7. REGULATIONS AND ADVISORIES

The international, national, and state regulations and guidelines regarding sulfur dioxide in air, water, and other media are summarized in Table 7-1.

A NTP cancer classification has not been reported for sulfur dioxide. NTP has not conducted genetic toxicology or chronic toxicology and carcinogenicity bioassays on sulfur dioxide (ACGIH 1991).

A STEL for occupational exposure has been established at 5 ppm (10 mg/m^3). World Health Organization (WHO) guidelines for exposure to sulfur dioxide are listed in Table 7-l.

EPA primary and secondary NAAQS are listed in Table 7-1. A 24 hour limit and an annual limit of exposure have been established. However, despite the effects induced in exercising asthmatics by brief exposure to sulfur dioxide (Utell and Frampton 1992), no short-term ambient sulfur dioxide standard has been established.

An acute-duration MRL of 0.01 ppm has been derived based on increased airway resistance in asthmatics (Sheppard et al. 1981).

TABLE 7-1. Regulations and Guidelines Applicable to Sulfur Dioxide

Agency	Description	Information	References
INTERNATIONAL			
IARC	Carcinogenic classification	Group 3[a]	IARC 1992a
WHO	10-minute exposure limit	500 µg/m^3 (0.2 ppm)	WHO 1987
	1-hour exposure limit	350 µg/m^3 (0.13 ppm)	WHO 1987
	24-hour exposure limit	100–150 µg/m^3 (0.04–0.06 ppm)	WHO 1979
	Annual arithmetic mean	40–60 µg/m^3 (0.015–0.023 ppm)	WHO 1979
NATIONAL			
Regulations:			
a. Air:			
EPA	NAAQS, national primary ambient air quality standard for sulfur oxides measured as sulfur dioxide		EPA 1998a (40 FR 50.4)
	24-hour exposure limit[b]	365 µg/m^3 (0.14 ppm)	
	Annual arithmetic mean	80 µg/m^3 (0.03 ppm)	
	NAAQS, national secondary ambient air quality standard for sulfur oxides measured as sulfur dioxide		EPA 1998b (40 CFR 50.5)
	3-hour exposure limit[b]	1,300 µg/m^3 (0.5 ppm)	
OSHA	PEL TWA (8 hours)	13 mg/m^3 (5 ppm)	OSHA 1998 (29 CFR 1910.1000)
b. Water:			
EPA	Hazardous substance under the Clean Federal Water Pollution Control Act Section 311(b)(2)(A)	No	EPA 1998c (40 CFR 116.4)
c. Food:			
EPA	Residues from the use of sulfur dioxide in liquid grain-fumigant formulations for market or fire-retardant purposes at levels not exceeding 5% by weight are exempted from the requirement of a tolerance in or on barley, buckwheat, corn, oats, popcorn, rice, rye, grain sorghum, (milo), and wheat	Yes	EPA 1998e (40 CFR 180.1013)
	Residues of sulfur dioxide resulting from postharvest fungicial use are exempted from the requirement of tolerances in or on corn for feed us only (non-human consumption)	Yes	EPA 1998e (54 CFR 180.1013)

TABLE 7-1. Regulations and Guidelines Applicable to Sulfur Dioxide (*continued*)

Agency	Description	Information	References
NATIONAL (cont'd)			
	Tolerance for sulfite residues from the fungicide sulfur dioxide in or on the following raw agricultural commodity: grapes, postharvest	10 ppm (26.2 mg/m^3)	EPA 1998d (40 CFR 180.444)
FDA	Recognized as safe when used in accordance with good manufacturing or feeding practices except meats and food sources of vitamin B1	Yes	FDA 1995 (21 CFR 582.3862)
b. Other:			
DOT	Forbidden for transport on passenger-carrying aircraft or railcars	Yes	DOT 1998a (49 CFR 172.101)
	Domestic transportation labels, poison gas, corrosive	Yes	DOT 1998a
EPA	CERCLA reportable quantity	500 pounds	EPA 1998f (40 CFR 355 Appendix A)
	Extremely hazardous substance, TPQ	500 pounds	EPA 1998f (40 CFR 355 Appendix A)
EPA-OSW	Designation of hazardous substance	No	EPA 1998c (40 CFR 116.4)
Guidelines:			
a. Air:			
ACGIH	TLV TWA	5.2 mg/m^3 (2 ppm)	ACGIH 1998
NIOSH	REL TWA	5 mg/m^3 (2 ppm)	NIOSH 1997
	STEL	13 mg/m^3 (5 ppm)	NIOSH 1997
STATE[c]			
Regulations and Guidelines:			
a. Air:			
	Acceptable ambient air concentation:		
California	1-hour	0.25 ppm	CA ARB 1998
	24-hour	0.04 ppm	
Colorado	1°: 24-hour	260 µg/m^3 (0.10 ppm)	CO DPHE 1998
	Annual	75 µg/m^3 (0.03 ppm)	
	2°: 24-hour	60 µg/m^3 (0.02 ppm)	
	Annual	150 µg/m^3 (0.06 ppm)	
Connecticut	1°: 24-hour	365 µg/m^3 (0.14 ppm)	CO DPHE 1998
	Annual	80 µg/m^3 (0.03 ppm)	
	2°: 24-hour	1300 µg/m^3 (0.5 ppm)	
	Annual	360 µg/m^3 (0.1 ppm)	

TABLE 7-1. Regulations and Guidelines Applicable to Sulfur Dioxide (*continued*)

Agency	Description	Information	References
STATE (cont'd)			
Florida	3-hour	1300 µg/m^3 (0.5 ppm)	FL DEP 1998
	24-hour	260 µg/m^3 (0.1 ppm)	
	Annual	60 µg/m^3 (0.02 ppm)	
Maine	3-hour	1150 µg/m^3 (0.4 ppm)	ME DEP 1998
	24-hour	230 µg/m^3 (0.09 ppm)	
	Annual	57 µg/m^3 (0.02 ppm)	
Minnesota	1°: 24-hour	365 µg/m^3 (0.14 ppm)	MN PCA 1998
	Annual	80 µg/m^3 (0.03 ppm)	
	2°: 24-hour	365 µg/m^3 (0.14 ppm)	
	Annual	60 µg/m^3 (0.02 ppm)	
Montana	1-hour	0.5 ppm	MT DHES 1998
	24-hour	0.10 ppm	
	Annual	0.02 ppm	
Nevada	1°: 24-hour	365 µg/m^3 (0.14 ppm)	NV DCNR 1998
	Annual	80 µg/m^3 (0.03 ppm)	
	2°: 24-hour	1300 µg/m^3 (0.5 ppm)	
	Annual	260 µg/m^3 (0.1 ppm)	
New Mexico	24-hour[e]	0.10 ppm	NM ED 1998
	Annual[e]	0.02 ppm	
	3-hour[f]	0.50 ppm	
	24-hour[f]	0.14 ppm	
	Annual[f]	0.03 ppm	
New York	3-hour	0.25 ppm[g]; 0.50 ppm[h]	NY DEC 1998
	24-hour	0.10 ppm[g]; 0.14 ppm[h]	
	Annual	0.03 ppm	
North Dakota	1-hour	715 µg/m^3 (0.27 ppm)	ND SDHCL 1998
	24-hour	260 µg/m^3 (0.10 ppm)	
	Annual	60 µg/m^3 (0.02 ppm)	
Oregon	3-hour	0.02 ppm	OR DEQ 1998
	24-hour	0.10 ppm	
	Annual	0.50 ppm	
Washington	1-hour[h]	0.4 ppm	WA DE 1998
	1-hour[i]	0.25 ppm	
	24-hour	0.1 ppm	
	Annual	0.02 ppm	

TABLE 7-1. Regulations and Guidelines Applicable to Sulfur Dioxide (*continued*)

Agency	Description	Information	References
STATE (cont'd)			
Wyoming	3-hour	1300 μg/m^3 (0.50 ppm)	WY DEQ 1998
	24-hour	260 μg/m^3 (0.10 ppm)	
	Annual	60 μg/m^3 (0.02 ppm)	

[a]The Working Group on the Evaluation of Carcinogenic Risks to Humans concluded that this agent is not classifiable as to its carcinogenicity to humans. There is inadequate evidence in humans and limited evidence in animals.
[b]Not to be exceeded more than once per year.
[c]State regulations are not necessarily applied state-wide. For specific information as to the areas affected by the regulations, refer to the corresponding state's code of regulations. All states not listed have adopted the federal ambient air standards without modification. When designated, 1° indicates primary standards and 2° indicates secondary (more stringent) standards.
[d]Not to be exceeded more than eighteen times in any twelve consecutive months.
[e]For the state except on area within 3.5 miles of Chino Mines Company smelter furnace stack at Hurley.
[f]For area within 3.5 miles of Chino Mines Company smelter furnace stack at Hurley.
[g]99% of the 3 or 24-hour average concentrations shall not exceed this standard.
[h]Not to be exceeded more than once per year; [i]Not to be exceeded more than twice per week.

ACGIH = American Conference of Governmental Industrial Hygienists; CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act; CFR = Code of Federal Regulations; DOT = Department of Transportation; DOT-IMO = Department of Transportation/International Maritime Organization; EPA = Environmental Protection Agency; FDA = Food and Drug Administration; FR = Federal Register; IARC = International Agency for Research on Cancer; NAAQS = National Ambient Air Quality Standard; NIOSH = National Institute for Occupational Safety and Health; OSHA = Occupational Safety and Health Administration; OSW = Office of Solid Wastes; PEL = Permissible Exposure Limit; REL = Recommended Exposure Limit; STEL = Short Term Exposure Limit; TLV = Threshold Limit Value; TPQ = Threshold Planning Quantity; TWA = Time-Weighted Average; WHO = World Health Organization