Italcementi
HEIDELBERGCEMENT Group

Safety, a way of living

Safety data sheet
For common cements and cement-containing mixtures
(slow and quick setting cementitious binders and hydraulic binders for non-structural applications)
6th Edition – of April 07, 2017

1. IDENTIFICATION OF THE MIXTURE AND OF THE COMPANY/UNDERTAKING

1.1 Product identifier
Common cement (hereinafter referred to as cement) and cement-containing mixtures (cementitious binders and hydraulic binders) conforming to specific technical standards and regulations.

Common cements: **i.tech ULTRACEM**, **i.tech ULTRACEM PRX, i.work TECNOCEM***, **i.pro CITYCEM, i.pro TERMOCEM*,**
i.pro DURACEM, i.tech PORTLAND FERRICO, i.tech FIBROCEM
Slow setting cementitious binders: **i.pro MURACEM, i.pro PAVI FORTE**
Oil-well binders: **i.tech GEOCEM, i.tech GEOTERM**
Hydraulic binders for non-structural applications: **i.pro PLASTOCEM***
***** *mixtures that may contain Flue Dust*

1.2 Relevant identified uses of the mixtures and uses advised against
Cement is used as a hydraulic binder to manufacture concrete, mortars, plasters, renders, etc. Cement and cement-containing mixtures (hydraulic binders) are intended for industrial and professional use. The identified uses of cement and cement-containing mixtures cover the dry products and the products in a wet suspension (paste).

Process Categories (PROC) and Use descriptors

PROC	Identified uses - Use description	Manufacture/ Formulation of Building and construction materials	Professional/ Industrial use of Building and construction materials
2	Use in closed, continuous process with occasional controlled exposure	X	X
3	Use in closed batch process (synthesis or formulation)	X	X
5	Mixing or blending in batch processes for formulation of preparations* and articles (multistage and/or significant contact)	X	X
7	Industrial spraying		X
8a	Transfer of substance or preparation* (charging/discharging) from/to vessels/large containers at non-dedicated facilities		X
8b	Transfer of substance or preparation* (charging/discharging) from/to vessels/large containers at dedicated facilities	X	X
9	Transfer of substance or preparation* into small containers (dedicated filling line, including weighing)	X	X
10	Roller application or brushing		X
11	Non industrial spraying		X
13	Treatment of articles by dipping and pouring		X
14	Production of preparations* or articles by tabletting, compression, extrusion, pelletisation	X	X
19	Hand-mixing with intimate contact and only PPE available		X
22	Potentially closed processing operations with minerals/metals at elevated temperature Industrial setting		X
26	Handling of solid inorganic substances at ambient temperature	X	X

*For the sake of consistency with the descriptor system in IUCLID 5.2, in the above table the term “preparation” has not been replaced by “mixture”

1.3 Details of the supplier of the safety data sheet

Italcementi S.p.A.
Via G. Camozzi, 124 – 24121 Bergamo
Telephone number: +39 035 396111
itc-reach@italcementi.it

1.4 Emergency telephone number

- Poison Centre - Hospital University Foggia, 71122 Foggia - V.le Luigi Pinto, 1 - Tel. 0039-0881-732326
- Poison Centre - Hospital "A. Cardarelli", 80131 Napoli - Via A. Cardarelli, 9 - Tel. 0039-081-7472870
- Poison Centre - Hospital "Umberto I", 00161 Roma - V.le del Policlinico, 155 - Tel. 0039-06-4450618
- Poison Centre - Hospital "A. Gemelli", 00168 Roma - Largo Agostino Gemelli, 8 - Tel. 0039-06-3054343
- Poison Centre - Hospital "Careggi" U.O. Tossicologia Medica, 50134 Firenze - Largo Brambilla, 3 - Tel. 0039-055-7947819
- Poison Centre – National center for toxicological information, 27100 Pavia - Via Salvatore Maugeri, 10 - Tel. 0039-0382-24444
- Poison Centre - Hospital Niguarda Ca' Granda, 20162 Milano - Piazza Ospedale Maggiore,3 - Tel. 0039-02-66101029
- Poison Centre - Hospital Papa Giovanni XXII, 24127 Bergamo - Piazza OMS, 1 Tel. 0039-800883300

Available outside office hours YES ☑ NO ☐

2. HAZARDS IDENTIFICATION

2.1 Classification of the mixture

2.1.1 Classification according to Regulation (EC) No. 1272/2008 (CLP)

Hazard class	Hazard category	Hazard statement
Skin irritation	2	H315: causes skin irritation
Serious eye damage / eye irritation	1	H318: causes serious eye damage
Skin sensitisation	1 B	H317: may cause an allergic skin reaction
Specific target organ toxicity (single exposure) Respiratory tract irritation	3	H335: may cause respiratory irritation

2.2 Label elements

In accordance with Regulation 1272/2008 (CLP)

Hazard Pictograms

Signal word
Danger

Hazard Statements
H318: Causes serious eye damage
H315: Causes skin irritation
H317: May cause an allergic skin reaction
H335: May cause respiratory irritation

Precautionary statements
P102 Keep out of the reach of children.
P280: wear protective gloves / protective clothing /eye protection / face protection.
P305+P351+P338+P312: IN CASE OF CONTACT WITH EYES: rinse thoroughly with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Call a doctor / Poison Centre if you feel unwell.
P302+P352+P333+P313: IN CASE OF CONTACT WITH SKIN: wash thoroughly with soap and water. If skin irritation or a rash occurs, get medical advice/attention.
P261+P304+P340+P312: Do not breathe dust. IN CASE OF INHALATION: Move the exposed person to fresh air. Call a doctor / Poison Centre if you feel unwell.
P501: Dispose product/container in accordance regulation.

2.3 Other hazards
When cement or cement-containing mixtures react with water, for instance when making concrete or mortar, or when the cement becomes wet, a strong alkaline solution is produced (high pH caused by the formation of calcium, sodium and potassium hydroxides).
Cement and cement-containing mixtures may irritate the eyes, the mucous system, the throat and the respiratory system and cause coughing. Frequent inhalation of cement dust or cement-containing mixtures over a long period of time increases the risk of developing lung diseases.
Frequent contact between cement and moist skin (due to sweat or humidity) over a long period of time may cause irritation and/or dermatitis (Reference [4]).
In case of prolonged contact with the skin, both cement and cement-containing mixtures, including pastes, may cause skin sensitisation due to the presence of trace amounts of chromium VI salts. Where necessary, such an effect can be minimized by incorporating a special reducing agent to maintain the water-soluble chromium VI content to concentration rates below 0.0002% (2 ppm) on the total dry weight of cement, in compliance with the applicable legislation referred to in Section 5 (Reference [3]).
If significant amounts are ingested, cement may cause ulcers in the digestive tract.
Under normal conditions of use, cement and cement-containing mixtures do not pose any particular risk to the environment, provided that all recommendations given under Sections 6, 8, 12 and 13 below are carried out.

Cement and cement-containing mixtures do not meet the criteria for PBT or vPvB in accordance with Annex XIII of REACH (Regulation 1907/2006/EC).

3. COMPOSITION / INFORMATION ON INGREDIENTS

3.1 Substances
Not applicable

3.2 Mixtures

3.2.1 Components presenting a health hazard

Substance	% by weight	CE number	CAS	Classification according to Regulation 1272/2008/EC		
				Hazard class	Hazard category	Hazard statement
Portland cement clinker	20-95	266-043-4	65997-15-1	Specific target organ toxicity (single exposure) Respiratory tract irritation	3	H335: may cause respiratory irritation
				Skin irritation	2	H315: causes skin irritation

				Serious eye damage / eye irritation	1	H318: causes serious eye damage
				Skin sensitisation	1B	H317: may cause an allergic skin reaction
Flue dust	0-5	270-659-9	68475-76-3	Specific target organ toxicity (single exposure) Respiratory tract irritation	3	H335: may cause respiratory irritation
				Skin irritation	2	H315: causes skin irritation
				Serious eye damage / eye irritation	1	H318: causes serious eye damage
				Skin sensitisation	1	H317: may cause an allergic skin reaction

Note:

- *Clinker: C& notification No. 02-2119682167-31-0000 (Notification update of July 1, 2013 - Submission of Report No. QJ420702-40).*
- *Flue dust: registration REACH No. 01-2119486767-17-0xxx*

Cements and cement-containing mixtures are finely ground mixes made up of clinker, gypsum (or other forms of calcium sulphate) and other special constituents (limestone, pozzolana, etc.).

When present in the cement formulation, flue dust is dosed as a secondary constituent. For some types of cement and cement-containing mixtures, other components may be used as secondary constituents, e.g. grinding aids and reducing agents if needed, whose toxicological properties and risk levels are the same as or smaller than those of clinker.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General notes
In general, no personal protective equipment is needed for first aid responders who must avoid inhaling the mixture's dust or coming into contact with the wet mixture or with preparations containing the mixture (concrete, mortar, plaster, etc.). Where this is not possible, personal protective equipment should be worn as indicated in Section 8.

Following contact with eyes
Do not rub eyes in order to avoid possible cornea damage as a result of mechanical stress.
Remove contact lenses, if any. Incline head to injured eye, open the eyelid(s) widely and flush eye(s) immediately by thoroughly rinsing with plenty of clean water for at least 20 minutes to remove all particles. If possible, use isotonic water (0.9% NaCl). Contact a specialist of occupational medicine or an eye specialist.

Following contact with skin
For dry cement, remove and rinse abundantly with water.
For the wet/moist mixture, wash skin with plenty of water and a pH-neutral soap or mild detergent intended for use on skin.
Remove contaminated clothing, footwear, watches, etc. and clean thoroughly before re-using them.
Seek medical treatment in all cases of irritation or burn.

Following inhalation
Move the exposed person to fresh air. Dust in throat and nasal passages should clear spontaneously. Contact a physician if irritation persists or later develops or if discomfort, coughing or other symptoms persist.

Following ingestion
Do not induce vomiting. If the person in conscious, wash out mouth with water and give plenty of water to drink. Get immediate medical attention or contact the anti-poison centre.

4.2 Most important symptoms and effects, both acute and delayed

Eyes: Eye contact with the mixture (dry or wet) may cause serious and potentially irreversible irritation or injuries.

Skin: Cement and cement-containing mixtures may have an irritating effect on moist skin (due to sweat or humidity) after prolonged contact or may cause contact dermatitis after repeated contact.
For more details see Reference (1).

***Inhalation*:** Repeated inhalation of dust of cement or cement-containing mixtures over a long period of time increases the risk of developing lung diseases.

Ingestion: If accidentally ingested, cement may cause burns to the digestive tract.

Environment: Under normal use, common cements are not hazardous to the environment.

4.3 Indication of any immediate medical attention and special treatment needed

See 4.1. When contacting a physician, take this SDS with you.

5. FIREFITHING MEASURES

5.1 Extinguishing media

Cement and cement-containing mixtures are not flammable. In case of fire, use extinguishing media appropriate to surrounding conditions.

5.2 Special hazards arising from the mixture

Cement and cement-containing mixtures are non-combustible and non-explosive and will not facilitate or sustain the combustion of other materials.

5.3 Advise for firefighters

Cement and cement-containing mixtures pose no fire-related hazards. No need for special protective equipment for firefighters.

6. ACCIDENTAL RELEASE MEASURES

6.1. Personal precautions, protective equipment and emergency procedures

6.1.1 For non-emergency personnel

Wear protective equipment as described under Section 8 and follow the advice for safe handling and use as given under Section 7.

6.1.2 For emergency responders

Emergency procedures are not required. However, eye, skin and respiratory protection equipment is needed in situations with high dust levels.

6.2 Environmental precautions

Do not wash cement down sewage or drainage systems or into bodies of water (e.g. streams).

6.3 Methods and material for containment and cleaning up

Use dry cleanup methods such a vacuum cleanup or vacuum extraction (industrial portable units, equipped with high efficiency air filter or equivalent techniques), which do not cause airborne dispersion. Never use compressed air.
Ensure that workers wear the appropriate personal protective equipment (see Section 8) to avoid inhalation of dust from cement or cement-containing mixtures and contact with skin and eyes.
Place spilled materials into a container for future use.
In case of large spillage of cement or cement-containing mixtures, close/cover any waste water pit in close proximity.

6.4 Reference to other sections
See Sections 8 and 13 for more details.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

7.1.1 Protective measures
Follow the recommendations as given under Section 8. To clean up cement and dry cement-containing mixtures, see Subsection 6.3.

Fire prevention measures
No preventive measure is needed as cement and cement-containing mixtures are neither combustible nor flammable.

Measures to prevent aerosol and dust generation
Do not sweep and do not use compressed air. Use dry cleanup methods such as vacuum clean-up or vacuum extraction, which do not generate airborne dust.

Environmental protection measures
When handling the material, avoid dust development..

7.1.2 Advice on general occupational hygiene
Do not eat, drink or smoke while handling or bagging the mixture.
In dusty environments, wear dust mask and protective goggles.
Use protective gloves to avoid skin contact.

7.2 Conditions for safe storage, including any incompatibilities
Cement and cement-containing mixtures should be stored in waterproof, dry (i.e. with internal condensation minimised) and clean conditions and protected from contamination.
Engulfment hazard: Cement can build up or adhere to the walls of the confined space where it is stored. Cement can release, collapse or fall unexpectedly.
To prevent engulfment or suffocation, do not enter a confined space, such as a silo, bin, bulk truck, or other storage container or vessel that stores or contains cement without taking the proper safety measures.
Keep the mixture away from the reach of children, away from acids, in suitably devised closed containers (storage silos and bags), in a cool and dry place, protected from excessive draught to maintain technical properties while avoiding airborne dust development (see Section 10).

Effectiveness of the Chrome VI reducing agent
Intact packaging and compliance with the appropriate storage conditions as indicated above are the essential conditions to keep the effectiveness of the reducing agent unaltered throughout the shelf life declared on the delivery documents (for both bag and bulk deliveries) as well as on each bag.
Declared shelf life refers exclusively to the period during which the reducing agent is effective in keeping the content of soluble chromium VI, determined according to EN 196-10, below the 0.0002% limit of the total dry weight of the cement ready to use (see Section 15), subject to the limitations of use of the mixture dictated by the general rules of storage and use of the product itself.

7.3 Specific end use(s)
No further information about specific end uses (see Subsection 1.2).

8. EXPOSURE CONTROL / PERSONAL PROTECTION

8.1 Control parameters
The Threshold Limit Value – Time Weighted Average (TLV-TWA) adopted by ACGIH, the American Conference of Governmental Industrial Hygienists for Portland cement in the workplaces is 1 mg/m^3 (respirable dust fraction).
Exposure level:
DNEL (respirable dust fraction): 1 mg/m^3
DNEL (skin): not applicable
DNEL (ingestion): not relevant

Environmental risk assessment:
PNEC (water): not applicable
PNEC (sediment): not applicable
PNEC (soil): not applicable

8.2 Exposure controls

For each Process Category (PROC), users can choose between options A) and B) shown in Table 8.2.1 below, depending on what is most appropriate to their specific situation. If an option is chosen, it must be indicated in Table 8.2.2 “Individual protection measures such as personal protection equipment – Specifications for respiratory protection equipment”. Hence, only combinations between A) – A) and B) – B) are possible.

8.2.1 Appropriate engineering controls

At plants where cement is handled, conveyed, loaded, unloaded and stored, appropriate engineering measures shall be taken to protect the workers’ health and to minimise dust propagating in the work environment as indicated in the table (DNEL = 1 mg/m^3). Localised controls shall be defined in relation to the existing conditions and the corresponding special equipment shall be identified according to the table given under Subsection 8.2.2.

Table 8.2.1

Exposure Scenario	PROC*	Exposure	Localised controls	Efficiency
Industrial manufacture/formulation of hydraulic building and construction materials	2, 3	Duration is not restricted (up to 480 minutes per shift, 5 shifts a week); (#) < 240 minutes	Not required	-
	14, 26		A) Not required or B) generic local exhaust ventilation	- 78 %
	5, 8b, 9		Generic local exhaust ventilation	78 %
Industrial uses of dry hydraulic and construction materials (indoor, outdoor)	2		Not required	-
	14, 22, 26		A) Not required or B) generic local exhaust ventilation	- 78 %
	5, 8b, 9		Generic local exhaust ventilation	78%
Industrial uses of we suspension of hydraulic building and construction materials	7		A) Not required or B) generic local exhaust ventilation	- 78 %
	2, 5, 8b, 9, 10, 13, 14		Not required	-
Professional use of dry hydraulic building and construction materials (indoor, outdoor)	2		A) Not required or B) generic local exhaust ventilation	- 72 %
	9, 26		A) Not required or B) generic local exhaust ventilation	- 72 %
	5, 8a, 8b, 14		Generic local exhaust ventilation	72 %
	19 (#)		Localised controls are not applicable, process only in well-ventilated rooms or outdoors	50 %
Professional uses of wet suspensions of hydraulic building and construction materials	11		A) Not required or B) generic local exhaust ventilation	- 72 %
	2, 5, 8a, 8b, 9, 10, 13, 14, 19		Not required	-

*PROC they are identified uses as defined in Section 1.2.

8.2.2 Individual protection measures such as personal protection equipment

General: At plants where cement and cement-containing mixtures are handled, conveyed, loaded and unloaded, appropriate engineering measures shall be taken to protect the workers’ health and to minimise dust propagating in the work environment. Do not eat, drink or smoke during mixing or pouring operations to avoid contact with the skin or mouth.
Immediately after handling cement or cement-containing products/mixtures, workers should wash or shower with a pH-neutral soap or mild detergent intended for use on skin. Remove contaminated clothing, footwear, glasses/goggles, etc. and clean thoroughly before re-using them.

Where personal protection is necessary, the following personal protective equipment (PPE) shall be used:

Eye/face protection

Wear approved glasses or safety goggles according to EN 166 when handling dry or wet cement and cement-containing mixes to prevent contact with eyes.

Skin protection

Use impervious, abrasion- and alkali-resistant gloves according to EN 374 – parts 1, 2 and 3.
Wear long-sleeved protective clothing, safety shoes or boots as well as skin care products (including moisturising creams) to protect the skin from prolonged contact with wet cement.

Respiratory protection

When a person is potentially exposed to dust levels above exposure limits, use appropriate respiratory protection. The type of respiratory protection should be adapted to the dust level and conform to the relevant EN standard (example UNI EN 149-certified filtering half mask).

The personal protective equipment (PPE), defined as a function of local controls and assessed for a DNEL value = 1 mg/m^3, is specified in Table 8.2.2.

Table 8.2.2

Exposure scenario	PROC*	Exposure	Specification of respiratory protective equipment (RPE)	RPE efficiency - assigned protection factor (APF)
Industrial manufacture/formulation of hydraulic building and construction materials	2, 3	Duration is not restricted (up to 480 minutes per shift, 5 shifts a week); (#) < 240 minutes	Not required	-
	14, 26		A) P2 mask (FF, FM) or B) P1 mask (FF, FM)	APF = 10 APF = 4
	5, 8b, 9		P2 mask (FF, FM)	APF = 10
Industrial uses of dry hydraulic building and construction materials (indoor, outdoor)	2		Not required	-
	14, 22, 26		A) P2 mask (FF, FM) or B) P1 mask (FF, FM)	APF = 10 APF = 4
	5, 8b, 9		P2 mask (FF, FM)	APF = 10
Industrial uses of wet suspension of hydraulic building and construction materials	7		A) P3 mask (FF, FM) or B) P2 mask (FF, FM)	APF = 20 APF = 10
	2, 5, 8b, 9, 10 13, 14		Not required	-
Professional use of dry hydraulic building and construction materials (indoor, outdoor)	2		A) P2 mask (FF, FM) or B) P1 mask(FF, FM)	APF = 10 APF = 4
	9, 26		A) P3 mask (FF, FM) or B) P2 mask (FF, FM)	APF = 20 APF = 10
	5, 8a, 8b, 14		P3 mask (FF, FM))	APF = 20
	19 (#)		P3 mask (FF, FM)	APF = 20
Professional use of wet suspensions of hydraulic building and construction materials	11		A) P3 mask (FF, FM) or B) P2 mask (FF, FM)	APF = 20 APF = 10
	2, 5, 8a, 8b, 9, 10, 13, 14, 19		Not required	-

*PROC they are identified uses as defined in Section 1.2.

A review of the APFs of the different RPE (in accordance with EN 529:2005) is available in the MEASE Glossary (16).

Thermal hazards
Not applicable

8.2.3 Environmental exposure controls

Refer to engineering controls (Subsection 8.2.1) to prevent the mixture from dispersing into the environment.
Adopt all measures to ensure that the mixture does not reach water (waste, ground or surface water).
At plants where cement and cement-containing mixtures are handled, conveyed, loaded, unloaded and stored, appropriate engineering measures shall be taken to minimise dust propagating in the work environment. In particular, adequate preventive actions should be taken to ensure that the concentration of respirable cement dust is kept below the time weighted threshold limit (TLV-TWA) adopted for Portland cement by ACGIH, the American Conference of Industrial Hygienists.
Environmental exposure control for the emission of cement particles into air must be in accordance with the available technology and in compliance with the applicable regulations for the emission of general dust particles.
Environmental exposure control is relevant for the aquatic environment as emissions of cement in the different life-cycle stages (production and use) mainly apply to ground and waste water. The aquatic effect and risk assessment cover the effect on organisms/ecosystems due to possible pH changes related to hydroxide discharges. The toxicity of other dissolved inorganic ions is expected to be negligible compared to the potential pH effect.
Any effects that might occur during production and use would be expected to take place on a local scale. The pH of effluent and surface water should not exceed 9. Otherwise, it could have an impact on municipal sewage treatment plants (STPs) and industrial waste water treatment plants (WWTPs). For that assessment of exposure, a stepwise approach is recommended:
Tier 1: Retrieve information on effluent pH and the contribution of the cement on the resulting pH. Should the pH be above 9 and be predominantly attributable to cement, 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. 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 cement during production or use phase.
No special emission control measures are necessary for the exposure to the terrestrial environment.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

(a) **Appearance**: Cement and cement-containing mixtures are a finely ground inorganic material (dark gray powder).
(b) **Odour:** Odourless
(c) **Odour threshold**: No odour threshold, odourless
(d) **pH**: (T = 20°C in water, solid/water ratio1:2): 11-13.5
(e) **Melting point**: > 1250 °C
(f) **Initial boiling point and boiling range**: Not applicable, as under normal atmospheric conditions, melting point >1250 °C
(g) **Flash point**: Not applicable as it is not a liquid
(h) **Evaporation rate:** Not applicable as it is not a liquid
(i) **Flammability (solid, gas):** not applicable as it is a solid which is non-combustible and does not cause or contribute to fire through friction
(j) **Upper/lower flammability or explosive limits:** Not applicable as it is not a flammable gas
(k) **Vapour pressure**: Not applicable as melting point > 1250 °C
(l) **Vapour density**: Not applicable as melting point > 1250 °C
(m) **Relative density**: 2.75-3.50; Apparent density: 0.9-1.5 g/cm³
(n) **Solubility(ies) in water (T = 20 °C)**: slight (0.1-1.5 g/l)
(o) **Partition coefficient:** n-octanol/water: Not applicable as it is an inorganic mixture
(p) **Self-ignition temperature**: Not applicable (no pyrophoricity – no organo-metallic, organo-metalloid or organo-phosphine bindings or of their derivatives, and no other pyrophoric constituent in the composition)
(q) **Decomposition temperature**: not applicable as no organic peroxide is present
(r) **Viscosity**: not applicable as it is not a liquid

(s) **Explosive properties**: not applicable. Not explosive or pyrotechnic. Not in itself capable by chemical reaction of producing gas at such temperature and pressure and at such a speed as to cause damage to the surroundings. Not capable of a self-sustaining exothermic chemical reaction.
(t) **Oxidising properties:** Not applicable as 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, cement and cement-containing mixes will harden into a stable mass that is not reactive in normal environments.

10.2 Chemical stability
As-is cement is stable as long as it is properly stored (see Section 7). It should be kept dry. Contact with incompatible materials should be avoided.
Wet cement is alkaline and incompatible with acids, with ammonium salts, with aluminium or other non-noble materials. When in contact with hydrofluoric acid, cement dissolves to produce corrosive silicon tetrafluoride gas. Cement reacts with water to form silicates and calcium hydroxide. Silicates in cement react with powerful oxidizers such as fluorine, boron trifluoride, chlorine trifluoride, manganese trifluoride and oxygen difluoride.
Intact packaging and compliance with the appropriate storage conditions as indicated in Subsection 7.2 (adequate tightly closed and sealed containers, dry and cool place, no ventilation) are the essential conditions to keep the effectiveness of the reducing agent unaltered throughout the shelf life declared on each bag or on the delivery documents.

10.3 Possibility of hazardous reactions
Cement does not cause hazardous reactions.

10.4 Conditions to avoid
Humid conditions during storage may case lump formation and loss of product quality.

10.5 Incompatible materials
Wet cement and wet cement-containing mixtures are alkaline and incompatible with acids, with ammonium salts, with aluminium or other non-noble materials. When in contact with aluminium powder, wet cement and wet cement-containing mixtures cause the production of hydrogen.

10.6 Hazardous decomposition products
Cement and cement-containing mixes will not decompose into any hazardous products.

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Hazard class	Cat	Effect	Reference
Acute toxicity – dermal	-	Limit test, rabbit, 24 hours' contact, 2,000 mg/g body weight – no lethality. Based on available data, the classification criteria are not met.	(2)
Acute toxicity – inhalation	-	No acute toxicity by inhalation observed. Based on available data, the classification criteria are not met.	(9)
Acute toxicity – oral	-	No indication of oral toxicity from studies with cement kiln dust. Based on available data, the classification criteria are not met.	Literature survey
Skin corrosion/irritation	2	Cement in contact with wet skin may cause thickening, cracking or fissuring of the skin. Prolonged contact in combination with abrasion may cause severe burns.	(2) Human experience
Serious eye damage/irritation	1	Clinker caused a mix picture of corneal effects and the calculation irritation index was 128. Direct contact with cement may cause corneal damage by mechanical stress, immediate or delayed irritation or inflammation. Direct contact by larger amounts of dry cement or splashes of wet cement may cause effects ranging from moderate eye irritation (e.g. conjunctivitis or blepharitis) to chemical burns and blindness.	(10), (11)

Skin sensitisation	1B	Some individuals may develop eczema upon exposure to wet cement dust, caused either by the high pH, which induces irritant contact dermatitis after prolonged contact, or by an immunological reaction to soluble Cr (VI), which elicits allergic contact dermatitis. The response may appear in a variety of forms ranging from a mild rash to severe dermatitis and is a combination of the two above-mentioned mechanisms. If the cement contains a soluble Cr(VI)-reducing agent and as long as the mentioned period of effectiveness of the chromate reduction is not exceeded, a sensitising effect is not expected [Reference (3)].	(3), (4), (17)
Respiratory sensitisation	-	There is no indication of sensitisation of the respiratory system. Based on available data, the classification criteria are not met.	(1)
Germ cell mutagenicity	-	No indication. Based on available data, the classification criteria are not met.	(12), (13)
Carcinogenicity	-	No causal association has been established between Portland cement exposure and cancer. The epidemiological literature does not support the designation of Portland cement as a suspected human carcinogen. Portland cement is not classifiable as a human carcinogen (according to ACGIH A4: Agents that cause concern that they could be carcinogenic for humans but which cannot be assessed conclusively because of a lack of data. In vitro or animal studies do not provide indications of carcinogenicity that are sufficient to classify the agent with one of the other notations). Based on available data, the classification criteria are not met.	(1) (14)
Reproductive toxicity	-	Based on available data, the classification criteria are not met.	No evidence from human experience
STOT – single exposure	3	Cement dust may irritate the throat and respiratory tract. Coughing, sneezing and shortness of breath may occur following exposures in excess of occupational exposure limits. Overall, the pattern of evidence clearly indicates that occupational exposure to cement dust has produced deficits in respiratory function. However, evidence available at the present time is insufficient to establish with any confidence 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. No chronic effects or effects at low concentration have been observed. Based on available data, the classification criteria are not met.	(15)
Aspiration hazard	-	Not applicable as cement is not used as an aerosol.	

Apart from skin sensitisation, Portland cement clinker and common cements have the same toxicological and eco-toxicological properties.

Medical conditions aggravated by exposure
Inhalation of the mixture can aggravate pre-existing respiratory diseases and/or medical conditions, such as emphysema or asthma, and/or pre-existing skin and eye diseases.

12. ECOLOGICAL INFORMATION

12.1 Toxicity
Cement is not hazardous to the environment. Ecotoxicological tests with Portland cement on Daphnia Magna [Reference (5)] and Selenastrum coli [Reference (6)] have shown little toxicological impact. Therefore, LC50 and EC50 values could not be determined [Reference (7)]. There is no indication of sediment phase toxicity [Reference (8)]. However, the addition of large amounts of cement to water may cause the pH to rise and may, therefore, be toxic to aquatic life under certain circumstances.

12.2 Persistence and degradability
Not relevant as cement is an inorganic material. After hardening, cement presents no toxicity risks.

12.3 Bio accumulative potential
Not relevant as cement is an inorganic material. After hardening, cement presents no toxicity risks.

12.4 Mobility in soil
Not relevant as cement is an inorganic material. After hardening, cement presents no toxicity risks.

12.5 Results of PBT and vPvB assessment
Not relevant as cement is an inorganic material. After hardening, cement presents no toxicity risks.

12.6 Other adverse effects
Not relevant.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods
Disposal of cement and any packaging shall be managed pursuant to Section IV "Waste treatment regulations" in Legislative Decree 152/2006 "Environmental Regulations", subsequent amendments and integrations and all related implementing decrees.

14. TRANSPORT INFORMATION

Cement and cement-containing mixtures do not meet the definition of any hazard class under the International regulation on the transport of dangerous goods (IMDG/sea, ADR/road, RID/rail, ICAO/IATA/air).
No special precautions are needed apart from those mentioned under Section 8.
Used closed containers to prevent airborne dispersion during transport.

14.1 UN number
Not relevant.

14.2 UN proper shipping name
Not relevant.

14.3 Transport hazard class(es)
Not relevant.

14.4 Packing group
Not relevant.

14.5 Environmental hazards
Not relevant.

14.6 Special precautions for user
Not relevant.

14.7 Transport in bulk according to Annex II of MARPOL and the IBC Code
In compliance with the provisions in Appendix C of the IMSBC/International Maritime Solid Bulk Cargoes code, adopted by IMO/International Maritime Organization by Resolution MSC 268(85):2008 and subsequent amendments and integrations, incorporated in Decree No. 1340 of November 30, 2010, of the Italian Ministry of Infrastructures and Transport.

15. REGULATORY INFORMATION

15.1 Safety, health and environmental regulation/legislation specific for the mixture
- Regulation (EC) No. 1907 of 18/12/2006 "Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH)"
- Regulation (EC) No. 987 of 8/10/2008 amending Regulation (EC) No. 1907/2006 of the European Parliament and of the Council on the Registration, Authorisation and Restriction of Chemicals (REACH) as regards Annexes IV and V
- Ministry of Health's Decree of 10/05/2004 implementing Directive 2003/53/EC of the European Parliament and of the Council of 18 June 2003 amending for the twenty-sixth time Council Directive 76/769/EEC relating to restrictions on the marketing and use of certain dangerous substances and preparations (nonylphenol, nonylphenol ethoxylate and cement)

- Ministry of Health's Decree of 17/02/2005 adopting a test method for cements with reference to the Ministerial Decree of 10/05/2004 implementing the twenty-sixth amendment of Council Directive 76/769/CEE
- Regulation (EC) No. 552 of 22/06/2009 amending Regulation (EC) No. 1907 as regards Annex XVII
- Regulation (EC) No. 1272 of the European Parliament and of the Council of 16/12/2008 on classification, labelling and packaging of substances and mixtures, amending and repealing Directives 67/548/EEC and 199/45/EC, and amending Regulation (EC) No. 1907/2006
- COMMISSION REGULATION (EU) 2015/830 of 28 May 2015 amending Regulation (EC) No 1907/2006 of the European Parliament and of the Council on the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH)"
- Commission Regulation (EU) No 487/2013 of 8 May 2013 amending, for the purposes of its adaptation to technical and scientific progress, Regulation (EC) No 1272/2008 of the European Parliament and of the Council on classification, labelling and packaging of substances and mixtures (Official Journal of the European Union L149 of June 1, 2013)
- Legislative Decree No. 81 of 09/04/2008 and subsequent amendments regarding "Occupational health and safety. Cement users shall apply all technical and organizational measures as specified in said Decree, taking into account the indications regarding exposure control and provision of adequate PPE as given under Section 8.
- EN 196-10 – "Methods of testing cement - Part 10: Determination of the water-soluble chromium (VI) content of cement"
- EN 197-1 – "Cement - Part 1: Composition, specifications and conformity criteria for common cements"
- UNI EN 413-1 – "Masonry cement - Part 1: Composition, specifications and conformity criteria"
- EN 15368 – "Hydraulic binder for non-structural applications"
- Legislative Decree 152/2006 "Environmental Regulations"

> According to Annex XVII, Point 47, under Regulation (EC) No. 1907/2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) as amended by Regulation No. 552/2009, cement and cement-containing mixtures shall not be placed on the market or used if they contain, after mixing with water, more than 0.0002% (2 ppm) of soluble chromium (VI) of the total dry weight of the cement. Compliance with this threshold limit is ensured through the introduction of a reducing agent into the preparation, the effectiveness of which is guaranteed for a certain period of time (shelf life), and the maintenance of the appropriate storage conditions (see Subsection 7.2 and Section 10).

Within the meaning of the above-mentioned Regulation, the following information shall be provided when reducing agents are used:

DATE OF PACKAGING	Clearly declared on the bag or on the delivery documents
STORAGE CONDITIONS (*)	In adequate tightly closed containers, within a cool, dry and not ventilated area, whilst preserving integrity of the packages
SHELF LIFE (*)	As stated on the delivery documents (for both bag and bulk products) as well as on each bag

(*) *for maintaining the activity of the reducing agent*

Declared shelf life refers exclusively to the period during which the reducing agent is effective in keeping the content of soluble chromium VI, determined according to EN 196-10, below the 0.0002% limit (see Section 15), subject to the limitations of use of the mixture dictated by the general rules of storage and use of the product itself.

Cement is a mixture and, as such, is not subject to REACH registration, which is mandatory for substances. Cement clinker is a substance but it is exempt from registration pursuant to article 2.7 (b) and Annex V.10 of REACH.
Should some substances used in the cement require REACH registration and the provision of the related exposure scenarios, such information will be introduced as an annex to the SDS as soon as it becomes available.

15.2 Chemical Safety Assessment
Not required

16. OTHER INFORMATION

16.1 Indication of changes

This Safety Data Sheet has been modified to implement provisions pursuant to Regulation (EC) No.1272/2008 and Annex II to Regulation (EC) No. 453/2010, in force since June 01, 2015.

16.2 Abbreviations and acronyms

ACGIH: American Conference of Industrial Hygienists
ADR/RID: European Agreement concerning the International Carriage of Dangerous Goods by Road / Regulations concerning the International Carriage of Dangerous Goods by Rail
APF: Assigned protection factor
CAS: Chemical Abstract Service
COPD: Chronic Obstructive Pulmonary Disease
DNEL: Derived no-effect level
EC50: half maximal effective concentration
EPA: Type of high efficiency air filter
IATA: International Air Transport Association
IMDG: International Maritime Dangerous Goods
IMO: International Maritime Organization
IMSBC: International Maritime Solid Bulk Cargoes
LC50: Median lethal dose
OEL: Occupational exposure limit value
PBT: Persistent, bio-accumulative and toxic
PNEC: Predicted no-effect concentration
PROC: Process category
REACH: Registration, Evaluation and Authorisation of Chemicals
SDS: Safety Data Sheet
STOT: Specific Target Organ Toxicity
TLV-TWA: Threshold Limit Value -Time Weighted Average
vPvB: very Persistent, very Bio-accumulative

16.3 Key literature references and sources of data

(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, http://www.ebrc.de/industrial-chemicals-reach/projects-and-references/mease.php
(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 health safety and environmental training programs for their workers, companies must ensure that workers read, understand and apply the requirements of this SDS.

16.5 Further information

The data and test methods used for the purpose of classifying common cements are given or referred to in Section 11.1.
The table below lists the methods of classification and procedures implemented to classify the mixture pursuant to Regulation (EC) 1272/2008 (CLP).

Classification according to Regulation (EC) No. 1272/2008	Classification procedure
H315: causes skin irritation, 2	test
H318: causes serious eye damage, 1	test
H317: may cause an allergic skin reaction, 1B	Human experience
H335: may cause respiratory irritation, 3	Human experience

This SDS, updated in compliance with the provisions set forth in REACH, is also available in electronic format from www.i-nova.net

16.6 Disclaimer

The information on this data sheet reflects the currently available knowledge and is reliable provided that the product is used under the prescribed conditions. Any other use of the product, including the use of the product in combination with any other product or any other process, is the responsibility of the user.
It is implicit that the user is responsible for determining appropriate safety measures and for applying the legislation covering his/her 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	
Title	Manufacture of Flue Dust containing mixtures: cement, hydraulic binder, controller low strength material, concrete (ready mixed or precast), mortar, grout and others for building and construction work W
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: Formulation of preparations
Worker scenario	PROC 2: Use in close, continuous process with occasional controller exposure PROC 3: Use in closed batch process (synthesis or formulation) PROC 5: Mixing or blending in batch process for formulation of preparations and articles (multistage and/or significant contact) 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 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 and 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. 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 (CL)	LC efficiency (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. to 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 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 may increase the pH of the environmental compartment. It is an intrinsic property of the hydraulic binder that after a relatively short time the end product will harden (e.g. as concrete or mortar) and enclose calcium hydroxide and residual alkaline moisture.

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 m³/g

Other given operational conditions affecting environmental exposure

Effluent discharge rate: 2,000 m³/g

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. If applicable, 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.

Organisational 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 regular basis and neutralised 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/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.

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 are 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.