

CHAPTER 7. REGULATIONS AND GUIDELINES

Pertinent international and national regulations, advisories, and guidelines regarding cobalt in air, water, and other media are summarized in Table 7-1. This table is not an exhaustive list, and current regulations should be verified by the appropriate regulatory agency.

ATSDR develops MRLs, which are substance-specific guidelines intended to serve as screening levels by ATSDR health assessors and other responders to identify contaminants and potential health effects that may be of concern at hazardous waste sites. See Section 1.3 and Appendix A for detailed information on the MRLs for cobalt.

Table 7-1. Regulations and Guidelines Applicable to Cobalt

Agency	Description	Information	Reference
Air			
EPA	RfC	No data	IRIS 2023
	Provisional peer reviewed toxicity values		EPA 2008
	Cobalt		
	Provisional subchronic RfC	0.00002 mg/m ³	
	Provisional chronic RfC	0.000006 mg/m ³	
WHO	Air quality guidelines	No data	WHO 2010
USC	HAP		USC 2011
	Cobalt compounds	Included in the Clean Air Acts list of HAPs to be regulated by EPA	
Water & Food			
EPA	Drinking water standards and health advisories	Not listed	EPA 2018a
	National primary drinking water regulations	Not listed	EPA 2009
	RfD	No data	IRIS 2023
	Provisional peer reviewed toxicity values		EPA 2008
	Cobalt		
	Provisional subchronic RfD	0.003 mg/kg/day	
WHO	Provisional chronic RfD	0.0003 mg/kg/day	
	Drinking water quality guidelines	No data	WHO 2022

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Agency	Description	Information	Reference
FDA	Substances added to food (formerly EAFUS)		
	Cobalt sulfate (as catalyst)	Permitted as boiler water additive in preparation of food for human consumption	FDA 2023b
	Cobaltous salts and its derivatives	Prohibited from use in human food	FDA 2023a
Cancer			
HHS	Carcinogenicity classification		NTP 2021
	Cobalt and cobalt compounds that release cobalt ions in vivo	Reasonably anticipated to be human carcinogens	
EPA	Carcinogenicity classification	No data	IRIS 2023
	Provisional peer reviewed toxicity values		EPA 2008
	Cobalt		
	Provisional carcinogenicity classification	Likely to be carcinogenic to humans by the inhalation route	
	Provisional IUR	9 (mg/m ³) ⁻¹	
IARC	Carcinogenicity classification		
	Cobalt metal (without tungsten carbide or other metal alloys)	Group 2A ^a	IARC 2023
	Soluble cobalt (II) salts (cobalt chloride, cobalt sulfide)	Group 2A ^a	
	Cobalt (II) oxide	Group 2B ^b	
	Cobalt (II, III) oxide	Group 3 ^c	
	Cobalt (II) sulfide	Group 3 ^c	
	Other cobalt (II) compounds	Group 3 ^c	
	Weapons-grade tungsten (with nickel and cobalt)	Group 2B ^b	
	Cobalt metal with tungsten carbide	Group 2A ^a	IARC 2006
Occupational			
OSHA	PEL (8-hour TWA) for general industry, shipyards, and construction		OSHA 2021a , 2021b , 2021c
	Cobalt metal, dust, and fume (as Co)	0.1 mg/m ³	
NIOSH	REL (up to 10-hour TWA)		
	Cobalt metal, dust, and fume (as Co)	0.05 mg/m ³	NIOSH 2019c
	Cobalt carbonyl (as Co)	0.1 mg/m ³	NIOSH 2019a
	Cobalt hydrocarbonyl (as Co)	0.1 mg/m ³	NIOSH 2019b

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Emergency Criteria			
AIHA	ERPGs		AIHA 2016
	Cobalt hydrocarbonyl ^d		
	ERPG-1	Insufficient data	
	ERPG-2	0.9 mg/m ³	
	ERPG-3	3 mg/m ³	
NIOSH	IDLH		
	Cobalt metal, dust, and fume (as Co)	20 mg/m ³	NIOSH 1994
EPA	AEGLs-air	Not listed	EPA 2018b
DOE	PACs-air		DOE 2018a
	Cobalt		
	PAC-1 ^d	0.18 mg/m ³	
	PAC-2 ^d	2 mg/m ³	
	PAC-3 ^d	20 mg/m ³	
	Cobalt acetate tetrahydrate		
	PAC-1 ^d	2.1 mg/m ³	
	PAC-2 ^d	23 mg/m ³	
	PAC-3 ^d	140 mg/m ³	
	Cobalt carbonyl		
	PAC-1 ^d	0.3 mg/m ³	
	PAC-2 ^d	3.3 mg/m ³	
	PAC-3 ^d	20 mg/m ³	
	Cobalt chloride		
	PAC-1 ^d	0.13 mg/m ³	
	PAC-2 ^d	18 mg/m ³	
	PAC-3 ^d	83 mg/m ³	
	Cobalt (II) chloride hexahydrate		
	PAC-1 ^d	0.24 mg/m ³	
	PAC-2 ^d	25 mg/m ³	
	PAC-3 ^d	150 mg/m ³	
	Cobalt hydrocarbonyl		
	PAC-1 ^d	0.3 mg/m ³	
	PAC-2 ^d	0.9 mg/m ³	
	PAC-3 ^d	3 mg/m ³	
	Cobalt hydroxide		
	PAC-1 ^d	0.095 mg/m ³	
	PAC-2 ^d	1.1 mg/m ³	
	PAC-3 ^d	6.3 mg/m ³	

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	Cobalt nitrate		
	PAC-1 ^d	0.19 mg/m ³	
	PAC-2 ^d	14 mg/m ³	
	PAC-3 ^d	86 mg/m ³	
	Cobalt nitrate hexahydrate		
	PAC-1 ^d	0.3 mg/m ³	
	PAC-2 ^d	23 mg/m ³	
	PAC-3 ^d	140 mg/m ³	
	Cobalt (II) oxide		
	PAC-1 ^d	0.076 mg/m ³	
	PAC-2 ^d	4.2 mg/m ³	
	PAC-3 ^d	25 mg/m ³	
	Cobalt oxide [cobalt tetroxide]		
	PAC-1 ^d	0.082 mg/m ³	
	PAC-2 ^d	4.5 mg/m ³	
	PAC-3 ^d	27 mg/m ³	
	Cobalt sulfate		
	PAC-1 ^d	0.16 mg/m ³	
	PAC-2 ^d	14 mg/m ³	
	PAC-3 ^d	84 mg/m ³	
	Cobalt sulfate heptahydrate		
	PAC-1 ^d	0.29 mg/m ³	
	PAC-2 ^d	19 mg/m ³	
	PAC-3 ^d	120 mg/m ³	
	Cobaltous carbonate		
	PAC-1 ^d	0.12 mg/m ³	
	PAC-2 ^d	210 mg/m ³	
	PAC-3 ^d	1,200 mg/m ³	

^aGroup 2A: probably carcinogenic to humans.

^bGroup 2B: possibly carcinogenic to humans.

^cGroup 3: not classifiable as to its carcinogenicity to humans.

^dValues are given as cobalt.

^eDefinitions of PAC terminology are available from DOE (2018b).

AEGL = acute exposure guideline level; AIHA = American Industrial Hygiene Association; DOE = Department of Energy; EAFUS = Everything Added to Food in the United States; EPA = Environmental Protection Agency; ERPG = Emergency Response Planning Guideline; FDA = Food and Drug Administration; HAP = hazardous air pollutant; HHS = Department of Health and Human Services; IARC = International Agency for Research on Cancer; IDLH = immediately dangerous to life or health; IRIS = Integrated Risk Information System; IUR = inhalation unit risk; NIOSH = National Institute for Occupational Safety and Health; NTP = National Toxicology Program; OSHA = Occupational Safety and Health Administration; PAC = protective action criteria; PEL = permissible exposure limit; REL = recommended exposure limit; RfC = inhalation reference concentration; RfD = oral reference dose; TWA = time-weighted average; USC = United States Code; WHO = World Health Organization