# PCBs (54% Chlorine)

| CAS number: | 11097-69-1 |
| --- | --- |
| Synonyms: | Aroclor 1254®, PCB, PCB 1254, polychlorinated biphenyl, chlorodiphenyl |
| Chemical formula: | C12H5Cl5 (approximate) |
| Structural formula: | — |

Workplace exposure standard (amended)

| TWA: | **—** |
| --- | --- |
| STEL: | **—** |
| Peak limitation: | **—** |
| Notations: | **Sk.** |
| IDLH: | **5 mg/m3** |
| **Sampling and analysis:** N/A | |

## Recommendation and basis for workplace exposure standard

This chemical has been nominated for removal from the *Workplace exposure standards for airborne contaminants* due to a lack of evidence that it is used or generated in Australian workplaces or that it presents a potential for legacy exposure. Therefore, a TWA is not recommended.

## Discussion and conclusions

Polychlorinated biphenyls (PCB) are used in insulating liquids, synthetic rubber, plasticisers, flame retardants, and wide range of similar products. There is lack of evidence that this chemical is used or generated in Australian workplaces or that it presents a potential for legacy exposure.

PCB are a group of 209 possible congeners that differ by the number and position of chlorine atoms at biphenyl. This evaluation relates to information specifically regarding PCB containing 54% chlorine and does not address the wide range of PCB.

Critical effects of exposure to PCB (54%) are liver injury and chloracne. Irritation of the eyes, mucous membranes and respiratory tract may also occur as a result of exposure. While carcinogenicity is demonstrated in animal studies when exposed orally, there is no evidence of cancers *via* inhalation.

Limited toxicological data are available. Accidental consumption of PCB (48%) contaminated rice by more than 1,000 people over three months resulted in various symptoms including eye discharges, swelling of the upper eyelids and hyperaemia of the conjunctiva, chloracne, and distinctive hair follicles. Although those affected may also have been exposed to polychlorinated dibenzofurans, mainly penta- and hexachloro-compounds. ACGIH (2018) derive a TWA based on analogy with PCB (42%), which is considered less chronically toxic. ACGIH stated that TLV-TWA for PCB (42%) may not guarantee complete protection from chloracne. Cats, rabbits, guinea pigs, rats and mice exposed to seven hours a day for 150 days showed slight, reversible, nonspecific hepatic cellular injury at 1.5 mg/m3 (ACGIH, 2018).

This chemical has been nominated for removal from the WES list. A TWA is not recommended.

## Recommendation for notations

Not classified as a carcinogen according to the Globally Harmonized System of Classification and Labelling of Chemicals (GHS). Evidence suggest some PCB may have carcinogenic properties and a review of the classification is recommended.

Not classified as a skin sensitiser or respiratory sensitiser according to the GHS.

A skin notation is recommended based on a report that PCB are absorbed through the skin of animals, causing fatty degeneration of the liver.

# Appendix

### Primary sources with reports

| Source Year set Standard |
| --- |
| SWA 1997 TWA: 0.5 mg/m3; STEL: 1 mg/m3 | |
|  |
| ACGIH 2001 TLV-TWA: 0.5 mg/m3 |
| TLV-TWA recommended to minimise the potential for irritation of the eyes, skin, and respiratory tract, liver effects and chloracne.  Summary of data:  TLV-TWA based, in part, on analogy with PCB (42%) which is considered less chronically toxic and the TLV-TWA is recommended at one half of the TLV-TWA for PCB (42%)  The chronic toxicities of PCB increase as the degree of chlorination increases, up to a chlorine content of at least 54%. The location of the chlorine atoms in the molecule may play an important role in toxicity.  Human data:   * PCB poisoning >1,000 people in Japan consuming rice contaminated with PCB (48% chlorine for 3 mo: * acneform eruptions, eye discharges, swelling of the upper eyelids and hyperaemia of the conjunctiva, hyperpigmentation of skin, nails, and mucous membranes, chloracne and distinctive hair follicles * potentially also attributed to polychlorinated dibenzofurans, mainly penta- and hexachloro-compounds * Case report of 2 malignant tumours among 31 male workers exposed to Aroclor 1254 (PCB [54%]); no further information.   Animal data:   * Report concluded that, based on extensive animal experiments, a suggested permissible limit for occupational exposure should be 0.5 mg/m3 for PCB containing 50–55% chlorine; no further information * Cats, rabbits, guinea pigs, rats, mice exposed 7 h/d for 150 d: * at 1.5 mg/m3 (0.11 ppm) slight, reversible, nonspecific hepatic cellular injury * at 5.4 mg/m3 (0.41 ppm) extensive but reversible liver injury * OEL of 1 mg/m3 considered appropriate according to authors * Rats fed 25, 50 or 100 ppm Aroclor 1254 in diet for 104–105 wk; non-statistically significant incidence hepatocellular proliferative lesions and the carcinomas of the gastrointestinal tract: * not considered carcinogenic under study conditions * Generally negative results of *in vivo* and *in vitro* genotoxicity studies * Skin notation recommended based on evidence of PCB absorbed through the skin in animals, causing fatty degeneration of the liver; no further information. |
| DFG 2014 MAK: 0.7 mg/m3 |
| No report provided. MAK obtained from website.  Note: Separate MAK of 0.003 mg/m3 recommended for a range of chlorinated biphenyls to protect for effects in the liver.  Summary of data:   * Human data not suitable to derive MAK value; animal data utilised * MAK value considers varying toxicity of dioxin-like chlorinated biphenyls, the toxicity of the non-dioxin-like chlorinated biphenyl and ubiquitous background levels. |
| 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 |
| --- | --- | --- | --- |
| US EPA |  | 1994 | * Oral RfD of 2 x 10-5 mg/kg/d * Based on LOAEL of 0.005 mg/kg/d; female rhesus monkeys ingesting gelatin capsules with doses of 0, 5, 20, 40, or 80 µg/kg/d for >5 yr; ocular exudate, inflamed and prominent Meibomian glands, distorted growth of finger and toe nails, decreased antibody. |
| US NIOSH |  | 1994 | * OSHA PEL of 0.5 mg/m3; skin notation * NIOSH REL: 0.001 mg/m3 TWA; NIOSH considers some chlorinated biphenyls a potential occupational carcinogen as per OSHA carcinogen policy * Reported concentrations >10 mg/m3 were unbearably irritating, no further information * Several deaths due to atrophy of the liver occurred among workers chronically exposed to the fumes of chlorinated biphenyls and chloronaphthalenes. |

### 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 | NA |
| NICNAS | NA |
| EU Annex | NA |
| ECHA | NA |
| ACGIH | Carcinogenicity – A3, Skin |
| DFG | Carcinogenicity – 4 |
| 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: | 328.4 (average) |
| --- | --- |
| 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) (2014) Access via website.

US Environmental Protection Authority (US EPA) (1994) Integrated Risk Information System (IRIS) Chemical Assessment Summary – Aroclor 1254.

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