# boron trifluoride

| CAS number: | 7637-07-2 |
| --- | --- |
| Synonyms: | Boron fluoride, trifluoroborane, trifluoroboron |
| Chemical formula: | BF3 |

Workplace exposure standard (amended)

| TWA: | **0.1 ppm (0.28 mg/m3)** |
| --- | --- |
| STEL: | — |
| Peak limitation: | **0.7 ppm (1.95 mg/m3)** |
| Notations: | — |
| IDLH: | **25 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 0.1 ppm (0.28 mg/m3) is recommended to protect for irritation of the respiratory system and pneumonitis in exposed workers.

A peak limitation of 0.7 ppm (1.95 mg/m3) is recommended to protect for corrosion and irritation of the respiratory tract in exposed workers based on the observed effects for hydrogen fluoride (HF).

Given the limited data available from the primary sources, it is recommended that a review of additional sources be conducted at the next scheduled review.

## Discussion and conclusions

Boron trifluoride is commonly used for catalytic alkylation reactions (isomerisation in petroleum cracking), applications for soldering flux and as a fumigant.

Limited human and animal data are available. The TWA of 0.1 ppm is based on reported pneumonitis at 1.5 ppm in rats. The TWA and peak values have been adopted based on protecting for respiratory tract irritation and pneumonitis.

The recommended peak limitation aligns with the ACGIH TLV-Ceiling value. This value of 0.7 ppm is calculated based on animal data and is one-third of the ACGIH hydrogen fluoride TLV-Ceiling (2 ppm) which is released in the hydrolytic process when exposed to moisture in the respiratory tract (ACGIH, 2018).

## Recommendation for notations

The current volume of data is considered insufficient to support recommendation of any notations.

Not classified as carcinogenic 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 assigning a skin notation.

# Appendix

### Primary sources with reports

| Source Year set Standard |
| --- |
| SWA 1991 Peak limitation: 1 ppm (2.8 mg/m3) | |
|  |
| ACGIH 2016 TLV-TWA: 0.1 ppm (0.28 mg/m3); TLV-C: 0.7 ppm (1.95 mg/m3) |
| TLV-TWA likely to minimise the potential for pneumonitis in nearly all workers.  TLV-Ceiling recommended to protect for respiratory tract irritation.  Rapid hydrolysis results in significant burns to respiratory tract, eyes or skin. Burns expected to be like H3BO3, HBF3, and HF effects observed when related boron compounds contact water.  Summary of data:  Animal data:   * LOAEL: 1.5 ppm; rats, 6 mo, inhalation * NOAEL: 8.8 ppm (24.6 mg/m3); rats, 4 hrs * LC50: 1.21 mg/L (3,400 ppm); rats * Increased fluorine concentrations in teeth and bones of rats and guinea pigs.   Value calculated based on animal data and one-third of the TLV-Ceiling for HF (2 ppm).  Insufficient data available for Skin, RSEN, DSEN or carcinogenicity notation recommendations. |
| DFG 1997 Not assigned |
| No human studies identified.  No NOAEL can be deduced from animal studies as pneumonitis was noted at lowest concentration tested 1.5 ppm (1.5 ml/m3). |
| SCOEL NA NA |
| No report. |
| OARS/AIHA NA NA |
| No report. |
| HCOTN 2003 TWA: 0.07 ppm (0.2 mg/m3); Ceiling limit: 1 ppm (3 mg/m3) |
| Health-based recommended occupational exposure limit (HBROEL) based on extrapolation of an overall assessment factor which covers the absence of a documented NOAEL, animal species variations and differences in worker exposure patterns and conditions.  Considered toxic following exposure by inhalation based on animal data.  Hydrolysed in moist air to H3BO3, HBF3, and HF.  No data found on the potential carcinogenicity, genotoxicity, mutagenicity or reproduction toxicity.  Odour threshold of BF3 not determined; detectable by smell at 1.5 ppm (6 mg/m3).  Summary of additional data:  Human data:   * Limited studies with limited details – most data with limited reliability * Case study of acid burn on skin from prolonged local exposure   Animal data:   * LOAEL: 4 mg/m3; rats, 6 mo * LC50: 1,180 mg/m3 (413 ppm); rats, 4 h * LC50: 109 mg/m3 (38 ppm); guinea pigs, no duration stated. |

### Secondary source reports relied upon

| Source |  | Year | Additional information |
| --- | --- | --- | --- |
| ECHA |  | 2012 | No further information. |
| US NIOSH |  | 1976 | No further information. |

### Carcinogenicity — non-threshold based genotoxic carcinogens

| Is the chemical mutagenic? | Insufficient data |
| --- | --- |
| Is the chemical carcinogenic with a mutagenic mechanism of action? | Insufficient data |
| **Insufficient data are available to determine if the chemical is a non-threshold based genotoxic carcinogen.** | |

## Notations

| Source | Notations |
| --- | --- |
| SWA | NA |
| HCIS | NA |
| NICNAS | NA |
| EU Annex | NA |
| ECHA | NA |
| ACGIH | NA |
| DFG | NA |
| 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: | 67.28 |
| --- | --- |
| 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) (1999) Boron trifluoride – MAK value documentation.

Health Council of the Netherlands (HCOTN) (2003) Boron trifluoride. Health-based reassessment of administrative occupational exposure limits. The Hague: Health Council of the Netherlands; publication no. 2000/15OSH/077.

US National Institute for Occupational Safety and Health (NIOSH) (1976) Criteria for a recommended standard: occupational exposure to boron trifluoride.

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