

7. REGULATIONS AND ADVISORIES

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

ATSDR has derived an acute-duration inhalation MRL of 1 ppm (3.8 mg/m³) for toluene based on a NOAEL for neurological effects in humans (Andersen et al. 1983).

ATSDR has derived a chronic-duration inhalation MRL of 0.08 ppm (0.3 mg/m³) for toluene based on a LOAEL for neurological effects in humans in a study by Zavalic et al. (1998a).

ATSDR has derived an acute-duration oral MRL of 0.8 mg/kg/day for toluene based on a LOAEL for neurological effects in rats (Dyer et al. 1988).

ATSDR has derived an intermediate-duration oral MRL of 0.02 mg/kg/day for toluene based on a LOAEL for neurological effects in mice (Hsieh et al. 1990b).

The EPA's reference concentration (RfC) for toluene is 0.4 mg/m³ and the EPA's reference dose (RfD) is 0.2 mg/kg/day (IRIS 2000).

The International Agency for Research on Cancer (IARC) classifies toluene as a Group 3 carcinogen (the agent is not classifiable as to its carcinogenicity to humans) based on inadequate evidence in humans for carcinogenicity of toluene and evidence suggesting lack of carcinogenicity of toluene in experimental animals (IARC 1999). The EPA and the American Conference of Governmental Industrial Hygienists (ACGIH) also state that there are inadequate data on which to classify toluene in terms of its carcinogenicity in humans or animals (ACGIH 1997; IRIS 2000). Therefore, toluene is assigned the cancer classification of "Group D" by the EPA and given the cancer category "A4" by the ACGIH (ACGIH 1997; IRIS 2000).

Toluene is listed as a chemical which must meet the requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act (SARA) (EPA 1996a). Title III of SARA, also known as "The Emergency Planning and Community Right-to-Know Act of 1986," requires owners and operators of certain facilities that manufacture, import, process, or otherwise use the chemicals on this list to report annually any release of those chemicals to any environmental media over a specified threshold level.

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Toluene has been designated as a hazardous substance pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 (EPA 1995a). The statutory source for this designation is Section 311(b)(4) of the Clean Water Act (CWA), Section 307 (a) of the CWA, Section 112 of the Clean Air Act (CAA), and Section 300 of the Resource Conservation and Recovery Act (RCRA) (EPA 1995a). The owner and operator of any facility that produces, uses, or stores a CERCLA hazardous substance is required to immediately report releases to any environmental media, if the amount released is equal to or exceeds the specified “reportable quantity” assigned to the substance. The reportable quantity for toluene is 1,000 pounds (454 kg) (EPA 1995a).

The Occupational Safety and Health Administration (OSHA) sets permissible exposure limits (PELs) to protect workers against adverse health effects resulting from exposure to hazardous substances. The PELs determined for hazardous substances are enforceable, regulatory limits on allowable air concentrations in the workplace. OSHA requires employers of workers who are occupationally exposed to these hazardous substances to institute engineering controls and work practices to reduce and maintain employee exposure at or below permissible exposure limits (PEL). Between June 27, 1974 and January 18, 1989, the Occupational Safety and Health Administration (OSHA) had promulgated protective, permissible exposure limits (PELs) for approximately 264 toxic substances (OSHA 1993). On January 18, 1989, OSHA promulgated more protective PELs for approximately 376 toxic substances. Toluene was included among the 212 toxic substances for which the PEL was lowered (OSHA 1989a). The new PELs for toluene were set at 50 ppm (TWA) and 100 ppm for the 15-minute, short-term exposure limit (STEL) (OSHA 1989a). Because the 1989 promulgation was rescinded by the 11th Circuit Court Appeals in July 1992, only those PELs in place prior to the 1989 rule are currently enforced by OSHA. On June 30, 1993, OSHA published in the Federal Register a final rule announcing the revocation of the 1989 exposure limits, including the newly established limits for toluene (OSHA 1993). An employer must ensure that an employee’s exposure to toluene in any 8-hour work shift of a 40-hour week does not exceed the 8-hour time-weighted average (TWA) of 200 ppm (OSHA 1974). The acceptable ceiling concentration for toluene which shall not be exceeded at any time during an 8-hour shift is 300 ppm (OSHA 1974). The acceptable maximum peak above the ceiling for an 8-hour shift is 500 ppm. The maximum exposure duration for this level is 5 minutes in any 2-hour period (OSHA 1974). The ACGIH (1999) recommends an 8-hour TWA Threshold Limit Value of 50 ppm toluene to protect against central nervous system effects.

Toluene is regulated as a hazardous air pollutant (U.S. Congress 1990) and is subject to the emission limitations for various processes and operations in the synthetic organic chemicals manufacturing

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industry (EPA 1983a, 1993b, 1995i). Source categories such as wood furniture manufacturing operations (EPA 1995g), polymer and resin producers (EPA 1996c) and petroleum refineries (EPA 1996b) that could release toluene to the atmosphere must meet the national emissions standards for hazardous air pollutants (NESHAPs).

Because of its potential to cause adverse health effects in exposed people, toluene is also regulated by the drinking water standards set by the EPA. Toluene generally gets into drinking water by improper waste disposal or leaking underground storage tanks. In order to protect humans from the risk of developing adverse health effects from exposure to toluene through drinking water, the EPA Drinking Water Regulations and Health Advisories (1996) lists the Maximum Contaminant Level and the Maximum Contaminant Level Goal for toluene as 1 mg/L.

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Table 7-1. Regulations and Guidelines Applicable to Toluene

Agency	Description	Information	Reference
<u>INTERNATIONAL</u>			
Guidelines:			
IARC	Cancer Classification	Group 3	IARC 1998
WHO	Drinking-water guideline values for health-related organics	700 µg/L	WHO 1996
<u>NATIONAL</u>			
Regulations and Guidelines:			
a. Air:			
ACGIH	TLV—TWA	50 ppm	ACGIH 1999
EPA	Listed as a Hazardous Air Pollutant	Yes	Clean Air Act Amendment, Title III, Section 112 (b) U.S. Congress 1990
NIOSH	Recommended Exposure Limit: TWA STEL	100 ppm 150 ppm	NIOSH 1999
OSHA	8-hour time weighted average	200 ppm	29 CFR 1910.1000 OSHA 1999a
	Acceptable ceiling concentration	300 ppm	29 CFR 1910.1000 OSHA 1999a
	Acceptable maximum peak above the acceptable ceiling concentration for an 8-hour shift for a maximum duration of 10 minutes	500 ppm	29 CFR 1910.1000 OSHA 1999a
	Vacated 1989 OSHA PEL ^a TWA STEL	100 ppm 150 ppm	OSHA 1989a
	8-hour time weighted average for shipyard workers	200 ppm	29 CFR 1915.1000 OSHA 1999b
	8-hour-time weighted average for construction workers	200 ppm	29 CFR 1926.55 OSHA 1999c
b. Water			

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Table 7-1. Regulations and Guidelines Applicable to Toluene (continued)

Agency	Description	Information	Reference
EPA (cont.)	MCLG	1 mg/L	40 CFR 141.50 EPA 1999g
EPA	MCL	1 ppm	40 CFR 141.32 EPA 1999f
	MCL for community and non-transient, non-community water systems	1 mg/L	40 CFR 141.61 EPA 1999h
	Health Advisories		EPA 1996a
	One-day (10-kg child)	20 mg/L	
	Ten-day (10-kg child)	2 mg/L	
	Longer-term (child)	2 mg/L	
	Longer-term (adult)	7 mg/L	
	Lifetime (adult)	1 mg/L	
	Cancer Classification	Group D ^b	
	Water Quality Criteria: water and organisms organisms only	6,800 µg/L 200,000 µg/L	EPA 1999j
	Universal treatment standards waste water non-waste water	0.080 mg/L ² 10 mg/kg ³	40 CFR 268.48 EPA 1999e
FDA	Bottled water limit for toluene	1 mg/L	21 CFR 165.110 FDA 1999e
c. Food			
EPA	Residue exempt from the requirement of a tolerance when used in accordance with good agricultural practice in pesticide formulations applied to growing crops or to raw agricultural commodities after harvest	Used as a solvent or co-solvent	40 CFR 180.1001 EPA 1999i
FDA	Indirect Food Additive—component of adhesives	Yes	21 CFR 175.105 FDA 1999a
	Indirect food additive—component of resinous and polymeric coatings	Yes	21 CFR 175.320 FDA 1999c
	Indirect food additive—residual solvent in finished polycarbonate resins	Not to exceed 800 ppm	21 CFR 177.1580 FDA 1999d

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Table 7-1. Regulations and Guidelines Applicable to Toluene (continued)

Agency	Description	Information	Reference
FDA (cont.)	Used as an adjuvant in the manufacturing of foam plastics intended for use in contact with foods— subject to the following limitations:	Use only as a blowing agent adjuvant to polystyrene at a level not to exceed 0.35% by weight of finished foam polystyrene	21 CFR 178.3010 FDA 1999b
	Indirect food additive— component of cellophane used for food packaging	Residue limit of 0.1%	21 CFR 177.1200 FDA 1999f
d. other			
ACGIH	Cancer classification	A4 ^c	ACGIH 1999
	Biological Exposure Index: o-Cresol in urine Hippuric acid in urine Toluene in blood	0.5 mg/L 1.6 g/g creatinine 0.05 mg/L	
EPA	RfD RfC Cancer Classification	0.2 mg/kg/day 0.4 mg/m ³ D ^d	IRIS 2000
	Reportable quantity for toluene regarded as a CERCLA hazardous substance under section 311(b)(4), 307(a) and 112 of the Clean Water Act; and by RCRA section 3001	1,000 lb	40 CFR 302.4 EPA 1999b
	Identification and Listing of toluene as a Hazardous Waste	Yes	40 CFR 261.33 EPA 1999a
	Toxic pollutant designated pursuant to section 307(a)(1) of the Act	Yes	40 CFR 401.15 EPA 1998a
	Toxic Chemical Release Reporting— effective date	1/1/87	40 CFR 372.65 EPA 1999d
EPA (cont.)	Designated hazardous substance in accordance with section 311(b)(2)(a) of the Act	Yes	40 CFR 116.4 EPA 1998b
	Health and Safety Data Reporting Rule	Yes	40 CFR 716.120 EPA 1995f

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Table 7-1. Regulations and Guidelines Applicable to Toluene (continued)

Agency	Description	Information	Reference
<u>STATE</u>			
a. Air:			
Arizona	Acceptable concentration 1-hour 24-hour	1 ppm 0.796 ppm	NATICH 1992
Connecticut	8-hour acceptable concentration	7,500 µg/m ³	NATICH 1992
Florida	Acceptable concentration Fort Lauderdale 8-hour Pinella 8-hour 24-hour Annual	7.5 mg/m ³ 3,750 µg/m ³ 900 µg/m ³ 300 µg/m ³	NATICH 1992
Idaho	Acceptable concentration Occupational exposure level	18.75 mg/m ³ 375 mg/m ³	ID Dept Health Welfare 1999a
Indiana	8-hour acceptable concentration	1,880 µg/m ³	NATICH 1992
Kansas	Concentration limits for hazardous air emissions	10 tons/year	KS Dept. Health Env 1998b
Louisiana	8-hour acceptable concentration	8,900 µg/m ³	NATICH 1992
Massachusetts	24-hour and annual acceptable concentration	10.20 µg/m ³	NATICH 1992
Maine	Acceptable concentration 24-hour Annual	260 µg/m ³ 180 µg/m ³	NATICH 1992
North Carolina	Acceptable concentration 15-minute 24-hour	56 mg/m ³ 4.7 mg/m ³	NATICH 1992
North Dakota	Acceptable concentration 8-hour 1-hour	3.77 mg/m ³ 5.65 mg/m ³	NATICH 1992
Nevada	8-hour acceptable concentration	8.93 mg/m ³	NATICH 1992
New York	Annual Acceptable concentration	7,500 µg/m ³	NATICH 1992
Oklahoma	24-hour acceptable concentration	37,500 µg/m ³	NATICH 1992

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Table 7-1. Regulations and Guidelines Applicable to Toluene (continued)

Agency	Description	Information	Reference
<u>STATE</u> (cont.)			
Rhode Island	Acceptable concentration 24-hour Annual	2,000 µg/m ³ 400 µg/m ³	RI Dept Env Management 1992
South Dakota	8-hour acceptable concentration	7,500 µg/m ³	NATICH 1992
Texas	0.5-hour acceptable concentration	3,750 µg/m ³	NATICH 1992
Virginia	24-hour acceptable concentration	6,300 µg/m ³	NATICH 1992
Vermont	24-hour acceptable concentration	8,930 µg/m ³	NATICH 1992
Washington	24-hour acceptable concentration	1,250 µg/m ³	NATICH 1992
Wisconsin	Acceptable emission levels <25 feet 25 feet	31 lbs/hour 131 lbs/hour	WI Dept Natural Resources 1997
EPA Region 9 ^e	Preliminary remedial goal (non cancer)	4.0 x 10 ⁺² µg/m ³	EPA 1998a
b. Water			
Alabama	Human health criteria for consumption of: water and fish ^f fish only ^f	6 mg/L 43.6 mg/L	AL Dept Env Management 1998
Alaska	Maximum contaminant level	1 mg/L	AK Dept Env Conserv 1999
Arizona	Human health based guidance levels (HBGLS) for ingestion of contaminants in drinking water Oral HBGL MCL	1400 µg/L 1000 µg/L	AR Dept Health Services 1999
	Aquifer water quality standard- drinking water protected use	1 mg/L	BNA 1998
California	Drinking water guideline	100 µg/L	FSTRAC 1995

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Agency	Description	Information	Reference
<u>STATE</u> (cont.)			
Colorado	Aquatic life based criteria for surface waters:		CO Dept Public Health Env 1999
	acute	17,500 µg/L	
	chronic	Not given	
	Human health based for surface water:		
	water and organism	1000 µg/L	
	water only	1000 µg/L	
Connecticut	Drinking water guideline	1,000 µg/L	FSTRAC 1995
	Surface-water protection criteria for substances in ground water	4×10^{-6} µg/L	BNA 1998
Delaware	Freshwater fish ingestion	370 mg/L	BNA 1998
	Freshwater fish and water	10 mg/L	
	Marine fish ingestion	52 mg/L	
Florida	Criteria for resource protection and recovery		BNA 1998
	freshwater	475 µg/L	
	marine	475 µg/L	
Hawaii	Health guidelines applicable to all water:		HI Dept Health 1999a
	Freshwater		
	acute	5,800 µg/L	
	chronic	NS ^g	
	Saltwater		
	acute	2,100 µg/L	
	chronic	NS ^g	
Fish consumption	140,000 µg/L		
	MCL applicable to community and non-transient, non-community water systems	1 mg/L	HI Dept Health 1999b
Idaho	Ground water quality	1 mg/L	ID Dept Health Welfare 1999a
Illinois	Human health standards	51.0 mg/L	IL Env Protec Agency 1999
Kansas	Guideline	2,000 µg/L	FSTRAC 1990
Kansas	Surface water quality standards for aquatic life:		KS Dept Health Envment 1998a
	acute	17,500 mg/L	
	chronic	Not given	
Maine	Guideline	1400	FSTRAC 1995

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Table 7-1. Regulations and Guidelines Applicable to Toluene (continued)

Agency	Description	Information	Reference
<u>STATE</u> (cont.)			
Massachusetts	Guideline	2,000 µg/L	FSTRAC 1995
Minnesota	Guideline	1,000 µg/L	FSTRAC 1995
New Hampshire	Guideline	2,000 µg/L	FSTRAC 1990
New Jersey	Ground water quality standards	1000 µg/L	NJ Dept Env Protec 1993
Oklahoma	Aquatic life Criteria acute chronic	Not given 875.0 µg/L	OK Dept Env Quality 1997
Rhode Island	Accepted level - annual average	2,000 µg/m ³	RI Dept Env Management 1992
South Dakota	Maximum contaminant levels— apply to community and non- transient and non-community water systems	1 mg/L	SD Dept Env Natural Resources 1998
Vermont	Guideline	2,420 µg/L	FSTRAC 1995
Wisconsin	Standard	1,000 µg/L	FSTRAC 1995
EPA Region 9 ^e	Preliminary remedial goal (noncancer)	7.2x10 ⁺² µg/m ³	EPA 1998a

^aOSHA set more protective PELs for 212 substances in 1989. However, in July 1992, the 11th Circuit Court Appeals rescinded the 1989 PELs promulgated by OSHA. Only PELs in place prior to the 1989 rule are currently allowed as OSHA standards.

^bNot classifiable; Inadequate or no human and animal evidence of carcinogenicity

^cA4-Not classifiable as a human carcinogen.

^dD-substances are unclassifiable as to their carcinogenicity

^eThe preliminary remediation goals (PRGs) are tools used by EPA Region 9 for evaluating and cleaning up contaminated sites. They are being used to streamline and standardize all stages of the risk decision-making process for soil remediation.

^fThe following equations were used to calculate the values as given in the Alabama State laws:

Consumption of water and fish: Concentration (mg/L) = (HBW X RfD) / [(FCR X BCF) + WCR]

Consumption of water only:

Concentration (mg/L) = (HBW X RfD) / (FCR X BCF)

HBW = human body weight, set at 70 kg

RfD = reference dose, 0.2 mg/(kg-day) for toluene

FCR = fish consumption rate, set at 0.030 kg/day

BCF = bioconcentration factor, 10.7 L/kg for toluene

WCR = water consumption rate, set at 2 L/day

⁹NS: no standard has been developed

ACGIH=American Conference of Governmental Industrial Hygienists; CFR=code of federal regulations; CPSC=Consumer Product Safety Commission; EPA=Environmental Protection Agency; FDA=Food and Drug Administration; FR=federal register; FSTRAC=Federal-State Toxicology and Regulatory Alliance Committee; IARC=International Agency for Research on Cancer; IRIS=Integrated Risk Information System; MCL=maximum contaminant level; MCLG=maximum contaminant level goal; NIOSH=National Institute for Occupational Safety and Health; NPDES=national pollutant discharge elimination system; OSHA=Occupational Safety and Health Administration; PEL=permissible exposure limit; RfC=inhalation reference concentration; RfD=oral reference dose; STEL=short term exposure limit; TLV=threshold limit value; TWA=time-weighted average; WHO=World Health Organization