# Perchloryl fluoride

| CAS number: | 7616-94-6 |
| --- | --- |
| Synonyms: | Chlorine fluoride oxide, chlorine oxyfluoride |
| Chemical formula: | ClO3F |
| Structural formula: | — |

Workplace exposure standard (amended)

| TWA: | **3 ppm (13 mg/m3)** |
| --- | --- |
| STEL: | — |
| Peak limitation: | — |
| Notations: | — |
| IDLH: | **100 ppm** |
| **Sampling and analysis:** The recommended value is quantifiable through available sampling and analysis techniques. | |

## Recommendation and basis for workplace exposure standard

A TWA of 3 ppm is recommended to protect for respiratory tract irritation, methaemoglobinaemia and fluorosis in exposed workers.

The previous STEL is recommended to be withdrawn as there is a lack of evidence for immediate acute toxicity within ten times of the recommended TWA.

## Discussion and conclusions

Perchloryl fluoride is used as a fluorinating agent in chemical syntheses and can also be used as an insulator for high voltage systems.

Critical effects of exposure are respiratory tract irritation, methaemoglobinaemia and fluorosis.

No human data are available and limited toxicological data in animals are available. Fluorosis and haematologic changes reported in dog and rat studies exposed at 24 ppm daily for six months. In a large repeat-dose inhalation study, 90% of rats, 51% of mice and 100% of guinea pigs died following exposure at 185 ppm for seven weeks. Cyanosis was the primary sign of toxicity. Additional effects observed in rats include methaemoglobinaemia, fluorosis of teeth, lung changes, splenomegaly and haemosiderosis in spleen, liver and kidneys (ACGIH, 2018; HCOTN, 2001). The TLV-TWA by ACGIH (2018) is based on analogy to the TLV-TWA for hydrogen fluoride.

Given the limited available data, the current SWA TWA of 3 ppm is recommended be retained, as assigned by ACGIH and HCOTN. The recommended TWA is cited to protect for irritant effects, methaemoglobinaemia and fluorosis.

There is insufficient evidence to recommend a STEL and it is recommended that the previous STEL is be withdrawn.

## 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.

There are insufficient data to recommend a skin notation.

# Appendix

### Primary sources with reports

| Source Year set Standard |
| --- |
| SWA 1991 TWA: 3 ppm (13 mg/m3); STEL: 6 ppm (25 mg/m3) | |
|  |
| ACGIH 2001 TLV-TWA: 3 ppm (13 mg/m3); 6 ppm (25 mg/m3) |
| TLV-TWA recommended to minimise the potential for respiratory tract irritation and, based on experimental animal studies, methaemoglobinaemia and fluorosis.  Summary of data:   * TLV-TWA is based on analogy to TLV-TWA for hydrogen fluoride; TLV-TWA of 0.5 ppm as F to minimise the potential for adverse effects in the respiratory tract, dermal or skeletal fluorosis and irritation of the eyes and skin; based upon the results of controlled inhalation studies in healthy human volunteers that demonstrated symptom increases and bronchoalveolar lavage fluid changes at 0.9–2.9 ppm * TLV–STEL intended to provide additional margin of safety against adverse pulmonary effects and fluorosis; no specific derivation provided   Human data:   * No human data reported.   Animal data:   * Dogs exposed at 220–450 ppm for 4 h and at 620 ppm for 2.5 h were cyanotic and hyperpneic; methaemoglobin values ranged from 29–71%; no further details * Repeated inhalation exposures at 185 ppm 6 h/d, 5 d/wk for 7 wk: * 18/20 rats, 20/39 mice and 10/10 guinea pigs died; effects included dyspnoea, cyanosis and methaemoglobinaemia, fluorosis (pigment alteration in incisor teeth), patchy areas of consolidation in rat lung, splenomegaly, haemosiderosis of the spleen, liver and kidneys and alveolar oedema following the first exposure that developed into bronchopneumonia * Bone fluoride concentrations increased to 4x control in guinea pigs and almost 3x control value in rats exposed at 24 ppm for 6 mo; no evidence of irritation; no further details.   Cited as supporting evidence: TWA 3 ppm is ≈1/10 of the 24 ppm concentration associated with fluorosis and haematologic alterations in repeat exposure animal studies.  Insufficient data to recommend skin, sensitiser or carcinogen notations. |
| DFG NA NA |
| No report. |
| SCOEL NA NA |
| No report. |
| OARS/AIHA NA NA |
| No report. |
| HCOTN 2001 TWA: 14 mg/m3 (3 ppm) |
| Considers the blood to be the target for toxicity.  Summary of additional data:   * Exposure of rats and dogs at 24 ppm (102 mg/m3) for 26 wk, did not induce mortality; caused persistent increases in fluoride contents of the bone and transient congestion and haemosiderosis of the spleen (as cited by ACGIH, 2018). |

### Secondary source reports relied upon

NIL.

### 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 | — |
| DFG | NA |
| SCOEL | NA |
| HCOTN | — |
| 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 recommend a skin notation. |

### IDLH

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

## Additional information

| Molecular weight: | 102.45 |
| --- | --- |
| Conversion factors at 25°C and 101.3 kPa: | 1 ppm = 4.17 mg/m3; 1 mg/m3 = 0.240 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.

Health Council of the Netherlands (HCOTN) (2001) Perchloryl Fluoride. Health-based calculated occupational cancer risk values. The Hague: Health Council of the Netherlands; publication no. 2000/15OSH/026.

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