Clinker Safety Data Sheet

20171024. In accordance with REACH Regulation (EC) no. 1907/2006 and its subsequent amendments.

In accordance with "Guidelines for the safety data sheet template for portland cement clinker" of 03/03/2017 by CEMBUREAU.

Product: Portland cement clinker
Sectoral version: 2.3
Version: 19.12.2017 Replaces all previous versions
Date of printing: 19.12.2017

1. Identification of the substance or the mixture and of the business or the company

1.1. Identification of the product

Portland cement clinker.

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

* The entry is called Portland cement, chemical products, but it describes Portland cement clinker.

Cement clinker is exempt from registration (Art. 2.7 (b) and Annex V.10 of REACH); for this reason, no registration number has been provided.

1.2. Identified relevant uses of the substance or of the mix and uses advised against

Portland cement clinker is used exclusively for the production of common cements and other hydraulic binders in industrial facilities.

Common cements and hydraulic binders are used in construction and in the production of construction materials for professional users or consumers.

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
Email address for the person responsible for the safety data sheet: 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. Hazard identification

2.1. Classification of the substance or of the mixture

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

Hazard class	Hazard category	Hazard indications
Skin irritation	2	H315: Causes skin irritation
Serious eye damage/ Eye irritation	1	H318: Causes serious eye damage
Skin sensitizer	1B	H317: May cause an allergic skin reaction
Specific Target Organ Systemic Toxicity (single exposure)	3	H335: May cause respiratory irritation

2.2. Elements of the label

According to Regulation (EC) No. 1272/2008

Hazard pictograms

Warning word
Hazard

Hazard indications

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

Precautionary tips

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 centre or a doctor.

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 INHALATION: remove person to fresh air and keep comfortable for breathing. Call a poison centre or doctor 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 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), which consists of 4 main phases: tricalcium and dicalcium silicates ($3CaO.SiO_2$ and $2CaO.SiO_2$); tricalcium aluminate ($3CaO.Al_2O_3$) and tetracalcium aluminoferrite ($4CaO.Al_2O_3.Fe_2O_3$.)). It can usually have a certain quantity of lime (CaO) without causing a reaction. It originates from a mineral transformation in a specific, precise mixture of raw materials based on calcium oxide, silicon, aluminium and iron and small quantities of other elements.

Information on composition - main components					
IUPAC name	EC number	CAS number	Molecular formula	Typical concentration (%p/p)	Concentration range (%p/p)
Tricalcium silicate	235-336-9	12168-85-3	$3CaO.SiO_2$	63	0 – 85
Dicalcium silicate	233-107-8	10034-77-2	$2CaO.SiO_2$	15	0 – 85
Tetracalcium aluminoferrite	235-094-4	12068-35-8	$4CaO.Al_2O_3.Fe_2O_3$	10	0 – 30
Tricalcium aluminate	234-932-6	12042-78-3	$3CaO.Al_2O_3$	10	0 – 20
Calcium oxide (free lime)	215-138-9	1305-78-8	CaO	1	0 - 10

3.2. Mixtures

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

4. First aid

4.1. First aid description

General indications

The use of personal protective equipment by the people providing first aid is not necessary. Workers who provide first aid must avoid coming into contact with wet Portland cement clinker or wet mixtures containing it.

After contact with the eyes

Do not rub the eyes to prevent damage to the cornea by mechanical stress. Remove contact lenses, if present. Tilt your head on the side of the affected eye, open your eyelid fully and

rinse immediately with plenty of water (if possible use saline solution 0.9% NaCl), for at least 20 minutes to remove all particles. Call an eye doctor or a specialist in occupational medicine.

After contact with skin

If the Portland cement clinker dust is dry, remove as much as possible and then wash thoroughly with water.

If the Portland cement clinker dust is wet, wash thoroughly with water.

Remove and thoroughly clean garments, footwear, watches, etc. stained before using them again.

Seek medical assistance whenever there is irritation or chemical burns.

After inhalation

Remove person to a place where he/she can breathe fresh air. The dust in the throat and in the nostrils should be dispelled spontaneously. Seek medical assistance if irritation persists or appears later or if the discomfort, cough or other symptoms persist.

After accidental ingestion

Do not induce vomiting. If the person is conscious rinse his/her mouth to remove the material or dust. Give him/her plenty of water to drink and immediately call a doctor or a Poison Centre.

4.2. Main acute and delayed symptoms and effects

Contact with eyes: direct contact with Portland cement clinker dust (wet or dry) can cause serious injury, potentially irreversible.

Contact with skin: Portland cement clinker can have an irritant effect on wet skin (due to sweat or moisture) after prolonged contact or can cause contact dermatitis after repeated contact without adequate protection.

Contact between Portland cement clinker dust and wet skin can cause irritation, dermatitis or burns.

For more information, 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: when using the product normally, Portland cement clinker does not pose any particular risk to the environment.

4.3. Indication of all medical attention and special treatments that must be given immediately

When you contact a doctor take this safety sheet with you.

5. Firefighting methods

5.1. Extinguishing media

Portland cement clinker is not flammable.

5.2. Specific hazards arising from the substance or mixture

Portland cement clinker is non-flammable, non-explosive and does not facilitate or feed the combustion of other materials.

5.3. Recommendations for the firefighting staff

Portland cement clinker does not pose any hazard related to fires. The firefighting staff does not have to use any special protective equipment.

6. Measures in the event of accidental spillages

6.1. Personal precautions, protection equipment and emergency procedures

6.1.1. For the staff who are not part of the emergency services

Wear the protective equipment described in section 8 and follow the tips for safe handling given in section 7.

6.1.2. For the emergency personnel

No emergency procedures are required.
However, in situations with high levels of concentration of dust breathing apparatus must be worn.

6.2. Environmental precautions

Do not pour Portland cement clinker either into sewage systems or into surface water (for example streams).

6.3. Material and methods of containment and of cleaning

Collect the poured material and reuse it.
Use dry cleaning methods that do not lift dust such as vacuum or extraction systems (hand-held industrial vacuum cleaners equipped with high efficiency particles (EPA and HEPA filters, UNE-EN 1822-1) or equivalent technique). Never use pressurised air.
Make sure that all workers have the appropriate personal protective equipment and prevent the dispersion of dust.
Avoid inhalation of Portland cement clinker dust and avoid contact with eyes and skin. Deposit the material collected in a container for reuse.

6.4. Reference to other sections

For more information, see sections 8 and 13.

7. Handling and storage

7.1. Precautions for safe handling

7.1.1. Protective measures

Follow the recommendations given in section 8.
For cleaning dry Portland cement clinker, see paragraph 6.3.
Fire prevention measures:
Not applicable.
Measures for preventing formation of particles in suspension and dust:
Do not sweep. Use dry cleaning methods that do not lift dust such as vacuum or extraction systems.
For more information, consult the “Good practice guide” adopted by the European Social Dialogue Agreement, “Agreement on the protection of the health of workers for the proper handling and good use of crystalline silica and products that contain it” by Trade Union Organisations and European trade associations, among which are Cembureau.
These recommendations on safe handling can be found at 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).
Measures to protect the environment:
No special measures are required.

7.1.2. General occupational hygiene measures

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. Safe storage conditions, including possible incompatibilities

Portland cement clinker should be stored in a dry (minimising condensation), indoor, clean place safe from contamination.

Hazard of being buried: Portland cement clinker may accumulate on or adhere to the walls of confined spaces and may come loose, collapse or fall unexpectedly. To prevent the risk of burial or asphyxia, do not enter confined spaces such as silos, containers, tanks or other containers that are used to store or contain Portland cement clinker without taking appropriate safety measures.

When stored in bulk, unstable walls or slopes can be formed, which presents a risk of collapse.

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

7.3. Specific end uses

Portland cement clinker is used for the production of common cements and other hydraulic binders. In general, these end products must have a low content of soluble Cr (VI), meaning that a chromium reducing agent is often used.

8. Exposure/personal protection controls

8.1. Control parameters

Name - limit value	Type of limit value	Value (at 8h TWA)	Units	Legal references
Particles (insoluble or not very soluble)	VLA-ED Inhalable fraction	10	mg/m^3	"Limits for Occupational Exposure to Chemical agents in Spain" by the INSHT.
Particles (insoluble or not very soluble)	VLA-ED Breathable fraction	3	mg/m^3	ORDER ITC/2585/2007. "Limits for Occupational Exposure to Chemical agents in Spain" by the INSHT.
Portland Cement	VLA-ED Breathable fraction	4	mg/m^3	"List of Occupational Exposure to Chemical agents in Spain" by the INSHT.

8.2. Controls of the exposure

8.2.1. Appropriate technical controls

Measures to reduce the formation of particles in suspension and the spreading of dust such as: dusting, vacuuming systems and methods of dry cleaning that do not raise dust.

Use	PROC*	Exposure	Measures / localised controls	Effectiveness
Industrial production / formulation of hydraulic binders and construction materials .	2, 3	The duration is not limited (up to 480 minutes/shift; 5 shifts/week)	Not required	-
	14, 26		A) Not required or B) Localised vacuuming	- 78 %
	5, 8b, 9		A) General ventilation or B) Localised vacuuming	17 % 78 %

** PROC are uses identified and defined in section 16.2.*

8.2.2. Individual protective measures, such as personal protective equipment

General: Do not eat, drink or smoke when working with Portland cement clinker to prevent contact with the skin or mouth.

Once the work with Portland cement clinker or materials that contain it has been finished, workers must wash or shower or apply moisturising creams immediately.

Remove any soiled garment (clothing, footwear, watches, etc.) and clean it before using it again.

Protection of the eyes or face:

When handling wet or dry Portland cement clinker, use approved glasses or certified protective goggles (e.g. UNE-EN 166).

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 skincare products (including protective creams) to protect the skin from long periods of contact with wet Portland cement clinker. Special care must be taken to prevent Portland cement clinker dust entering safety footwear. With regards to gloves, respect the maximum time limit for usage to avoid skin problems.

Breathing apparatus:

When a person is potentially exposed to dust concentrations above the limits allowed, appropriate breathing apparatus must be used. The type of breathing apparatus must be adapted to the concentration of particles present and in accordance with the standards laid down in harmonised standards (for example UNE EN149) or other national standards.

Thermal hazards:

Not applicable.

Scenario of Exposure	PROC*	Exposure	Specification of the Breathing Apparatus (BA)	BA Effectiveness Assigned Protection Factor (FPA).
Industrial manufacturing/formulation of hydraulic binders and construction materials	2, 3	The duration is not limited (up to 480 minutes/shift; 5 shifts/week)	Not required	-
	14.26		A) Breathing apparatus P1 or B) Not required	FPA = 4 -
	5, 8b, 9		A) Breathing apparatus P2 or B) Breathing apparatus P1	FPA = 10 FPA = 4

** PROC are uses identified and defined in section 16.2.*

8.2.3. Environmental exposure controls

Air: controls to avoid the dispersion of clinker particles into the environment must be in accordance with the available technology and standards on dust particle emissions.
Water: Do not pour cement either into sewerage systems or in surface waters to prevent increasing the pH. A pH greater than 9 can cause negative eco-toxicological impacts.
Floor and surrounding land: No special emission control measures are required for exposure to the surrounding land.

9. Physical and chemical properties

9.1. Information on basic physical and chemical properties

a) **Appearance:** Portland cement clinker is a granulated, inorganic solid material that is grey or white in colour.
b) **Smell:** odourless.
c) **Olfactory threshold:** there is no threshold, odourless.
d) **pH:** (Temp = 20 °C; in water, water proportion - solid 1:2): basic between 11 and 13.5.
e) **Melting point:** > 1250 ºC.
f) **Initial boiling point and boiling range**: not applicable since in normal atmospheric conditions the boiling point >1250 ºC.
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 since it is a non-flammable solid nor can it cause fire or contribute to causing fire by friction.
j) **Upper/lower limits of flammability or explosivity:** not applicable as it is not a flammable gas.
k) **Vapour pressure:** not applicable as its boiling point is >1250 ºC.
l) **Vapour density:** not applicable as its boiling point is >1250 ºC.
m) **Relative density:** 2.75 - 3.20 g/cm^3 at 20 °C; apparent density 0.9-1.5 g/cm^3 at 20 °C.
n) **Solubility(ies) in water:** (Temp 20 ºC): mild (0.1-1.5 g/l).
o) **N-octanol/water partition coefficient:** not applicable as it is an inorganic substance.
p) **Self-ignition temperature**: not applicable (not pyrophoric - not organometallic, organophosphated or organometalloid links or their derivatives. There is no other pyrophoric constituent in their composition).
q) **Decomposition temperature:** not applicable on not having presence of organic peroxides.
r) **Viscosity:** not applicable as it is not a liquid.
s) **Explosive properties:** not applicable on not having explosive or pyrotechnic effect and not having the capacity spontaneously, by chemical reaction, of being able to give off gases at a temperature, pressure and speed that can cause damage to their environment. It is not able to produce a self-sustained exothermic chemical reaction.
t) **Oxidising properties:** not applicable as it does not cause or facilitate the combustion of other substances.

9.2. Additional information

Not applicable.

10.Stability and reactivity

10.1. Reactivity

When mixed with water, Portland cement clinker hardens forming a stable stone mass resistant to normal environmental conditions.

10.2. Chemical stability

Portland cement clinker is stable, as long as it is stored correctly (see section 7). It must be prevented from coming into contact with incompatible materials.
Wet Portland cement clinker is alkaline and incompatible with acids, ammonium salts, aluminium or other non-precious metals. The clinker is dissolved in hydrofluoric acid producing corrosive silicon tetrafluoride gas. Clinker reacts with water forming silicates and calcium hydroxide. Silicates in clinker react with strong oxidising agents such as fluoride; boron trifluoride; chlorine trifluoride; manganese trifluoride and oxygen difluoride.

10.3. Possibility of a dangerous reactions

Portland cement clinker does not cause hazardous reactions.

10.4. Conditions that must be avoided

Moisture during its storage can cause the Portland cement clinker to harden and lose product quality.

10.5. Incompatible materials

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

10.6. Hazardous decomposition products

Portland cement clinker does not decompose into dangerous products.

11.Toxicological information

11.1. Information on the toxicological effects

Hazard class	Cat	Effect	Reference
Acute skin toxicity	-	Test parameters: rabbit, 24 hours of contact, 2000 mg/kg body weight - not lethal. The cement used in the study is Portland cement, with more than 90% Portland cement clinker. According to the data available it does not meet the criteria for its classification.	(2)
Acute toxicity from inhalation	-	Acute toxicity from inhalation has not been observed. According to the data available it does not meet the criteria for its classification.	(8)
Acute oral toxicity	-	According to studies conducted with dust from the clinker furnace, there is no indication of oral toxicity. Dust from the clinker furnace contains Portland cement clinker in quantities that may vary. According to the data available it does not meet the criteria for its classification.	Bibliographical study
Skin corrosion or irritation	2	If the Portland cement clinker comes into contact with moist skin, without adequate protection, this can cause skin thickening, cracking or fissures on the skin. Prolonged contact in combination with abrasion can cause severe burns. Some individuals exposed to wet Portland cement clinker dust may develop eczema, caused by the high level of pH, which can cause an irritating contact dermatitis after a long period of time in contact. The cement used in the study is Portland cement, with more than 90% Portland cement clinker.	(2) Experience in humans
Severe eye injuries or eye irritation	1	Portland cement clinker caused different effects on the cornea and the irritation index calculated was 128. Direct contact with Portland cement clinker dust can cause damage to the cornea due to mechanical stress,	(9), (10)

Hazard class	Cat	Effect	Reference
		immediate or delayed irritation and inflammation. Direct contact with large amounts of dry Portland cement clinker dust or splashing of wet clinker can cause keratopathies of a varying nature, which can range from moderate irritations (for example conjunctivitis or blepharitis) to chemical burns and blindness.	
Skin sensitization	1B	Some individuals exposed to wet Portland cement clinker dust may develop eczema caused by an immunological reaction to the soluble Cr (VI) which causes an allergic contact dermatitis.	(3), (11), (16)
Respiratory sensitization	-	There are no indications that it causes sensitization of the respiratory system. According to the data available it does not meet the criteria for its classification.	(1)
Mutagenicity in germ cells	-	There are no indications. According to the data available it does not meet the criteria for its classification.	(12), (13)
Carcinogenicity	-	No causal relationship has been established between exposure to Portland cement and the development of cancer. The epidemiological data present in the literature do not support the consideration of Portland cement as a suspected of being carcinogenic in humans. Portland cement is not classifiable as carcinogenic in humans (in accordance with the ACIGH A4 Agents that are feared to be carcinogenic in humans but this cannot be concluded due to a lack of evidence to corroborate this fact. The *in vitro* tests and tests animals do not provide sufficient evidence to classify the agent in relation to carcinogenicity in some of the other categories). The Portland cement used in the study contains more than 90% Portland cement clinker. According to the data available it does not meet the criteria for its classification.	(1), (14)
Toxicity for the reproduction	-	According to the data available it does not meet the criteria for its classification.	There is no evidence from experience in humans
Specific target organ toxicity (stot) — single exposure	3	Portland cement clinker dust may cause irritation of the throat and the respiratory tract. Exposures to concentrations above exposure limit values can cause coughing, sneezing and suffocation. In general, historical data indicates that exposure in the workplace to cement dust causes a deficit in the respiratory function. However, currently there is a lack of sufficient data to establish a dose-response relationship for these effects.	(1)
Specific target organ toxicity (stot) — repeated exposures	-	There are indications of chronic obstructive pulmonary disease (COPD). The effects are acute and due to exposure to high concentrations. No chronic effects or effects arising from exposures to low concentrations have been observed. According to the data available it does not meet the	(15)

Hazard class	Cat	Effect	Reference
		criteria for its classification.	
Danger from inhalation	-	Not applicable as Portland cement clinker does not use an aerosol.	-

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

Worsening of previous diseases by exposure

Exposure to Portland cement clinker dust can aggravate the symptoms of pre-existing diseases such as respiratory disorders, emphysema, asthma, eye pathologies and skin pathologies.

12.Ecological information

12.1. Toxicity

The product is not hazardous for the environment. Ecotoxicity tests of Portland cement with Daphnia magna [Reference (4)] and Selenastrum coli [Reference (5)) have shown a minimum toxicological impact, and therefore it has not been possible to determine values of LC50 and EC50 [Reference (6)). There is no indication on toxicity of the sediment phase [Reference (7)). In the event of accidental spillages of large amounts of Portland cement clinker into water a slight increase in its pH may occur, which under circumstances could represent some toxicity for aquatic life.

12.2. Persistence and degradability

Not applicable, as Portland cement clinker is an inorganic material.

After being hydrated, Portland cement clinker hardens and does not present any kind of toxicity risk.

12.3. Potential for bioaccumulation

Not applicable, as Portland cement clinker is an inorganic material.

After being hydrated, Portland cement clinker hardens and does not present any kind of toxicity risk.

12.4. Mobility in the soil

Not applicable, as Portland cement clinker is an inorganic material.

After being hydrated, Portland cement clinker hardens and does not present any kind of toxicity risk.

12.5. Results of the PBT and vPvB valuation

Not applicable, as Portland cement clinker is an inorganic material.

After being hydrated, Portland cement clinker hardens and does not present any kind of toxicity risk.

12.6. Other adverse effects

Not relevant.

13.Considerations regarding disposal

13.1. Methods for the treatment of waste

Portland cement clinker must always be reused, meaning that disposal considerations are not applicable.

Do not pour Portland cement clinker either into the sewage system or surface water.

14.Transport information

Portland cement clinker is not affected by the law of international transport of Dangerous Goods (IMDG, IATA, ADR/RID). Non-hazardous good according to transport regulations.
It is not necessary to adopt any special precautions apart from those mentioned in section 8.

14.1. UN number

Not relevant.

14.2. Official designation of transport of the United Nations

Not relevant.

14.3. Class(es) of danger for transport

Not relevant.

14.4. Packing group

Not relevant.

14.5. Dangers for the environment

Not relevant.

14.6. Special precautions for users

Not relevant.

14.7. Carriage in bulk in accordance with annex II of the Marpol Convention 73/78 and the IBC Code

Not relevant.

15.Regulatory information

15.1. Regulation and legislation on health, safety and environmental matters specific for the substance or the mixture

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

15.2. Evaluation of chemical safety

There has been no evaluation of chemical safety.

16.Other information

16.1. Control of changes

This version is in accordance with Regulation (EC) No. 1907/2006 (REACH) and its subsequent amendments. It was written in accordance with the "Guidelines for the safety data sheet template for Portland cement clinker" of 03/03/2017 by Cembureau.
This safety data sheet replaces and supersedes all previous versions.

16.2. Identified uses, descriptors and usage categories

Process category (PROC)	Identified uses - Description of use	Manufacturing/Formulation of construction and building materials	Industrial/professional use of construction and building materials
2	Use in continuous and closed processes with sporadic controlled exposures.	X	X
3	Use in closed processes by batches / dosing	X	X
5	Mix by dosing processes to	X	X

Process category (PROC)	Identified uses - Description of use	Manufacturing/Formulation of	Industrial/professional use of
		construction and building materials	
	formulate preparations or articles		
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 tabletting, extrusion-compression, pelletisation	X	X
26	Management of solid inorganic substances at room temperature	X	X

16.3. Abbreviations and Acronyms

ADR/RID European Agreement concerning the international carriage of dangerous goods by road / Regulations concerning the international carriage of dangerous goods by rail.
CAS Chemical Abstracts Service, is a division of the American Chemical Society.
CLP Classification, Labelling and Packaging of substances and mixtures (European Regulation, no. 1272/2008).
DNEL Derived no-effect level.
ECHA European Chemicals Agency.
EINECS European Inventory of Existing Chemical Substances.
EPA Efficient air filter for particles.
COPD Chronic obstructive pulmonary disease.
FDS Safety data sheet (Spanish acronym for “ficha de datos de seguridad”).
FPA Assigned Protection Factor (FPA).
FF P Particle filtering mask (disposable).
HEPA High efficiency particle air filter.
IATA International Air Transport Association.
IMDG International Maritime Dangerous Goods code.
LC50 Lethal dose of a compound in the air or water that kills 50% of organisms studied in specific conditions.
EC50 Concentration, calculated statistically, which is expected to produce a non-lethal effect defined in 50% of a population of organisms in certain conditions.
MS Member State.
PBT Persistent, bioaccumulative and toxic.
PNEC Predicted No Effect Concentration.
PROC Process category.
REACH Registration, Evaluation, Authorisation and Restriction of chemical substances and preparations (Regulation (EC) No. 1907/2006).
STOT Specific target organ toxicity
UVCB Substances of unknown or variable composition, complex reaction products or biological materials.
vPvB Very persistent and very bioaccumulative.
VLA/ED Occupational Limit Value - Daily Exposure

16.4. References

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) 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.
4) 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).
5) 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).
6) 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.
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, July 2010 – unaudited draft.
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). http://ec.europa.eu/health/archive/ph_risk/committees/sct/documents/out158_en.pdf
12) Investigation of the cytotoxic and proinflammatory effects of cement dusts in rat alveolar macrophages, Van Berlo et al, Chem. Res. Toxicol., 2010.
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) Ocurrence of allergic contact dermatitis caused by chromium in cement. A review of epidemiological investigations, Käre Lenvik, Helge Kjuus, NIOH, Oslo, December 2011.

16.5. Training

To complement training programmes for workers in the environment and health and safety field, companies must ensure that workers read, understand and apply the requirements of this safety data sheet (FDS).

16.6. Classification and procedure used to reduce the classification for mixtures in accordance with Regulation (EC) no. 1272/2008 (CLP)

Classification according to Regulation (EC) No. 1272/2008	Classification procedure
Skin irritation 2 H315	Results of tests

Classification according to Regulation (EC) No. 1272/2008	Classification procedure
Serious eye damage / eye irritation 1 H318	Results of tests
Skin sensitizer 1B H317	Experience in humans
Specific Target Organ Systemic Toxicity (single exposure) 3, H335	Experience in humans

16.7. Legal Notice / Explanatory Note / Disclaimer

The information provided in this sheet reflects the knowledge currently available and trusts that the product is used under the conditions set out and according to the indications that appear in the instructions, 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 Portland cement clinker within its recommended term and comply with all legal requirements that are applicable to its activity.