

CHAPTER 7. REGULATIONS AND GUIDELINES

Pertinent international and national regulations, advisories, and guidelines regarding nickel 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 nickel.

Table 7-1. Regulations and Guidelines Applicable to Nickel

Agency	Description	Information	Reference
Air			
EPA	RfC		
	Nickel, soluble salts	Not evaluated	IRIS 1994
	Nickel refinery dust	Not evaluated	IRIS 2006
	Nickel subsulfide	Not evaluated	IRIS 2002
WHO	Air quality guidelines		WHO 2000
	Incremental risk for 1 µg/m ³ nickel in air	3.8X10 ⁻⁴	
Water & Food			
EPA	Drinking water standards and health advisories		EPA 2018a
	Nickel		
	1-day health advisory for a 10-kg child	1 mg/L	
	10-day health advisory for a 10-kg child	1 mg/L	
	DWEL	0.7 mg/L	
	Lifetime health advisory	0.1 mg/L	
	National primary drinking water regulations	Not listed	EPA 2009
	RfD		
	Nickel, soluble salts	0.02 mg/kg/day	IRIS 1994
	Nickel refinery dust	Not evaluated	IRIS 2006
	Nickel subsulfide	Not evaluated	IRIS 2002
WHO	Guideline value		WHO 2022
	Nickel	0.07 mg/L	
FDA	Substances added to food (formerly EAFUS)		
	Nickel	GRAS Permitted as a component of	FDA 2023a FDA 2023b

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Agency	Description	Information	Reference
		paper/paperboard in contact with dry food	
	Allowable level of nickel in bottled water	0.1 mg/L	FDA 2022
Cancer			
HHS	Carcinogenicity classification		NTP 2021
	Nickel compounds	Known to be human carcinogens	
	Nickel metallic	Reasonably anticipated to be a human carcinogen	
EPA	Carcinogenicity classification		
	Nickel, soluble salts	Not evaluated	IRIS 1994
	Nickel refinery dust	A ^a	IRIS 2006
	Nickel subsulfide	A ^a	IRIS 2002
	Inhalation unit risk		
	Nickel refinery dust	0.00024 (µg/m ³) ⁻¹	IRIS 2006
	Nickel subsulfide	0.00048 (µg/m ³) ⁻¹	IRIS 2002
IARC	Carcinogenicity classification		
	Nickel compounds	Group 1 ^c	IARC 2012
	Nickel, metallic	Group 2B ^d	IARC 1990
Occupational			
OSHA	PEL (8-hour TWA) for general industry, construction, and shipyards		OSHA 2021a , 2021b , 2021c
	Nickel, metal, and insoluble compounds (as Ni)	1 mg/m ³	
	Nickel, soluble compounds (as Ni)	1 mg/m ³	
NIOSH	REL (up to 10-hour TWA)		
	Nickel metal and other compounds (as Ni)	0.015 mg/m ³ ^e	NIOSH 2019
Emergency Criteria			
NIOSH	IDLH		
	Nickel metal and other compounds (as Ni)	10 mg/m ³ ^e	NIOSH 2019
EPA	AEGLS-air ^f	No data	EPA 2018b
DOE	PACs-air ^h		DOE 2018a
	Nickel		
	PAC-1	4.5 mg/m ³	
	PAC-2	50 mg/m ³	
	PAC-3	99 mg/m ³	
	Nickel acetate tetrahydrate		
	PAC-1	13 mg/m ³	
	PAC-2	140 mg/m ³	
	PAC-3	830 mg/m ³	

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Agency	Description	Information	Reference
	Nickel(II) carbonate		
	PAC-1	0.61 mg/m ³	
	PAC-2	6.6 mg/m ³	
	PAC-3	40 mg/m ³	
	Nickel chloride		
	PAC-1	0.66 mg/m ³	
	PAC-2	22 mg/m ³	
	PAC-3	130 mg/m ³	
	Nickel cyanide		
	PAC-1	1.1 mg/m ³	
	PAC-2	13 mg/m ³	
	PAC-3	75 mg/m ³	
	Nickel(II) nitrate		
	PAC-1	0.93 mg/m ³	
	PAC-2	10 mg/m ³	
	PAC-3	61 mg/m ³	
	Nickel oxide		
	PAC-1	0.76 mg/m ³	
	PAC-2	220 mg/m ³	
	PAC-3	1,300 mg/m ³	
	Nickel sulfamate		
	PAC-1	1.3 mg/m ³	
	PAC-2	12 mg/m ³	
	PAC-3	71 mg/m ³	
	Nickel sulfate		
	PAC-1	0.79 mg/m ³	
	PAC-2	8.6 mg/m ³	
	PAC-3	51 mg/m ³	

^aA: human carcinogen.^bB2: probable human carcinogen.^cGroup 1: carcinogenic to humans.^dGroup 2B: possibly carcinogenic to humans^ePotential occupational carcinogen.^fDefinitions of AEGL terminology are available from EPA (2018c).^gNot recommended due to insufficient data.^hDefinitions of PAC terminology are available from DOE (2018b).

AEGL = acute exposure guideline levels; HHS = Department of Health and Human Services; DOE = Department of Energy; DWEL = drinking water equivalent level; EAFUS = Everything Added to Food in the United States; EPA = U.S. Environmental Protection Agency; FDA = Food and Drug Administration; GRAS = Generally Recognized As Safe; IARC = International Agency for Research on Cancer; IDLH = immediately dangerous to life or health; IRIS = Integrated Risk Information System; 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; WHO = World Health Organization