1. MIXTURE IDENTIFICATION AND COMPANY/ENTERPRISE DETAILS

1.1 Mixture Identification

Cement and/or cement based mixture in compliance with specific technical standards.
Common cement:

- see table in section 3.2

Cement based mixture:

- hydraulic binder for non-structural applications HB 3,0: "Superplast"*
- pre-measured building mortars: "Ready –mixed"*

(*) mixtures, can be contained Flue Dust (see label bags or information in the transport document)

1.2 Relevant identified uses of the mixture and not recommended uses

The common cement is used as a hydraulic binder in the production of concrete, mortars, plaster, etc. Common cements and cement containing mixtures (hydraulic binders) have both an industrial and professional usage. Identified uses of cements and cement- containing mixtures cover dry and moist-suspension products (mixture) of products.

PROC	– Usage Description	Production/ Formulation of Materials	Professional/ Industrial usage
		Building and construction Materials	
2	Usage in a closed and continuous process, with occasional controlled exposure	X	X
3	Usage in a closed batch process (synthesis or formulation)	X	X
5	Mixing or blending in batch processes for the formulation of mixtures and articles (contact at different stages and/or significant contact)	X	X
7	Application of industrial spray		X
8a	Transferring of a substance or mixture (filling/emptying) from/to vessels /large containers, at non dedicated facilities		X
8b	Transferring of a substance or mixture (filling/emptying) from/to vessels /large containers, at dedicated facilities	X	X
9	Transferring of a substance or mixture into small containers (dedicated filling line, weighing included)	X	X
10	Application with rollers or brushes		X
11	Application with non industrial spray		X
13	Treatment of articles by dipping and pouring		X
14	Production of mixtures or articles in tablet compression, compression, extrusion, pelletizing	X	X
19	Hand-mixing with direct contact, with the use of only a personal protective equipment (PPE)		X
22	Working operation in potentially closed processes with minerals/metals at high temperatures. Industrial environment		X
26	Handling of inorganic solid substances at room temperature	X	X

1.3 Information on the provider of the safety data sheet

Company: COLACEM S.p.A.
Headquarters: Via della Vittorina n. 60 – 06024 Gubbio (PG)
Telephone: 075/92.401 - Fax: 075/92.76.676
E-mail: sicurezza@colacem.it

1.4 Emergency Contacts

Hospital	City	Address – ZIP code	Telephone
Azienda Ospedaliera Università di Foggia	Foggia	V.le Luigi Pinto, 1 - 71122	0881-732326
Azienda Ospedaliera "A. Cardarelli"	Napoli	Via A. Cardarelli, 9 - 80131	081-7472870
CAV Policlinico "Umberto I"	Roma	V.le del Policlinico,155 - 00161	06-49978000
CAV Policlinico "A. Gemelli"	Roma	Largo Agostino Gemelli, 8 - 00168	06-3054343
Azienda Ospedaliera "Careggi" U.O. Tossicologia Medica	Firenze	Largo Brambilla, 3 - 50134	055-7947819
CAV Centro Nazionale di Informazione Tossicologica	Pavia	Via Salvatore Maugeri, 10 - 27100	0382-24444
Ospedale Niguarda Ca' Granda	Milano	Piazza Ospedale Maggiore,3 - 20162	02-66101029
Azienda Ospedaliera Papa Giovanni XXII	Bergamo	Piazza OMS, 1 - 24127	800883300

The service is available outside office hours: ☒ yes ☐ NO

2. IDENTIFICATION OF HAZARDS

2.1. Compound classification according to Regulation (CE) 1272/2008 (CLP)

Danger class	Danger category	Danger Identification
Skin irritation	2	H315: It causes skin irritation
Serious eye lesions/eye irritation	1	H318: It causes serious eye lesions
Skin sensitization	1 B	H317: It can cause an allergic reaction in case of contact with the skin
Specific toxicity for target organs (single exposure) Respiratory organs irritation	3	H335: It can irritate the respiratory organs

2.2 Labeling according to Regulation (UE) 1272/2008 (CLP)

Warning
Danger

Danger Identification
H318: It causes serious eye lesions
H315: It causes skin irritation
H317: It can cause an allergic reaction in case of contact with the skin
H335: It can irritate the respiratory organs

Precaution advisory
P102 Keep it out of reach of children
P280: Wear protective gloves/ clothes /Protect your eyes/Protect your face.
P305+P351+P338+P312: IN THE EVENT OF CONTACT WITH THE EYES: rinse carefully with abundant water for several minutes. If possible remove any contact lenses. Continue to rinse. In case of uneasiness, please contact a POISON CENTER or consult a doctor.
P302+P352+P333+P313: IN THE EVENT OF CONTACT WITH THE SKIN: wash the skin immediately with abundant water and soap. In case of skin irritation or rash, please consult a doctor.

P261+P304+P340+P312: Avoid breathing the dust. IN THE EVENT OF INHALATION: move the injured person to the open-air and keep him/her at rest in a position that can facilitate breathing. In case of uneasiness, contact a POISON CENTER or consult a doctor.
P501: Dispose the product/container according to the regulations in force.

2.3 Other dangers

The cement, when used together with water, for example in concrete or mortar fabrication, or when wet , produces a highly alkaline solution (a very high pH due to the formation of calcium, sodium and potassium hydroxide).
Frequent inhalation of the cement for a long period of time increases the risk of pulmonary diseases.
The repeated and prolonged contact of the cement with the damp skin, due to perspiration or humidity, can cause irritation and/or dermatitis (Bibliography (4)).
In case of significant ingestion, the cement can cause ulceration in the digestive apparatus
Both the cement and its mixtures, in the case of prolonged contact with the skin , can cause a sensitization of the skin (due to the presence of VI chrome salt traces . When necessary , this effect can be reduced by adding a specific reducing agent in order to keep the water-soluble VI chrome percentage at concentration levels lower than 0,0002 % (2 ppm) of the cement total dry weight, in compliance with the regulation mentioned in point 15

The PBT or vPvB criteria do not apply to cement, according to ATTACHMENT XIII of REACH (Regulation 1907/2006/CE).

3. COMPOSITION /INFORMATION ABOUT THE INGREDIENTS

3.1 Substances

Not applicable

3.2 Compound

The common cements are fabricated in compliance with the EN 197-1 Standard "Composition, specifications and conformity criteria for common cements" and subsequent amendments, while the Hydraulic Binders for non-structural uses `HB 3,0' are fabricated in compliance with the EN 15368 standard.
The premixed "Ready Soon " products contain hydraulic binders fabricated according to the EN 197-1 and EN 15368 standards.

Main Types	Denomination of 27 products (types of common cement)		Composition (mass percentage) [a]										
			Main constituents										Secondary constituents
			Clinker	Blast furnace slag	Silicon dioxide fumes	Pozzuolana		Fly ash		Limed schist	Limestone		
						Natural	Limed natural	Siliceous	Calcium				
			K	S	D [b]	P	Q	V	W	T	L	LL	
CEM I	Portland Cement	CEM I	95 - 100	-	-	-	-	-	-	-	-	-	0 - 5
CEM II	Slag Portland Cement	CEM II/A-S	80 – 94	6 - 20	-	-	-	-	-	-	-	-	0 - 5
		CEM II/B-S	65 – 79	21 - 35	-	-	-	-	-	-	-	-	0 - 5
	Silicon Dioxide fumes Portland Cement	CEM II/A-B	90 – 94	-	6 - 10	-	-	-	-	-	-	-	0 - 5
	Pozzuolana Portland Cement	CEM II/A-P	80 – 94	-	-	6 – 20	-	-	-	-	-	-	0 - 5
		CEM II/B-P	65 – 79	-	-	21 – 35	-	-	-	-		-	0 - 5
		CEM II/A-Q	80 – 94	-	-	-	6 – 20	-	-	-	-	-	0 - 5
		CEM II/B-Q	65 – 79	-	-	-	21 – 35	-	-	-	-	-	0 - 5
	Fly ashes Portland Cement	CEM II/A-V	80 – 94	-		-	-	6 – 20	-	-	-	-	0 - 5
		CEM II/B-V	65 – 79	-	-	-	-	21 – 35	-	-	-	-	0 - 5
		CEM II/A-W	80 – 94	-	-	-	-	-	6 – 20	-	-	-	0 - 5
		CEM II/B-W	65 – 79	-	-	-	-	-	21 - 35	-	-	-	0 - 5
	Limed schist Portland Cement	CEM II/A-T	80 – 94	-	-	-	-	-	-	6 – 20	-	-	0 - 5
		CEM II/B-T	65 – 79	-	-	-	-	-	-	21 - 35		-	0 - 5
	Limestone Portland Cement	CEM II/A-L	80 – 94	-	-	-	-	-	-	-	6 – 20	-	0 - 5
		CEM II/B-L	65 – 79	-	-	-	-	-	-	-	21 - 35	-	0 - 5
		CEM II/A-LL	80 – 94	-	-	-	-	-	-	-	-	6 – 20	0 - 5
		CEM II/B-LL	65 – 79	-	-	-	-	-	-	-	-	21 - 35	0 - 5
	Composite Portland Cement [c]	CEM II/A-M	80 – 94	---------- 6 – 20 ----------									0 - 5
		CEM II/B-M	65 – 79	---------- 21 – 35 ----------									0 - 5
CEM III	Slag Cement	CEM III/A	35 – 64	36 – 65	-	-	-	-	-	-	-	-	0 - 5
		CEM III/B	20 – 34	66 – 80	-	-	-	-	-	-	-	-	0 - 5
		CEM III/C	5 – 19	81 – 95	-	-	-	-	-	-	-	-	0 - 5
CEM IV	Pozzuolana Cement [c]	CEM IV/A	65 – 89	-	---------- 11 – 35 ----------					-	-	-	0 - 5
		CEM IV/B	45 – 64	-	---------- 36 – 55 ----------					-	-	-	0 - 5
CEM V	Composite Cement [c]	CEM V/A	40 – 64	18 – 30	-	---------- 18 – 30 ----------		-		-	-	-	0 - 5
		CEM V/B	20 – 38	31 – 50	-	---------- 31 – 50 ----------		-		-	-	-	0 – 5

a) The values in this table refer to the sum of the main and secondary constituents.
b) b) The silicon dioxide fume proportion is limited to 10%
c) In the CEM II/A-M and CEM II/B-M composite Portland cements, in the CEM IV/A and CEM IV/B pozzuolana cements and in the CEM V/A and CEM V/B composite cements the main constituents different from clinker have to be stated in the cement description (see the example in point 8).

3.2.1 Components that represent a health risk

Component	% in weigh t	CE Number	CAS	REACH registration no.	Classification according to Reg. 1272/2008		
					Danger class	Danger category	Danger Identification
Portland cement clinker	**5-100**	266-043-4	65997-15-1	Exempt (Notification no. 02-2119682167-31-0000 – Notification update dated 1/7/2013 –Report presentation no. QJ420702-40)	Skin irritation Skin sensitization Eye lesions STOT SE	2 1B 1 3	H315 H317 H318 H335
Flue dust	**0,1-5**	270-659-9	68475-76-3	01-2119486767-17-0000	Skin irritation Skin sensitization Eye lesions STOT SE	2 1B 1 3	H315 H317 H318 H335

The content of clinker in various types of cement is shown in table 3.2;
Flue Dust, if present in the formulation of cement, is measured as a minor component.

The other components of cement under the Table in section 3.2, setting regulators, any other materials used as minor components, grinding additives and any eventual reducing agents have toxicological characteristics and risk levels equal or lower than those of clinker.

4. FIRST AID MEASURES

4.1 Description of first –aid measures

General advice
The individual protection devices are not necessary for rescuers, who must avoid breathing the cement dust and avoid direct contact with wet cement or with preparations containing wet cement. If it is not possible, the individual protection devices described in Section 8 must be worn.

In case of contact with eyes
Do not rub eyes to prevent any possible corneal damage caused by rubbing. If present, remove contact lenses. Tilt your head towards the affected eye, open eyelids and rinse abundantly with water for at least 20 minutes in order to remove all residues. If possible, use isotonic water (0.9% NaCl). Contact a specialist in occupational medicine or an ophthalmologist.

In case of contact with skin
For dry cement, remove and rinse well with water. As for wet/moist cement, wash skin well with abundant water and soap with a neutral pH or an adequate mild detergent. Remove any contaminated clothing, shoes, glasses, and watches, cleaning everything thoroughly before reusing. Consult a doctor in all cases of burns or irritation.

In case of inhalation
Move the person to the outdoors. Any dust in the throat and nostrils should clear out naturally . Contact a physician if irritation persists, or if it occurs later, or if there is any discomfort, cough or other symptoms that persist.

In case of ingestion
Do not induce vomiting. If the person is conscious, wash the mouth out with water and have him/her drink a lot of water. Consult a physician immediately or contact a poison control center.

4.2 Main symptoms and effects, both acute and delayed

Eyes: Eye contact with cement powder (wet or dry) may cause severe and potentially irreversible injury.

Skin : Cement and its mixtures may have an irritating effect on wet skin (due to perspiration or humidity) after prolonged contact or may cause dermatitis after repeated contact. Prolonged skin contact with wet cement or its moist mixtures, (concrete/fresh mortar etc.) may cause irritation, dermatitis or burns. For more details see Bibliography (1).

Inhalation: repeated inhalation of cement dust over a long period of time increases the risk of developing lung disease.

Ingestion: In case of accidental ingestion, cement may cause digestive tract ulcers.

Environment: under normal usage conditions, cement is not hazardous to the environment.

4.3 Indication of when to see a doctor immediately or need special treatment
See what mentioned in paragraph 4.1. When you see a doctor, bring the SDS with you.

5. FIRE-FIGHTING MEASURES

5.1 Fire extinction means
Cement is not flammable.

5.2 Special hazards coming from the substance
Cement is not flammable or explosive and does not support combustion of other materials.
5.3 Advice for fire-fighters
The cement does not present fire risks. No special protective equipment is required for fire-fighting personnel.

6. MEASURES TO UNDERTAKE IN CASE OF ACCIDENTAL RELEASE

6.1 Personal precautions, protective equipment and emergency procedures

6.1.1 For those not directly involved
Wear protective equipment as described in Section 8 and follow the usage and safe handling recommendations found in section 7.

6.1.2 For those directly involved
Emergency procedures are not required.
In any case, protection of the respiratory tract, eyes and skin is necessary in situations with elevated dust levels.

6.2 Environmental precautions

Avoid the discharge or release of cement into sewage and drainage systems or water bodies. (e.g. water ways).

6.3 Methods and materials for containment and cleaning up

Use dry cleaning methods such as vacuum cleaners or vacuum extractors (industrial portable units, equipped with high-efficiency particulate filters or equivalent techniques) that do not disperse dust into the environment. Never use compressed air.
Ensure that workers wear appropriate personal protective equipment and prevent the spreading of cement dust (see section 8).
Avoid inhalation of cement dust and contact with skin.
Store spilled material in containers for further use.

6.4 Reference to other Sections

For more details, see sections 8 and 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

7.1.1 Protective measures
Follow the advice given in section 8.
To remove dried cement, see paragraph 6.3.

Fire prevention measures
Not applicable.

Measures to prevent the creation of aerosols and dust
Do not sweep or use compressed air. Use dry cleaning methods (such as vacuum cleaners and vacuum extractors), which do not cause dispersion into the air.

Environmental protection measures
When handling the material prevent it from being dispersed into the environment.

7.1.2 Information on general workplace hygiene
Do not handle or store near food and beverages or smoking materials. In dusty environments, wear dust masks and goggles. Use protective gloves in order to prevent skin contact.

7.2 Conditions for safe storage, including any eventual incompatibilities

Cement must be stored in waterproof, dry , (e.g. with minimal internal condensation), clean and protected from contamination conditions.
Risk of burial: the cement may thicken or stick to the walls of the confined space in which it is stored. The cement may crumble, collapse or fall unexpectedly. In order to avoid burial or suffocation do not enter confined spaces, such as silos, containers, trucks for bulk transportation, or other storage containers that store or contain the cement without taking appropriate security measures.
Do not use aluminium containers due to the incompatibility of materials.

7.3 Specific final uses
No further information (see section 1.2)

7.4 Effectiveness of chromium VI reducing agent

The package integrity and compliance with the above mentioned storage conditions are essential in ensuring the continued effectiveness of the reducing agent for the time period mentioned on the DDT (for both the product in bags and in bulk) and also for every single bag.
Such a time limit applies only to the effectiveness of the reducing agent in keeping the level of soluble chromium VI , determined according to the EN 196-10 standard, below the limit of 0,0002% of the total dry weight of the ready to use cement required by the standard in force (see p. 15), subject to the application restrictions of the mixture given by the general conservation and usage rules of the product itself.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

The time weighted threshold limit value (TLV-TWA) adopted in the workplaces of the Association of American Industrial Hygienists (ACGIH) for the particulate is equal to 1 mg/m^3 (breathable fraction).
The exposure level is:
DNEL (breathable fraction): 1 mg/m^3
DNEL (skin): not applicable
DNEL (ingestion): not relevant

The environmental risk assessment is:
PNEC (water): not applicable
PNEC (sediment): not applicable
PNEC (soil): not applicable

8.2 Exposure controls
For each single Process Category (PROC), users can choose between options A) and B), detailed in the Table 8.2.1 below, depending on what is most appropriate to the specific situation . To choose an option, users will need to select it in the Table 8.2.2 of Section 8.2.2 "*Individual precaution measures , such as individual protection devices – Specifications for respiratory organs protection devices*". Therefore, only A) – A) and B) – B) combinations are possible.

8.2.1 Appropriate technical controls
In those plants where the cement is handled , transported, loaded and unloaded and stored, suitable measures must be taken for worker protection and for the limitation of dusts released into the work

environments, as shown in the table (DNEL = 1 mg/m^3). Localized controls will be defined depending on already existing situations and, therefore, the necessary specific protection devices for respiratory organs will be identified, which are mentioned in the table in paragraph 8.2.2.

Table 8.2.1

Exposure Scenario	PROC*	Exposure	Localized Controls	Efficiency
Industrial production/formulation of plumbing materials for building and construction	2, 3	Non-limited Duration (up to 480 minutes per shift , 5 shifts (a week); (#) < 240 minutes	Not required	-
	14, 26		A) not required o B) general local ventilation	- 78 %
	5, 8b, 9		general local ventilation	78 %
Industrial uses of plumbing materials for building and construction (internal, external)	2		Not required	-
	14, 22, 26		A) Not required o B) general local ventilation	- 78 %
	5, 8b, 9		general local ventilation	78%
Industrial uses, of wet suspension or plumbing materials for building and construction	7		A) Not required o B) general local ventilation	- 78 %
	2, 5, 8b, 9, 10, 13, 14		Not required	-
Professional uses of plumbing materials for building and construction (internal, external)	2		A) Not required o B) general local ventilation	- 72 %
	9, 26		A) Not required o B) general local ventilation	- 72 %
	5, 8a, 8b, 14		general local ventilation	72 %
	19 (#)		localized controls are not applicable, The processes are in well ventilated areas or outdoors	50 %
Professional uses of wet suspensions or plumbing materials for building and construction	11		A) Not required o B) general local ventilation	- 72 %
	2, 5, 8a, 8b, 9, 10, 13, 14, 19		Not required	-

*PROC uses are identified as defined in section 1.2.

8.2.2 Individual protection measures, such as personal protective equipment

In general: In plants where cement is handled, transported, loaded, unloaded and stored, measures must be taken in order to protect workers and to control the emission of dust in the workplace.
Do not eat, drink, or smoke while handling cement to avoid contact with the skin or mouth.
Immediately after having moved/or handled cement/or products/ mixtures containing cement it is necessary to wash with a neutral soap or an adequate mild detergent or use moisturizing creams.
Remove contaminated clothing, shoes, glasses, etc and clean thoroughly before reusing.

Eye/Face Protection
Wear approved safety masks and goggles according to EN 166 when handling dry or wet cement to avoid contact with eyes.

Skin Protection

Use water-proof gloves, which are abrasion and alkali resistant, certified according to UNI EN 374 parts 1,2,3, lined entirely in cotton, safety boots or shoes, protective long sleeved clothing ,as well as skin care products (including moisturizing creams), in order to ensure maximum skin protection from prolonged contact with wet cement.

Respiratory protection

When a person is potentially exposed to dust levels above the exposure limits, use appropriate respiratory protection commensurated with the level of dust and in conformity with relevant EN standards (filtering face piece certified according to UNI EN 149 or face piece dust mask certified according to UNI EN 140).

The individual protection devices, which have been defined on the basis of localized controls and estimated at a value of DNEL = 1 mg/m^3 , are mentioned in the Table .

Table 8.2.2

Exposure scenario	PROC*	Exposure	Specific respiratory protection equipment (RPE)	RPE Efficiency – Assigned protection factor (APF)
Industrial production/formulation of plumbing materials for building and construction	2, 3	Non-limited duration (up to 480 minutes per shift, 5 shifts a week;); (#) < 240 minutes	Not required	-
	14, 26		A) mask P2 (FF, FM) o B) mask P1 (FF, FM)	APF = 10 APF = 4
	5, 8b, 9		Mask P2 (FF, FM)	APF = 10
Industrial uses of plumbing materials for building and construction (internal external)	2		Not required	-
	14, 22, 26		A) mask P2 (FF, FM) o B) mask P1 (FF, FM)	APF = 10 APF = 4
	5, 8b, 9		Mask P2 (FF, FM)	APF = 10
Industrial uses of wet suspensions o plumbing materials for building and construction	7		A) mask P3 (FF, FM) o B) mask P2 (FF, FM)	APF = 20 APF = 10
	2, 5, 8b, 9, 10, 13, 14		Not required	-
Professional use of plumbing materials for building and construction (internal external)	2		A) mask P2 (FF, FM) o B) mask P1(FF, FM)	APF = 10 APF = 4
	9, 26		A) mask P3 (FF, FM) o B) mask P2 (FF, FM)	APF = 20 APF = 10
	5, 8a, 8b, 14		Mask P3 (FF, FM))	APF = 20
	19 (#)		Mask P3 (FF, FM)	APF = 20
Professional use of wet suspension o plumbing materials for building and construction	11		A) mask P3 (FF, FM) o B) mask P2 (FF, FM)	APF = 20 APF = 10
	2, 5, 8a, 8b, 9, 10, 13, 14, 19		Not required	-

*PROC uses are identified as defined in Section 1.2.

An APF list of different RPE (according to EN 529:2005 standard) can be consulted in the MEASE glossary(16).

Thermal Hazards
Not applicable

8.2.3 Environmental exposure controls

See technical controls in order to avoid the dispersion of cement dust in the air.
Adopt any measures necessary to ensure that the cement does not reach the water (ground water, sewer systems or surface water).
In plants where cement is handled, transported, loaded, unloaded and stored, measures must be taken in order to protect workers and to control the emission of dust in the workplace. In particular, preventive measures must ensure the control of the concentration of breathable particulate within the time weighted threshold limit value (TLV-TWA) adopted by the American Industrial Hygienists (ACGIH) for Portland cement.

The control of environmental exposure for the emission of cement particles in the air shall be carried out according to the available technology and regulations concerning the emission of dust particles in general.
The environmental exposure control is appropriate for the aquatic environment as cement emissions at different stages of the lifecycle (production and use) mainly applied to soil and wastewater. The aquatic effect and the risk assessment cover the effect on organisms/ ecosystems due to the possible changes to pH levels connected with the release of hydroxides. It is believed that the toxicity of the other dissolved inorganic ions may be negligible compared to the potential effect of the pH.
Any other effect that may occur during the production and usage is to be considered as taking place on a local scale. The pH of the discharge and surface water should not exceed the value 9. Otherwise it may affect municipal wastewater treatment systems (STPs) and industrial wastewater treatment systems (WWTPs). A gradual approach is recommended for such an exposure assessment.
Level 1: Obtain information on the pH of the discharge and the contribution of the cement to the resulting pH. If the pH is above 9, and mainly attributable to the cement, then further actions should be required to prove safe usage.
Level 2: Collect information on the pH of collected water after the point of discharge. The pH level must not be higher than 9.
Level 3: Measure the pH of the water collected after the point of discharge. If the pH is less than 9, safe usage is reasonably proved. If the pH is above 9, risk management measures must be implemented: the discharge must be subject to neutralization, in order to ensure safe usage of cement during its production or during its use.
No special emission control measures are necessary for exposure to the Earth environment.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information about fundamental physical and chemical properties

(a) **Aesthetic**: Cement is a solid inorganic powder material
(b) **Odour**: odourless
(c) **Odour threshold** : none, odourless
(d) **pH**: (T = 20°C in water, ratio water/solid 1:2): 11-13.5
(e) **Melting point**: > 1 250 °C
(f) **Initial boiling point and boiling range**: not applicable since, under normal atmospheric conditions, the melting point>1 250°C
(g) **Flash point**: not applicable because it is not liquid
(h) **Evaporation rate**: not applicable because it is not liquid
(i) **Flammability (solid, gas)**: not applicable as it is a non-combustible solid and does not cause or contribute to fire starting through friction.
(j) **Higher/lower flammability or explosion limit**: not applicable because it is not a flammable gas
(k) **Vapour pressure**: not applicable because the melting point is > 1250 °C
(l) **Vapour density**: not applicable because the melting point is > 1250 °C
(m) **Relative density**: 2.75-3.20; Apparent density: 0.9-1.5 g/cm³
(n) **Water solubility (T = 20 °C)**: low (0.1-1.5 g/l)
(o) **Partition coefficient**: n-octanol/water: not applicable because it is an inorganic substance
(p) **Auto-ignition temperature**: not applicable (no pyrophoricity- no metal-organic, organ - metalloid or phosphine-organic bonds or their derivatives and no other pyrophoric constituents in its composition.

(q) **Decomposition temperature**: not applicable due to the absence of organic peroxide
(r) **Viscosity**: not applicable because it is not liquid
(s) **Explosive properties**: not applicable. It is not explosive or pyrotechnic. It is not in itself capable by means of chemical reactions to produce gas temperatures and pressures and speeds as to cause such harm to the environment. It is not capable of self-sustaining exothermic chemical reactions.
(t) **Oxidizing properties**: not applicable because it does not cause or contribute to the combustion of other materials.

9.2 Other information
Not applicable

10. STABILITY AND REACTIVITY

10.1 Reactivity
When mixed with water, the cement hardens forming a stabile mass that does not react with the environment.

10.2 Chemical stability
Cement is more stable the longer it is stored properly and appropriately (see section 7). It must be kept dry. Contact with incompatible materials must be avoided.
Wet cement is alkaline and is incompatible with acids, ammonium salts, with aluminium and other base metals. The cement, when in contact with hydrofluoric acid, decomposes producing corrosive silicon tetra fluoride gas. The cement reacts with water to form silicates and calcium hydroxide. The silicates in the cement react with powerful oxidizers such as fluorine, boron tri fluoride, chlorine tri fluoride, manganese tri fluoride, and oxygen bi fluoride.
The package integrity and compliance with the storage conditions mentioned in paragraph 7.2 (special closed containers, cool and dry space with no ventilation) are conditions essential to maintain the effectiveness of the reducing agent in the retention period specified on the bag or on the DDT.

10.3 Possibility of dangerous reactions
Not applicable.

10.4 Conditions to avoid
Humid conditions during storage periods may cause clumping and the loss of product quality.

10.5 Incompatible materials
Acids , ammonium salts, aluminum or other non noble metals. An uncontrolled use of aluminum powder in wet cement must be avoided, as hydrogen can be generated.

10.6 Products with dangerous decomposition
Cement does not decompose into any dangerous substance.

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Danger Class	Cat	Effect	Bibliography
Acute dermal toxicity	-	Rabbit limit test, 24 hour contact, , 2.000 mg/kg body weight – non lethal. Based on available data, does not fall within the criteria for classification	(2)
Acute inhalation Toxicity	-	No acute inhalation toxicity observed. Based on available data, does not fall within the criteria for classification	(9)
Acute oral toxicity	-	No indication of oral toxicity studies with cement kiln dust. Based on available data, does not fall within the criteria for classification	From Bibliography
Corrosion/ Skin irritation	2	The cement, when in contact with moist skin may cause thickening, cracking and splitting of the skin. Prolonged contact in combination with existing abrasions can cause severe burns.	(2) Experience on man
Serious eye damage/ irritation	1	The clinker caused a set of heterogeneous effects on the cornea and the irritation index was calculated equal to 128. Direct contact with cement can cause corneal injury due to mechanical stress, immediate or delayed irritation or inflammation. Direct contact with large amounts of dry cement or wet cement can cause projected effects ranging from moderate ocular irritation (e.g. Conjunctivitis or blepharitis) to chemical burns and blindness.	(10), (11)

Skin sensitization	1	Some individuals may develop eczema after exposure to wet cement dust, caused by both its high pH, which induces dermatitis after prolonged contact, and by an immunological reaction to Cr (VI) soluble, which causes allergic dermatitis on contact. The reaction may appear in a variety of forms that can range from a mild rash to severe dermatitis and is a combination of the two mechanisms mentioned above. This sensitizing effect is not expected if the cement contains a reducing agent of water soluble Cr (VI) until the period specified of effectiveness of such a reducing agent has been exceeded. (reference (3)).	(3), (4)
Respiratory Sensitization	-	There is no indication of sensitization of the respiratory system. Based on available data, does not fall within the criteria for classification.	(1)
Germ cell Mutagenicity (germ)	-	No indication. Based on available data, it does not fall within the criteria for classification.	(12), (13)
Carcinogenicity	-	No causal association has been established between exposure to Portland cement and cancer. The epidemiological literature does not support the identification of Portland cement as a suspected human carcinogen. Portland cement is not classifiable as a human carcinogen (A4 of ACGIH under: agents that cause concern about the possibility of being carcinogenic to humans, but which cannot be definitively assessed due to lack of data. In vitro studies or animals, give no indication of carcinogenicity, which are sufficient to classify the agent in one of the other notations). Based on available data, it does not fall within the criteria for classification.	(1) (14)
Reproductive toxicity	-	Based on available data, it does not fall within the criteria for classification	no experience trial on man
STOT – single exposure	3	Cement dust can irritate the throat and respiratory system. Coughing, sneezing and panting may occur following exposures above the occupational exposure limits. Overall, the evidence gathered clearly indicates that occupational exposure to cement dust has produced deficits in lung function. However, the evidence available at present is insufficient in establishing with certainty the dose-response relationship for these effects.	(1)
STOT – repeated exposure	-	There is an indication of COPD. The effects are acute and due to high exposures. There were no chronic effects or effects at low concentrations. Based on available data, it does not fall within the criteria for classification.	(15)
Danger in case of aspiration	-	Not applicable because cement is not utilized as an aerosol.	

Except for skin sensitization, Portland cement clinker and common cement have the same toxicological and eco toxicological properties.

Health conditions worsened by the exposure
Inhalation of cement can worsen already existing respiratory diseases and / or troubles like emphysema or asthma and can worsen already existing pathologies of the skin and / or the eyes.

12. ECOLOGIC INFORMATION

12.1 Toxicity
The cement is not hazardous to the environment. The eco toxicity tests with Portland cement on Daphnia magna (Bibliography (5)) and Selenastrum coli (Bibliography (6)) have shown a low toxicological impact. Therefore LC50 and EC50 values cannot be determined (Bibliography (7)). There are no indications of toxicity in the sedimentary phase (Bibliography (8)). The addition of large amounts of cement to water may, however, cause an increase in pH, therefore it may be toxic to aquatic life in certain circumstances.

12.2 Persistence and degradability
Not relevant, since the cement is an inorganic material. After hardening, the concrete has no risk of toxicity.

12.3 Bioaccumulation potential
Not relevant, since the cement is an inorganic material. After hardening, the concrete has no risk of toxicity.

12.4 Mobility
Not relevant, being that cement is an inorganic material. After hardening, the cement does not show any risks of toxicity.

12.5 Results of evaluations PBT and vivo
Not applicable, because cement is an inorganic material. After hardening, cement presents no toxic risk.

12.6 Other adverse effects
Not applicable.

13. DISPOSAL CONSIDERATIONS

The cement which is destined for disposal must be managed in accordance with Part IV of the "Regulations on waste management" of the 152/2006 Legislative Decree "Regulations on the environment" and s.m.i. and implemented decrees. However, the cement does not hold any type of risk for eventual disposal.

14. TRANSPORT INFORMATION

The cement does not fall within any class of danger for the transport of dangerous goods and is not subject to relevant modal regulations: IMDG (sea), ADR (road). RID (rail), ICAO / IATA (air). During transport avoid wind dispersal by utilizing closed containers.

14.1 ONU Number
Not relevant.

14.2 ONU sea shipping number
Not relevant.

14.3 Class of danger connected with transport
Not relevant.

14.4 Packing group
Not relevant.

14.5 Environmental hazards
Not relevant.

14.6 Special precautions for users
Not relevant

14.7 Transport of bulk material in accordance with Annex II of MARPOL73/78 and the IMSBC code
Pursuant to the provisions of the IMSBC Code for shipping solid cargo in bulk (Appendix C), adopted by the International Maritime Organization (IMO) with MSC 268 (85): 2008 Resolution and s.m.i., and acknowledged with the Managerial Decree of the Ministry of Infrastructures and Transports No. 1340 dated November 30th, 2010.

15. REGULATORY INFORMATION

15.1Standards and legislation on health, safety and environment, specifically applicable to the compound.

- Regulation CE 18/12/2006 no. 1907 "Registration, evaluation, authorization and restriction about the use of chemical substances" (REACH) and s.m.i (subsequent modifications and integrations) .
- Regulation 1272/2008/CE related to the classification, labeling and packaging of substances and compounds (CLP), with modification and abrogation of Directives 67/548/CEE and 1999/45/CE and Regulation 1907/2006/CE and s.m.i (subsequent modifications and integrations)
- Regulation 453/2010/UE containing the modification to Regulation 1907/2006/CE , concerning Attachment II "Guidelines for drawing up safety data sheets (SDS)"
- Regulation 487/2013/UE containing the modification to Regulation (CE) no. 1272/2008, for the purposes of compliance with technical and scientific progress, by the European Parliament and Council concerning the classification, labeling and packaging of substances and compounds .
- Regulation 830/2015/UE dated 28 May 2015 containing the modification to Regulation (CE) no. 1907/2006 by the European Parliament and Council concerning the registration, evaluation, authorization and restriction about the use of chemical substances REACH)

- Health Ministry Decree 10/05/2004 "Application of 2003/53/CE Directive containing the twenty-sixth modification to the 76/769/CEE Directive, concerning the restrictions about the sale and use of certain dangerous materials and compounds (nonylphenol, nonylphenol, ethoxylate, cement) " .
- Health Ministry Decree dated February 17 2005 "Application of a method for testing cements in reference to the M. D. dated May 10 2004 that contained the twenty-sixth modification to 76/769/CEE Directive".
- Legislative Decree 9/04/2008 no. 81 and s.m.i. (subsequent modifications and integrations) "Application of article 1 of the Law no. 123, dated 3 August 2007, concerning workplace health and safety protection".
- EN 196/10:2006 – "Methods of testing cement - Part 10: Determination of the water soluble VI chrome content in cement"
- EN 197/1 – " Cement – Composition, specifications and conformity criteria for common cements"
- EN 15368 - Hydraulic binder for non –structural use – Definition, specifications and conformity criteria "
- EN 413-1 - Masonry cement - Part 1: Composition, specifications and conformity criteria"
- EN 14216 Cement - Composition, specifications and conformity criteria for very low heat special cement "
- Legislative Decree 152/2006 "Unified Environmental Law" and s.m.i. (subsequent modifications and integrations)

The Regulation 1907/2006/CE (REACH), in Attachment XVII, point 47, as amended by the Regulation no. 552/2009, introduces the prohibition of selling and using the cement and its compounds if, after being mixed with water , they contain more than 0,0002% (2 ppm) water soluble VI chrome on the total dry weight of the cement itself. The respect of this threshold limit is ensured by adding a reducing agent in the cement, whose effectiveness is granted for a fixed period of time and under the constant observance of suitable stocking procedures (mentioned in points 7.2 and 10.2).

According to the aforementioned Regulation, the use of the reducing agent requires the publication of the following information :

FABRICATION DATE	Mentioned on the bag and/or on DDT
CONSERVATION CONDITIONS (*)	In suitable closed containers, stored in a fresh and dry place with no wind, ensuring that the packaging is kept intact .
CONSERVATION PERIOD (*)	According to what is mentioned in the DDT (both for the product in a bag and loose) and in any single bag

(*) for keeping the effectiveness of the reducing agent

This expiration date refers exclusively to the effectiveness of the reducing agent against the VI chrome salts, being understood that the restrictions of use of the product given by the general conservation and use instructions , are valid.

Since cement is a compound, it is not submitted to the registration obligation provided for by the REACH, which is then applicable to substances.

Cement clinker is a substance, but it is not submitted to a registration according to art. 2.7 (b) and Attachment V.10 of the REACH, but is subjected to a notification (Notification no. 02-2119682167-31-0000 – Notification update dated 1/7/2013 –Report Presentation no. QJ420702-40).

As far as "Flue dusts" are concerned , in the ***ATTACHMENT*** the substance usage descriptors related to the uses identified are given, and, in particular, the exposure scenario connected with their standard/normal use in the production cycle of hydraulic binders.

Exposure scenario	Sector of Use SU	Product Category PC	Process Category PRC	Environmental Release Category ERC
9.1 Industrial production of hydraulic materials for the building and construction sectors.	not applicable	0 – 9a - 9b	2, 3, 5, 8b, 9, 14, 26	2

16. OTHER INFORMATION

16.1 Modifications

This Safety Data Sheet has been completely revised in compliance with the Regulation 1272/2008 "CLP" and the Attachment II of the Regulation 453/2010, whose provisions have come into force since 1 June 2015.

16.2 Abbreviations and acronyms

ACGIH: American Conference of Industrial Hygienists
ADR/RID: Agreement on the transport of dangerous goods by road/Regulations on the international transport of dangerous goods by rail
APF: Assigned Protection Factor
CAS: Chemical Abstract Service
CLP: Classification, Labelling and Packaging (Regulation 1272/2008)
COPD: Chronic Obstructive Pulmonary Disease
DDT: Transport document
DNEL: Derived no-effect level
DPI: Individual protection devices
EC50: half maximale effective concentration
ECHA: European Chemical Health Agency
HEPA: High efficiency particulate air filter
FF P: Filtering Facepiece against Particles
FM P: Filtering Mask against Particles with filter cartridge
IATA: International Air Transport Association
IMDG: International Maritime Dangerous Goods
IMO: International Maritime Organization
IMSBC: International Maritime Solid Bulk Cargoes
LC50: Median lethal dose
MEASE: Metal Exstimation and Assessment of Substance Exposure, EBRC Consulting GmbH for Eurometaux,http://www.ebrc.de/industrial-chemicals-reach/projects-and-references/mease.php
OEL: occupational exposure limit
PBT: Persistent, bioaccumulative and toxicity
PNEC: Predicted no-effect concentration
PROC: Process categories
RPE: Respiratory Protective Equipment
REACH: Registrazion, Evaluation and Authorization of Chemicals
SDS: Safety data sheet
STOT: Specific target organ toxicity
TLV-TWA: Threshold Limit Value-Time Weighted Averages
vPvB: very persistent, very bioaccumulative

16.3 Bibliography and information sources

(1) Portland Cement Dust - Hazard assessment document EH75/7, UK Health and Safety Executive, 2006. Available from: http://www.hse.gov.uk/pubns/web/portlandcement.pdf.

(2) Observations on the effects of skin irritation caused by cement, Kietzman et al, Dermatosen, 47, 5, 184-189 (1999).

(3) European Commission's Scientific Committee on Toxicology, Ecotoxicology and the Environment (SCTEE) opinion of the risks to health from Cr (VI) in cement (European Commission, 2002). http://ec.europa.eu/health/archive/ph_risk/committees/sct/documents/out158_en.pdf.

(4) Epidemiological assessment of the occurrence of allergic dermatitis in workers in the construction industry related to the content of Cr (VI) in cement, NIOH, Page 11, 2003.

(5) U.S. EPA, Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms, 3rd ed. EPA/600/7-91/002, Environmental Monitoring and Support Laboratory, U.S. EPA, Cincinnati, OH (1994a) and 4th ed. EPA-821-R-02-013, US EPA, office of water, Washington D.C. (2002).

(6) U.S. EPA, Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms, 4th ed. EPA/600/4-90/027F, Environmental Monitoring and Support Laboratory, U.S. EPA, Cincinnati, OH (1993) and 5th ed. EPA-821-R-02-012, US EPA, office of water, Washington D.C. (2002).

(7) Environmental Impact of Construction and Repair Materials on Surface and Ground Waters. Summary of Methodology, Laboratory Results, and Model Development. NCHRP report 448, National Academy Press, Washington, D.C., 2001.

(8) Final report Sediment Phase Toxicity Test Results with Corophium volutator for Portland clinker prepared for Norcem A.S. by AnalyCen Ecotox AS, 2007.

(9) TNO report V8801/02, An acute (4-hour) inhalation toxicity study with Portland Cement Clinker CLP/GHS 03-2010-fine in rats, August 2010.

(10) TNO report V8815/09, Evaluation of eye irritation potential of cement clinker G in vitro using the isolated chicken eye test, April 2010.

(11) TNO report V8815/10, Evaluation of eye irritation potential of cement clinker W in vitro using the isolated chicken eye test, April 2010.

(12) Investigation of the cytotoxic and proinflammatory effects of cement dusts in rat alveolar macrophages, Van Berlo et al, Chem. Res. Toxicol., 2009 Sept; 22(9):1548-58.

(13) Cytotoxicity and genotoxicity of cement dusts in A549 human epithelial lung cells in vitro; Gminski et al, Abstract DGPT conference Mainz, 2008.

(14) Comments on a recommendation from the American Conference of governmental industrial Hygienists to change the threshold limit value for Portland cement, Patrick A. Hessel and John F. Gamble, EpiLung Consulting, June 2008.

(15) Prospective monitoring of exposure and lung function among cement workers, Interim report of the study after the data collection of Phase I-II 2006-2010, Hilde Notø, Helge Kjuus, Marit Skogstad and Karl-Christian Nordby, National Institute of Occupational Health, Oslo, Norway, March 2010.

(16) MEASE, Metals estimation and assessment of substance exposure, EBRC Consulting GmgH for Eurometaux.

(17) Occurrence of allergic contact dermatitis caused by chromium in cement. A review of epidemiological investigations, Kåre Lenvik, Helge Kjuus, NIOH, Oslo, December 2011.

16.4 Training advice

In addition to training programs about the environment, health and safety for their workers, companies shall make sure that workers read, understand and follow the requirements of this Safety Data Sheet.

16.5 Further information

Test data and methods used for classifying common cements are mentioned in section 11.1.

A classification and the procedures adopted to obtain the compound classification according to the Regulation 1272/2008/UE (CLP) is listed in the table below :

Classification according to (CE) 1272/2008 Regulation	Classification procedure
Skin irritation 2, H315	Based on test data
Eye lesions 1, H318	Based on test data
Skin Sensitization 1B, H317	Experience carried out on men
STOT SE 3, H335	Experience carried out on men

This Safety Data Sheet, and any subsequent amendments as well , are also available in electronic format on this web site: www.colacem.it

16.6 Disclaimer

The information contained in this SDS is based on current available knowledge and we expect that the product is used according to the usage conditions given . Any other use of the product, including the use of the product in association with other products or in other processes, is the responsibility of the user.

It is understood that the user is responsible for the security measures specifically identified and the application of appropriate operating procedures concerning the prevention of risks in his own activities.

Exposure Scenario No 9.1: Industrial manufacture of hydraulic building and construction materials

Exposure Scenario addressing uses carried out by workers	
1. Title: Industrial manufacture of hydraulic building and construction materials	
Free short title	Manufacture of Flue Dust containing mixtures: cement, hydraulic binder, controlled low strength material, concrete (ready-mixed or precast), mortar, grout and others for building and construction work
Sector of uses	not applicable
Market sectors	PC 0: Building and construction products PC 9b: Fillers, putties, plasters, modelling clay PC 9a: Coatings and paints, thinners and fillers
Environmental scenario	ERC 2: Formulations of preparations
Worker scenarios	PROC 2: Use in closed, continuous process with occasional controlled exposure PROC 3: Use in closed batch process PROC 5: Mixing or blending in batch process for formulation of preparations and articles. PROC 8b: Transfer of substance or preparation from/to vessels/large containers at dedicated facilities PROC 9: Transfer of substance or preparation into small containers PROC 14: Production of preparations or articles by tabletting, compression extrusion, pelletisation PROC 26: Handling of solid inorganic substances at ambient temperature
Assessment method	The assessment of inhalation exposure is based on the dustiness / fugacity of the substance, using the exposure estimation tool MEASE. The environmental assessment is based on a qualitative approach, described in the introduction. Relevant parameter is the pH in water and soil.
2. Operational conditions and risk management measures	
2.1 Control of workers exposure	
Product characteristic	
Hydraulic building and construction materials are inorganic binders. Generally, these products are mixtures of Portland cement clinker and other hydraulic or non hydraulic constituents. Flue Dust can be part of common cements, like Portland cement. In this main application, the Flue Dust content is below 5 %. In other hydraulic binders the Flue Dust content could be up to 50 %. Generally, the content in a hydraulic mixture is not restricted. Flue Dust is a highly dusty powder. At all end uses, the substance will intentionally come into contact with water. Partly, the substance reacts with water and forms hydration products. At this stage of a wet or pasty suspension, the product is irritating, due to the pH, which is above 11. Finally, the end product is hardened (e.g. as mortar, concrete) and not irritating, since no free alkaline moisture remains.	
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	
Processes	Duration of exposure
PROC 2, 3, 5, 8b, 9, 14, 26 (all)	not restricted (480 minutes)

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.

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

Risk management measures at the process level are generally not required in the process.

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

Processes	Localised controls (LC)	Efficiency of LC (according to MEASE)	Further information
PROC 2, 3	general ventilation	17 %	-
PROC 5, 8b, 9, 14, 26	generic local exhaust ventilation	78 %	-

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

Processes	Specification of respiratory protective equipment (RPE)	RPE efficiency - assigned protection factor (APF)	Specification of gloves	Further personal protective equipment (PPE)
PROC 2, 3	not required	not applicable	Impervious, abrasion and alkali resistant gloves, internally lined with cotton. The use of gloves is mandatory, since Flue Dust is classified as irritating to skin.	Safety goggles or visors (acc. EN 166) are mandatory, since Flue Dust is classified as highly irritating to eyes. Additional face protection, protective clothing and safety shoes are required to be worn as appropriate.
PROC 5, 8b, 9	FFP2 mask	APF = 10		
PROC 14, 26	FFP1 mask	APF = 4		

Gloves and eye protective equipment must be worn, unless potential contact with the skin and eyes can be excluded by the nature and type of application (i.e. closed process).

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

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.

2.2 Control of environmental exposure

Product characteristic

Hydraulic building and construction materials are inorganic binders. Generally, these products are mixtures of Portland cement clinker and other hydraulic or non hydraulic constituents. Flue Dust can be part of common cements, like Portland cement. In this main application, the Flue Dust content is below 5 %. In other hydraulic binders the Flue Dust content could be up to 50 %. Generally, the content in a hydraulic mixture is not restricted. Flue Dust is a highly dusty powder.

At all end uses, the substance will intentionally come into contact with water. Partly, the substance reacts with water and forms hydration products. At this stage of a wet or pasty suspension, the product is irritating, due to the pH, which is above 11. Finally, the end product is hardened (e.g. as mortar, concrete) and not irritating, since no free alkaline moisture remains.

Amounts used

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

Frequency and duration of use

Intermittent (used < 12 times per year for not more than 24 h) or continuous use/release

Environment factors not influenced by risk management

Flow rate of receiving surface water: 18,000 m^3/d

Other given operational conditions affecting environmental exposure

Effluent discharge rate: 2,000 m^3/d

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 suspensions containing Flue Dust 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.

Organizational measures to prevent/limit release from site

Training for the workers, based on the chemical safety data sheet.

Conditions and measures related to municipal sewage treatment plant

The pH of the wastewater going into the municipal sewage treatment plant has to be controlled on a regularly base and neutralized if necessary. Solid Flue Dust constituents have to be separated from the sewage effluent.

Conditions and measures related to waste

Solid industrial waste of Flue Dust should be reused or discharged after hardening and/or neutralisation.

3 Exposure estimation and reference to its source

3.1 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 of 1 mg/m^3 (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.

Processes	Method used for inhalation exposure assessment	Inhalation exposure estimate (RCR)	Method used for dermal exposure assessment	Dermal exposure estimate (RCR)
PROC 2, 3, 5, 8b, 9, 14, 26	MEASE	< 1 mg/m³ (0.44 - 0.83)	Since Flue Dust is classified as irritating to skin and eyes, dermal exposure has to be minimised as far as technically feasible. A DNEL for dermal effects has not been derived. Therefore, dermal exposure is not assessed in this exposure scenario.	

3.2 Environmental emissions

Significant emissions or exposure to air are not expected due to the low vapour pressure of Flue Dust.

Emissions or exposure to the terrestrial environment are not expected and therefore not relevant for this exposure scenario.

The environmental exposure assessment is only relevant for the aquatic environment as emissions of Flue Dust in the different life-cycle stages (production and use) mainly apply to ground and waste water. The aquatic effect and risk assessment covers the effect on organisms/ecosystems due to possible pH changes related to hydroxide discharges. The toxicity of the different solved inorganic ions 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 exposure assessment is approached by assessing the resulting pH impact. The pH of surface water should not exceed 9.

Environmental emissions	The production of Flue Dust can potentially result in an aquatic emission, whereby locally the pH and the amount of the following ions can be increased in the aquatic environment: K^+, Na^+, Ca^{2+}, Mg^{2+}, SO_4^{2-}, Cl^-. When the pH is not neutralised, the effluent of the production sites may impact the pH of the receiving water. Generally, the pH of the effluents is measured frequently and can be neutralised easily as often as required by national legislation.
Exposure concentration in waste water treatment plant (WWTP)	Waste water from Flue Dust production is an inorganic wastewater stream, for which no biological treatment is necessary. Wastewater streams from Flue Dust 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 Flue Dust is emitted to surface water the following happens. Some Flue Dust constituents (sulphate and chloride salts from sodium, potassium, calcium and magnesium) are highly or moderate soluble and will remain in water. These chloride and sulphate salts are naturally occurring in sea water and groundwater. The amount in groundwater depends on the geological soil formation and varies between different regions. Some constituents react with water and form highly insoluble inorganic hydration products. Due to the hydration reaction, the pH of the water 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 (CO_2), the bicarbonate ion (HCO_3^-) and the carbonate ion (CO_3^{2-}).
Exposure concentration in sediments	A risk assessment for the sediment compartment is considered as not relevant and therefore not included. When Flue Dust is emitted to this compartment the following happens. Some Flue Dust constituents are inert and insoluble (calcite, quartz, clay minerals), they are naturally occurring minerals and will have no impact on the sediment. Some Flue Dust constituents react with water and form highly insoluble inorganic hydration products. Even these products have no bioaccumulation potential. Other constituents are highly soluble and will remain in water.
Exposure concentrations in soil and groundwater	When Flue Dust is emitted to the soil and groundwater compartment the following happens. Some Flue Dust constituents are inert and insoluble (calcite, quartz, clay minerals), they are naturally occurring minerals and will have no impact on the soil. Some Flue Dust constituents (sulphate and chloride salts from sodium, potassium, calcium and magnesium) are moderate or highly soluble and will remain in groundwater. These chloride and sulphate salts are naturally occurring in sea water

	und ground water. The amount in groundwater depends on the geological soil formation and is therefore variable. Some other constituents react with water and form highly insoluble inorganic hydration products. Due to the hydration reaction, the pH of the groundwater may increase, depending on the buffer capacity of the groundwater. The higher the buffer capacity of the groundwater, 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 (CO_2), the bicarbonate ion (HCO_3^-) and the carbonate ion (CO_3^{2-}).
Exposure concentration in atmospheric compartment	A risk assessment for the air compartment is considered as not relevant and therefore not included. When Flue Dust particles are emitted to air, they will sediment or washed out by rain in a reasonable short time. Thus, the atmospheric emissions end up in soil and water.
Exposure concentration relevant for the food chain (secondary poisoning)	A risk assessment for secondary poisoning is not required, because bioaccumulation in organisms is not relevant for Flue Dust, which is an inorganic substance.

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

Occupational exposure

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

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

For that assessment, a stepwise approach is recommended.

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

Tier 2: Retrieve information on receiving water pH after the discharge point. The pH of the receiving water shall not exceed the value of 9.

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 flue dust during production or use phase.