	9		
Product characteristics				
Not relevant for exposure asses	ssment			
Amounts used*				
Not relevant for exposure asses	ssment			
Frequency and duration of use				
Not relevant for exposure assessment				
Environment factors not influenced by risk management				
Default river flow and dilution				
Other given operational conditions affecting environmental exposure				
Indoor				
Conditions and measures related to municipal sewage treatment plant				
Default size of municipal sewage system/treatment plant and sludge treatment technique				
Conditions and measures related to external treatment of waste for disposal				
Not relevant for exposure assessment				
Conditions and measures related to external recovery of waste				
Not relevant for exposure assessment				
3. Exposure estimation and reference to its source				
Human exposure				
Human exposure to cosmetics will be addressed by other legislation and therefore need not be addressed under regulation (EC)				
1907/2006 according to Article 14(5) (b) of this regulation.				
Environmental exposure				
The pH impact due to use of lime in cosmetics is expected to be negligible. The influent of a municipal wastewater treatment plant is often neutralized anyway and lime may even be used beneficially for pH control of acid wastewater streams that are treated in biological WWTPs. Since the pH of the influent of the municipal treatment plant is circum neutral, the pH impact is negligible on the receiving environmental compartments, such as surface water, sediment and terrestrial compartment.				

End of the safety data sheet