



# BC GUIDANCE DOCUMENT

April 2024



## Health, Safety and Reclamation Code for Mines in British Columbia



### Occupational Health Revisions to Part 2



Ministry of Energy, Mines and Low Carbon Innovation

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## Purpose of Guidance Document

The purpose of this document is to provide information and be a practical guide for mine managers, qualified professionals, individuals, and proponents that rely on the Health, Safety and Reclamation Code (the Code) for Mines in British Columbia.

This Guidance document is for qualified persons and those who are responsible for the development and implementation of occupational hygiene programs to manage workplace exposures to hazardous substances.

This guidance document is intended to provide further information on the changes to the Code regarding the requirements of the Code related to Occupational Health.

## Section 2.1.1

Section 2.1.1 of the Code identifies the exposure limits, also referred to as Threshold Limit Values (TLVs), for airborne concentrations of substances or noise levels that must not be exceeded. It establishes the exposure limits identified in Table 2-1 (substances) and 2-2 (noise) are to be followed or, where not specified, adopts the TLVs established by the American Conference of Governmental Industrial Hygienists (ACGIH).

The ACGIH is an industrial health association comprised of scientists, industrial hygienists and other occupational health and safety professionals, which publishes guidelines for exposure limits for a variety of substances. According to the ACGIH, TLVs represent conditions under which it is believed nearly all workers may be repeatedly exposed, day after day, over a working lifetime, without adverse health effects.

ACGIH acknowledges that these values are not fine lines between “safe” and “dangerous” conditions and are evidence-based recommendations. The ACGIH limits are health-based and therefore economic or technical feasibility is not considered. This is why the Code has included Table 2-1—commonly referred to as a “table of exceptions”—where adopted exposure limits for substances either differ or agree with the ACGIH TLVs, as they have a significant impact on the mining industry and require isolation. A table of exceptions is a standard regulatory practice in occupational health in Canada, US and other international jurisdictions.

Table 2-1 and 2-2 are the primary sources of exposure limits for mines and allow EMLI to better control updates to these exposure limits. This ensures that implementation issues such as technical and economic feasibility and/or availability of validated sampling methods do not impact regulatory effectiveness and can be adequately considered in conjunction with health-based exposure documentation to make an educated, risk-based decision on an appropriate exposure limit. ACGIH highlights that these technical and economic factors are not considered in their scientific input for TLV adoption and acknowledges that the TLVs should not be adopted as standards without full compliance with applicable regulatory procedures and consideration to these other factors.

Up until 2024, the Code previously referenced the 1994/1995 version of the ACGIH. This version is outdated and does not represent the most up to date occupational health information available. Further, the 1994/1995 version is no longer readily accessible. The revision to 2.1.1 removes any reference to a particular dated version of the ACGIH and now references the most up to date version of the ACGIH “as amended from time to time.”

## New 2.1.1 Language

### Maximum Allowable Exposures

- 2.1.1 (1) The manager must ensure that no employee is exposed to airborne concentrations of a substance or noise in excess of the limit specified in
- (a) Table 2-1 or 2-2, or
  - (b) The publication by the American Conference of Governmental Industrial Hygienists entitled, "Threshold Limit Values for Chemical Substances and Physical Agents & Biological Exposure Indices", as amended from time to time, if the substance or noise is not specified in Table 2-1 or Table 2-2.
- (2) In the case of Item 17, Diesel Particulate Matter, as Elemental Carbon, in Table 2-1, the manager does not have to comply with subsection (1) with respect to this Item until May 1, 2025.

### Guidance

Table 2-1 lists exposure limits for substances that require isolation as they either differ or agree with ACGIH TLVs and have a significant impact on the mining industry. Table 2-1 considers technical and economic feasibility and availability of validated sampling methods when establishing an exposure limit to ensure limits are both achievable and enforceable.

The following revisions have been made to Table 2-1 in the 2024 updates to the Code:

- The exposure limit for asbestos has been reduced and is in alignment with the current ACGIH TLV, including the amalgamation of all forms of asbestos under a single limit (i.e. amosite, chrysotile, crocidolite, and other forms).
- The exposure limit for coal dust has been reduced overall and now includes two limits to differentiate between different types of coal (anthracite, and bituminous or lignite). This is in alignment with the current ACGIH TLVs for coal dust. Footnote (G) has also been revised in conjunction with this update.
- The exposure limit for respirable combustible dust has been rescinded and replaced with an exposure limit for diesel particulate matter, as elemental carbon. This exposure limit is enforceable as of May 1, 2025, as identified by the updated Code section 2.1.1(2), referenced in the previous section of this document.
- The exposure limit for formaldehyde has been reduced and is in alignment with the current ACGIH TLV.

- Exposure limits for the following substances, which are commonly associated with exposures to welding fumes, have been added to Table 2-1: aluminum, antimony, arsenic, beryllium, cadmium, chromium (trivalent), hexavalent chromium, cobalt, copper, iron oxide, manganese, molybdenum, nickel, vanadium pentoxide, and zinc oxide. The exposure limit for lead was also included in this review and remains in Table 2-1, in alignment with ACGIH.
- Other housekeeping changes have been made to the Footnotes.

The Occupational Health Sub-Committee will be standing for the foreseeable future while the group works through updating Part 2 of the Code including continuous review of Table 2-1.

## New Table 2-1

Item	Substance [CAS #] <sup>(i)</sup>	TLV-TWA <sup>(ii)</sup>	TLV-STEL	Notation *
1	Acetone [67-64-1]	750 ppm <sup>(iii)</sup>	1,000 ppm	-
2	Aluminum metal [7429-90-5] and insoluble compounds	1 mg/m <sup>3</sup> <sup>(iv)</sup> (R) <sup>(v)</sup>	-	-
3	Ammonia [7664-41-7]	25 ppm	35 ppm	-
4	Antimony [7440-36-0] and compounds, as Sb	0.5 mg/m <sup>3</sup>	-	-
5	Arsenic [7440-38-2] and inorganic compounds, as As	0.01 mg/m <sup>3</sup>	-	A1, 1
6	Asbestos [1332-21-4], all forms	0.1 fibre/cc <sup>(vi)</sup> (F) <sup>(vii)</sup>	-	A1, 1
7	Beryllium [7440-41-7], soluble and insoluble compounds, as Be	0.002 mg/m <sup>3</sup>	-	A1, 1, Skin, DSEN <sup>(viii)</sup> (soluble); A1, 1, RSEN <sup>(ix)</sup> (soluble and insoluble)
8	Cadmium [7440-43-9] and compounds, as Cd	0.002 mg/m <sup>3</sup> (R), 0.01 mg/m <sup>3</sup>	-	A2, 1
9	Carbon dioxide [124-38-9]	5,000 ppm	30,000 ppm	-
10	Carbon disulphide [75-15-0]	1 ppm	-	Skin <sup>(x)</sup>
11	Carbon monoxide [630-08-0]	25 ppm	-	Repro <sup>(xi)</sup>
12	Chlorine [7782-50-5]	0.5 ppm	1 ppm	-
13	Chromium [7440-47-3] and inorganic compounds Trivalent chromium compounds, as Cr (III), Water-soluble compounds	0.5 mg/m <sup>3</sup>	-	DSEN, RSEN
	Hexavalent chromium compounds, as Cr (VI) Water-soluble compounds	0.025 mg/m <sup>3</sup>	-	A1, 1, Skin, DSEN, RSEN
	Insoluble compounds	0.01 mg/m <sup>3</sup>	-	A1, 1, DSEN, RSEN
14	Coal Dust Anthracite [8029-10-5]	0.4 mg/m <sup>3</sup> (G) <sup>(xii)</sup> , (R)	-	-
	Bituminous or Lignite [308062-82-0]	0.9 mg/m <sup>3</sup> (G), (R)	-	-
15	Cobalt [7440-48-4] and inorganic compounds, as Co	0.02 mg/m <sup>3</sup>	-	2B, DSEN, RSEN
16	Copper [7440-50-8] Fume, as Cu	0.2 mg/m <sup>3</sup>	-	-
	Dusts, and mists, as Cu	1 mg/m <sup>3</sup>	-	-
17	Diesel Particulate Matter, as Elemental Carbon	0.1 mg/m <sup>3</sup>	-	1
18	Formaldehyde [50-00-0]	0.1 ppm	0.3 ppm	A1, 1, DSEN, RSEN
19	Hydrogen chloride [7647-01-0]	-	C <sup>(xiii)</sup> 5 ppm	-
20	Hydrogen cyanide [74-90-8]	-	C 10 ppm	Skin
21	Hydrogen sulphide [7783-06-4]	10 ppm	15 ppm	-
22	Iron oxide dust and fume (Fe <sub>2</sub> O <sub>3</sub> ) [1309-37-1], as Fe	5 mg/m <sup>3</sup>	-	-

Revisions to Part 2 Occupational Health: New Table 2-1

Item	Substance [CAS #] <sup>(xiv)</sup>	TLV-TWA <sup>(xv)</sup>	TLV-STEL	Notation *
23	Lead [7439-92-1] and inorganic compounds, as Pb	0.05 mg/m <sup>3</sup>	-	2B, Repro (Elemental); 2A, Repro (Inorganic)
24	Manganese [7439-96-5], elemental and inorganic compounds, as Mn	0.02 mg/m <sup>3</sup> (R), 0.1 mg/m <sup>3</sup> (I)	-	Repro
25	Molybdenum [7439-98-7], as Mo			
	Soluble compounds	0.5 mg/m <sup>3</sup> (R)	-	-
	Metal and insoluble compounds	10 mg/m <sup>3</sup> (I) <sup>(xvi)</sup> , 3 mg/m <sup>3</sup> (R)	-	-
26	Methane [74-82-8]	(D) <sup>(xvii)</sup>	-	-
27	Methylene bisphenyl isocyanate (MDI) [101-68-8]	0.005 ppm	-	Skin, RSEN
28	Nickel [7440-02-0], Elemental and soluble inorganic compounds, as Ni	0.05 mg/m <sup>3</sup>	-	1 (Ni compounds), 2B (elemental and alloys containing Ni)
29	Nickel [7440-02-0], Insoluble inorganic compounds, as Ni	0.05 mg/m <sup>3</sup>	-	A1, 1
30	Nitric acid [7697-37-2]	2 ppm	4 ppm	-
31	Nitric oxide [10102-43-9]	25 ppm	-	-
32	Nitrogen dioxide [10102-44-0]	1 ppm	-	
33	Nitrous oxide [10024-97-2]	50 ppm	-	Repro
34	Ozone [10028-15-6]	-	C 0.1 ppm	-
35	Silica – Amorphous			
	Diatomaceous earth (uncalcined) [61790-53-2]	10 mg/m <sup>3</sup> (E) <sup>(xviii)</sup>	-	-
	Precipitated silica [112926-00-8]	10 mg/m <sup>3</sup> (E)	-	-
	Silica gel	10 mg/m <sup>3</sup> (E)	-	-
	Silica, fume [69012-64-2]	2 mg/m <sup>3</sup> (E)	-	-
36	Silica – Crystalline			
	Cristobalite [14464-46-1]	0.05 mg/m <sup>3</sup> , (R)	-	A2, 1
	Quartz [14808-60-7; 1317-95-9]	0.05 mg/m <sup>3</sup> , (R)	-	A2, 1
37	Sulphur dioxide [7446-09-5]	2 ppm	5 ppm	
38	Sulphuric acid [7664-93-9]	1 mg/m <sup>3</sup>	3 mg/m <sup>3</sup>	A2, 1
39	Toluene [108-88-3]	100 ppm	150 ppm	Repro
40	Vanadium pentoxide [1314-62-1], as V	0.05 mg/m <sup>3</sup> (I)	-	2B
41	Wood dust			
	Certain hard woods as beech and oak	1 mg/m <sup>3</sup>	-	A1, A2, 1
	Soft wood	5 mg/m <sup>3</sup>	10 mg/m <sup>3</sup>	1
42	Zinc oxide [1314-13-2]	2 mg/m <sup>3</sup> (R)	-	-

\*ACGIH notations A1 and A2 and International Agency for Research on Cancer (“IARC”) notations. Notations 1, 2A and 2B indicate substances designated as carcinogens. The different categories used by the two organizations indicate different levels of certainty of carcinogenic effect, e.g., from confirmed carcinogen to probable or possible.

For additional information on the background and rationale for the different categories of carcinogens, refer to the ACGIH publication, TLVs & BEIs, as amended from time to time, ACGIH publication, “Supplement to the Documentation of the Threshold Limit Values and Biological Exposure Indices”, as amended from time to time, and the IARC publication, “Overall Evaluations of Carcinogenicity to Humans”, as amended from time to time. Both agencies provide information on their web sites.

ACGIH Carcinogen designation:	IARC Carcinogen classification:
A1 Confirmed Human Carcinogen.	1 Carcinogenic to humans.
A2 Suspected Human Carcinogen	2A Probably carcinogenic to humans.
	2B Possibly carcinogenic to humans.



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- <sup>i</sup> CAS # means Chemical Abstract Series number.
- <sup>ii</sup> Exposure limits are reported in ppm, mg/m<sup>3</sup> or fibre/cc. In general, contaminants present in air in a vapour or gaseous state are reported in parts per million (ppm). Contaminants present in air as an aerosol (dust, fume, mist) are typically reported in milligrams per cubic meter (mg/m<sup>3</sup>). For information on unit conversions between ppm and mg/m<sup>3</sup>, consult the publication by the American Conference of Governmental Industrial Hygienists ("ACGIH") entitled, "Threshold Limit Values for Chemical Substances and Physical Agents & Biological Exposure Indices" ("TLVs & BEIs").
- <sup>iii</sup> ppm means parts of vapour or gas per million parts of contaminated air volume at 25 degrees Celsius and 760 torr.
- <sup>iv</sup> mg/m<sup>3</sup> means milligrams of substance per cubic meter of air.
- <sup>v</sup> (R) These threshold limit values are for the respirable fraction of particulate matter for the substance listed. The mass concentration of respirable particulate matter for the application of this limit is to be determined in accordance with the parameters established in the ACGIH publication, TLVs & BEIs, as amended from time to time.
- <sup>vi</sup> fibre/cc means fibre per cubic centimeter.
- <sup>vii</sup> (F) Respirable fibres longer than 5 µm and with an aspect ratio equal to or greater than 3:1, as determined by the membrane filter method at 400 450× magnification (4 mm objective), using phase contrast illumination.
- <sup>viii</sup> DSEN means that the substance has been identified by the ACGIH as having specific evidence of the potential to produce sensitization by the dermal route.
- <sup>ix</sup> RSEN means that the substance has been identified by the ACGIH as having specific evidence of the potential to produce sensitization by the respiratory route.
- <sup>x</sup> Skin means that the ACGIH has identified that there is potential significant contribution to the overall exposure by this route, including mucous membranes and the eyes, by contact with vapours, liquids, and solids.
- <sup>xi</sup> Repro means that the substance has been identified by the ACGIH as a reproductive toxin.
- <sup>xii</sup> (G) The value is for particulate matter containing <5% free silica.
- <sup>xiii</sup> (C) means ceiling limit (TLV C).
- <sup>xiv</sup> CAS # means Chemical Abstract Series number.
- <sup>xv</sup> Exposure limits are reported in ppm, mg/m<sup>3</sup> or fibre/cc. In general, contaminants present in air in a vapour or gaseous state are reported in parts per million (ppm). Contaminants present in air as an aerosol (dust, fume, mist) are typically reported in milligrams per cubic meter (mg/m<sup>3</sup>). For information on unit conversions between ppm and mg/m<sup>3</sup>, consult the publication by the American Conference of Governmental Industrial Hygienists ("ACGIH") entitled, "Threshold Limit Values for Chemical Substances and Physical Agents & Biological Exposure Indices" ("TLVs & BEIs").
- <sup>xvi</sup> (I) These threshold limit values are for the inhalable fraction of particulate matter for the substance listed. The mass concentration of inhalable particulate matter for the application of this limit is to be determined in accordance with the parameters established in the ACGIH publication, TLVs & BEIs, as amended from time to time.
- <sup>xvii</sup> (D) Simple asphyxiant; for more information consult the ACGIH publication, TLVs and BEIs, as amended from time to time, on this topic.
- <sup>xviii</sup> (E) The value is for particulate matter containing no asbestos and < 1% crystalline silica.