# Portland cement

| CAS number: | 65997-15-1 |
| --- | --- |
| Synonyms: | Cement, hydraulic cement |
| Chemical formula: | — |
| Structural formula: | — |

Workplace exposure standard (amended)

| TWA: | **1 mg/m3 (respirable dust fraction)** |
| --- | --- |
| STEL: | **—** |
| Peak limitation: | **—** |
| Notations: | **—** |
| IDLH: | **5,000 mg/m3** |
| **Sampling and analysis:** The recommended value is quantifiable through available sampling and analysis techniques. | |

## Recommendation and basis for workplace exposure standard

A TWA of 1 mg/m3 (respirable dust fraction) is recommended to protect for asthma, respiratory symptoms and lung function effects in exposed workers.

## Discussion and conclusions

Portland cement is a hydraulic binding material containing cement clinkers (calcium silicates with aluminium and iron) and may contain low-level materials such as silica and hexavalent chromium. Exposure to Portland cement dust is expected to occur mainly in the cement and construction industries.

Critical effects of exposure are asthma, adverse respiratory and lung function effects including cough, phlegm, wheezing and shortness of breath (dyspnoea). Respiratory function changes and symptom rates are found to increase with length of exposure and with increasing exposure levels. A study in 119 workers found no effect on respiratory symptoms or pulmonary function at 0.9 mg/m3 (respirable dust fraction). A study in 591 male workers reported that mean concentrations of 4 mg/m3 (respirable fraction) are associated with a decreased lung function in workers relative to those exposed at an average of 0.4 mg/m3. An increased asthma prevalence rate (14.1%) is noted in workers exposed at 1.6 mg/m3 (respirable geometric mean) relative to the rate (8.8%) among workers exposed at 0.5 mg/m3. In a study involving 2,736 exposed workers and 755 controls, adjusted odds ratios for wheezing of 1.2, 1.6 and 2.0 are associated with respirable exposures of 1, 3 and 5 mg/m3, respectively (ACGIH, 2018).

A TWA of 1 mg/m3 (respirable dust fraction) is recommended as derived by the ACGIH (2018). Based on the evidence presented in humans, this TWA is considered suitable to minimise asthma, respiratory symptoms and lung function effects observed in workers.

## Recommendation for notations

Not classified as a carcinogen according to the Globally Harmonized System of Classification and Labelling of Chemicals (GHS).

Not classified as a skin sensitiser or respiratory sensitiser according to the GHS. A review of sensitisation classification and chromium content is recommended as there is clear evidence of allergic contact dermatitis in humans.

There are insufficient data to recommend a skin notation.

# Appendix

### Primary sources with reports

| Source Year set Standard |
| --- |
| SWA 1991 TWA: 10 mg/m3 (inspirable dust) | |
| TWA for inspirable (respirable) dust containing no asbestos and less than 1% crystalline silica adopted from ACGIH in 1991. |
| ACGIH 2010 TLV-TWA: 1 mg/m3 (respirable particle matter) |
| TLV-TWA recommended to protect most of exposed individuals from asthma, respiratory symptoms and lung function effects.  Summary of data:   * Previous TLVs for Portland cement based on a “nuisance dust”— or Particulate Not Otherwise Specified (PNOS)—classification no longer supported * Raw materials used in manufacture of Portland cement may contain various concentrations of crystalline silica: * final product may contain none or very small amounts of free silica * Chromium may be present in the finished cement: * abrasion of the refractory lining of the kiln and the steel balls used in the finish milling operations are possible chromium sources * No animal inhalation data presented * Basis of TLV-TWA: * X-ray changes, decrements in pulmonary function and increased respiratory symptoms in workers at ≈5 mg/m3 and higher total dust * increased symptom rates, asthma and lung function effects associated >1 mg/m3 respirable aerosol.   Human data:   * Highly alkaline material; toxicity to the respiratory tract, with increased pulmonary symptoms and significant decrements in lung function indices among exposed workers * Study of irregular opacities and pleural abnormalities on chest X-rays from 2,738 cement workers compared with 1,715 workers from non-cement manufacturing plants: * increased prevalence of pleural abnormalities associated with current exposures and job tenure * odds ratio of 1.5 for pleural abnormalities associated with total dust levels of 5 mg/m3 * Comparison of 119 cement workers with 50 non-exposed controls; personal exposure to cement dust at 7.5 mg/m3 total dust and 0.9 mg/m3 respirable dust: * no significant differences in respiratory symptoms or pulmonary function indices found between cement workers and controls * no significant difference found when cement workers were stratified by exposure; no further information.   A study of 591 male workers in 4 production facilities; 412 exposed at average of 3.6 mg/m3 and 179 (labelled unexposed) exposed at 0.4 mg/m3:   * increased rates of respiratory symptoms and decreased lung function among the 412 exposed workers relative to the “unexposed” group * A study of 2,736 exposed workers and 755 controls: * adjusted odds ratios for wheezing of 1.2, 1.6 and 2.0 associated with respirable exposures of 1, 3 and 5 mg/m3, respectively; a 5–10% drop in peak expiratory flow associated with exposure at 5 mg/m3 * Study of pre- and post-shift lung function in 150 cement workers compared to 35 unexposed workers; respirable levels of 5 mg/m3 associated with significantly greater cross-shift reductions in FEV1, FEV1/FVC and FEF25-75 in exposed than control workers * An increased asthma prevalence (14.1%) was noted in workers exposed at 1.6 mg/m3 (respirable geometric mean) relative to the rate (8.8%) among workers exposed at 0.5 mg/m3 (respirable geometric mean); excluded workers with heart disease, family asthma, smokers, exposure to other respiratory hazards.   Data inadequate to recommend confirm carcinogenic potential in humans.  Insufficient data to recommend a sensitiser or skin notation. |
| DFG 2011 Not assigned |
| No MAK value can be derived from the available studies; previous MAK withdrawn.  Summary of additional data:   * Based on available data, considers the general threshold limit value for dust of 4 mg/m3 inhalable fraction does not provide protection against irritation * Studies on threshold concentration for induction of allergic reaction to chromates in Portland cement showed sensitisation is very unlikely to be induced by a chromate concentration of <2 ppm: * low-chromate Portland cements may still induce allergic reactions in the case of an existing chromate sensitisation. * Not possible to estimate toxicologically relevant dermal exposure for systemic absorption of Portland cement or its components. * No further details. |
| SCOEL NA NA |
| No report. |
| OARS/AIHA NA NA |
| No report. |
| HCOTN NA NA |
| No report. |

### Secondary source reports relied upon

| Source |  | Year | Additional information |
| --- | --- | --- | --- |
| NICNAS |  | ND | * Human health tier I assessment * No further information. |

### Carcinogenicity — non-threshold based genotoxic carcinogens

| Is the chemical mutagenic? | No |
| --- | --- |
| **The chemical is not a non-threshold based genotoxic carcinogen.** |  |

## Notations

| Source | Notations |
| --- | --- |
| SWA | — |
| HCIS | — |
| NICNAS | NA |
| EU Annex | NA |
| ECHA | NA |
| ACGIH | Carcinogenicity – A4 |
| DFG | Carcinogenicity – 3B |
| SCOEL | NA |
| HCOTN | NA |
| IARC | NA |
| US NIOSH | NA |

NA = not applicable (a recommendation has not been made by this Agency); — = the Agency has assessed available data for this chemical but has not recommended any notations

### Skin notation assessment

| Calculation |
| --- |
| Insufficient data to assign a skin notation. |

### IDLH

| Is there a suitable IDLH value available? | Yes |
| --- | --- |

## Additional information

| Molecular weight: | 228.3 |
| --- | --- |
| Conversion factors at 25°C and 101.3 kPa: | 1 ppm = Number mg/m3; 1 mg/m3 = Number ppm |
| This chemical is used as a pesticide: |  |
| This chemical is a biological product: |  |
| This chemical is a by-product of a process: |  |
| A biological exposure index has been recommended by these agencies: | ACGIH  DFG  SCOEL |

## Workplace exposure standard history

| Year | Standard |
| --- | --- |
| Click here to enter year |  |

## References

American Conference of Industrial Hygienists (ACGIH®) (2018) TLVs® and BEIs® with 7th Edition Documentation, CD-ROM, Single User Version. Copyright 2018. Reprinted with permission. See the [*TLVs® and BEIs® Guidelines section*](http://www.acgih.org/tlv-bei-guidelines/policies-procedures-presentations) on the ACGIH website.

Deutsche Forschungsgemeinschaft (DFG) (2012) Portland cement dust – MAK value documentation.

US National Institute for Occupational Safety and Health (NIOSH) (1994) Immediately dangerous to life or health concentrations – Portland cement.

National Industrial Chemicals Notification and Assessment Scheme (NICNAS) (No Date) Portland Cement: Human health tier I assessment – IMAP report.