



## Portland cement clinker Safety Data Sheet

*According to the REACH Regulation (EC) n° 1907/2006 and Regulation (EU) n° 453/2010 amending it.*

*According to "Guidelines for the safety data sheet template for common cements" of 15-12-2014 approved by the WG C of CEMBUREAU on 24-11-2014.*

**Product: Portland cement clinker**

**Sectoral version: 2.1**

**Version: 01.06.2015 Replaces all previous versions**

**Date of printing: 01.06.2015**

### 1. Identification of the substance/mixture

#### 1.1. Product identifier

Portland cement clinker

Substance	EINECS	CAS	Reference N° C&L notification
Portland cement clinker	266-043-4*	65997-15-1	02-2119682167-31-0000

\* Entry is referred to as Cement, portland, chemicals but actually describes Portland cement clinker.

Cement Clinker is exempt from registration (Art 2.7 (b) and Annex V.10 of REACH), hence no registration number is given.

#### 1.2. Relevant identified uses of the substance or mixture and use advised against

Portland cement clinker is used for the production of Common cements or other hydraulic binders in industrial installations.

Cement and hydraulic binders are used in the production of building materials and in construction by professional users or consumers.

Process category (PROC)	Identified uses-Description of use	Manufacturing/ Formulation of	Industrial/ Professional use of
		construction and building materials	
2	Use in continuous and closed process with sporadic controlled exposures	X	X
3	Use in closed process by batches / dosing	X	X
5	Mix by dosing processes to formulate preparations or articles	X	X
8b	Transfer of substances or preparations from/to vessels/large containers to dedicated/specific facilities	X	X
9	Transfer of substances or preparations to smaller containers	X	X
14	Production of preparations or articles via tableting, extrusion-compression, pelletisation	X	X
26	Management of solid inorganic substances at room temperature	X	X

### 1.3. Data of the supplier of the safety data sheet

**Name of the company:** CEMENTOS LEMONA, S. A.

**Factory of:** Lemona

**Address:** Arraibi, 40. 48330 Lemona (Vizcaya)

**Telephone no:** 94 487 22 55

**Contact e-mail address:** [lemona@lemona.com](mailto:lemona@lemona.com)

### 1.4. Emergency telephone number

Call the medical emergency telephone number of your area or the emergency telephone number **112** and transmit the information on this sheet.

## 2. **Hazards identification**

### 2.1. Classification of the substance or mixture

#### 2.1.1. According to Regulation (EC) No 1272/2008 (CLP)

Hazard class	Hazard category	Hazard statements	Procedure for their classification
Skin irritation	2	H315: Causes skin irritation	Results of tests
Serious eye damage/ Eye irritation	1	H318: Causes serious eye damage	Results of tests
Skin sensitizer	1B	H317: May cause an allergic skin reaction	Bibliographical studies
Specific Target Organ Systemic Toxicity (single exposure)	3	H335: May cause respiratory irritation	Bibliographical studies

### 2.2. Label elements

**According to Regulation (EC) No 1272/2008 (CLP)**

**Hazard pictograms GHS07 y GHS05**

**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**

P280	Wear protective gloves/protective clothing/eye protection/face protection
P305+P351+P338+P310	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do. Continue rinsing. Immediately call a poison center or doctor/physician.
P302+P352+P333+P313	IF ON SKIN: Wash with plenty of soap and water. If skin irritation or rash occurs: Get medical advice/attention.
P261+P304+P340+P312	Avoid breathing dust/fume/gas/mist/vapours/spray. IF INHALED: Remove person to fresh air and keep at rest in a position comfortable for breathing. Call a poison center or doctor/physician if you feel unwell.

**2.3. Other hazards**

Portland cement clinker does not meet the criteria for being classified as PBT or vPvB, in accordance with Annex XIII of the REACH (Regulation (EC) No 1907/2006).

**3. Composition/information on components****3.1. Substances**

Portland cement clinker is a UVCB substance (Substances of Unknown or Variable composition, Complex reaction products or Biological materials) consisting of 4 main clinker phases, namely tri- and dicalcium-silicates ( $3\text{CaO}\cdot\text{SiO}_2$  y  $2\text{CaO}\cdot\text{SiO}_2$ ); tricalcium-aluminate ( $3\text{CaO}\cdot\text{Al}_2\text{O}_3$ ) and tetracalcium-aluminoferrite ( $4\text{CaO}\cdot\text{Al}_2\text{O}_3\cdot\text{Fe}_2\text{O}_3$ ), usually together with some unreacted CaO (free lime). It is made by mineralogical transformation of a precisely specified mixture of raw materials based on oxides of calcium, silicon, aluminium and iron and small quantities of other elements.

Composition information – main constituents					
IUPAC name	EC number	CAS number	Mol. Formula	Typical conc. (%w/w)	Conc. Range (%w/w)
Tricalcium silicate	235-336-9	12168-85-3	$3\text{CaO}\cdot\text{SiO}_2$	63	0 – 85
Dicalcium silicate	233-107-8	10034-77-2	$2\text{CaO}\cdot\text{SiO}_2$	15	0 – 85

Composition information – main constituents					
IUPAC name	EC number	CAS number	Mol. Formula	Typical conc. (%w/w)	Conc. Range (%w/w)
Tetracalcium aluminoferrite	235-094-4	12068-35-8	4CaO.Al <sub>2</sub> O <sub>3</sub> .Fe <sub>2</sub> O <sub>3</sub>	10	0 – 30
Tricalcium aluminate	234-932-6	12042-78-3	3CaO.Al <sub>2</sub> O <sub>3</sub>	10	0 – 20
Calcium oxide (free lime)	215-138-9	1305-78-8	CaO	1	0 - 10

### 3.2. **Mixtures**

Not applicable as the product is a substance, not a mixture.

## 4. **First aid**

### 4.1. **Description of first aid**

#### **General indications**

No personal protective equipment is needed for first aid responders. First aid workers should avoid contact with wet Portland cement Clinker or wet Portland cement Clinker containing mixtures.

#### **Following contact with eyes**

Do not rub eyes in order to avoid possible corneal damage by mechanical stress. Remove contact lenses if any. Incline head to injured eye, open the eyelids 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 skin contact**

For dry Portland cement Clinker, remove and rinse abundantly with water.

For wet/damp Portland cement clinker, wash skin with plenty of water.

Remove contaminated clothing, footwear, watches, etc. and clean thoroughly before re-using them.

Seek medical treatment in all cases of irritation or burns.

#### **Following inhalation**

Move the 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 is 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**

**Contact with Eyes:** Eye contact with Portland cement clinker dust (dry or wet) may cause serious and potentially irreversible injuries.

**Contact with Skin:** Portland cement clinker may have an irritating effect on moist skin (due to sweat or humidity) after prolonged contact or may cause contact dermatitis after repeated contact. Prolonged contact between clinker dust and moist skin may cause irritation, dermatitis or burns.

*For more details see Reference [1].*

**Inhalation:** Repeated inhalation of Portland cement clinker dust over a long period of time increases the risk of developing lung diseases.

**Environment:** Under normal use, Portland cement clinker is not hazardous to the environment.

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

When contacting a physician, take this SDS with you.

**5. Firefighting measures****5.1. Extinguishing media**

Portland cement clinker is not flammable.

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

Portland cement clinkers are non-combustible and non-explosive and will not facilitate or sustain the combustion of other materials.

**5.3. Advice for firefighters**

Portland cement clinker poses 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 given under Section 7.

**6.1.2. For emergency responders**

Emergency procedures are not required.

However, respiratory protection is needed in situations with high dust levels.

**6.2. Environmental precautions**

Do not pour Portland cement clinker into drains or in the surface waters (e.g. streams).

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

Collect spilled material and use it.

Use dry cleanup methods such as vacuum clean-up or vacuum extraction (Industrial portable units equipped with high efficiency air filters (EPA and HEPA filters, EN 1822-1:2009 or equivalent technique) which do not cause airborne dispersion. Never use compressed air.

Ensure that the workers wear appropriate personal protective equipment and prevent dust from spreading.

Avoid inhalation of Portland cement clinker dust and contact with skin. Place spilled material in a container for future use.

**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 dry Portland cement clinker, see Subsection 6.3.

**Measures to prevent fire**

Not applicable.

**Measures to prevent aerosol and dust generation**

Do not sweep. Use dry cleanup methods such as vacuum clean-up or vacuum extraction, which do not cause airborne dispersion.

For more information, consult the “Good practice guide” adopted by de European Social Dialogue Agreement “Agreement on the protection of the health of workers for the proper handling and good use of crystalline silica and the products that contain it” by Trade Union Organisation and European trade associations, among which are CEMBUREAU. These recommendations on safe handling can be found in <http://www.nepsi.eu/good-practice-guide.aspx>.

The Spanish cement industry voluntarily adopted the terms of the Agreement and has written a protocol for the application of this specific document of the Spanish cement sector. [http://www.oficemen.com/reportajePag.asp?id\\_rep=139](http://www.oficemen.com/reportajePag.asp?id_rep=139).

**Measures to protect the environment**

No particular measures.

**7.1.2. Information on general occupational hygiene**

Do not handle or store near food, beverages or tobacco.

In dusty environments wear mask and goggles.

Use gloves to avoid contact with the skin.

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

Portland cement clinker should be stored under waterproof, dry (i.e. with internal condensation minimised) conditions, clean and protected from contamination.

**Engulfment hazard:** Portland cement clinker can build-up or adhere to the walls of a confined space. The clinker 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 Portland cement clinker without taking the proper safety measures.

When the storage is in the form of stockpiles, unstable walls or slopes can be formed that pose a risk of collapse.

Do not use aluminium containers for the storage or transport of wet cement containing mixtures due to incompatibility of the materials.

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

Clinker is used for the production of common cements or other hydraulic binders. In general such final products have to be low in water soluble Cr(VI). Typically, the final products contain a chromate reducing agent.

**8. Exposure/personal protection controls****8.1. Control parameters**

Limit name-value	Type of limit value	Value (at 8h TWA)	Units	Legal references
Particles (insoluble or not very soluble)	VLA-ED Inhalable fraction	10	mg/m3	“List of Occupational Exposure to chemical agents in Spain” of the INSHT.
Particles (insoluble or not very soluble)	VLA-ED Breathable fraction	3	mg/m3	ORDER itc/2585/2007 “List of Occupational Exposure to chemical agents in Spain” of the INSHT.

Portland Cement	VLA-ED Breathable fraction	4	mg/m3	"List of Occupational Exposure to chemical agents in Spain" of the INSHT.
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## 8.2. Exposure controls

### 8.2.1. Appropriate technical controls

Measures to reduce generation of dust and to avoid dust propagating in the environment such as dedusting, exhaust ventilation and dry clean-up methods which do not cause airborne dispersion.

Use	PROC*	Exposure	Localised controls	Efficiency
Industrial manufacture/formulation of hydraulic building and construction material	2, 3	Duration is not restricted (up to 480 minutes per shift, 5 shifts a week)	Not required	-
	14, 26		A) Not required or B) Local exhaust ventilation	- 78 %
	5, 8b, 9		A) General ventilation o B) Local exhaust ventilation	17 % 78 %

\* PROC's are identified uses and defined in section 1.2

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

**General:** Do not eat, drink or smoke when working with Portland cement Clinker to avoid contact with skin or mouth. Immediately after working with Portland cement clinker or Portland cement clinker-containing materials, workers should wash or shower or use skin moisturisers.

Remove contaminated clothing, footwear, watches, etc. and clean thoroughly before re-using them.

#### Eye/face protection



Wear approved glasses or certificated safety goggles when handling dry or wet Portland cement clinker.

#### Skin protection



Wear waterproof gloves resistant to abrasion and alkalis (e.g. gloves with special outer nitrile coating and cotton lining), safety footwear, long-sleeved protective clothing as well as products for the care of the skin (including protective creams) to protect the skin from prolonged contact with wet Portland cement clinker. Special care must be taken to prevent Portland cement clinker dust entering safety footwear.



#### 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 standards laid down in harmonised UNE standard (e.g. UNE EN149, UNE EN 140, UNE EN 14387, UNE EN 1827) or other national standards.

#### Thermal hazards

Not applicable.

Exposure scenarios	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)	Not required	-
	14,26		A) Respiratory protective 1 or B) Not required	APF = 4  -
	5, 8b, 9		A) Respiratory protective 2 or B) Respiratory protective 1	APF = 10  APF = 4

\* PROC 's are identified uses and defined in section 1.2.

The employer and self-employed workers are legally obliged to provide and maintain breathing apparatus, and ensuring its correct use in the workplace. Therefore, they must define and document an appropriate breathing apparatus policy and programme, including the training of workers.

### 8.2.3. Environmental exposure controls

Environmental exposure control for the emission of clinker particles into air has to be in accordance with the available technology and regulations for the emission of general dust particles.

Do not wash clinker into sewage systems or in surface water, to avoid high pH. Above pH 9 negative ecotoxicological impacts are possible.

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:** portland cement clinker is a grey or white, granular inorganic solid material.
- b) **Odour:** odourless
- c) **Odour threshold:** no odour threshold, odourless.
- d) **pH:** (Temp = 20 °C in water, water proportion - solid 1:2): basic between 11 and 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 is a solid which is non combustible and does not cause or contribute to fire through friction.
- j) **Upper/lower limits of flammability or explosivity:** not applicable as 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 - 3.20 g/cm<sup>3</sup> at 20 °C; apparent density 0.9-1.5 g/cm<sup>3</sup> at 20 °C
- n) **Solubility(ies) in water:** (Temp 20 °C): mild (0.1-1.5 g/l)
- o) **Partition coefficient: n-octanol/water:** not applicable as is an inorganic substance.



- p) **Auto-ignition temperature:** not applicable (not pyrophoricity - no organo-metallic, organo-metalloid or organo-phosphine bindings or of their derivatives, and no other pyrophoric constituent in their composition).
- q) **Decomposition temperature:** not applicable as no organic peroxide present.
- r) **Viscosity:** not applicable as it not a liquid.
- s) **Explosive properties:** not applicable. Not explosive or pyrotechnic. Not in itself capable of producing gas by chemical reaction at temperature and pressure and a speed as to cause damage to the surroundings. Not capable of a self-sustaining exothermic chemical reaction.
- t) **Oxidising properties:** not applicable as 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, Portland cement Clinker will harden into a stable mass that is not reactive in normal environments.

### 10.2. Chemical stability

Portland cement clinker is stable as long as it is properly stored (see Section 7). Contact with incompatible materials should be avoided.

Wet clinker is alkaline and incompatible with acids, with ammonium salts, with aluminium or other non-noble metals. Clinker dissolves in hydrofluoric acid to produce corrosive silicon tetrafluoride gas. Clinker reacts with water to form silicates and calcium hydroxide. Silicates in clinker react with powerful oxidizers such as fluorine, boron trifluoride, chlorine trifluoride, manganese trifluoride, and oxygen difluoride.

### 10.3. Possibility of hazardous reactions

Portland cement clinkers do not cause hazardous reactions.

### 10.4. Conditions to avoid

Humid conditions during storage may cause lump formation and loss of product quality.

### 10.5. Incompatible materials

Acids, ammonium salts, aluminium or other non-noble metals.

### 10.6. Hazardous decomposition products

Portland cement clinker 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/kg body weight – no lethality. Cement used in the study is Portland cement with over 90% of Portland cement clinker. 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.	(8)

Hazard class	Cat	Effect	Reference
Acute toxicity - oral	-	No indication of oral toxicity from studies with cement kiln dust. Cement kiln dust contains Portland cement clinker in varying amounts. Based on available data, the classification criteria are not met.	Bibliographical study
Skin corrosión/irritation	2	Portland cement Clinker in contact with wet skin, without adequate protection, may cause thickening, cracking or fissuring of the skin. Prolonged contact in combination with abrasion may cause severe burns. Cement used in the study is Portland cement with over 90% Portland cement clinker	(2) Human experience
Serious eye damage/irritation	1	Portland cement clinker caused a mixed picture of corneal effects and the calculated irritation index was 128. Direct contact with Portland cement clinker may cause corneal damage by mechanical stress, immediate or delayed irritation or inflammation. Direct contact with larger amounts of dry Portland cement clinker dust or splashes of wet clinker may cause effects ranging from moderate eye irritation (e.g. conjunctivitis or blepharitis) to chemical burns and blindness	(9), (10)
Skin sensitisation	1	Some individuals exposed to wet cement dust may develop eczema, caused either because the high pH induces a contact dermatitis or by an immunological reaction against the soluble Cr (VI) that causes an allergic contact dermatitis.	(3), (11)
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). Portland cement contains over 90% Portland cement clinker. 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
Specific target organ toxicity (STOT) single	3	Portland cement clinker dust may irritate the throat and respiratory tract. Coughing, sneezing, and shortness of breath may occur following exposures in excess of	(1)

Hazard class	Cat	Effect	Reference
exposure		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.	
Specific target organ toxicity (STOT) repeated exposure	-	There are indications of chronic obstructive pulmonary disease (COPD). 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 Portland cement Clinker is not used as an aerosol.	-

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

#### Medical conditions aggravated by exposure

Portland cement clinker dust may aggravate existing respiratory system disease(s) and/or medical conditions such as emphysema or asthma and/or existing skin and/or eye conditions.

## 12. Ecological information

### 12.1. Toxicity

The product is not hazardous to the environment. Ecotoxicological tests with Portland cement – whose composition is very closely related to that of Clinker – on *Daphnia magna* [Reference (4)] and *Selenastrum coli* [Reference (5)] have shown little toxicological impact. Therefore LC50 and EC50 values could not be determined [Reference (6)]. There is no indication of sediment phase toxicity [Reference (7)]. The addition of large amounts of Portland cement clinker to water may, however, cause a rise in pH and may, therefore, be toxic to aquatic life under certain circumstances.

### 12.2. Persistence and degradability

Not relevant as Portland cement clinker is an inorganic material. After hydration, Portland cement clinker lumps present no toxicity risks.

### 12.3. Bioaccumulative potential

Not relevant as Portland cement clinker is an inorganic material. After hydration, Portland cement clinker lumps present no toxicity risks.

### 12.4. Mobility in soil

Not relevant as Portland cement clinker is an inorganic material. After hydration, Portland cement clinker lumps present no toxicity risks.

### 12.5. Results of PBT and vPvB assessment

Not relevant as Portland cement clinker is an inorganic material. After hydration, Portland cement clinker lumps present no toxicity risks.

### 12.6. Other adverse effects

Not relevant.

## 13. Disposal considerations

### 13.1. Waste treatment methods

Cement clinker may always be reused. Waste treatment methods do not apply.  
Do not dispose of into sewage systems or surface waters.

## 14. Transport information

Portland cement clinker is not covered by the international regulation on the transport of dangerous goods (IMDG, IATA, ADR/RID); no classification is required.  
No special precautions are needed apart from those mentioned under Section 8.

### 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 MARPOL73/78 and the IBC Code

Not relevant.

## 15. Regulatory information

### 15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture

Cement clinker is exempt from registration (Art. 2.7 (b) y Anexo V.10 of REACH).

### 15.2. Chemical Safety Assessment

No chemical safety assessment has been carried out for this substance by the supplier.

## 16. Other information

### 16.1. Indication of changes

This version is in accordance with Regulation (EC) No. 1907/2006 (REACH) and Regulation (EU) No. 453/2010 amending it. It has been written according to the guide "Guidelines for the safety data sheet template for common Cements Co." dated 15-12-2014, approved by the WG C of Cembureau on 11-24-2014.

This safety data sheet replaces and supersedes all previous versions.

**16.2. Abbreviations and acronyms**

ADR/RID	European Agreements on the transport of Dangerous goods by Road/Railway
CAS	Chemical Abstracts Service (Division of the American Chemical Society)
CLP	Classification, labelling and packaging (Regulation (EC) No 1272/2008)
COPD	Chronic Obstructive Pulmonary Disease
DNEL	Derived no-effect level
ECHA	European Chemicals Agency
EINECS	European Inventory of Existing Commercial Chemical Substances
EPA	Type of high efficiency air filter
EC50	Concentration, calculated statistically, which is expected to produce a non-lethal effect defined in 50% of a population of organisms in certain conditions
FPA	Assigned Protection Factor (FPA)
FF P	Filtering facepiece against particles (disposable)
HEPA	Type of high efficiency air filter
IATA	International Air Transport Association
IMDG	International agreement on the maritime transport of dangerous goods
LC50	Lethal dose of a compound in the air or water that kills 50% of organisms studied in specific conditions
MS	Member State
OELV/ED	Occupational exposure limit value / daily exposure
PBT	Persistent, bio-accumulative and toxic
PNEC	Predicted no-effect concentration
PROC	Process category
REACH	Registration, Evaluation and Authorisation of Chemicals (Regulation (EC) No 1907/2006)
SDS	Safety Data Sheet
STOT	Specific target organ toxicity UVCB Substances of unknown or variable composition, complex reaction products or biological materials
UVCB	Substances of Unknown or Variable composition, Complex reaction products or Biological materials
VLE-MP	Very persistent, very bio-accumulative

**16.3. References**

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- 7) Final report Sediment Phase Toxicity Test Results with *Corophium volutator* for Portland clinker prepared for Norcem A.S. by AnalyCen Ecotox AS, 2007.
- 8) TNO report V8801/02, An acute (4-hour) inhalation toxicity study with Portland Cement Clinker CLP/GHS 03-2010-fine in rats, August 2010
- 9) TNO report V8815/09, Evaluation of eye irritation potential of cement clinker G in vitro using the isolated chicken eye test, April 2010
- 10) TNO report V8815/10, Evaluation of eye irritation potential of cement clinker W in vitro using the isolated chicken eye test, April 2010
- 11) 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).  
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- 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) Occurrence of allergic contact dermatitis caused by chromium in cement. A review of epidemiological investigations, Käre 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. Other information**

The information provided in this sheet reflects the knowledge currently available and trusting that the product is used under the conditions laid down and according to the indications that appear on the packaging or in technical guides. Any other use not specified for the product, including its use in conjunction with other products or in other processes, shall be under the exclusive responsibility of the user.

It is the responsibility of the user to take appropriate protection measures, use the cement within its recommended term and comply with all legal requirements that are applicable to its activity.

This cement safety data sheet cancels and replaces the sectoral version 2.0 and the safety data sheet of the clinker of Cementos Lemona of July 2013.