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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.

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⁻ 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⁻ 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 oxide 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. 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

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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/m³ and 4 mg/m³, 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

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/m³ and 4 mg/m³, 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 Contam Toxicol. 126: 1-85.), has been used to calculate the inhalation exposure. The inhalation exposure for consumers is estimated at 15 μ g/hr or 0.25 μ 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 μ g/hr. To convert these values in mg/m³ a default value of 1.25 m³/hr for the breathing volume under light working conditions will be assumed (van Hemmen, 1992) giving 12 μ g/m³ for small tasks and 120 μ g/m³ 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.

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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

			lde use	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 Ident	Sector of use category (SU)	Chemical Product Category (PC)	category (PROC)	categor y (AC)	release category (ERC)
9.1	Manufacture and industrial uses of aqueous solutions of lime substances	x	x	x		x	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	1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 13	6c, 6d, 7, 12a, 12b,
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	1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 13	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	х	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	1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 13	1, 2, 3, 4, 5, 6a, 6b, 6c, 6d, 7, 12a, 12b, 10a, 10b, 11a, 11b

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			lde use	ntifi es	ed	Resultin g life cycle stage	Identified Use			Process	Article	Environmental release
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)
9.4	Manufacture and industrial uses of high dusty solids/powders of lime substances	x	x	x		х		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	1, 2, 3, 4, 5, 6a, 6b, 6c, 6d, 7, 12a, 12b, 10a, 11a
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	1, 2, 3, 4, 5, 6a, 6b, 6c, 6d, 7, 12a, 12b, 10a, 10b, 11a, 11b
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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			lde use	entifi es	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 Iden	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		x	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		x	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		x	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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			lde use	ntifi es	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 Iden	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	х			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		x	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		x	21	9b, 9a			8
9.13	Consumer use of CO ₂ absorbent in breathing apparatuses				x		x	21	2			8

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			lde use	entifi es	ed	Resultin g life cycle stage	Identified Use			Process	Article	Environmental release
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	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	ວ Format (1) addressing uses carried oເ	ut by workers					
1. Title							
Free short title	Manufacture and industrial uses of a	queous solutions of lime substances					
Systematic title based on use descriptor	on use descriptor PC19, PC20, PC21, PC23, PC24, PC25, PC26, PC27, PC26, 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 covered 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					
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? Physical form **Emission potential** preparation PROC 7 not restricted aqueous solution medium All other applicable not restricted aqueous solution very 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 PROCs or by removing the 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 compressed air.

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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)				
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				
For reasons as given abo the use of RPE), (ii) have hair). The recommended contours of the face prop The employer and self-e devices and the manage policy for a respiratory pr An overview of the APFs	mployed persons have leg ment of their correct use in rotective device programm of different RPE (accordin	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 g to BS EN 529:2005) car	cially in view of medical pro- tween face and mask (in v t provide the required prot naintenance and issue of ro , they should define and do workers.	oblems that may affect iew of scars and facial ection unless they fit the espiratory protective ocument a suitable				
	ronmental exposure	<u>}</u>						
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 environmenta				
Frequency and duratio	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 su	rface water: 18000 m³/day							
Other given operationa	I conditions affecting en	vironmental exposure						
Effluent discharge rate: 2	2000 m³/day							
Technical onsite condi	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 the	ures related to the environ uch discharges are expecte aters is required. In genera g. through neutralisation). he description of standard an be found in the introduc	ed to cause significant pH of I discharges should be car In general most aquatic or OECD tests with aquatic o	changes. Regular control c ried out such that pH char ganisms can tolerate pH v	of the pH value during ages in receiving surface alues in the range of 6-9				
Conditions and measured	res related to waste							

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Revision date: December 2010 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 **Dermal exposure** Inhalation 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/m³ (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 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 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 equilibrium between carbon dioxide (CO2), the bicarbonate ion (HCO3-) and the carbonate ion compartment (CO32-). Exposure The sediment compartment is not included in this ES, because it is not considered relevant for lime 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_{inhalation}: 1 mg/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/m³. 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 m³/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 m³/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.

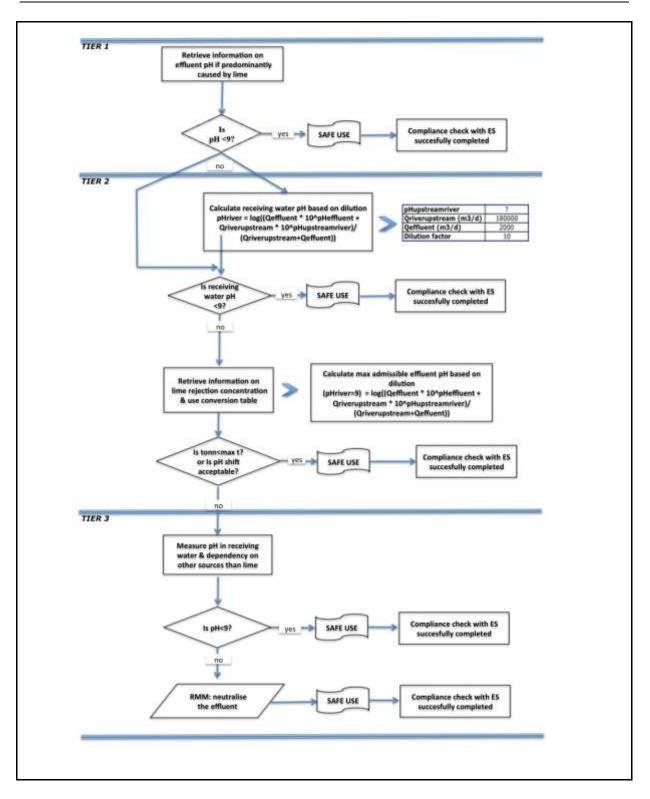
Such equation has to be seen as a worst case scenario, where water conditions are standard and not case specific.

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 ou	It by workers					
1. Title							
Free short title	Manufacture and industrial uses of low o	dusty solids/powders of lime substances					
Systematic title based on use descriptor	on use descriptor PC19, PC20, PC21, PC23, PC24, PC25, PC26, PC27, PC26, 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 covered 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	6					
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						

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	minerals/metals at elevated temperature 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)				

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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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.	not required	na	-	
Organisational measu	res to prevent /limit releas	ses, dispersion and expo	osure		
These measures involv eating and smoking at Shower and change cl compressed air.	stion. General occupationa e good personal and hous the workplace, the wearir othes at end of work shift ures related to personal pr	ekeeping practices (i.e. re ng of standard working c t. Do not wear contamina	gular cleaning with suitable lothes and shoes unless ated clothing at home. Do	ble cleaning devices), n otherwise stated belov	
PROC	Specification of respiratory protective equipment (RPE)	RPE efficiency (assigned protection factor, APF)	Specification of gloves	Further personal protective equipmen (PPE)	
PROC 22, 24, 27a	FFP1 mask	APF=4		Eye protection equipment (e.g. goggles or visors) mus	
			Since calcium oxide is classified as irritating to skin, the use of	be worn, unless potential contact with the eye can be excluded by the nature	

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

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

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.

na

mandatory for all

process steps.

2.2 Control of environmental exposure

not required

Amounts used

All other applicable

PROCs

The daily and annual amount per site (for point sources) is not considered to be the main determinant for environmental exposure.

Frequency and duration of use

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

(i.e. closed process).

Additionally, face

protection, protective clothing and safety shoes are required to be worn as appropriate.

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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 m³/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

particles is negligible.

Occupational exposure

sediments

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.

additional safety margins	since the respirable fractio	in being a sub-fraction of th	ne innalable fraction accord	UINY 10 EN 401.
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)	skin, dermal exposure ha as technically feasible. A	classified as irritating to as to be minimised as far DNEL for dermal effects hus, dermal exposure is exposure scenario.
Environmental emission	ns			
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 pH should 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) Exposure concentration in aquatic pelagic compartment	easily as often required by national laws. easily as often required by national laws. wate 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. VTP) 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			
Exposure concentration in	The sediment compartme		S, because it is not consice 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	•
met or the downstream u measures are adequate. respective DNEL (given t measured data are not a	boundaries set by the ES if either the proposed risk management measures as described above are user 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

(<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 site as "high dusty".

DNEL_{inhalation}: 1 mg/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/m³. 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 m³/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 $\rm m^{3}/day$
- 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.

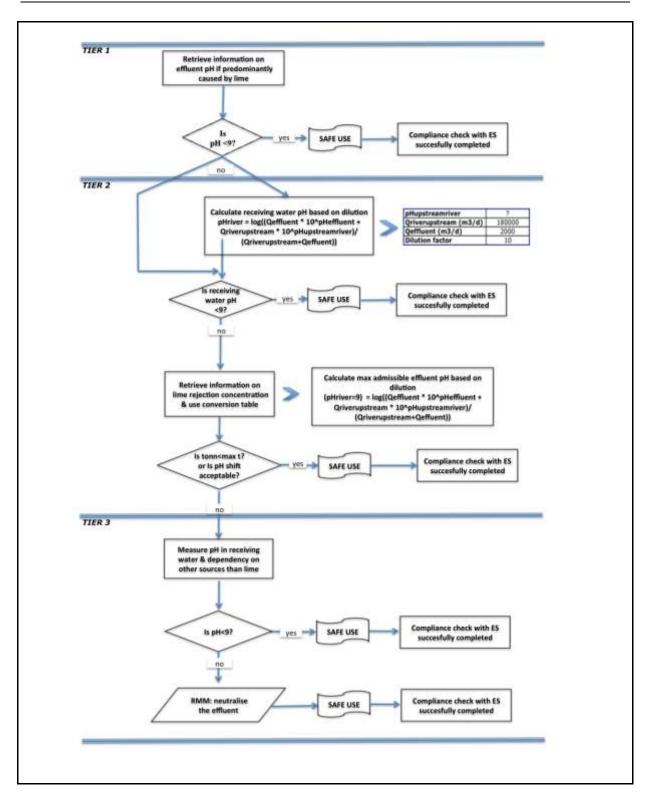
Such equation has to be seen as a worst case scenario, where water conditions are standard and not case specific.

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

Exposure Scenario	Format (1) addressing uses carried ou	It by workers		
1. Title				
Free short title	Manufacture and industrial uses of mediur	n 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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PROC 24	High (mechanical) energ bound in materia	y work-up of substances Is and/or articles			
PROC 25		rations with metals			
PROC 26	Handling of solid inorgan tempe	ic substances at ambient trature			
PROC 27a	Production of metal po	wders (hot processes)			
PROC 27b	Production of metal po	wders (wet processes)			
ERC 1-7, 12	industri				
ERC 10, 11	Wide-dispersive outdoor life articles a	and indoor use of long- and materials			
2.1 Control of worl	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. For ustiness of that substance temperature and the melt	I is one of the main exposu or operations conducted w . Whereas in hot metal ope ing point of the substance. rinsic emission potential.	ith solid substances at erations, fugacity is	
PROC	Used in preparation?	Content in preparation	Physical form	Emission potential	
PROC 22, 23, 25, 27a	not res	tricted	solid/powder, molten	high	
PROC 24	not res	stricted	solid/powder	high	
All other applicable PROCs	not res	stricted	solid/powder	medium	
Amounts used					
combination of the scale		vs. Professional) and lev	exposure as such for this el of containment/automa		
Frequency and duration	n 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 influ	enced by risk managem	ent			
The shift breathing volume during all process steps reflected in the PROCs is assumed to be 10 m ³ /shift (8 hours).					
	I conditions affecting wo				
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.					
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	Efficiency of LC	Further information	
	Any potentially required	(LC)	(according to MEASE)	Further information	
PROC 1, 2, 15, 27b	separation of workers	not required	na	-	
PROC 3, 13, 14	from the emission source is indicated	general ventilation	17 %	-	
PROC 19	above under "Frequency and	not applicable	na	-	
All other applicable PROCs	duration of exposure". A reduction of exposure	local exhaust ventilation	78 %	-	

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	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.				
Organisational measure	es to prevent /limit releas	ses, dispersion and expo	sure		
These measures involve eating and smoking at t	good personal and hous he workplace, the wearing	ekeeping practices (i.e. reng of standard working cl	equired to ensure a safe hat egular cleaning with suitat lothes and shoes unless ated clothing at home. Do	ble cleaning devices), no otherwise stated below.	
Conditions and measur	es related to personal pr		ealth evaluation		
PROC	Specification of respiratory protective	RPE efficiency (assigned protection	Specification of gloves	Further personal protective equipment	
PROC 4, 5, 7, 8a, 8b, 9, 10, 16, 17, 18, 19, 22, 24, 27a	equipment (RPE) FFP1 mask	factor, APF) APF=4		(PPE) 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.					
	ronmental exposure	•			
	mount per site (for point	sources) is not consider	ed to be the main deterr	ninant for environmental	
exposure. Frequency and duration	n 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 m³/day					
Other given operational conditions affecting environmental exposure					
Effluent discharge rate: 2000 m ³ /day					
Technical onsite condit	ions and measures to re	duce or limit discharges	, air emissions and relea	ses to soil	
surface water, in case su introduction into open wa	ch discharges are expecte ters is required. In general	ed to cause significant pH o I discharges should be car	ying lime solutions into mu changes. Regular control c ried out such that pH chan ganisms can tolerate pH v	of the pH value during ges in receiving surface	

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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/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.

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	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 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 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 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

the surface water pri sho	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 and substances with a du	boundaries set by the ES if either the proposed risk management measures as described above are user 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 <u>nl</u>) 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 _{inhalation} : 1 m	g/m ³ (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 ³ . 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 d only be reduced to half-shift as a risk management measure (leading to an exposure reduction of
Environmental exposu	e
9 and be predominantly a Tier 2a : retrieve informativalue of 9. If the measure	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.
$pHriver = Log \boxed{\frac{Qe}{Qe}}$	$\frac{effluent * 10^{pHeffluent} + Qriverupstream * 10^{pHupstream}}{Qriverupstream + Qeffluent}$
	Eq 1)
Where:	
	rs to the effluent flow (in m³/day)
Q river upstrea	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:
• Q riv m³/d	ver upstream flows: use the 10th of existing measurements distribution or use default value of 18000 lay
Q ef	fluent: use default value of 2000 m³/day
	upstream pH is preferably a measured value. If not available, one can assume a neutral pH of 7 if this 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	

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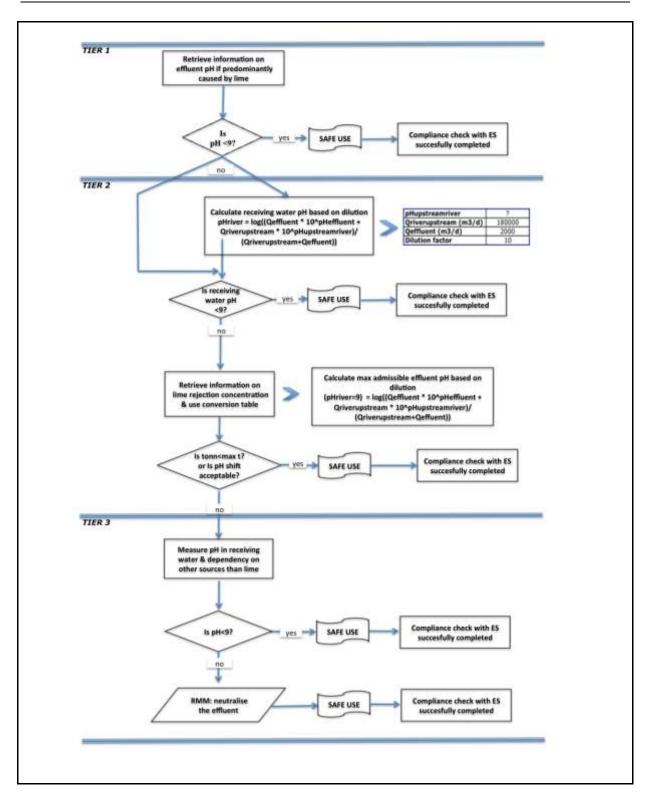
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Tier 3: measure the pH in the receiving water after the discharge point. If pH is below 9, safe use is reasonably demonstrated and the ES ends here. If pH is found to be above 9, risk management measures have to be implemented: the effluent has to 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	Format (1) addressing uses carried ou	It 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	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) energ bound in materia	y work-up of substances ls and/or articles			
PROC 25	Other hot work ope	rations with metals			
PROC 26	0 0	ic substances at ambient trature			
PROC 27a	Production of metal po	wders (hot processes)			
PROC 27b	Production of metal po	wders (wet processes)			
ERC 1-7, 12	Manufacture, formul industri	ation and all types of al uses			
ERC 10, 11	•	and indoor use of long- and materials			
2.1 Control of work	kers exposure				
Product characteristic					
reflected by an assignme ambient temperature the temperature based, takin	nt of a so-called fugacity of fugacity is based on the d g into account the process	intrinsic emission potential lass in the MEASE tool. For ustiness of that substance temperature and the melt istead of the substance int	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 res		solid/powder, molten	high	
All other applicable PROCs	not restricted		solid/powder	high	
Amounts used					
combination of the scale	•	red to influence the exposi Professional) and level of nsic emission potential.		-	
Frequency and duration	n of use/exposure				
PROC		Duration o	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 m ³ /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 an	nd measures at process	level (source) to prevent	release		
Dials as a second set as a set	iron at the propage lovel (a dia a set da a secto a ta a secon	\	

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	
These measures involve eating and smoking at the Shower and change cloth compressed air.	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			
	Specification of	RPE efficiency		Further personal
PROC	respiratory protective equipment (RPE)	(assigned protection factor, APF)	Specification of gloves	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 the increase 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	mount per site (for paint	sources) is not consider	ed to be the main determ	ninant for onvironmental
exposure.	mount per site (for point	sources) is not consider	ed to be the main detern	
Frequency and duration				
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 m³/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 was tewater 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/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.

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)	skin, dermal exposure ha as technically feasible. A	DNEL for dermal effects hus, dermal exposure is

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 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 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 general the buffer capacity preventing shifts in acidity or alkalinity in natural waters is regulated by the aquatic pelagic compartment equilibrium between carbon dioxide (CO2), the bicarbonate ion (HCO3-) and the carbonate ion (CO32-)

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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	•			
met or the downstream u measures are adequate. respective DNEL (given a measured data are not a (www.ebrc.de/mease.htm according to the MEASE	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 <u>nl</u>) 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"			

DNEL_{inhalation}: 1 mg/m³ (as respirable dust)

and substances with a dustiness ≥10 % are defined as "high dusty".

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/m³. 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 m³/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 $\rm m^{3}/day$
- 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.

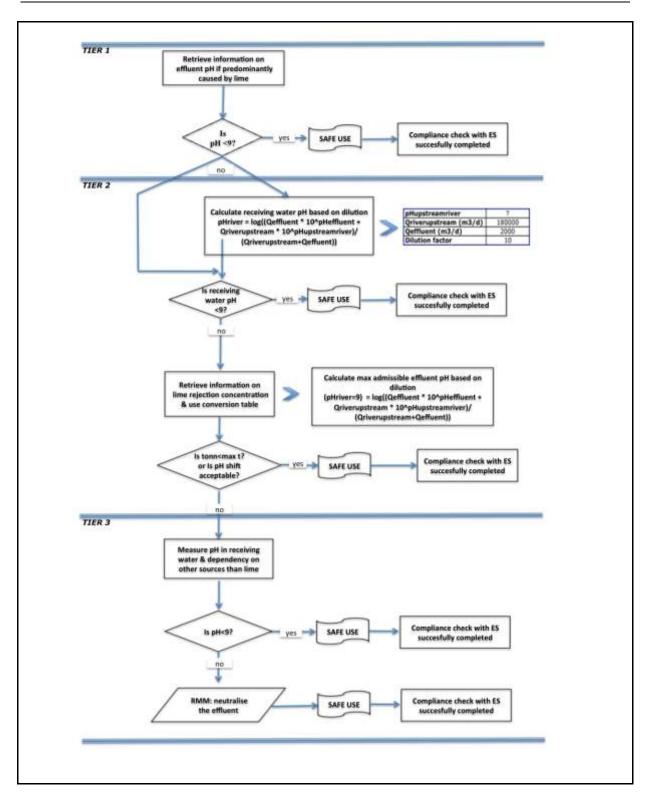
Such equation has to be seen as a worst case scenario, where water conditions are standard and not case specific.

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

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, tasks and/or activities covered are described in Section 2 below.				
Assessment Method	The assessment of inhalation exposure is based on the exposure estimation tool MEASE.				
2. Operational con	ditions and risk mar	nagement measures	5		
PROC/ERC	REACH d	efinition	Involved tasks		
PROC 6	Calendering	operations			
PROC 14	Production of prepar tabletting, compression,	extrusion, pelletisation			
PROC 21	Low energy manipulation materials an	d/or articles			
PROC 22	Potentially closed proc minerals/metals at e Industria	evated temperature I setting	Further information is provided in the ECHA Guidance on information requirements and		
PROC 23	chemical safety assessment, Ch		nent, Chapter R.12: Use		
PROC 24	High (mechanical) energ bound in materia		descriptor system (ECHA-2010-G-05-EN).		
PROC 25	Other hot work operations with metals				
ERC 1-7, 12	Manufacture, formula industri	al uses			
ERC 10, 11	Wide-dispersive outdoor life articles a				
2.1 Control of work	kers exposure				
Product characteristic					
reflected by an assignme ambient temperature the remperature based, takin	approach, the substance- int 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	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	not restricted		massive objects, molten	high	
PROC 24	not restricted		massive objects	high	
All other applicable PROCs	not restricted		massive objects	very low	
Amounts used					

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Frequency and duratio	n of use/exposure			
PROC	Duration of exposure			
PROC 22		≤ 240 r	minutes	
All other applicable PROCs		480 minutes (not restricted)	
Human factors not influ	uenced by risk managem	ent		
The shift breathing volun	ne during all process steps	reflected in the PROCs is	assumed to be 10 m ³ /shift	t (8 hours).
Other given operationa	I conditions affecting wo	rkers exposure		
exposure assessment in temperatures are expect estimation. Thus all proc	acted processes. In process MEASE is however based ed to vary within the indust ess temperatures are auto and measures at process	on the ratio of process ter ry the highest ratio was ta matically covered in this e	mperature and melting poi ken as a worst case assur xposure scenario for PRO	nt. As the associated nption for the exposure
required in the processes				ource) are generally no
Technical conditions a	nd measures to control d	•		
PROC	Level of separation	Localised controls (LC)	Efficiency of LC (according to MEASE)	Further information
PROC 6, 14, 21	Any potentially required separation of workers	not required	na	-
PROC 22, 23, 24, 25	from the emission source is indicated above under "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 measur	es to prevent /limit releas	ses, dispersion and expo	sure	
These measures involve eating and smoking at th	tion. General occupational good personal and housel e workplace, the wearing on hes at end of work shift. Do	keeping practices (i.e. regu of standard working clothes	ular cleaning with suitable s and shoes unless otherw	cleaning devices), no vise 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 22	FFP1 mask	APF=4	Since calcium oxide is classified as irritating to	Eye protection equipment (e.g. goggles or visors) musi 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
resistance and mass of t considered that the work For reasons as given abo the use of RPE), (ii) have hair). The recommended contours of the face prop The employer and self-ed devices and the manage policy for a respiratory pr	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 verly and securely. mployed persons have leg- ment of their correct use in rotective device programmed of different RPE (according	creased thermal stress by s and of communicating ar 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	renclosing the head. In ad re reduced during the weat cially in view of medical pro- tween face and mask (in v t provide the required prot maintenance and issue of ro- they should define and d workers.	dition, it shall be ring of RPE. oblems that may affect iew of scars and facial ection unless they fit the espiratory protective ocument a suitable
2.2 Control of envi	ronmental exposure	•		
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 environmenta
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 su	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	ises 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 ach discharges are expecte aters is required. In general g. through neutralisation). he description of standard an be found in the introduc	ed to cause significant pH of I discharges should be car In general most aquatic or OECD tests with aquatic o	changes. Regular control of ried out such that pH char ganisms can tolerate pH v	of the pH value during nges in receiving surface alues in the range of 6-9
o				
Conditions and measur	res related to waste			

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3. Exposure estima	ation and reference	to its source			
Occupational exposure	1				
is the quotient of the refir demonstrate a safe use. dust) and the respective	ned exposure estimate and For inhalation exposure, th inhalation exposure estima	the respective DNEL (den the RCR is based on the DI ate derived using MEASE (ion exposure. The risk cha rived no-effect level) and h NEL for calcium oxide of 1 (as inhalable dust). Thus, t ne inhalable fraction accord	as to be below 1 to mg/m ³ (as respirable he RCR includes an	
PROC	Method used for inhalation exposure assessment	Inhalation exposure estimate (RCR)	Method used for dermal exposure assessment	Dermal exposure estimate (RCR)	
PROC 6, 14, 21, 22, 23, 24, 25	MEASE	< 1 mg/m³ (0.01 – 0.44)	Since calcium oxide is o skin, dermal exposure ha as technically feasible. A has not been derived. Th not assessed in this	as to be minimised as far DNEL for dermal effects hus, dermal exposure is	
Environmental emissio	ns				
effect and risk assessme discharges, being the tox being addressed, includir when applicable, both for local scale. The high wat water. Significant emissions emissions or exposure to assessment for the aqual related to the OH- discha the surface water pH sho Environmental	nt only deal with the effect icity of Ca2+ is expected to g municipal sewage treatr production and industrial er solubility and very low v ons or exposure to air are r the terrestrial environmen tic environment will therefor inges at the local scale. The uld not increase above 9. The production of calcium calcium oxide concentration	on organisms/ecosystems o be negligible compared ment plants (STPs) or indu- use as any effects that mig apour pressure indicate the not expected due to the low t are not expected either for e only deal with the poss e exposure assessment is noxide can potentially resi- tion and affect the pH in the	d use) mainly apply to (was s due to possible pH chang to the (potential) pH effect. Istrial waste water treatment ght occur would be expected at calcium oxide will be fou w vapour pressure of calcius or this exposure scenario. ible pH changes in STP eff approached by assessing ult in an aquatic emission a e aquatic environment. Wh poxide production sites may	ges related to OH- Only the local scale is nt plants (WWTPs) ed to take place on a und predominantly in um oxide. Significant The exposure fluent and surface water the resulting pH impact: and locally increase the then the pH is not	
emissions Exposure concentration in waste water treatment plant (WWTP)	receiving water. The pH c easily as often required b Waste water from calcium no biological treatment. T normally not be treated in	of effluents is normally mean y national laws. In oxide production is an in Therefore, wastewater stread biological waste water tread	asured very frequently and organic wastewater stream ams from calcium oxide pr eatment plants (WWTPs), b	and therefore there is oduction sites will	
plant (WWTP) control of acid wastewater streams that are treated in biological WWTPs. Exposure 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					
Exposure concentrations in soil and groundwater	The terrestrial compartme be relevant.		exposure scenario, because		
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 organ poisoning is therefore not		lcium oxide: a risk assessr	nent for secondary	

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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_{inhalation}: 1 mg/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/m³. 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 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:

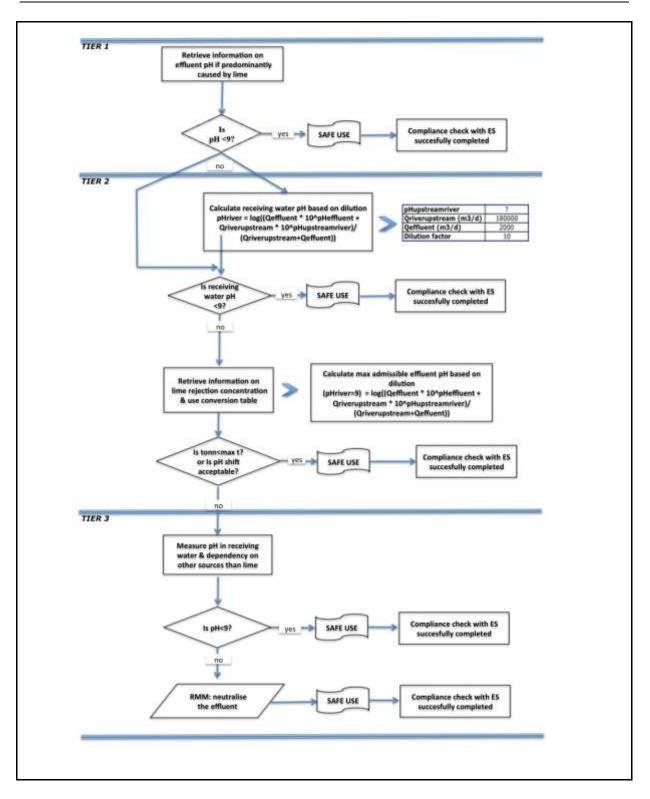
- Q river upstream flows: use the 10th of existing measurements distribution or use default value of 18000 $\rm m^{3}/day$
- Q effluent: use default value of 2000 m³/day
- The upstream pH is preferably a measured value. If not available, one can assume a neutral pH of 7 if this can be justified.
- Such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

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2.1 Control of work	kers 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.				
PROC	Use in preparation	Content in preparation	Physical form	Emission potential
All applicable PROCs	not res	stricted	aqueous solution	very low
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		-
Frequency and duration	n of use/exposure			
PROC		Duration of	f exposure	
PROC 11		≤ 240 n	ninutes	
All other applicable PROCs		480 minutes (i	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 ³ /shift	(8 hours).
	I conditions affecting wo			
	s are not used in hot-met at considered relevant for o			
Technical conditions an	nd measures at process I	ievel (source) to prevent	release	
Risk management measurequired in the processes	ures at the process level	(e.g. containment or segr	egation of the emission s	ource) are generally not
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 conducted processes.	not required	na	-
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.

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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	O ran a la compañía de la	Eye protection equipment (e.g. goggles or visors) must 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
	mployed persons have leg		naintenance and issue of re	
devices and the manage policy for a respiratory p An overview of the APFs 2.2 Control of envi Product characteristics	rotective device programm of different RPE (accordin ironmental exposure s se estimate based on data i Quan	e including training of the vag to BS EN 529:2005) car a - only relevant for from dust measurements in tity of dust m3 (in mg) a - only relevant for b - only r	a be found in the glossary of agricultural soil pro	of MEASE. ptection stance from application)
devices and the manage policy for a respiratory p An overview of the APFs 2.2 Control of envi Product characteristics	rotective device programm of different RPE (accordin ironmental exposure se estimate based on data to Quan per 120 100 80 60 40	e including training of the vag to BS EN 529:2005) car a - only relevant for from dust measurements in tity of dust m3 (in mg) 3 7 11	Wind speed: Wind speed: - 3.5 m/s - 3.5 m/s	of MEASE. ptection stance from application)
devices and the manage policy for a respiratory p An overview of the APFs 2.2 Control of envi Product characteristics Drift: 1% (very worst-cas	rotective device programm of different RPE (accordin fronmental exposure se estimate based on data f Quan per 120 100 80 60 40 20 0 1	e including training of the vag to BS EN 529:2005) car a - only relevant for 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	of MEASE. ptection stance from application)
devices and the manage policy for a respiratory p An overview of the APFs 2.2 Control of envi Product characteristics	rotective device programm of different RPE (accordin fronmental exposure se estimate based on data f Quan per 120 100 80 60 40 20 0 1	e including training of the vag to BS EN 529:2005) car a - only relevant for from dust measurements in tity of dust m3 (in mg) 3 7 11 ken from: Laudet, A. et al.,	Wind speed: Wind speed: - 3.5 m/s - 6 m/s - 3.5 m/s	of MEASE. ptection stance from application)

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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.

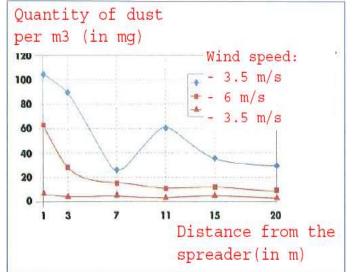
Organizational measures to prevent/limit release from site

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)



(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 (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.

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, 12, 13, 15, 16, 17, 18, 19	MEASE	< 1 mg/m³ (<0.001 – 0.6)	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 soil, calcium oxide can indeed migrate then towards surface waters, via drift.

the soil, calcium oxide ca	in indeed migrate then tow	ards surface waters, via dr	rift.		
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 volatile. The vapour pressures is below 10 ⁻⁵ Pa.				
Exposure concentration relevant for the food chain (secondary poisoning)		because calcium oxides ca uses covered do not signifi rironment.			

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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 ground water 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 drifts can be improved a	coording 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	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.	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 ²⁺ and OH ⁻) in the environment.					
Environmental exposur	Environmental exposure for other uses					
 The operational 	antitative environmental ex al conditions and risk man rban soil treatment			tlined for agricultural soil		

 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 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_{inhalation}: 1 mg/m³ (as respirable dust)

<u>Important note</u>: 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/m³. 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 ou	ut by workers		
1. Title				
Free short title	Professional uses of low 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		
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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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	Use in preparation	Content in preparation	Physical form	Emission potential		
PROC 25	not res	not restricted solid/powder, high				
All other applicable PROCs	not res	tricted	solid/powder	low		
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				
Frequency and duration	n of use/exposure					
PROC		Duration o	f exposure			
PROC 17		≤ 240 r	minutes			
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 ³ /shift	: (8 hours).		
Other given operationa	I conditions affecting wo	rkers exposure				
assessment of the conductive exposure assessment in temperatures are expected.	te process temperature and acted processes. In process MEASE is however based ad to vary within the indust ass temperatures are autor	s steps with considerably h on the ratio of process ter ry the highest ratio was ta	high temperatures (i.e. PR mperature and melting poin ken as a worst case assun	OC 22, 23, 25), the nt. As the associated nption for the exposure		
Technical conditions a	nd measures at process l	evel (source) to prevent	release			
Risk management measurequired in the processes	ures at the process level (e s.	.g. containment or segreg	ation of the emission source	ce) are generally not		
Technical conditions and	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 not applicable na - above under "Frequency and duration of exposure".					
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 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) 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.

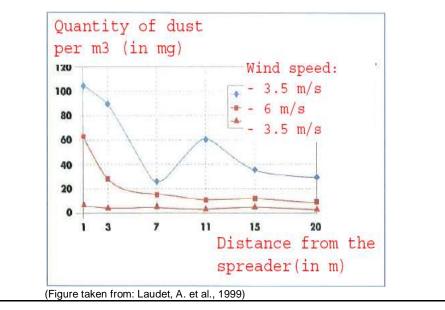
Any RPE as defined above shall only be worn if the following principles are implemented in parallel: The duration of work (compare with "duration of exposure" above) should reflect the additional physiological stress for the worker due to the breathing resistance and mass of the RPE itself, due to the 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 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	n of use
1 day/year (one applicati kg/ha is not exceeded (C	on per year) Multiple applications during the year are allowed, provided the total yearly amount of 1,700 caO)
Environment factors no	ot influenced by risk management
Volume of surface water: Field surface area: 1 ha	: 300 L/m ²
Other given operationa	I conditions affecting environmental exposure
Outdoor use of products Soil mixing depth: 20 cm	
Technical conditions a	nd measures at process level (source) to prevent release
There are no direct relea	ses to adjacent surface waters.
Technical conditions a	nd measures to reduce or limit discharges, air emissions and releases to soil
Drift should be minimised	1.
Organizational measure	es to prevent/limit release from site
	ents for good agricultural practice, agricultural soil should be analysed prior to application of lime and Id be adjusted according to the results of the analysis.
2.2 Control of envi	ronmental exposure – only relevant for urban soil treatment
Product characteristics	;
	Quantity of dust per m3 (in mg) Wind speed: - 3.5 m/s - 6 m/s - 3.5 m/s - 3.5 m/s - 3.5 m/s - 3.5 m/s - 3.5 m/s - 0 Distance from the spreader (in m)
Amounts used	(Figure taken from: Laudet, A. et al., 1999)
CaO	180,000 kg/ha
Frequency and duration	L nof use
	ce in a lifetime. Multiple applications during the year are allowed, provided the total yearly amount of
Environment factors no	ot influenced by risk management
Field surface area: 1 ha	

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	Less Relation and a set of the second	An example the second second		
· · ·	I conditions affecting en	vironmental exposure		
Outdoor use of products Soil mixing depth: 20 cm				
Technical conditions an	nd measures at process	level (source) to prevent	release	
Lime is only applied onto surface waters.	the soil in the technosphe	re zone before road const	ruction. There are no direc	t releases to adjacent
Technical onsite condit	tions and measures to re	duce or limit discharges	, air emissions and relea	ses to soil
Drift should be minimised	d.			
3. Exposure estimation	ation and reference	to its source		
Occupational exposure	•			
is the quotient of the refir demonstrate a safe use. dust) and the respective	ned exposure estimate and For inhalation exposure, th inhalation exposure estima	I the respective DNEL (den the RCR is based on the DI ate derived using MEASE (ion exposure. The risk cha rived no-effect level) and h NEL for calcium oxide of 1 (as inhalable dust). Thus, t ne inhalable fraction accord	as to be below 1 to mg/m ³ (as respirable he RCR includes an
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, 21, 25, 26	MEASE	< 1 mg/m³ (0.01 – 0.75)	Since calcium oxide is o skin, dermal exposure ha as technically feasible. A has not been derived. Th not assessed in this	as to be minimised as far DNEL for dermal effects hus, dermal exposure is
Environmental exposur	e for agricultural soil pro	otection		
on the calculation of prec surface water and sedim more appropriate for agri modelling. FOCUS is a n German EXPOSIT 1.0 m the soil, calcium oxide ca	dicted environmental conce ent (Kloskowksi et al., 199 cultural-like application as nodel typically developed for	entration values (PEC) of p 9). The FOCUS/EXPOSIT in this case where parameter or biocidal applications and uch as drifts can be improv	I group (FOCUS, 1996) and lant protection products fo modelling tool is preferred eter as the drift needs to be d was further elaborated or red according to collected or rift.	r soil, ground water, to the EUSES as it is e included in the n the basis of the
Environmental emissions	See amounts used			
Exposure concentration in waste water treatment plant (WWTP)	Not relevant for agricultur			
Exposure concentration in	Substance	PEC (ug/L)	PNEC (ug/L)	RCR
aquatic pelagic compartment	CaO	5.66	370	0.015
Exposure concentration in sediments	natural waters the hydrox reacting with Ca2+. The c	ide ions react with HCO3-		CO32- forms CaCO3 by ediment. Calcium
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	tile. The vapour pressures	is below 10 ⁻⁵ Pa.
Exposure concentration relevant for the food chain (secondary poisoning)	This point is not relevant environment. The uses co and OH') in the environm	overed do not significantly	onsidered to be omniprese influence the distribution o	ent and essential in the f the constituents (Ca ²⁺

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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 ground water 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 drifts can be improved a	coording to collected data.		
Environmental emissions	See amounts used			
Exposure concentration in waste water treatment plant (WWTP)	Not relevant for road bord	ler scenario		
Exposure concentration in aquatic pelagic compartment	Not relevant for road bord	ler scenario		
Exposure concentration in sediments	Not relevant for road bord	ler 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 volati	ile. The vapour pressures	is below 10 ^{−5} Pa.
Exposure concentration relevant for the food chain (secondary poisoning)		because calcium can be co overed do not significantly ent.		
Environmental exposur	re for other uses			
 The operational 	antitative environmental ex al conditions and risk man rban soil treatment			tlined for agricultural soil

 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 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_{inhalation}: 1 mg/m³ (as respirable dust)

<u>Important note</u>: 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/m³. 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	Format (1) addressing uses carried ou	ut by workers
1. Title		
Free short title	Professional uses of medium dusty	solids/powders of lime substances
Systematic title based on use descriptor	SU23, PC1, PC2, PC3, PC7, PC8, PC9a, PC9b, PC11, PC19, PC20, PC21, PC23, PC24, PC25, PC26, PC34, PC35, PC36, AC1, AC2, AC3, AC4, AC5, AC6	1, SU12, SU13, SU16, SU17, SU18, SU19, SU20, , SU24 PC12, PC13, PC14, PC15, PC16, PC17, PC18, PC27, PC28, PC29, PC30, PC31, PC32, PC33, , PC37, PC39, PC40 S, AC7, AC8, AC10, AC11, AC13 s 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	6
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 FOUA
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	cers exposure			
Product characteristic				
reflected by an assignme ambient temperature the temperature based, takin	approach, the substance- nt of a so-called fugacity of fugacity is based on the d g into account the process on the level of abrasion ir	lass in the MEASE tool. Foustiness 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
PROC	Use in preparation	Content in preparation	Physical form	Emission potential
PROC 25	not res	tricted	solid/powder, molten	high
All other applicable PROCs	not res	tricted	solid/powder	medium
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		
Frequency and duration	n of use/exposure			
PROC		Duration o	f exposure	
PROC 11, 16, 17, 18, 19		≤ 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 ³ /shift	t (8 hours).
Other given operational	l conditions affecting wo	rkers exposure		
assessment of the conduction exposure assessment in temperatures are expected	e process temperature an cted processes. In process MEASE is however based ed to vary within the indust ass temperatures are auto	s steps with considerably h on the ratio of process ter ry the highest ratio was tal	high temperatures (i.e. PR nperature and melting poi ken as a worst case assum	OC 22, 23, 25), the nt. As the associated nption for the exposure
Technical conditions an	nd measures at process	level (source) to prevent	release	
Risk management meas required in the processes	ures at the process level	(e.g. containment or segr	regation of the emission s	ource) are generally not
	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 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". A reduction of exposure	not applicable	na	-
All other applicable PROCs	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		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
PROC 11	FFP1 mask	APF=10	Since calcium oxide is	potential contact with
PROC 15	not required	na	classified as irritating to skin, the use of protective gloves is mandatory for all process steps.	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.

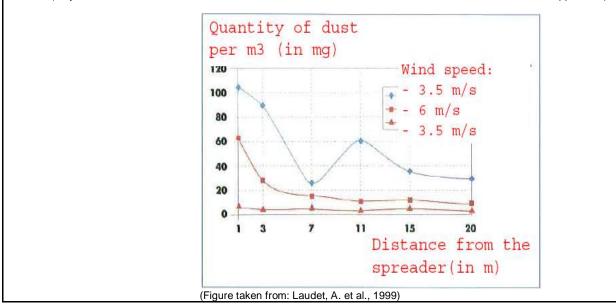
The employer and self-employed persons have legal responsibilities for the maintenance and issue of respiratory protective devices and the management of their correct use in the workplace. Therefore, they should define and document a suitable policy for a respiratory protective device programme including 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 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) kg/ha is not exceeded (CaO)	Multiple applications during the year are allowed, provided the total yearly amount of 1,700
Environment factors not influenced	by risk management
Volume of surface water: 300 L/m ² 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 adjace	nt 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
	agricultural practice, agricultural soil should be analysed prior to application of lime and a according to the results of the analysis.
2.2 Control of environmental	exposure – only relevant for urban soil treatment
Product characteristics	
	sed on data from dust measurements in air as a function of the distance from application) Quantity of dust per m3 (in mg) ¹²⁰ ¹²¹ ¹²¹ ¹²⁵ ¹²⁰ ¹²¹ ¹²¹ ¹²⁵ ²⁰ ¹²¹ ¹²⁵ ¹²⁰ ¹²¹ ¹²⁵ ¹²⁰ ¹²¹ ¹²¹ ¹²⁵ ¹²⁰ ¹²¹ ¹²¹ ¹²⁵ ¹²⁰ ¹²¹ ¹²¹ ¹²⁵ ¹²⁰ ¹²¹ ¹²¹ ¹²⁵ ¹²⁰ ¹²¹ ¹²¹ ¹²⁵ ¹²⁰ ¹²¹ ¹²⁵ ¹²⁰ ¹²¹ ¹²⁵ ¹²⁰ ¹²¹ ¹²⁵ ¹²⁰ ¹²¹ ¹²⁵ ¹²⁰ ¹²¹ ¹²⁵ ¹²⁰ ¹²¹ ¹²⁵ ¹²⁰ ¹²¹ ¹²⁵ ¹²⁰ ¹²¹ ¹²⁵ ¹²⁰ ¹²⁵
Amounts used	
CaO	180,000 kg/ha
Frequency and duration of use	
	e. Multiple applications during the year are allowed, provided the total yearly amount of
Environment factors not influenced	by risk management
Field surface area: 1 ha	

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Other given operationa	I conditions affecting env	vironmental exposure		
Outdoor use of products Soil mixing depth: 20 cm				
Technical conditions and	nd measures at process	level (source) to prevent	release	
Lime is only applied onto surface waters.	the soil in the technosphe	re zone before road const	ruction. There are no direc	t releases to adjacent
Technical onsite condit	ions and measures to re	duce or limit discharges	, air emissions and relea	ses to soil
Drift should be minimised	1.			
3. Exposure estimation	ation and reference	to its source		
Occupational exposure	1			
is the quotient of the refir demonstrate a safe use. dust) and the respective	tool MEASE was used for ned exposure estimate and For inhalation exposure, th inhalation exposure estima since the respirable fraction	I the respective DNEL (den the RCR is based on the Di ate derived using MEASE (rived no-effect level) and h NEL for calcium oxide of 1 (as inhalable dust). Thus, t	as to be below 1 to mg/m ³ (as respirable he RCR includes an
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)	Since calcium oxide is o skin, dermal exposure ha as technically feasible. A has not been derived. T not assessed in this	DNEL for dermal effects hus, dermal exposure is
Environmental exposur	e for agricultural soil pro	otection		
surface water and sedim more appropriate for agri modelling. FOCUS is a n German EXPOSIT 1.0 m the soil, calcium oxide ca Environmental	licted environmental conce ent (Kloskowksi et al., 1999 cultural-like application as nodel typically developed fo odel, where parameters su in indeed migrate then tow See amounts used	9). The FOCUS/EXPÓSIT in this case where parameter or biocidal applications and uch as drifts can be improving the proving the parameter of the proving the proving the parameter of the proving the proving the parameter of the proving the parameter of the par	modelling tool is preferred eter as the drift needs to be d was further elaborated of red according to collected of	I to the EUSES as it is e included in the n the basis of the
emissions 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	natural waters the hydrox reacting with Ca2+. The c	ide ions react with HCO3-	nor sediment to lime is exp to form water and CO32 ates and deposits on the s atural soils.	CO32- forms CaCO3 by
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 vola	tile. The vapour pressures	is below 10 ⁻⁵ 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 ground water 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 drifts can be improved a	iccording to collected data.		
Environmental emissions	See amounts used			
Exposure concentration in waste water treatment plant (WWTP)	Not relevant for road bord	der scenario		
Exposure concentration in aquatic pelagic compartment	Not relevant for road bord	der scenario		
Exposure concentration in sediments	Not relevant for road bord	der 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 volat	ile. The vapour pressures is	s below 10 ⁻⁵ Pa.
Exposure concentration relevant for the food chain (secondary poisoning)	This point is not relevant environment. The uses co and OH ⁻) in the environm	overed do not significantly	onsidered to be omniprese influence the distribution of	nt and essential in the the constituents (Ca ²⁺
Environmental exposur	e for other uses			
 The operational 		posure assessment is carr agement measures are les	ied because ss stringent than those outl	ined for agricultural soil

protection or urban soil treatment
Lime is an ingredient and chemically bound into a matrix. Releases are negligible and insufficient to cause a pH-shift

 Entre is an ingredient and chemically bound into a matrix. Releases are negligible and insumclent to cause a pre-shint in soil, wastewater or surface water
 Lime is pre-silically word to release CO2 free breathable siz upon releases are negligible and insumclent to cause a pre-shint

• 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 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_{inhalation}: 1 mg/m³ (as respirable dust)

<u>Important note</u>: 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/m³. 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

Exposure Scenario	Format (1) addressing uses carried ou	ut by workers
1. Title		
Free short title	Professional uses of high dusty s	olids/powders of lime substances
Systematic title based on use descriptor	SU23, PC1, PC2, PC3, PC7, PC8, PC9a, PC9b, PC11, PC19, PC20, PC21, PC23, PC24, PC25, PC26, PC34, PC35, PC36, AC1, AC2, AC3, AC4, AC5, AC6	1, SU12, SU13, SU16, SU17, SU18, SU19, SU20, , SU24 , PC12, PC13, PC14, PC15, PC16, PC17, PC18, PC27, PC28, PC29, PC30, PC31, PC32, PC33, , PC37, PC39, PC40 S, AC7, AC8, AC10, AC11, AC13 s 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	6
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
PROC 10	Roller application or brushing	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	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. Found 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	Use in preparation	Content in preparation	Physical form	Emission potential
All applicable PROCs	not res	stricted	solid/powder	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		
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 ³ /shift	: (8 hours).
Other given operational	I conditions affecting wo	rkers exposure		
assessment of the condu exposure assessment in temperatures are expected	te process temperature an inted processes. In process MEASE is however based ed to vary within the indust ess temperatures are autor	s steps with considerably h on the ratio of process ter ry the highest ratio was ta	nigh temperatures (i.e. PR mperature and melting poin ken as a worst case assun	OC 22, 23, 25), the nt. As the associated nption for the exposure
Technical conditions an	nd measures at process	level (source) to prevent	release	
Risk management measurequired in the processes	ures at the process level (e s.	e.g. containment or segreg	ation of the emission source	ce) are generally not
Technical conditions an	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 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 "Freguency and	integrated local exhaust ventilation	87 %	-
PROC 19	duration of exposure". A reduction of exposure duration can be	not applicable	na	only in well ventilated rooms or outdoors (efficiency 50 %)-
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.	not required	na	-
Organisational measure	es to prevent /limit releas	ses, dispersion and expo	sure	
These measures involve eating and smoking at the	tion. General occupational good personal and housel e workplace, the wearing c nes at end of work shift. Do	keeping practices (i.e. regulation of standard working clothes	ular cleaning with suitable of and shoes unless otherw	cleaning devices), no ise stated below.

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PROC 11, 17, 18, 19 FFP3 mask APF=20 Since calcium oxide is classified as initiating PROC 25 FFP2 mask APF=10 Since calcium oxide is classified as initiating skin, the use of protective gloves is process steps. General process steps. All other applicable PROCs FFP2 mask APF=10 Since calcium oxide is indicatory for all process steps. 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 breath esistance 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 worker due to the breath esistance 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 wavering of RPE. To reasons as given above, the worker should therefore be () healthy (especially in view of scars and facia and). The recommended devices above which rely on a tight face seal will not provide the required protection unless they fit to onto and self-employed persons have legal responsibilities for the waintenance 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. 2.2 Control of environmental exposure – only relevant for agricultural soil protect	PROC	Specification of respiratory protective equipment (RPE)	RPE efficiency (assigned protection factor, APF)	Specification of gloves	Further personal protective equipment (PPE)
PROC 11, 17, 18, 19 FFP3 mask APF=20 Since calcium oxide is Since calcium oxide is gagslies or visors) m PROC 25 FFP2 mask APF=10 Since calcium oxide is protective gloves is All other applicable FFP2 mask APF=10 Since calcium oxide is protective gloves is protective gloves is madatory for all protection, protection of exposure "above) should reflect the additional physiological stress for the worker due to the breatt esistance and mass of the RPE itself, due to the increased 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 the possibilities for the maintenance and issue of respiratory protective device programme including training of the workers. and RPE is all, due to group and securely. The employer and sel-employed persons have legal responsibilities for the maintenance and issue of respiratory protective device programme including training of the workers. and the Areproperi	PROC 9, 26	FFP1 mask	APF=4		
PROC 25 FFP2 mask APF=10 Since calcium oxide is irritating of askin, the use of protective gloves is madatory for all process steps. protentive gloves is madatory for all process steps. protective gloves is madatory for all process steps. Arr fees of different RPE (accordin	PROC 11, 17, 18, 19	FFP3 mask	APF=20		goggles or visors) mus
All other applicable RCOCs FFP2 mask FFF2 mas	PROC 25	FFP2 mask	APF=10		potential contact with
compare with "duration of exposure" above) should reflect the additional physiological stress for the worker due to the breath esistance 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 affec he use of RPE). (iii) have suitable facial characteristics reducing leaving see which rely on a tight face seal will not provide the required protection unless they fit is contours of the face properly and securely. The employer and self-employed persons have legal responsibilities for the maintenance and issue of respiratory protective favices and the management of their correct use in the workplace. Therefore, they should define and document a suitable facial corrective device programme including training of the workers. 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 of the distance from application of the distance from application of the distance from the spreader (in m). Figure taken from: Laudet, A. et al., 1999)	All other applicable PROCs			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
Distance from the spreader(in m) (Figure taken from: Laudet, A. et al., 1999)	contours of the face prop The employer and self-e devices and the manage policy for a respiratory pl	perly and securely. Imployed persons have legement of their correct use in rotective device programment	al responsibilities for the m n the workplace. Therefore e including training of the v	naintenance and issue of re they should define and d workers.	espiratory protective ocument a suitable
(Figure taken from: Laudet, A. et al., 1999)	2.2 Control of envi Product characteristics	e estimate based on data f Quan per 1 120 100 80 60 40	from dust measurements in tity of dust	Wind speed: - 3.5 m/s - 6 m/s	otection
	2.2 Control of envi Product characteristics	e estimate based on data f Quan per 1 120 100 80 60 40	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	stance from application)
	2.2 Control of envi Product characteristics	s s se estimate based on data f 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 - 3.5 m/s Distance from spreader (in m	the
CaO 1,700 kg/ha	2.2 Control of envi Product characteristics	s s se estimate based on data f 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 - 3.5 m/s Distance from spreader (in m	stance from application

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Environment factors not influenced by risk management

Volume of surface water: 300 L/m2 Field surface area: 1 ha

Tield Sulface alea. Tha

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.

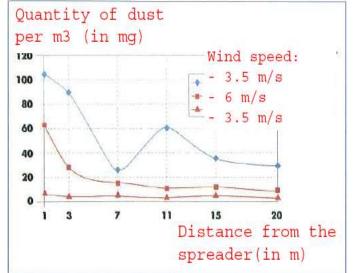
Organizational measures to prevent/limit release from site

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

chain (secondary

poisoning)

and OH⁻) in the environment.

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.

additional safety margins	since the respirable fractio	The being a sub-maction of the		
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 (0.5 – 0.825)	Since calcium oxide is skin, dermal exposure ha as technically feasible. A has not been derived. T not assessed in this	as to be minimised as far DNEL for dermal effects hus, dermal exposure is
Environmental exposur	e for agricultural soil pro	otection		
on the calculation of pred surface water and sedime more appropriate for agri modelling. FOCUS is a m German EXPOSIT 1.0 m the soil, calcium oxide ca	soil and surface water was licted environmental conce ent (Kloskowksi et al., 199 cultural-like application as nodel typically developed fo odel, where parameters su in indeed migrate then tow	entration values (PEC) of p 9). The FOCUS/EXPOSIT in this case where parameter or biocidal applications and ich as drifts can be improv	Nant protection products for modelling tool is preferred eter as the drift needs to be d was further elaborated of red according to collected	r soil, ground water, I to the EUSES as it is e included in the n the basis of the
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 ⁻⁵ Pa.			
Exposure concentration relevant for the food			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 drifts can be improved a	ccording 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	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 ²⁺ and OH ⁻) in the environment.			
Environmental exposure for other uses				
 The operation 	antitative environmental ex al conditions and risk man rban soil treatment	•		tlined for agricultural soil

 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.

prepared in accordance with Annex II of the REACH Regulation EC 1907/2006, Regulation (EC) 1272/2008 and Regulation (EC) 453/2010

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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 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_{inhalation}: 1 mg/m³ (as respirable dust)

<u>Important note</u>: 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/m³. 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

Exposure occurant	o Format (1) address	any uses carried of		
1. Title				
Free short title	Professional use of lime substances in soil treatment			
Systematic title based on use descriptor	SU22 (appropriate PROCs and ERCs are given in Section 2 below)			elow)
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	efinition	Involve	ed tasks
Milling	PRO)C 5		
Loading of spreader	PROC 8b,	PROC 26		f calcium oxides for soil ment.
Application to soil (spreading)	PRO	C 11	- treatment.	
ERC2, ERC8a, ERC8b, ERC8c, ERC8d, ERC8e, ERC8f	Wide dispersive indoc reactive substances or p syste	processing aids in open	Calcium oxide is applied in numerous cases wide dispersive uses: agricultural, forestry, fi and shrimps farming, soil treatment and environmental protection.	
2.1 Control of work	ters exposure			
2.1 Control of work Product characteristic				
Product characteristic According to the MEASE 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 on the level of abrasion in	lass in the MEASE tool. For ustiness of that substance temperature and the melt stead of the substance int	or operations conducted v Whereas in hot metal op ing point of the substance	vith solid substances at erations, fugacity is
Product characteristic According to the MEASE reflected by an assignme ambient temperature the temperature based, takin abrasive tasks are based	approach, the substance- ent 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 v Whereas in hot metal op ing point of the substance	vith solid substances at erations, fugacity is
Product characteristic According to the MEASE reflected by an assignme ambient temperature the temperature based, takin abrasive tasks are based Task	approach, the substance- ent 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. Fustiness of that substance temperature and the melt stead of the substance int Content in preparation	or operations conducted v Whereas in hot metal op ing point of the substance rinsic emission potential.	vith solid substances at erations, fugacity is e. As a third group, high
Product characteristic According to the MEASE reflected by an assignme ambient temperature the temperature based, takin abrasive tasks are based Task Milling Loading of spreader	approach, the substance- ent 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 stead of the substance int Content in preparation tricted	or operations conducted v Whereas in hot metal op ing point of the substance rinsic emission potential. Physical form	vith solid substances at erations, fugacity is As a third group, high Emission potential
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Product characteristic 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	approach, the substance-i ent 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 not res	lass in the MEASE tool. Fustiness of that substance temperature and the melt stead of the substance int Content in preparation tricted tricted tricted tricted tricted to influence the expos professional) and level of	or operations conducted v Whereas in hot metal op ing point of the substance rinsic emission potential. Physical form solid/powder solid/powder solid/powder	vith solid substances at erations, fugacity is e. As a third group, high Emission potential high high high rio. Instead, the
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Product characteristic 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 deter Frequency and duration Task Milling Loading of spreader Application to soil (spreading)	approach, the substance- ent of a so-called fugacity of fugacity is based on the du 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 consider of operation (industrial vs. minant of the process intrin	lass in the MEASE tool. F- ustiness of that substance temperature and the melt stead of the substance int Content in preparation tricted tricted tricted tricted tricted tricted Duration o 240 m 240 m	or operations conducted v Whereas in hot metal op ing point of the substance rinsic emission potential. Physical form solid/powder solid/powder solid/powder ure as such for this scena containment/automation (f exposure inutes	vith solid substances at erations, fugacity is e. As a third group, high Emission potential high high high rio. Instead, the

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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

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	Since calcium oxide is classified as irritating to skin, the use of protective gloves is mandatory for all process steps.	equipment (e goggles or visors be worn, unle	Eye protection equipment (e.g. goggles or visors) must be worn, unless
Loading of spreader	FFP3 mask	APF=20		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		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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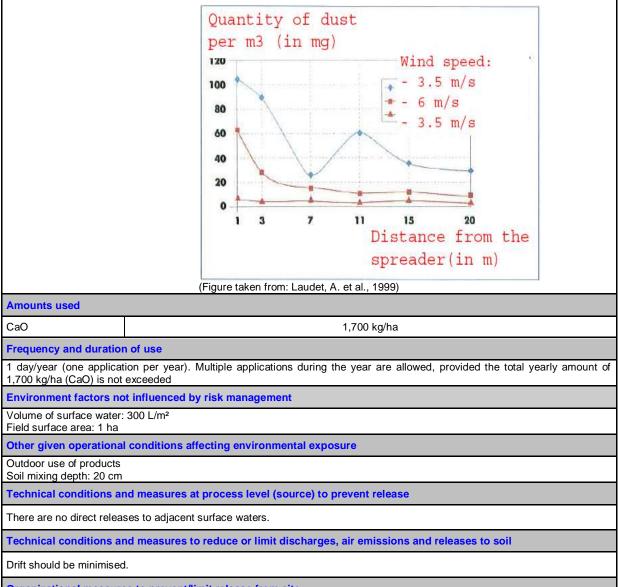
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2.2 Control of environmental exposure – only relevant for agricultural soil protection

Product characteristics

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



Organizational measures to prevent/limit release from site

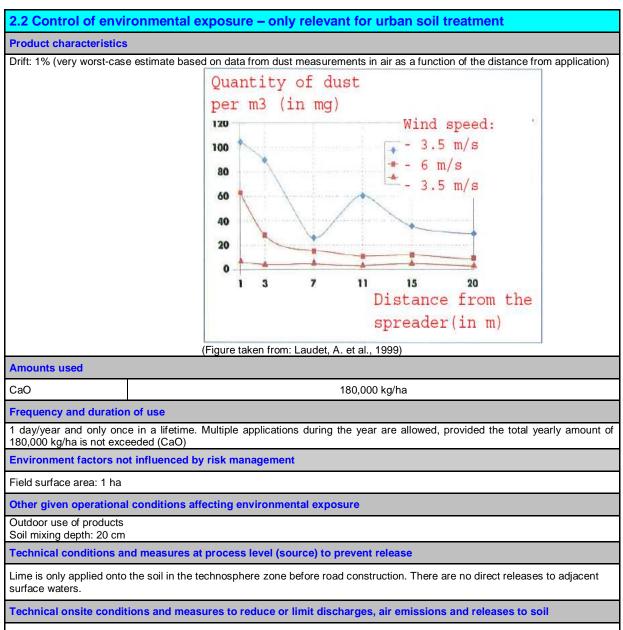
In line with the requirements for good agricultural practice, agricultural soil should be analysed prior to application of lime and the application rate should be adjusted according to the results of the analysis.

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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/m³ (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)	Since calcium oxide is classified as irritating skin, dermal exposure has to be minimised as as technically feasible. A DNEL for dermal eff	
Loading of spreader	MEASE (PROC 8b)	0.488 mg/m³ (0.48)		
Application to soil (spreading)	measured data	0.880 mg/m³ (0.88)		
	measured data	0.880 mg/m³ (0.88)	has not been derived. Thus, dermal expos not assessed in this exposure scenari	

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 soil, calcium oxide ca	in indeed migrate them tow	aius suitace waleis, via ui				
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 ⁻⁵ Pa.					
Exposure concentration relevant for the food chain (secondary poisoning)		because calcium can be co overed do not significantly ent.				

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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 drifts can be improved a	coording to collected data	l.		
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	Substance	Substance PEC (mg/L) PNEC (mg/L) RC			
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 i	s below 10 ⁻⁵ Pa.	
Exposure concentration relevant for the food chain (secondary poisoning)					
Environmental exposur	Environmental exposure for other uses				
 For all other uses, no quantitative environmental exposure assessment is carried because The operational conditions and risk management measures are less stringent than those outlined for agricultural soil protection or urban soil treatment 					

• 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 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_{inhalation}: 1 mg/m³ (as respirable dust)

<u>Important note</u>: 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/m³. 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 9.11: Professional uses of articles/containers containing lime substances

1. Title						
Free short title	Professional uses of articles/containers containing lime substances					
	SU22, SU1, SU5, SU6a		1, SU12, SU13, SU16, SU	17, SU18, SU19, SU20,		
Systematic title based on use descriptor	AC1, A (app	SU23, AC2, AC3, AC4, AC5, AC6 ropriate PROCs and ERC3	SO24 5, AC7, AC8, AC10, AC11, s are given in Section 2 be	AC13 elow)		
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	nation tool MEASE.		
2. Operational con	ditions and risk mar	nagement measures	5			
PROC/ERC	REACH o	lefinition	Involve	d tasks		
PROC 0	Other p (PROC 21 (low emission) exposure e	n potential) as proxy for estimation)	oxide/preparations as breathing	containing calcium CO ₂ absorbents (e.g. apparatus)		
PROC 21	Low energy manipulation materials an		Handling of substances I arti	oound in materials and/o cles		
PROC 24	High (mechanical) energ bound in materia	y work-up of substances		hanical cutting		
PROC 25	Other hot work ope	rations with metals	Welding, soldering Calcium oxide bound into or onto articles and			
ERC10, ERC11, ERC 12	Wide dispersive indoor a life articles and mater	0	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- ent 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. Fustiness of that substance temperature and the melt stead of the substance interesting the substance into the substance intot the substance into the substance	or operations conducted w . Whereas in hot metal op ing point of the substance	vith 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 assumptio 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						

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PROC			Duration o	f exposure				
PROC 0	480 minutes (not restricted as far as occupational exposure to calcium oxide is concerned, the actual wearing duration may be restricted due the user instructions of the actual breathing apparatus)							
PROC 21			480 minutes (not restricted)				
PROC 24, 25			≤ 240 r	ninutes				
Human factors not infl	uenced by risk managem	ent						
The shift breathing volur	ne during all process steps	reflected in	n the PROCs is	assumed to be 10 m3/shift	t (8 hours).			
Other given operationa	I conditions affecting wo	rkers expo	osure					
assessment of the conductive exposure assessment in temperatures are expected.	ke process temperature an ucted processes. In process MEASE is however based ted to vary within the indust tess temperatures are autor	s steps with on the rati ry the high	n considerably h o of process ten est ratio was ta	high temperatures (i.e. PR mperature and melting poin ken as a worst case assum	OC 22, 23, 25), the nt. As the associated nption for the exposure			
Technical conditions a	nd measures at process	level (sour	ce) to prevent	release				
	ures at the process level (e	.g. contain	ment or segreg	ation of the emission sour	ce) are generally not			
required in the processe	nd measures to control d	ispersion	from source to	owards the worker				
PROC	Level of separati		Localised controls (LC)	Efficiency of LC (according to MEASE)	Further informatior			
PROC 0, 21, 24, 25	Any potentially required separation of workers from the emission source is indicated above under "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.		not required	na	-			
	es to prevent /limit releas							
These measures involve eating and smoking at th Shower and change clot compressed air.	tion. General occupational good personal and house he workplace, the wearing of hes at end of work shift. Do res related to personal pr	deeping pra f standard o not wear d otection, I	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 ise stated below. ow dust off with			
PROC	Specification of respiratory protective equipment (RPE)	(assigne	efficiency ed protection or, APF)	Specification of gloves	Further personal protective equipmen (PPE)			
PROC 0, 21	not required		na		Eye protection equipment (e.g. goggles or visors) mu be worn, unless			
PROC 24, 25	FFP1 mask AF		PF=4	Since calcium oxide is classified as irritating to skin, the use of protective gloves is mandatory for all process steps.	potential contact with the eye can be excluded by the natu and type of applicatio (i.e. closed process) Additionally, face protection, protectiv, clothing and safety			

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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

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/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.

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 skin, dermal exposure has to be minimised a as technically feasible. A DNEL for dermal eff has not been derived. Thus, dermal exposur not assessed in this exposure scenario.	
PROC 21	MEASE	0.05 mg/m ³ (0.05)		
PROC 24	MEASE	0.825 mg/m ³ (0.825)		
PROC 25	MEASE	0.6 mg/m ³ (0.6)		

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 E

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_{inhalation}: 1 mg/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/m³. 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) addi	ressing	uses carried out by	, consum	ers	
1. Title							
Free short title			Consur	mer use of building and	constructio	n material	
Systematic title based descriptor	on use		SU21,	PC9a, PC9b, ERC8c, E	RC8d, ERC	8e, ERC8f	
Processes, tasks acti	vities co	overed		ng (mixing and filling) of ation of liquid, pasty lime			
Assessment Method*			Human A quali as expo Dutch r	health:	been perforr tion exposu 992).	med for oral and d re to dust has bee	
2. Operational col	ndition	is and r					
RMM				ated risk management r		e in place	
PC/ERC			on of ac	tivity referring to artic			ironmental release
PC 9a, 9b		Mixing an Application Post-appl	d loading on of lime ication e	g of powder containing plaster, putty or slurry xposure.	to the walls	or ceiling.	
ERC 8c, 8d, 8e, 8f Wide disp Wide disp			ersive o ersive o ersive o	Idoor use resulting in in utdoor use of processin utdoor use of reactive s utdoor use resulting in i	g aids in op ubstances i	en systems n open systems	
2.1 Control of cor	isume	rs expos	sure				
Product characteristic	;						
Description of the preparation	subst	entration ance in th		Physical state of the preparation	Dustine	ss (if relevant)	Packaging design
Lime substance	100 %	ration		Solid, powder	Ligh me	edium and low,	Bulk in bags of up to
Plaster, Mortar	20-40			Solid, powder	dependir lime sub (indicativ	ng on the kind of stance ve value from sheet see	35 kg.
Plaster, Mortar	20-40	%		Pasty	-		-
Putty, filler	30-55			Pasty, highly viscous, thick liquid	-		In tubes or buckets
Pre-mixed lime wash paint	~30%			Solid, powder		ve value from sheet see	Bulk in bags of up to 35 kg.
Lime wash paint/milk of lime preparation	~ 30 %	%		Milk of lime preparation	-		-
Amounts used Description of the		Amoun	t used p	per event			
Difficult			 1 kg powder (2:1 powder water) It to determine, because the amount is heavily dependent on the depth and size of the to be filled. 				
			g depending on the size of the room, wall to be treated.				
Floor/wall equalizer		~ 25 kg	depending on the size of the room, wall to be equalized.				
Frequency and duration	on of us	e/exposu	e.				
Description of task			Duratio	on of exposure per ev		frequency of e	vents
Mixing and loading of lin powder.	me conta	aining	1.33 m	in (DIY ¹ -fact sheet, RIV er 2.4.2 Mixing and load	M,	2/year (DIY ¹ fac	t sheet)
Application of lime plast slurry to the walls or cei		or	Severa	l minutes - hours		2/year (DIY ¹ fac	t sheet)

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Human factors not influ	uenced by	risk managem	ent				
Description of the task		ion exposed	Breathing rat	e	Exposed body part		Corresponding skin area [cm²]
Handling of powder	Adult		1.25 m³/hr		Half of both hands		430 (DIY ¹ fact sheet)
Application of liquid,							
pasty lime	Adult		NR		Hands and forearms		1900 (DIY ¹ fact sheet)
preparations.							
Other given operationa							
Description of the task		Indoor/outdo	or		volume		exchange rate
Handling of powder		indoor			ersonal space, small ound the user)	0.6	hr ⁻¹ (unspecified room)
Application of liquid, pas preparations.	ty lime	indoor		NR		NR	
Conditions and measu	res relate	d to information	n and behaviou	ral advid	ce to consumers		
In order to avoid health o						hich a	apply to professional
workplaces:							
•	othing sh	oes and gloves i	mmediately				
J. J	0.	0				-4:	e ve durate unhight als suid
		· · ·	U ,		ous effective skin prote		•
		a care product.	cion plan (skin p	Diotection	i, cleansing and care).	Clear	nse the skin thoroughly
Conditions and measu			rotection and h	vaiene			
In order to avoid health of					nrotective measures w	hich a	apply to professional
workplaces:	amaye Di		npiy with the sa		protective measures w		
	na or mixin	a building mater	ials during dem	nolition or	caulking and above a	ll du	ring overhead work, wear
		ell as face masks			caulting and, above a	, aa	
1 0 0	0		• •		an facilitate burns. Whe	en wo	rking in a wet
					r. Wear gauntlet gloves		
					nich permeates the wor		
2.2 Control of envi					•	Ŭ	
Product characteristics							
Not relevant for exposure		ent					
Amounts used*							
Not relevant for exposure	e assessm	ent					
Frequency and duratio							
Not relevant for exposure		ent					
Environment factors no			nagement				
Default river flow and dilu							
Other given operationa		ns affecting en	vironmental ex	posure			
Indoor						_	
Direct discharge to the w	astewater	is avoided.					
Conditions and measu			sewage treatm	ent plant			
Default size of municipal	sewage s	vstem/treatment	t plant and slude	e treatm	ent technique		
Conditions and measu							
Not relevant for exposure					•		
Conditions and measures related to external recovery of waste							
Not relevant for exposure assessment							
	3. Exposure estimation and reference to its source						
The risk characterisation					estimate and the resp	ective	DNEL (derived no-
effect level) and is given							
substances of 4 mg/m ³ (
includes an additional sa							
exposure to the eve.	Since limes are classified as irritating to skin and eyes a qualitative assessment has been performed for dermal exposure and exposure to the eye						·

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Human exposure	Human exposure					
Handling of powder						
Route of exposure	Exposure estimate	Method used, comments				
Oral	-	Qualitative assessment				
		Oral exposure does not occur as part of the intended product use.				
Dermal	small task: 0.1 µg/cm ²	Qualitative assessment				
	(-)	If risk reduction measures are taken into account no human exposure is				
	large task: 1 µg/cm ² (-)	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 ¹ -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 advice after accidental exposure is advisable.				
Inhalation	Small task: 12 µg/m ³	Quantitative assessment				
minalation	(0.003)	Dust formation while pouring the powder is addressed by using the dutch				
	Large task: 120 µg/m ³	model (van Hemmen, 1992, as described in section 9.0.3.1 above).				
	(0.03)					
Application of liquid	I, pasty lime preparations	S				
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				
		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				
lab alation		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		of mists of aerosols does not take place.				
		ueous lime preparation will quickly convert to calcium carbonate with carbon				
dioxide from the atmo		······································				
Environmental expo						
Referring to the OC/F	RMMs related to the enviror	nment to avoid discharging lime solutions directly into municipal wastewater, the				
		tment plant is circum-neutral and therefore, there is no exposure to the				
		stewater treatment plant is often neutralized anyway and lime may even be				
		ter streams that are treated in biological WWTPs. Since the pH of the influent of				
•	•	the pH impact is negligible on the receiving environmental compartments, such				
as surrace water, sed	liment and terrestrial compa	anment.				

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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				Consumer use of CO ₂	absorbent	in breathing appa	ratuses
		on use descripto	r	SU21, PC2, ERC8b			
Processes, ta	asks activ	ities covered		Filling of the formulation			
				Use of closed circuit b		paratuses	
	M - (1, 14			Cleaning of equipmen	t		
Assessment	Method*			Human health			
							oral and dermal exposure
				The inhalation exposu Hemmen, 1992).	re nas beer	assessed by the	e Dutch model (van
				Environment			
				A qualitative justification	n seeseem	ent is provided	
2. Operatio	onal con	ditions and ri	isk ma	nagement measur		ent is provided.	
RMM				ar form. Furthermore, a		ount of water (14	-18%) is added which
							hydroxide will be quickly
		with CO_2 to form t			lo broathing	reyele calcium an	
PC/ERC				o article categories (A	C) and env	ironmental relea	se categories (ERC)
PC 2							ne as CO ₂ absorbent. Th
				sorbent and CO ₂ will qu			
							re-breathed again, after
		of oxygen.					J.,
	Handling	of the absorbent:		orbent will be discarded		use and refilled b	efore each dive.
ERC 8b				g in inclusion into or ont	o a matrix		
2.1 Contro	l of cons	sumers expos	sure				
Product char							
Description o	of the	Concentration	of the	Physical state of	Dustine	ss (if relevant)	Packaging design
preparation		substance in the	ne	the preparation			
		preparation					
CO ₂ absorben	nt	78 - 84%		Solid, granular		dustiness	4.5, 18 kg canister
		Depending on the				n by 10 %	
		application the r	nain			d to powder)	
		component has				nation cannot	
		different additive				out during the	
		A specific amou water is always			cartridge	he scrubber	
		(14-18%).	auueu		carinuge	•	
"Used" CO2 at	hearhant	~ 20%		Solid, granular	Very low dustiness		1-3 kg in breathing
	USUIDEIII	~ 20 %		Soliu, granulai			apparatus
					(reduction by 10 % compared to powder)		apparatus
Amounts use	ed				oompare		
		preathing apparatu	IS	1-3 kg depending on tl	ne kind of b	reathing apparatu	IS
		n of use/exposur					
Description o				on of exposure per eve		frequency of events	
Filling of the fo	ormulation	into the	Ca. 1.3	3 min per filling, in sum	< 15 min	< 15 min Before each dive (up to 4 times)	
cartridge Use of closed		athing	104			linto Antinaria	dov
	circuit brea	aming	1-2 h			Up to 4 dives a	day
apparatus Cleaning and	omotiving	foguinmont	< 15 m	in		After each dive	(up to 1 timos)
		Jenced by risk m					
Description of		Population exp		Breathing rate	Exposed	d body part	Corresponding skin
task						pur	area [cm ²]
Filling of the		adult		1.25 m ³ /hr (light	hands		840
formulation int	to the			working activity)			(REACH guidance
cartridge				<i>c y</i>			R.15, men)
Use of closed	circuit	1			-		· ·
breathing app							
Cleaning and	emptying				hands		840
of equipment							(REACH guidance
							R.15, men)
				onsumers exposure			
	of the task	lass days	or/outdo	ar Deam	volume	Air	exchange rate

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Filling of the formulation cartridge		NR	NR	NR
Use of closed circuit bi apparatus	eathing	-	-	-
Cleaning and emptying equipment	g of	NR	NR	NR
	ures related	to information and b	ehavioural advice to consu	umers
Do not get in eyes, on Keep container tightly Keep out of reach of cl Wash thoroughly after In case of contact with Do not mix with acids. Carefully read the instr Conditions and meas Wear suitable gloves, 9 149). 2.2 Control of en Product characteristi Not relevant for expose Amounts used* Not relevant for expose Frequency and durat Not relevant for expose Environment factors Default river flow and co Other given operation Indoor Conditions and meas Default size of municip	skin, or on c closed as to hildren. handling. eyes, rinse i uctions of th ures related goggles and vironmen cs ure assessm not influence dilution hal conditio sures related al sewage s	In thing. Do not breathe avoid the soda lime to a mmediately with plenty e breathing apparatus t i to personal protection protective clothes durin tal exposure ent ent ent ent ent ent set by risk manageme ins affecting environm i to municipal sewage system/treatment plant a	dust dry out. of water and seek medical a o assure a proper use of the on and hygiene g handling. Use a filtering ha g handling. Use a filtering ha net ental exposure treatment plant nd sludge treatment techniq	Idvice. breathing apparatus. alf mask (mask type FFP2 acc. to EN
Conditions and meas	ures related	to external treatmen	t of waste for disposal	
Not relevant for exposi-				
		to external recovery	of waste	
Not relevant for exposi-	ure assessm	ent		
		d reference to its	source	
effect level) and is give substances of 4 mg/m ³ includes an additional Since lime substances exposure and exposur Due to the very specia taken into account to r	en in parenth (as respirat safety margi are classifie e to the eye. lised kind of	eses below. For inhalat ole dust) and the respec in since the respirable fr d as irritating to skin, an consumers (divers fillin	ion exposure, the RCR is ba tive inhalation exposure esti action is a sub-fraction of the nd eyes a qualitative assess	nd the respective DNEL (derived no- sed on the acute DNEL for lime mate (as inhalable dust). Thus, the RCR e inhalable fraction according to EN 481. ment has been performed for dermal can be assumed that instructions will be
Human exposure				
Filling of the formula	-		Martha 1	1-
Route of exposure	Exposure e	stimate	Method used, comment	ts
Oral	-			occur as part of the intended product use.
Dermal	-		exposure is expected. He loading of granular soda cannot be excluded if no	s are taken into account no human owever, dermal contact to dust from lime or direct contact to the granules protective gloves are worn during casionally result in mild irritation easily g with water.
Eye	Dust		Qualitative assessment If risk reduction measure exposure is expected. Du is expected to be minima even without protective g	s are taken into account no human ust from loading of the granular soda lime I, therefore eye exposure will be minimal loggles. Nevertheless, prompt rinsing with al advice after accidental exposure is
Inhalation		1.2 μg/m³ (3 × 10 ⁻⁴) 12 μg/m³ (0.003)	Quantitative assessment Dust formation while pou the dutch model (van He	ring the powder is addressed by using mmen, 1992, as described in section ing a dust reduction factor of 10 for the

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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
Derna		Due to the product characteristics, it can be concluded that derma
		exposure to the absorbent in breathing apparatuses is non-
		existent.
Eye		Qualitative assessment
Lye	-	Due to the product characteristics, it can be concluded that eye
		exposure to the absorbent in breathing apparatuses is non-
		existent.
Inhalation	nogligible	Qualitative assessment
Innalation	negligible	
		Instructional advice is provided to remove any dust before
		finishing the assembly of the scrubber. Divers filling their own CO ₂
		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.
• •	tying of equipment	
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
		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/m ³ (7.5 × 10 ⁻⁵)	Quantitative assessment
	Large task: $3 \mu g/m^3 (7.5 \times 10^{-4})$	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 exp	osure	
		is expected to be negligible. The influent of a municipal wastewater
		even be used beneficially for pH control of acid wastewater streams
nearnein piant is 0		
that are treated in h	inlogical W/W/TDo Since the pU of the in	nfluent of the municipal treatment plant is circum neutral, the pH

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ES number 9.14: Consumer use of garden lime/fertilizer

Exposure Scenario Format (2) addressing uses carried out by consumers									
1. Title	UTITA	(z) add	essing	y uses carried	out by	consum	er S		
							11		
Free short title				Consumer use			ilizer		
Systematic title based on use descriptor Processes, tasks activities covered			SU21, PC20, PC12, ERC8e						
Processes, tasks activities covered			Manual application of garden lime, fertilizer						
Assessment Method*			Post-application exposure Human health						
Assessment Method [*]			A qualitative assessment has been performed for oral and dermal exposure						
				as well as for the exposure to the eye. The dust exposure has been					
			assessed by the Dutch model (van Hemmen, 1992).						
			Environment						
			A qualitative justification assessment is provided.						
2. Operational conditions and risk ma									
RMM No product integra						e in place.			
PC/ERC			ctivity referring				d env	vironmental release	
PC 20					ime hv s	hovel/hand	(worst case	anc	soil incorporation.
20				exposure to play			1101010000		
PC 12		Surface s	preading	g of the garden I	ime bv sl	hovel/ hand	d (worst cas	e) an	d soil incorporation.
		Post-app	ication e	exposure to play	ing childr	en.	•	•	
ERC 8e				outdoor use of re			n open syst	ems	
2.1 Control of con	sume	ers expo	sure						
Product characteristic									
Description of the		entration	of the	Physical stat	e of	Dustines	ss (if releva	nt)	Packaging design
preparation	subs	tance in th	ne	the preparati					
		aration							
Garden lime	100 %	6		Solid, powder		High dus	ty		Bulk in bags or
									containers of 5, 10 and
		00.0/				<u> </u>			25 kg
Fertilizer	Up to	20 %		Solid, granular		Low dusty			Bulk in bags or
						containers of 5, 25 kg		containers of 5, 10 and	
Amounto used			25 Kg			20 Kg			
Amounts used Description of the prep	aratio	n		Amount used per event Source of information			nformation		
Garden lime		•		100g /m ² (up to 200g/m ²)		Information and direction of use			
Fertilizer				$100g /m^2$ (up to 1kg/m ² (compost)					
Frequency and duratio	n of us	se/exposu	re	(ap ((,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	,		
Description of the task				on of exposure	per eve	nt	frequency	ofe	vents
Manual application				es-hours		1 tasks per year			
11				iding on the size of the treated					
			area	0					
Post-application				ddlers playing on grass (EPA		EPA			to 7 days after
		re factors handbook)			application	1			
Human factors not influenced by risk management						· · · ·			
Description of the task		Population exposed		Breathing rate		Exposed body part			Corresponding skin area [cm²]
Manual application	Adult			1.25 m ³ /hr		Hands and forearms			1900 (DIY fact sheet)
Post-application		/Toddlers		NR		NR			NR
Other given operationa						-			
	Description of the task Indoor/outo								exchange rate
Manual application out		outdo	outdoor		\mathbf{u}		NR		
Post application		or	area around the user) NR NR NR						
Post-application outdoor									
Conditions and measures related to information and behavioural advice to consumers Do not get in eyes, on skin, or on clothing. Do not breathe dust. Use a filtering half mask (mask type FFP2 acc. to EN 149). Keep container closed and out of reach of children. In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. Wash thoroughly after handling. Do not mix with acids and always add limes to water and not water to limes.									
Incorporation of the gard						atering will	facilitate the	e effe	ct.
Conditions and measu					hygiene				
Wear suitable gloves, goggles and protection clothes									

Wear suitable gloves, goggles and protection clothes.

prepared in accordance with Annex II of the REACH Regulation EC 1907/2006, Regulation (EC) 1272/2008 and Regulation (EC) 453/2010

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	nvironmental exposur	re	
Product characterist			
		from dust mossuror	nents in air as a function of the distance from application)
	case estimate based on data	a nom dust measuren	lents in all as a function of the distance from application)
Amounts used	0-(011)2	0.044 ha/ha	In professional environteurol soil protection, it is
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
	Ca(OH)2.Mg(OH)2	2,030 kg/ha	$Ca(OH)_2/ha$. This rate is three times the amount
	CaCO3.MgO	2,149 kg/ha	needed to compensate the annual losses of lime
	Ca(OH)2.MgO	1,774 kg/ha	by leaching. For this reason, the value of 1700 kg
Freeman and dura	Natural hydraulic lime	2,420 kg/ha	CaO/ha or the corresponding amount of 2244 kg Ca(OH) ₂ /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 durat			
kg/ha is not exceeded	(CaO)		ear are allowed, provided the total yearly amount of 1,700
	not influenced by risk mai	nagement	
Not relevant for expos	ure assessment		
	nal conditions affecting en	vironmental exposi	Ire
Outdoor use of produc			
Soil mixing depth: 20 of			
<u> </u>	s and measures at process	level (source) to pr	event release
	leases to adjacent surface w		
			air emissions and releases to soil
		or minin discriarges,	
Drift should be minimis			
	sures related to municipal	sewage treatment p	lant
Not relevant for expos			
	sures related to external t	reatment of waste for	or disposal
Not relevant for expos	sure assessment		
Conditions and mea	sures related to external r	ecovery of waste	
N			
Not relevant for expos	sure assessment		
Not relevant for expos		to its source	
3. Exposure esti The risk characterisat	imation and reference tion ratio (RCR) is the quotien	nt of the refined expo	sure estimate and the respective DNEL (derived no-
3. Exposure estit The risk characterisat effect level) and is giv substances of 1 mg/m includes an additional	imation and reference tion ratio (RCR) is the quotien ren in parentheses below. For n ³ (as respirable dust) and th I safety margin since the resp s are classified as irritating to	nt of the refined expo or inhalation exposure e respective inhalatic pirable fraction is a su	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 ib-fraction of the inhalable fraction according to EN 481. litative assessment has been performed for dermal
3. Exposure estit The risk characterisat effect level) and is giv substances of 1 mg/m includes an additional Since lime substance	imation and reference tion ratio (RCR) is the quotien ren in parentheses below. For n ³ (as respirable dust) and th I safety margin since the resp s are classified as irritating to	nt of the refined expo or inhalation exposure e respective inhalatic pirable fraction is a su	, the RCR is based on the long-term DNEL for lime n exposure estimate (as inhalable dust). Thus, the RCR ib-fraction of the inhalable fraction according to EN 481.
3. Exposure estit The risk characterisat effect level) and is giv substances of 1 mg/m includes an additional Since lime substance exposure and exposure Human exposure	imation and reference tion ratio (RCR) is the quotien ren in parentheses below. For n ³ (as respirable dust) and th I safety margin since the resp s are classified as irritating to	nt of the refined expo or inhalation exposure e respective inhalatic pirable fraction is a su	, the RCR is based on the long-term DNEL for lime n exposure estimate (as inhalable dust). Thus, the RCR ib-fraction of the inhalable fraction according to EN 481.
3. Exposure estit The risk characterisat effect level) and is giv substances of 1 mg/m includes an additional Since lime substance exposure and exposu	imation and reference tion ratio (RCR) is the quotien ren in parentheses below. For n ³ (as respirable dust) and th I safety margin since the resp s are classified as irritating to	nt of the refined expo or inhalation exposure e respective inhalatic pirable fraction is a su o skin and eyes a qua	, the RCR is based on the long-term DNEL for lime n exposure estimate (as inhalable dust). Thus, the RCR ib-fraction of the inhalable fraction according to EN 481.
3. Exposure estit The risk characterisat effect level) and is giv substances of 1 mg/m includes an additional Since lime substance exposure and exposure Human exposure Manual application	imation and reference tion ratio (RCR) is the quotien ren in parentheses below. For n ³ (as respirable dust) and th I safety margin since the resp s are classified as irritating to re to the eye.	nt of the refined expo or inhalation exposure e respective inhalatic pirable fraction is a su o skin and eyes a qua	, the RCR is based on the long-term DNEL for lime n exposure estimate (as inhalable dust). Thus, the RCR ib-fraction of the inhalable fraction according to EN 481. litative assessment has been performed for dermal
3. Exposure estii The risk characterisat effect level) and is giv substances of 1 mg/m includes an additional Since lime substance exposure and exposure Human exposure Manual application Route of	imation and reference tion ratio (RCR) is the quotien ren in parentheses below. For n ³ (as respirable dust) and th I safety margin since the resp s are classified as irritating to re to the eye.	nt of the refined expo or inhalation exposure e respective inhalatio pirable fraction is a su o skin and eyes a qua Method u Qualitative	the RCR is based on the long-term DNEL for lime n exposure estimate (as inhalable dust). Thus, the RCR ib-fraction of the inhalable fraction according to EN 481. litative assessment has been performed for dermal sed, comments e assessment
3. Exposure esti The risk characterisat effect level) and is giv substances of 1 mg/m includes an additional Since lime substance exposure and exposure Human exposure Manual application Route of exposure Oral	imation and reference tion ratio (RCR) is the quotien ren in parentheses below. For n ³ (as respirable dust) and th I safety margin since the resp s are classified as irritating to the eye. Exposure estimate	nt of the refined expo or inhalation exposure e respective inhalatio pirable fraction is a su o skin and eyes a qua Method u Qualitative Oral expo	the RCR is based on the long-term DNEL for lime n exposure estimate (as inhalable dust). Thus, the RCR ib-fraction of the inhalable fraction according to EN 481. litative assessment has been performed for dermal sed, comments e assessment sure does not occur as part of the intended product use.
3. Exposure estii The risk characterisat effect level) and is giv substances of 1 mg/m includes an additional Since lime substance exposure and exposure Human exposure Manual application Route of exposure	imation and reference tion ratio (RCR) is the quotien ren in parentheses below. For n ³ (as respirable dust) and th I safety margin since the resp s are classified as irritating to the eye. Exposure estimate	nt of the refined expo or inhalation exposure e respective inhalatio pirable fraction is a su o skin and eyes a qua Method u Qualitativu Oral expo	 the RCR is based on the long-term DNEL for lime n exposure estimate (as inhalable dust). Thus, the RCR ib-fraction of the inhalable fraction according to EN 481. litative assessment has been performed for dermal sed, comments e assessment sure does not occur as part of the intended product use. e assessment
3. Exposure esti The risk characterisat effect level) and is giv substances of 1 mg/m includes an additional Since lime substance exposure and exposure Human exposure Manual application Route of exposure Oral	imation and reference tion ratio (RCR) is the quotien ren in parentheses below. For n ³ (as respirable dust) and th I safety margin since the resp s are classified as irritating to the eye. Exposure estimate	nt of the refined expo or inhalation exposure e respective inhalatio pirable fraction is a su o skin and eyes a qua Method u Qualitative Oral expo Qualitative If risk redu	 the RCR is based on the long-term DNEL for lime n exposure estimate (as inhalable dust). Thus, the RCR ib-fraction of the inhalable fraction according to EN 481. litative assessment has been performed for dermal sed, comments e assessment sure does not occur as part of the intended product use. e assessment uction measures are taken into account no human
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3. Exposure esti The risk characterisat effect level) and is giv substances of 1 mg/m includes an additional Since lime substance exposure and exposure Human exposure Manual application Route of exposure Oral	imation and reference tion ratio (RCR) is the quotien ren in parentheses below. For n ³ (as respirable dust) and th I safety margin since the resp s are classified as irritating to the eye. Exposure estimate	nt of the refined expo or inhalation exposure e respective inhalatio pirable fraction is a su o skin and eyes a qua Method u Qualitative Oral expo Qualitative If risk redu exposure applicatio	by the RCR is based on the long-term DNEL for lime in exposure estimate (as inhalable dust). Thus, the RCR ib-fraction of the inhalable fraction according to EN 481. ditative assessment has been performed for dermal sed, comments e assessment sure does not occur as part of the intended product use. e assessment uction measures are taken into account no human is expected. However, dermal contact to dust from n of lime substances or by direct contact to the limes
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3. Exposure esti The risk characterisat effect level) and is giv substances of 1 mg/m includes an additional Since lime substance exposure and exposure Human exposure Manual application Route of exposure Oral	imation and reference tion ratio (RCR) is the quotien ren in parentheses below. For n ³ (as respirable dust) and th I safety margin since the resp s are classified as irritating to the eye. Exposure estimate	nt of the refined expo or inhalation exposure e respective inhalatio pirable fraction is a su o skin and eyes a qua	 the RCR is based on the long-term DNEL for lime n exposure estimate (as inhalable dust). Thus, the RCR ib-fraction of the inhalable fraction according to EN 481. litative assessment has been performed for dermal sed, comments e assessment sure does not occur as part of the intended product use. e assessment uction measures are taken into account no human is expected. However, dermal contact to dust from n of lime substances or by direct contact to the limes excluded if no protective gloves are worn during 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
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3. Exposure esti The risk characterisat effect level) and is giv substances of 1 mg/m includes an additional Since lime substance exposure and exposure Human exposure Manual application Route of exposure Oral	imation and reference tion ratio (RCR) is the quotien ren in parentheses below. For n ³ (as respirable dust) and th I safety margin since the resp s are classified as irritating to the eye. Exposure estimate	nt of the refined expo or inhalation exposure e respective inhalatio pirable fraction is a su o skin and eyes a qua	 the RCR is based on the long-term DNEL for lime n exposure estimate (as inhalable dust). Thus, the RCR ib-fraction of the inhalable fraction according to EN 481. litative assessment has been performed for dermal sed, comments e assessment sure does not occur as part of the intended product use. e assessment uction measures are taken into account no human is expected. However, dermal contact to dust from n of lime substances or by direct contact to the limes excluded if no protective gloves are worn during 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, which will be reversible, can be assumed
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3. Exposure esti The risk characterisat effect level) and is giv substances of 1 mg/m includes an additional Since lime substance exposure and exposure Manual application Route of exposure Oral Dermal	imation and reference tion ratio (RCR) is the quotien ven in parentheses below. For ³ (as respirable dust) and th I safety margin since the resp s are classified as irritating to the eye. Exposure estimate - Dust, powder	nt of the refined expo or inhalation exposure e respective inhalatio pirable fraction is a su o skin and eyes a qua	a, the RCR is based on the long-term DNEL for lime in exposure estimate (as inhalable dust). Thus, the RCR ib-fraction of the inhalable fraction according to EN 481. litative assessment has been performed for dermal sed, comments e assessment sure does not occur as part of the intended product use. e assessment uction measures are taken into account no human is expected. However, dermal contact to dust from is expected. However, dermal contact to dust from in of lime substances or by direct contact to the limes excluded if no protective gloves are worn during 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, which will be reversible, can be assumed recurring. e assessment
3. Exposure esti The risk characterisat effect level) and is giv substances of 1 mg/m includes an additional Since lime substance exposure and exposure Manual application Route of exposure Oral Dermal	imation and reference tion ratio (RCR) is the quotien ven in parentheses below. For ³ (as respirable dust) and th I safety margin since the resp s are classified as irritating to the eye. Exposure estimate - Dust, powder	nt of the refined expo or inhalation exposure e respective inhalatio pirable fraction is a su o skin and eyes a qua	 the RCR is based on the long-term DNEL for lime n exposure estimate (as inhalable dust). Thus, the RCR ib-fraction of the inhalable fraction according to EN 481. litative assessment has been performed for dermal sed, comments e assessment sure does not occur as part of the intended product use. a assessment uction measures are taken into account no human is expected. However, dermal contact to dust from n of lime substances or by direct contact to the limes excluded if no protective gloves are worn during n. Due to the relatively long application time, skin irritation e exset. 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. a assessment uction measures are taken into account no human is 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. a assessment uction measures are taken into account no human is expected. Dust from surfacing with lime cannot be
3. Exposure esti The risk characterisat effect level) and is giv substances of 1 mg/m includes an additional Since lime substance exposure and exposure Manual application Route of exposure Oral Dermal	imation and reference tion ratio (RCR) is the quotien ven in parentheses below. For ³ (as respirable dust) and th I safety margin since the resp s are classified as irritating to the eye. Exposure estimate - Dust, powder	nt of the refined expo or inhalation exposure e respective inhalatio pirable fraction is a su o skin and eyes a qua	 the RCR is based on the long-term DNEL for lime in exposure estimate (as inhalable dust). Thus, the RCR ib-fraction of the inhalable fraction according to EN 481. litative assessment has been performed for dermal sed, comments e assessment sure does not occur as part of the intended product use. e assessment uction measures are taken into account no human is expected. However, dermal contact to dust from n of lime substances or by direct contact to the limes excluded if no protective gloves are worn during 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. e assessment uction measures are taken into account no human

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Inhalation (garden	Small task: 12 µg/m ³ (0.0012)	Quantitative assessment
lime)	Large task: 120 µg/m ³ (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 (fertilizer)	Small task: 0.24 µg/m ³ (2.4 * 10 ⁻⁴) Large task: 2.4 µg/m ³ (0.0024)	Quantitative assessment 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		
products which are a exposure of children	pplied in parks or amateur products us who may have access to these areas	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
	vilication exposure to products used in p route through hand-to-mouth activities	private gardens (e.g. lawns) by toddlers crawling on the treated area
	3	c soil. Therefore, after application to the soil and subsequent watering eutralized. Exposure to lime substances will be negligible within a

short time after application.

Environmental exposure

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								
1. Title								
Free short title				Consumer use of lime substances as water treatment chemicals				
Systematic title based on use descriptor				SU21, PC20, PC37, ERC8b				
Processes, tasks activities covered				Loading, filling or re-filling of solid formulations into container/preparation of lime milk				
Accessment Method*				Application of lime milk to water				
Assessment Method*				Human health: 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		ment is provided.		
2. Operational conditions and risk ma								
RMM				t integrated risk manage				
PC/ERC		categorie	s (ERC)		-			
PC 20/37				g (transfer of lime substa				
		Dropwise	applicat	ubstances (solid) into co ion of lime milk to water	mamer to	n runner applicatio	11.	
ERC 8b				idoor use of reactive sul		in open systems		
2.1 Control of con	sume					spen cyclonio		
Product characteristic	Jame							
Description of the	Conc	entration	of the	Physical state of	Dustir	ness (if relevant)	Packaging design	
preparation		tance in th		the preparation				
		aration						
Water treatment	Up to	100 %		Solid, fine powder		ustiness	Bulk in bags or	
chemical					`	tive value from	buckets/containers.	
						DIY fact sheet see ection 9.0.3)		
Water treatment	Up to	99 %		Solid, granular of	low dustiness		Bulk-tank lorry or in	
chemical	0010			different size		tion by 10%	"Big Bags" or in sacks	
				(D50 value 0.7	compa	red to powder)		
			D50 value 1.75					
A				D50 value 3.08)				
Amounts used Description of the prep	oratio	•		Amount used per ove	n 4			
Water treatment chemic			or.	Amount used per event depending on the size of the water reactor to be filled (~ 100g /L)				
aguaria		ie reactor it		depending on the size of the water reactor to be fined (~ 100g/L)				
Water treatment chemic	al in lim	e reactor fo	or	depending on the size of the water reactor to be filled (~up to 1.2 kg/L)				
drinking water Lime milk for further app	liantion			~ 20 g / 5L				
Frequency and duratio			•	~ 20 g / 5L				
Description of task	or on posul		on of exposure per eve	ent	frequency of e	events		
		1.33 m			1 task/month			
and refilling)		5, 5		ct sheet, RIVM, Chapte		1task/week		
Mixing		Mixing	and loading of powders)					
		al minutes - hours		1 tasks/ month	1 tasks/ month			
water				ant				
Human factors not influenced by risk managemen Description of the Population exposed				Breathing rate Exposed body par		sed body part	Corresponding skin	
task	Population exposed		osea	-	-		area [cm²]	
Preparation of lime	adult			1.25 m³/hr	Half	of both hands	430	
milk (loading, filling							(RIVM report	
and refilling) Dropwise application	adult			NR	Handa		320104007) 860	
of lime milk to water	auult				Hands		(RIVM report	
						320104007)		
Other given operational conditions affecting consumers exposure								
Description of the task			or/outdo		volume	Ai	r exchange rate	

prepared in accordance with Annex II of the REACH Regulation EC 1907/2006, Regulation (EC) 1272/2008 and Regulation (EC) 453/2010

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Revision date: December 2010

Preparation of lime m filling and refilling)	ilk (loading,	Indoor/outdoor	1 m ³ (person area around	al space, small	0.6 hr ⁻¹ (unspecified room indoor)
Dropwise application	of lime milk	indoor	NR		NR
	sures relate	to information and	behavioural advice to	consumers	
Do not get in eyes, or				Jon Sumers	
Keep container close			e dusi		
Use only with adequa					
			ty of water and seek med	lical advice.	
Wash thoroughly afte					
Do not mix with acids		dd limes to water and	I not water to limes.		
Conditions and mea					
			se a filtering half mask (m	ask type FFP2 a	acc. to EN 149).
2.2 Control of er			, , , , , , , , , , , , , , , , , , ,		
Product characterist					
Not relevant for expos		ont			
Amounts used*	sule assessin	ent			
		- mt			
Not relevant for expos		ent			
Frequency and dura		ont.			
Not relevant for expos					
Environment factors		ed by risk manager	nent		
Default river flow and					
Other given operation	onal conditio	ns affecting environ	mental exposure		
Indoor		the second states a	and the section of th		
Conditions and mea				a haa taasa	
			and sludge treatment te		
Conditions and mea	sures related	to external treatm	ent of waste for dispose	al	
Not relevant for even					
Not relevant for expos					
Conditions and mea			ry of waste		
Conditions and mea Not relevant for expos	sure assessm	ent			
Conditions and mea Not relevant for expose 3. Exposure esti	sure assessm imation an	ent d reference to it	s source		
Conditions and mea Not relevant for expos 3. Exposure esti The risk characterisat	sure assessm imation an tion ratio (RCI	ent <mark>d reference to it</mark> R) is the quotient of th	s source e refined exposure estim		ective DNEL (derived no-
Conditions and mea Not relevant for expose 3. Exposure estit The risk characterisat effect level) and is give	sure assessm imation an tion ratio (RCI ven in parenth	ent d reference to it R) is the quotient of th eses below. For inhal	s source e refined exposure estim ation exposure, the RCR	is based on the	acute DNEL for lime
Conditions and mea Not relevant for expose 3. Exposure estit The risk characterisat effect level) and is giv substances of 4 mg/m	sure assessm imation an tion ratio (RCI ven in parenth n ³ (as respirat	ent d reference to it R) is the quotient of th eses below. For inhal ble dust) and the resp	S SOUICE e refined exposure estim ation exposure, the RCR ective inhalation exposur	is based on the estimate (as in	acute DNEL for lime halable dust). Thus, the RCR
Conditions and mea Not relevant for expose 3. Exposure estit The risk characterisat effect level) and is giv substances of 4 mg/m includes an additional	sure assessm imation an tion ratio (RCI /en in parenth n ³ (as respirat I safety margi	ent d reference to if R) is the quotient of th eses below. For inhal ble dust) and the resp n since the respirable	S SOURCE e refined exposure estim ation exposure, the RCR ective inhalation exposur fraction is a sub-fraction	is based on the e estimate (as in of the inhalable	acute DNEL for lime halable dust). Thus, the RCR fraction according to EN 481.
Conditions and mea Not relevant for expose 3. Exposure estit The risk characterisat effect level) and is giv substances of 4 mg/m includes an additional Since lime substance	sure assessm imation an tion ratio (RCI ven in parenth n ³ (as respirat I safety margi s are classifie	ent d reference to if R) is the quotient of th eses below. For inhal ble dust) and the resp n since the respirable d as irritating to skin a	S SOURCE e refined exposure estim ation exposure, the RCR ective inhalation exposur fraction is a sub-fraction	is based on the e estimate (as in of the inhalable	acute DNEL for lime halable dust). Thus, the RCR
Conditions and mean Not relevant for expose 3. Exposure esting The risk characterisat effect level) and is give substances of 4 mg/m includes an additional Since lime substance exposure and exposure	sure assessm imation an tion ratio (RCI ven in parenth n ³ (as respirat I safety margi s are classifie	ent d reference to if R) is the quotient of th eses below. For inhal ble dust) and the resp n since the respirable d as irritating to skin a	S SOURCE e refined exposure estim ation exposure, the RCR ective inhalation exposur fraction is a sub-fraction	is based on the e estimate (as in of the inhalable	acute DNEL for lime halable dust). Thus, the RCR fraction according to EN 481.
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Conditions and mean Not relevant for expose 3. Exposure esting The risk characterisat effect level) and is give substances of 4 mg/m includes an additional Since lime substance exposure and exposure Human exposure Preparation of lime	sure assessm imation ratio (RCI ven in parenth n ³ (as respirat I safety margi s are classifie ure to the eye. milk (loading	ent d reference to if r) is the quotient of th eses below. For inhal ble dust) and the resp n since the respirable d as irritating to skin a	S SOUICE e refined exposure estim ation exposure, the RCR ective inhalation exposur fraction is a sub-fraction and eyes a qualitative as: Method used, con Qualitative assess	is based on the e estimate (as in of the inhalable sessment has be ments nent	acute DNEL for lime halable dust). Thus, the RCR fraction according to EN 481. en performed for dermal
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prepared in accordance with Annex II of the REACH Regulation EC 1907/2006, Regulation (EC) 1272/2008 and Regulation (EC) 453/2010

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Inhalation	Small task: 1.2 µg/m ³ (0.0003)	Quantitative assessment
(granules)	Large task: 12 µg/m ³ (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 applicat	ion of lime milk to water	
Route of exposure	e 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 exp		
		d to be negligible. The influent of a municipal wastewater treatment
		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 conditio	ns and risk ma				
ERC 8a		ndoor use of processing aids in open systems			
2.1 Control of consume	ers exposure				
Product characteristic		· · · · · · ·			
	an health from this	use does not need to be considered.			
Amounts used					
		use does not need to be considered.			
Frequency and duration of us					
		use does not need to be considered.			
Human factors not influence					
		use does not need to be considered.			
Other given operational conc					
		use does not need to be considered.			
		n and behavioural advice to consumers			
Not relevant, as the risk to hum	an health from this	use does not need to be considered.			
Conditions and measures rel	ated to personal p	rotection and hygiene			
Not relevant, as the risk to human health from this use does not need to be considered.					
2.2 Control of environmental exposure					
Product characteristics					
Not relevant for exposure asse	ssment				
Amounts used*					
Not relevant for exposure asse	ssment				
Frequency and duration of us					
Not relevant for exposure asse					
Environment factors not influ		nagement			
Default river flow and dilution	inter by fisk fild	ingonion.			
Other given operational conc	litions affecting on	vironmental exposure			
Indoor	anothe uncoming ch				
Conditions and measures rel	ated to municipal	seware 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					
	and reference	to its source			
Human exposure					
		y other legislation and therefore need not be addressed under regulation (EC)			
1907/2006 according to Article	14(5) (b) of this reg				
Environmental exposure					
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