



Material Safety Datasheet

PORTLAND CEMENT CLINKER

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Portland cement clinker

EINECS: 266-043-4*

CAS: 65997-15-1

*Entry is referred to as Portland cement but actually describes Portland cement clinker
Cement clinker is exempt from registration (Art 2.7 (b) and Annex V.10 of REACH).

1.2. Relevant identified uses of the substance or mixture and uses 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.

1.3. Details of the supplier of the safety data sheet

CEMEX UK Operations Ltd

CEMEX House, Evreux Way

Rugby, Warwickshire CV21 2DT

Tel: 01788 517000 (out of hours 01932 568833)

Fax: 01788 517009

www.cemex.co.uk

1.4. Emergency telephone number

For further information please contact

Customer Services on:

Tel: 01788 517000

(out of hours) 01932 568833

Fax: 01788 517009

Email: gb-enquiries@cemex.com

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

2.1.1 According to Regulation (EC) No 1272/2008

Hazard class	Hazard category	Classification procedure
Skin irritation	2	On the basis of test data
Serious eye damage/eye irritation	1	On the basis of test data
Skin sensitisation	1	On the basis of literature survey
Specific target organ toxicity single exposure respiratory tract irritation	3	On the basis of literature survey

Hazard statements

H318: Causes serious eye damage

H315: Causes skin irritation

H317: May cause an allergic skin reaction

H335: May cause respiratory irritation

2.1.2 According to Council Directive 67/548/EEC

Xi Irritant

R37/38 Irritating to respiratory system and skin

R41 Risk of serious damage to eyes

R43 May cause sensitisation by skin contact

Portland cement clinker dust may cause irritation of the respiratory system.

When Portland cement clinker accidentally comes into contact with water or when clinker or clinker dust becomes damp, a strong alkaline solution is produced.

Due to the high alkalinity, wet Portland cement clinker may provoke skin and eye irritation. It may also cause an allergic reaction in some individuals due to the soluble Cr(VI) content.

2.2. Label elements

2.2.1 According to Regulation (EC) No 1272/2008



Danger

Causes serious eye damage

Causes skin irritation

May cause an allergic skin reaction

May cause respiratory irritation

Wear protective gloves/protective clothing/eye protection/face protection

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

IF ON SKIN: Wash with plenty of soap and water. If skin irritation or rash occurs: Get medical advice/attention

Avoid breathing dust/fume/gas/mist/vapours/spray. IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Call a POISON CENTER or doctor/physician if you feel unwell.

2.2.2 According to Council Directive 67/548/EEC



Xi Irritant

Xi Irritant

R37/38 Irritating to respiratory system and skin

R41 Risk of serious damage to eyes

R43 May cause sensitisation by skin contact

S2 Keep out of reach of children

S22 Do not breathe dust

S24/25 Avoid contact with skin and eyes

S26 In case of contact with eyes, rinse immediately with plenty of water and seek medical advice

S36/37/39 Wear suitable protective clothing, gloves and eye/face protection

S46 If swallowed, seek medical advice immediately and show this container or label

2.3. Other hazards

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

SECTION 3: Composition/information on ingredients

3.1. Substances

Portland cement clinker is a multiconstituent substance consisting of 4 main clinker phases, namely tri- and dicalcium-silicates ($3\text{CaO} \cdot \text{SiO}_2$ and $2\text{CaO} \cdot \text{SiO}_2$), 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 Hill method	Typical conc. (%w/w)	Conc. Range (%w/w)
A	Tricalcium silicate	235-336-9	12168-85-3	$3\text{CaO} \cdot \text{SiO}_2$	65	40 – 85
B	Dicalcium silicate	233-107-8	10034-77-2	$2\text{CaO} \cdot \text{SiO}_2$	15	5 – 50
C	Tricalcium aluminate	234-932-6	12042-78-3	$3\text{CaO} \cdot \text{Al}_2\text{O}_3$	10	0 – 16
D	Tetracalcium aluminoferrite	235-094-4	12068-35-8	$4\text{CaO} \cdot \text{Al}_2\text{O}_3 \cdot \text{Fe}_2\text{O}_3$	10	0 – 20

SECTION 4: First aid measures

4.1. Description of first aid measures

General notes

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 preparations.

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. Avoid flushing particles into uninjured eye. 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

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

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, the product 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.

SECTION 5: Fire-fighting measures**5.1. Extinguishing media**

Portland cement clinker is not flammable.

5.2. Special hazards arising from the substance or mixture

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

5.3. Advice for fire-fighters

Clinker poses no fire-related hazards. No need for special protective equipment for fire fighters.

SECTION 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 wash Portland cement clinker down sewage and drainage systems or into bodies of water (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 particulate filters (HEPA filter) 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.

SECTION 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.

Measure to protect the environment

No particular measures.

7.1.2 Information on general occupational hygiene

Do not handle or store near food and beverages or smoking materials.
In dusty environment, wear dust mask and protective goggles.
Use protective gloves to avoid skin contact.

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.
Do not use aluminium containers due to incompatibility of the materials.

7.3. Specific end use(s)

No additional information for the specific end uses (see section 1.2).

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Workplace Exposure Limits:
Workplace Exposure Limits (WEL's) for general dust are listed in EH40 of 10mg/m³ total inhalable and 4mg/m³ respirable (8 hour TWA).
Chromium (VI) compound are listed with a WEL of 0.05mg/m³ (8 hour TWA).

8.2. Exposure controls

8.2.1 Appropriate engineering 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.

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.

Before starting to work with clinker, apply a barrier creme and reapply it at regular intervals. 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 safety goggles according to EN 166 when handling dry or wet Portland cement clinker to prevent contact with eyes.

Skin protection



Use impervious, abrasion and alkali resistant gloves (made of low soluble Cr (VI) containing material) internally lined with cotton, boots, closed long-sleeved protective clothing as well as skin care products (including barrier creams) to protect the skin from prolonged contact with wet Portland cement clinker.

Respiratory protection



When a person is potentially exposed to dust levels above exposure limits, use appropriate respiratory protection. It should be adapted to the dust level and conform to the relevant EN standard.

8.2.3 Environmental exposure controls

According to available technology.

See engineering control measures to avoid dust propagating in the environment.

Take measures to ensure that clinker or clinker dust does not reach water (sewage systems and ground or surface water).

SECTION 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: (T = 20 °C in water, water-solid ratio 1:2): 11-13.5
- (e) Melting point: > 1 250 °C
- (f) Initial boiling point and boiling range: Not applicable as under normal atmospheric conditions, melting point >1 250 °C
- (g) Flash point: Not applicable as is not a liquid
- (h) Evaporation rate: Not applicable as 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 flammability or explosive limits: 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; 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 is inorganic substance
- (p) Auto-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 present
- (r) Viscosity: Not applicable as 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 at 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.

SECTION 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). It should be kept dry. 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

Not applicable.

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.

SECTION 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 study is Portland cement with over 90% of Portland cement clinker Based on available data, the classification criteria are not met.	(2)
Acute toxicity-	-	No acute toxicity by inhalation observed.	(8)

inhalation		Based on available data, the classification criteria are not met	
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	Literature survey
Skin corrosion/irritation	2	Portland cement clinker in contact with wet skin 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 may develop eczema upon exposure to wet clinker 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.	(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
STOT-single exposure	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 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 Portland cement clinker is not used as an aerosol.	

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.

SECTION 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.

SECTION 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.

SECTION 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.

SECTION 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) and Annex V.10 of REACH).
Chemicals (Hazard Information and Packaging for Supply) Regulations

European Social Dialogue Agreement on Crystalline Silica

Under the Social Dialogue "Agreement on Workers' Health Protection Through the Good Handling and Use of Crystalline Silica and Products Containing it, Employee and Employer European sectoral associations adopted the so-called "Good practice guides" which contain advice on safe handling practices (<http://www.nepsi.eu/good-practice-guide.aspx>).

15.2. Chemical Safety Assessment

No chemical safety assessment has been carried out.

SECTION 16: Other information

16.1 Indication of changes

Supersedes March 2009 version and incorporates requirements of Regulation (EC) No 1272/2008.

16.2 Abbreviations and acronyms

DNEL	Derived no-effect level
OEL	Occupational exposure limit
PBT	Persistent, bioaccumulative and toxic
PNEC	Predicted no-effect concentration
SDS	Safety Data sheet
STOT	Specific target organ toxicity
vPvB	Very persistent, very bioaccumulative

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) *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).
- (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).

- (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*, 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). 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., 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.

16.4 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 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 and in accordance with the application specified on the packaging and/or in the technical guidance literature. 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.