



Oregon Administrative Rules  
Chapter 437

Division 2

General Occupational Safety and Health

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# Oregon Rules for Air Contaminants

Subdivision

# Z

Administrative  
Order 3-2019



The Oregon Department of Consumer and Business Services adopted these rules pursuant to ORS 654.025(2).

The Secretary of State designated OAR Chapter 437 as the "Oregon Occupational Safety and Health Code." Six general subject areas within this code are designated as "Divisions."

- **Division 1** General Administrative Rules
- **Division 2** General Occupational Safety and Health Rules
- **Division 3** Construction
- **Division 4** Agriculture
- **Division 5** Maritime Activities
- **Division 7** Forest Activities
- **Oregon Revised Statutes (ORS) 654** The Oregon Safe Employment Act (OSEAct)

Oregon-initiated rules in this division of the Oregon Occupational Safety and Health Code are numbered in a uniform system developed by the Secretary of State. This system does not number the rules in sequence (001, 002, 003, etc.). Omitted numbers may be assigned to new rules at the time of their adoption.

**Oregon-initiated rules** are arranged in the following Basic Codification Structure adopted by the Secretary of State for Oregon Administrative Rules (OAR):

Chapter	Division	Rule	Section	Subsection	Paragraphs
<i>437</i>	<i>002</i>	<i>0322</i>	<i>(1)</i>	<i>(a)</i>	<i>(A)(i)(I)</i>

The majority of Oregon OSHA rules are adopted by reference from the Code of Federal Regulations (CFR), and are arranged in the following basic federal numbering system:

Chapter	Division	Part	Subpart (Subdivision)	Section	Paragraphs
437	002	1910	G	.303	(a)(1)(i)(A)(1)

The terms "subdivision" and "subpart" are synonymous within OAR 437, Oregon Occupational Safety and Health Code.

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To obtain an order form or copies of these codes, address:

**Department of Consumer & Business Services**  
**Oregon Occupational Safety & Health Division (Oregon OSHA)**  
**350 Winter St. NE**  
**Salem, OR 97301-3882**

Or call the Oregon OSHA Resource Library at 503-378-3272

The rules referenced in this division are available for viewing in the Office of the Secretary of State, Oregon State Archives Building, Salem, Oregon, or the Central Office, Oregon Occupational Safety and Health Division of the Department of Consumer and Business Services, 350 Winter St. NE, Salem, Oregon, and on our web site at [osha.oregon.gov](http://osha.oregon.gov).

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**437-002-0360 Adoption by Reference**

*In addition to, and not in lieu of, any other safety and health codes contained in OAR Chapter 437, the Department adopts by reference the following federal regulations printed as part of the Code of Federal Regulations, 29 CFR 1910, in the Federal Register:*

(1) (Reserved) 29 CFR 1910.1000 Air contaminants.

**Note:** 29 CFR 1910.1000 was repealed on 11/15/93 by OR OSHA. In Oregon, OAR 437-002-0382 applies.

(2) 29 CFR 1910.1001 Asbestos, published 5/14/19, FR vol. 84, no. 93, p. 21416.

(3) 29 CFR 1910.1002 Coal tar pitch volatiles, interpretation of term, published 1/21/83, Federal Register, vol. 43, p. 2768.

(4) 29 CFR 1910.1003 13 Carcinogens, published 3/26/12, FR vol. 77, no. 58, p. 17574.

(5) 29 CFR 1910.1004 See 1910.1003, 13 Carcinogens.

(6) Reserved for 29 CFR 1910.1005.

(7) 29 CFR 1910.1006 See 1910.1003, 13 Carcinogens.

(8) 29 CFR 1910.1007 See 1910.1003, 13 Carcinogens.

(9) 29 CFR 1910.1008 See 1910.1003, 13 Carcinogens.

(10) 29 CFR 1910.1009 See 1910.1003, 13 Carcinogens.

(11) 29 CFR 1910.1010 See 1910.1003, 13 Carcinogens.

(12) 29 CFR 1910.1011 See 1910.1003, 13 Carcinogens.

(13) 29 CFR 1910.1012 See 1910.1003, 13 Carcinogens.

(14) 29 CFR 1910.1013 See 1910.1003, 13 Carcinogens.

(15) 29 CFR 1910.1014 See 1910.1003, 13 Carcinogens.

(16) 29 CFR 1910.1015 See 1910.1003, 13 Carcinogens.

(17) 29 CFR 1910.1016 See 1910.1003, 13 Carcinogens.

(18) 29 CFR 1910.1017 Vinyl chloride, published 5/14/19, FR vol. 84, no. 93, p. 21416.

- (19) 29 CFR 1910.1018 Inorganic arsenic, published 5/14/19, FR vol. 84, no. 93, p. 21416.
- (20) 29 CFR 1910.1020 Access to Employee Exposure and Medical Records, published 6/8/11, Federal Register, vol. 76, no. 110, p. 33590.
- Appendix A Sample Authorization Letter.
- Appendix B Availability of NIOSH RTECS.
- (21) 29 CFR 1910.1025 Lead, published 5/14/19, FR vol. 84, no. 93, p. 21416.
- (22) 29 CFR 1910.1026 Chromium (VI), published 5/14/19, FR vol. 84, no. 93, p. 21416.
- (23) 29 CFR 1910.1027 Cadmium, published 5/14/19, FR vol. 84, no. 93, p. 21416.
- (24) 29 CFR 1910.1028 Benzene, and Appendices A, B, C, D, and E, published 5/14/19, FR vol. 84, no. 93, p. 21416.
- (25) 29 CFR 1910.1029 Coke oven emissions, published 5/14/19, FR vol. 84, no. 93, p. 21416.
- (26) 29 CFR 1910.1030 Bloodborne pathogens, published 5/14/19, Federal Register, vol. 84, no. 93, p. 21416.
- (27) 29 CFR 1910.1043 Cotton dust, published 5/14/19, FR vol. 84, no. 93, p. 21416.
- (28) 29 CFR 1910.1044 1,2 dibromo-3 chloropropane, published 5/14/19, FR vol. 84, no. 93, p. 21416.
- (29) 29 CFR 1910.1045 Acrylonitrile, published 5/14/19, FR vol. 84, no. 93, p. 21416.
- (30) 29 CFR 1910.1047 Ethylene oxide, published 5/14/19, FR vol. 84, no. 93, p. 21416.
- (31) 29 CFR 1910.1048 Formaldehyde, and Appendices A, B, C, D and E, published 5/14/19, FR vol. 84, no. 93, p. 21416.
- (32) 29 CFR 1910.1050 Methylenedianiline (MDA), published 5/14/19, FR vol. 84, no. 93, p. 21416.
- (33) 29 CFR 1910.1051 1,3-Butadiene, published 5/14/19, FR vol. 84, no. 93, p. 21416.

(34) 29 CFR 1910.1052 Methylene Chloride, published 5/14/19, FR vol. 84, no. 93, p. 21416.

**Note:** 29 CFR 1910.1101 Asbestos, was repealed by Federal Register, vol. 57, no. 110, issued 6/8/92, p. 24330.

(35) 29 CFR 1910.1096 Ionizing radiation, published 5/14/19, FR vol. 84, no. 93, p. 21416.

(36) 29 CFR 1910.1200 Hazard communication, published 2/8/13, FR vol. 78, no. 27, p. 9311.

(37) 29 CFR 1910.1201 Retention of DOT Markings, Placards and Labels, published 7/19/94, Federal Register, vol. 59, p. 36700.

(38) 29 CFR 1910.1450 Occupational Exposure to Hazardous Chemicals in Laboratories, published 1/22/13, FR vol. 78, no. 14, p. 4324.

(39) 29 CFR 1910.1499 Removed. Published 3/7/96, Federal Register, vol. 61, no. 46, p. 9245.

(40) 29 CFR 1910.1500 Removed. Published 3/7/96, Federal Register, vol. 61, no. 46, p. 9245.

*These standards are available at the Oregon Occupational Safety and Health Division, Oregon Department of Consumer and Business Services, and the United States Government Printing Office.*

Statutory/Other Authority: ORS 654.025(2) & 656.726(4)

Statutes/Other Implemented: ORS 654.001 - 654.295

History: APD Admin. Order 13-1988, f. 8/2/88, ef. 8/2/88 (Benzene).

APD Admin. Order 14-1988, f. 9/12/88, ef. 9/12/88 (Formaldehyde).

APD Admin. Order 18-1988, f. 11/17/88, ef. 11/17/88 (Ethylene Oxide).

APD Admin. Order 4-1989, f. 3/31/89, ef. 5/1/89 (Asbestos-Temp).

APD Admin. Order 6-1989, f. 4/20/89, ef. 5/1/89 (Non-Asbestiforms-Temp).

APD Admin. Order 9-1989, f. 7/7/89, ef. 7/7/89 (Asbestos & Non-Asbestiforms-Perm).

APD Admin. Order 11-1989, f. 7/14/89, ef. 8/14/89 (Lead).

APD Admin. Order 13-1989, f. 7/17/89, ef. 7/17/89 (Air Contaminants).

OR-OSHA Admin. Order 1-1990, f. 1/11/90, ef. 1/11/90 (Formaldehyde-Temp).

OR-OSHA Admin. Order 3-1990, f. 1/19/90, ef. 1/19/90 (Asbestos & Non-Asbestiforms-Temp).

OR-OSHA Admin. Order 6-1990, f. 3/2/90, ef. 3/2/90 (Formaldehyde-Perm).

OR-OSHA Admin. Order 7-1990, f. 3/2/90, ef. 3/2/90 (Asbestos & Non-Asbestiforms-Perm).

OR-OSHA Admin. Order 9-1990, f. 5/8/90, ef. 8/8/90 (Labs).

OR-OSHA Admin. Order 11-1990, f. 6/7/90, ef. 7/1/90 (Air Contaminants).

OR-OSHA Admin. Order 13-1990, f. 6/28/90, ef. 8/1/90 (Asbestos-Temp).

OR-OSHA Admin. Order 14-1990, f. 6/28/90, ef. 8/1/90 (Lead).

OR-OSHA Admin. Order 19-1990, f. 8/31/90, ef. 8/31/90 (Asbestos-Perm).

OR-OSHA Admin. Order 20-1990, f. 9/18/90, ef. 9/18/90 (Lead).

OR-OSHA Admin. Order 21-1990, f. 9/18/90, ef. 9/18/90 (Air Contaminants).

OR-OSHA Admin. Order 7-1991, f. 4/25/91, ef. 4/25/91 (Air Contaminants, Asbestos, Formaldehyde).

OR-OSHA Admin. Order 13-1991, f. 10/10/91, ef. 10/10/91 (Lead, Formaldehyde).

OR-OSHA Admin. Order 15-1991, f. 12/13/91, ef. 12/13/91 (Asbestos).

OR-OSHA Admin. Order 1-1992, f. 1/22/92, ef. 1/22/92 (Formaldehyde).

OR-OSHA Admin. Order 4-1992, f. 4/16/92, ef. 4/16/92 (Formaldehyde).

OR-OSHA Admin. Order 5-1992, f. 4/24/92, ef. 7/1/92 (Bloodborne Pathogens).

OR-OSHA Admin. Order 6-1992, f. 5/18/92, ef. 5/18/92 (Asbestos).

OR-OSHA Admin. Order 10-1992, f. 9/24/92, ef. 9/24/92 (Lead-temp).

OR-OSHA Admin. Order 11-1992, f. 10/9/92, ef. 10/9/92 (Asbestos).

OR-OSHA Admin. Order 12-1992, f. 10/13/92, ef. 10/13/92 (Formaldehyde).  
OR-OSHA Admin. Order 15-1992, f. 12/30/92, ef. 12/30/92 (Air Contaminants, BBP, Labs).  
OR-OSHA Admin. Order 1-1993, f. 1/22/93, ef. 1/22/93 (Cadmium, MDA).  
OR-OSHA Admin. Order 6-1993, f. 5/17/93, ef. 5/17/93 (Air Contaminants-Temp).  
OR-OSHA Admin. Order 12-1993, f. 8/20/93, ef. 11/1/93 (remainder of 2/Z).  
OR-OSHA Admin. Order 17-1993, f. 11/15/93, ef. 11/15/93 (Air Contaminants-Perm).  
OR-OSHA Admin. Order 4-1995, f. 3/29/95, ef. 3/29/95 (Asbestos).  
OR-OSHA Admin. Order 8-1995, f. 8/25/95, ef. 8/25/95 (Asbestos).  
OR-OSHA Admin. Order 4-1996, f. 9/13/96, ef. 9/13/96 (Lead).  
OR-OSHA Admin. Order 6-1996, f. 11/29/96, ef. 11/29/96 (Asbestos).  
OR-OSHA Admin. Order 4-1997, f. 4/2/97, ef. 4/2/97.  
OR-OSHA Admin. Order 6-1997, f. 5/2/97, ef. 5/2/97.  
OR-OSHA Admin. Order 8-1997, f. 11/14/97, ef. 11/14/97 (Methylene Chloride).  
OR-OSHA Admin. Order 1-1998, f. 2/13/98, ef. 2/13/98 (Methylene Chloride).  
OR-OSHA Admin. Order 3-1998, f. 7/7/98, ef. 7/7/98.  
OR-OSHA Admin. Order 1-1999, f. 3/22/99, ef. 3/22/99.  
OR-OSHA Admin. Order 4-1999, f. 4/30/99, ef. 4/30/99.  
OR-OSHA Admin. Order 6-2001, f. 5/15/01, ef. 5/15/01 (Cotton Dust).  
OR-OSHA Admin. Order 10-2001, f.9/14/01, ef. 10/18/01 (Bloodborne Pathogens).  
OR-OSHA Admin. Order 12-2001, f. 10/26/01, ef. 10/26/01 (Methylene Chloride).  
OR-OSHA Admin. Order 1-2005, f. 4/12/05, ef. 4/12/05.  
OR-OSHA Admin. Order 4-2006, f. 4/24/06, ef. 4/24/06.  
OR-OSHA Admin. Order 6-2006, f. 8/30/06, ef. 8/30/06.  
OR-OSHA Admin. Order 10-2006, f. 11/30/06, ef. 11/30/06.  
OR-OSHA Admin. Order 5-2009, f. 5/29/09, ef. 5/29/09.  
OR-OSHA Admin. Order 3-2010, f. 6/10/10, ef. 6/15/10.  
OR-OSHA Admin. Order 4-2011, f. 12/8/11, ef. 12/8/11.  
OR-OSHA Admin. Order 5-2011, f. 12/8/11, ef. 7/1/12.  
OR-OSHA Admin. Order 1-2012, f. 4/10/12, ef. 4/10/12.  
OR-OSHA Admin. Order 5-2012, f. 9/25/12, ef. 9/25/12.  
OR-OSHA Admin. Order 3-2013, f. 7/18/13, ef. 7/18/13.  
OR-OSHA Admin. Order 4-2013, f. 7/19/13, ef. 7/19/13.  
OR-OSHA Admin. Order 3-2019, f. 10/29/19, ef. 10/29/19.

## 437-002-0382 Oregon Rules for Air Contaminants

An employee's exposure to any substance listed in Oregon Tables Z-1, Z-2, or Z-3 of this section shall be limited in accordance with the requirements of the following paragraphs of this section.

### (1) Oregon Table Z-1.

- (a) Substances with limits preceded by "C" – Ceiling Values. An employee's exposure to any substance in Oregon Table Z-1, the exposure limit of which is preceded by a "C", shall at no time exceed the exposure limit given for that substance. If instantaneous monitoring is not feasible, then the ceiling shall be assessed as a 15-minute time weighted average exposure which shall not be exceeded at any time during the working day.
- (b) Other substances – 8-hour Time Weighted Averages. An employee's exposure to any substance in Oregon Table Z-1, the exposure limit of which is not preceded by a "C", shall not exceed the 8-hour Time Weighted Average given for that substance in any 8-hour work shift of a 40-hour work week.

- (c) Other Substances – Excursion Limits. Excursions in worker exposure levels may exceed 3 times the PEL-TWA for no more than a total of 30 minutes during a workday, and under no circumstances should they exceed 5 times the PEL-TWA, provided that the PEL-TWA is not exceeded.
- (d) Skin Designation. To prevent or reduce skin absorption, an employee's skin exposure to substances listed in Oregon Table Z-1 with an "X" in the Skin Designation column following the substance name shall be prevented or reduced to the extent necessary in the circumstances through the use of gloves, coveralls, goggles, or other appropriate personal protective equipment, engineering controls or work practices.
- (2) Oregon Table Z-2. An employee's exposure to any substance listed in Oregon Table Z-2 shall not exceed the exposure limits specified as follows:
- (a) 8-hour time weighted averages. An employee's exposure to any substance listed in Oregon Table Z-2, in any 8-hour work shift of a 40-hour work week, shall not exceed the 8-hour time weighted average limit given for that substance in Oregon Table Z-2.
- (b) Acceptable ceiling concentrations. An employee's exposure to a substance listed in Oregon Table Z-2 shall not exceed the acceptable ceiling concentration for the given substance in the table at any time during an 8-hour shift except:
- (i) Acceptable maximum peak above the acceptable ceiling concentration for an 8-hour shift. An employee's exposure to a substance listed in Oregon Table Z-2 shall not exceed the acceptable maximum peak above the acceptable ceiling concentration, and shall not exceed the maximum duration for the given substance during an 8-hour shift.

## (c) Example.

Example					
Substance	8-Hour Time-Weighted Average	Acceptable Ceiling Concentration	Acceptable Max. Peak Above the acceptable Ceiling Concentration for an 8-hour Shift		Skin
			Concentration	Maximum Duration	
Benzene <sup>(a)</sup> (Z87.4-1969)	10 ppm	25 ppm	50 ppm	10 min.	
Beryllium, and beryllium compounds (Z37.29-1970)	2 µg/m <sup>3</sup>	5 µg/m <sup>3</sup>	25 µg/m <sup>3</sup>	30 min.	
Cadmium fume <sup>(b)</sup> (Z37.5-1970)	0.1 mg/m <sup>3</sup>	0.3 mg/m <sup>3</sup>			
Cadmium dust <sup>(b)</sup> (Z37.5-1970)	0.2 mg/m <sup>3</sup>	0.6 mg/m <sup>3</sup>			
Carbon disulfide (Z37.3-1968)	20 ppm	30 ppm	100 ppm	30 min.	X
Carbon tetrachloride (Z37.17-1967)	10 ppm	25 ppm	200 ppm	5 min. in any 4 hrs	

During an 8-hour work shift, an employee exposed to benzene may be exposed to an 8-hour time weighted average (TWA) of 10 ppm. Concentrations of benzene during the 8-hour work shift may not exceed 25 ppm, unless that exposure is no more than 50 ppm and does not exceed 10 minutes during an 8-hour work shift. Such exposures must be compensated by exposures to concentrations below 10 ppm so that the 8-hour time-weighted average is less than 10 ppm.

(d) Skin Designation. To prevent or reduce skin absorption, an employee's skin exposure to substances listed in Oregon Table Z-2 with an "X" in the Skin Designation column following the substance name shall be prevented or reduced to the extent necessary in the circumstances through the use of gloves, coveralls, goggles, or other appropriate personal protective equipment, engineering controls or work practices.

(3) Oregon Table Z-3. An employee's exposure to any substance listed in Oregon Table Z-3, in any 8-hour work shift of a 40-hour work week, shall not exceed the 8-hour time weighted average limit given for that substance in the table.

(4) Computation formulae. The computation formula which shall apply to employee exposure to more than one substance for which 8-hour time weighted averages are included in OAR 437, Division 2/Z, Toxic and Hazardous Substances, in order to determine whether an employee is exposed over the regulatory limit is as follows:

(a) Cumulative exposures

- (i) The cumulative exposure for an 8-hour work shift shall be computed as follows:

$$E = (C_a T_a + C_b T_b + \dots C_n T_n) \div 8$$

Where:

E is the equivalent exposure for the working shift.

C is the concentration during any period of time T where the concentration remain constant.

T is the duration in hours of the exposure at the concentration C.

The value of E shall not exceed the 8-hour time weighted average specified in subpart Z of 29 CFR part 1910 for the substance involved.

- (ii) To illustrate the formula prescribed in paragraph (4)(a)(i) of this section, assume that Substance A has an 8-hour time weighted average limit of 100 ppm (Oregon Table Z-1). Assume that an employee is subject to the following exposure:

Two hours exposure at 150 ppm  
Two hours exposure at 75 ppm  
Four hours exposure at 50 ppm

Substituting this information in the formula, we have

$$[(2 \times 150) + (2 \times 75) + (4 \times 50)] \div 8 = 81.25 \text{ ppm}$$

Since 81.25 ppm is less than 100 ppm, the 8-hour time weighted average limit, the exposure is acceptable.

#### (b) Mixtures

- (i) In case of a mixture of air contaminants an employer shall compute the equivalent exposure as follows:

$$E_m = (C_1 \div L_1) + (C_2 \div L_2) + \dots (C_n \div L_n)$$

Where:

$E_m$  is the equivalent exposure for the mixture.

C is the concentration of a particular contaminant.

L is the exposure limit for that substance specified in Subpart Z of 29 CFR Part 1910.

The value of  $E_m$  shall not exceed unity (1).

(ii) To illustrate the formula prescribed in paragraph (4)(b)(i) of this section, consider the following exposures:

Substance	Actual concentration of 8-hour exposure	8-hour time weighted average exposure limit
B	500 ppm	1,000 ppm
C	45 ppm	200 ppm
D	40 ppm	200 ppm

Substituting in the formula, we have:

$$E_m = (500 \div 1000) + (45 \div 200) + (40 \div 200)$$

$$E_m = 0.500 + 0.225 + 0.200$$

$$E_m = 0.925$$

Since  $E_m$  is less than unity (1), the exposure combination is within acceptable limits.

(5) To achieve compliance with paragraphs (1) through (4) of this section, administrative or engineering controls must first be determined and implemented whenever feasible. When such controls are not feasible to achieve full compliance, protective equipment or any other protective measures shall be used to keep the exposure of employees to air contaminants within the limits prescribed in this section. Any equipment and/or technical measures used for this purpose must be approved for each particular use by a competent industrial hygienist or other technically qualified person. Whenever respirators are used, their use shall comply with 1910.134.

**Note:** Bold print identifies substances for which the Oregon Permissible Exposure Limits (PELs) are different than the federal Limits.

Table Z-1 Adopted Values (In Alphabetical Order)

Substance	CAS No. <sup>(c)</sup>	ppm <sup>(a)</sup>	mg/m <sup>3</sup> <sup>(b)</sup>	Skin
<b>Abate</b>	<b>3383-96-8</b>	—	<b>10</b>	
<b>Acetaldehyde</b>	<b>75-07-0</b>	<b>100</b>	<b>180</b>	
Acetic Acid	64-19-7	10	25	
Acetic anhydride	108-24-7	5	20	
Acetone	67-64-1	1,000	2,400	
Acetonitrile	75-05-8	40	70	
2-Acetylaminoflourine	53-96-3	(C)	(See 1910.1003)	
<b>Acetylene</b>	<b>74-86-2</b>	<b>1,000</b>	—	
Acetylene dichloride, see 1,2-Dichloroethylene				
Acetylene tetrabromide	79-27-6	1	14	
Acrolein	107-02-8	0.1	0.25	
Acrylamide	79-06-1	—	0.3	X
Acrylonitrile	107-13-1		(See 1910.1045)	
Aldrin	309-00-2	—	0.25	X
Allyl alcohol	107-18-6	2	5	X
Allyl chloride	107-05-1	1	3	
<b>Allyn glycidyl ether (AGE)</b>	<b>106-92-3</b>	<b>5</b> (C) 10	<b>22</b> (C) 45	
Allyl propyl disulfide	2179-59-1	2	12	
<b>alpha Alumina</b>	<b>1344-28-1</b>			
<b>Total Dust</b>		—	<b>10</b>	
<b>Respirable Fraction</b>		—	<b>5</b>	
<b>Aluminum Metal Dust</b>	<b>7429-90-5</b>			
<b>Total Dust</b>		—	<b>10</b>	
<b>Respirable Fraction</b>		—	<b>5</b>	
<b>Alundum (A1203)</b>		—	<b>10</b>	
4-Aminodiphenyl	92-67-1		(See 1910.1003)	
2-Aminoethanol, see Ethanolamine				
2-Aminopyridine	504-29-0	0.5	2	
<b>Ammonia</b>	<b>7664-41-7</b>	<b>25</b>	<b>18</b>	
<b>Ammonium Chloride Fumes</b>	<b>12125-02-9</b>	—	<b>10</b>	
<b>Ammonium sulfamate</b>	<b>7773-06-0</b>			
<b>Total Dust</b>		—	<b>10</b>	
<b>Respirable Fraction</b>		—	<b>5</b>	
n-Amyl acetate	628-63-7	100	525	
sec-Amyl acetate	626-38-0	125	650	

Substance	CAS No. <sup>(c)</sup>	ppm <sup>(a)</sup>	mg/m <sup>3</sup> <sup>(b)</sup>	Skin
Aniline and homologs	62-53-3	5	19	X
Anisidine (o, p-isomers)	29191-52-4		0.5	X
Antimony & Compounds (as Sb)	7440-36-0	—	0.5	
ANTU (alpha Naphthylthiourea)	86-88-4	—	0.3	
Arsenic, Inorganic Compounds (as As)	7440-38-2		0.01 (See 1910.1018)	
Arsenic, Organic Compounds (as As)	7440-38-2	—	0.5	
Arsine	7784-42-1	0.05	0.2	
Asbestos		(See 1910.1001 and 1926.1101)		
<b>Asphalt (petroleum) Fumes</b>	<b>8052-42-4</b>	—	<b>5</b>	
Azinphos-methyl	86-50-1	—	0.2	X
Barium (soluble compounds)	7440-39-3	—	0.5	
<b>Barium Sulfate</b>	<b>7727-43-7</b>			
<b>Total Dust</b>		—	<b>10</b>	
<b>Respirable Fraction</b>		—	<b>5</b>	
<b>Benomyl</b>	<b>17804-35-2</b>			
<b>Total Dust</b>		—	<b>10</b>	
<b>Respirable Fraction</b>		—	<b>5</b>	
Benzene See Oregon Table Z-2 for the limits applicable in the operations or sectors excluded in 1910.1028 <sup>(d)</sup>	71-43-2		(See 1910.1028)	
Benzidine	92-87-5		(See 1910.1003)	
p-Benzoquinone, see Quinone				
Benzoyl peroxide	94-36-0	—	5	
Benzyl chloride	100-44-7	1	5	
Beryllium and Beryllium compounds (as Be); see Division 2/Z Beryllium <sup>(k)</sup>	7440-41-7		(See Oregon Table Z-2)	
Biphenyl, see Diphenyl				
<b>Bismuth telluride (undoped)</b>	<b>1304-82-1</b>			
<b>Total Dust</b>		—	<b>10</b>	
<b>Respirable Fraction</b>		—	<b>5</b>	
<b>Bismuth telluride (Se-doped)</b>		—	<b>5</b>	
Bisphenol A, see Diglycidyl ether				
<b>Boron oxide</b>	<b>1303-86-2</b>	—	<b>10</b>	
<b>Boron tribromide</b>	<b>10294-33-4</b>	<b>1</b>	<b>10</b>	
Boron trifluoride	7637-07-2	(C) 1	(C) 3	
Bromine	7726-95-6	0.1	0.7	
<b>Bromine pentafluoride</b>	<b>7789-30-2</b>	<b>0.1</b>	<b>0.7</b>	
Bromoform	75-25-2	0.5	5	X
Butadiene (1,3-Butadiene)	106-99-0	1 ppm/5 ppm STEL	(See 1910.1051; 1910.19(l))	

Substance	CAS No. <sup>(c)</sup>	ppm <sup>(a)</sup>	mg/m <sup>3</sup> <sup>(b)</sup>	Skin
<b>Butane</b>	<b>106-97-8</b>	<b>800</b>	<b>1,900</b>	
Butanethiol, see Butyl mercaptan				
2-Butanone (Methyl Ethyl Ketone)	78-96-3	200	590	
2-Butoxyethanol (Butyl cellosolve)	111-76-2	50	240	X
Butyl acetate (n-Butyl acetate)	123-86-4	150	710	
sec-Butyl acetate	105-46-4	200	950	
tert-Butyl acetate	540-88-5	200	950	
n-Butyl alcohol	71-36-3	100	300	
sec-Butyl alcohol	78-92-2	150	450	
tert-Butyl alcohol	75-65-0	100	300	
<b>Butyl lactate</b>	<b>138-22-7</b>	<b>1</b>	<b>5</b>	
Butylamine	109-73-9	(C) 5	(C) 15	X
tert-Butyl chromate (as CrO <sub>3</sub> )	1189-85-1	(See 1910.1026) <sup>9</sup>		
n-Butyl glycidyl ether (BGE)	2426-08-6	50	270	
<b>Butyl mercaptan</b>	<b>109-79-5</b>	<b>0.5</b>	<b>1.5</b>	
p-tert-Butyltoluene	98-51-1	10	60	
Cadmium dust and fume (as Cd)	7440-43-9	(See 1910.1027,1926.1127 and Division 4) 0.005		
<b>Calcium carbonate</b>	<b>1317-65-3</b>			
Total Dust		—	10	
Respirable Fraction		—	5	
<b>Calcium hydroxide</b>	<b>1305-62-0</b>			
Total Dust		—	10	
Respirable Fraction		—	5	
Calcium oxide	1305-78-8	—	5	
<b>Calcium silicate</b>	<b>1344-95-2</b>			
Total Dust		—	10	
Respirable Fraction		—	5	
<b>Calcium sulfate</b>	<b>7778-18-9</b>			
Total Dust		—	10	
Respirable Fraction		—	5	
Camphor, synthetic	76-22-2	—	2	
<b>Caprolactam (2-Oxonexa-methylenimine)</b>	<b>105-60-2</b>	—	5	
Carbaryl (Sevin®)	63-25-2	—	5	
Carbon black	1333-86-4	—	3.5	
Carbon dioxide	124-38-9	5,000	9,000	
Carbon disulfide	75-15-0		(See Oregon Table Z-2)	
Carbon monoxide	630-08-0	50	55	
Carbon tetrachloride	56-23-5		(See Oregon Table Z-2)	

Substance	CAS No. <sup>(c)</sup>	ppm <sup>(a)</sup>	mg/m <sup>3</sup> <sup>(b)</sup>	Skin
<b>Cellulose</b>	<b>9006-34-6</b>			
<b>Total Dust</b>		—	<b>10</b>	
<b>Respirable Fraction</b>		—	<b>5</b>	
Chlordane	57-74-9	—	0.5	X
Chlorinated camphene	8001-35-2	—	0.5	X
Chlorinated diphenyl oxide	55720-99-5	—	0.5	
Chlorine	7782-50-5	(C) 1	(C) 3	
Chlorine dioxide	10049-04-4	0.1	0.3	
Chlorine trifluoride	7790-91-2	(C) 0.1	(C) 0.4	
Chloroacetaldehyde	107-20-0	(C) 1	(C) 3	
a-Chloroacetophenone (Phenacyl chloride)	532-27-4	0.05	0.3	
Chlorobenzene	108-90-7	75	350	
o-Chlorobenzylidene malononitrile	2698-41-1	0.05	0.4	
Chlorobromomethane	74-97-5	200	1,050	
2-Chloro-1, 3-butadiene, see beta-Chloroprene				
Chlorodiphenyl (42% Chlorine)	53469-21-9	—	1	X
Chlorodiphenyl (54% Chlorine)	11097-69-1	—	0.5	X
1-Chloro, 2, 3-epoxypropane, see Epichlorhydrin				
2-Chloroethanol, see Ethylene chlorohydrin				
Chloroethylene, see Vinyl Chloride				
<b>Chloroform (Trichloromethane)</b>	<b>67-66-3</b>	<b>(C) 25</b>	<b>(C) 120</b>	
bis-Chloromethyl ether	542-88-1		(See 1910.1003)	
Chloromethyl methyl ether	107-30-2		(See 1910.1003)	
1-Chloro-1-nitropropane	600-25-9	20	100	
Chloropicrin	76-06-2	0.1	0.7	
beta-Chloroprene (2-chloro-1,3-butadiene)	126-99-8	25	90	X
<b>2-Chloro-6-(trichloromethyl) pyridine</b>	<b>1929-82-4</b>			
<b>Total Dust</b>		—	<b>10</b>	
<b>Respirable Fraction</b>		—	<b>5</b>	
Chromic acid and chromates (as CrO <sub>3</sub> )			(See Oregon Table Z-2)	
Chromium (II) compounds (as Cr)	7440-47-3	—	0.5	
Chromium (III) compounds (as Cr)	7440-47-3	—	0.5	
Chromium (VI) compounds		(See 1910.1026)		
Chromium metal & insol. salts (as Cr)	7440-47-3	—	1	
<b>Clopidol</b>	<b>2971-90-6</b>			
<b>Total Dust</b>		—	<b>10</b>	
<b>Respirable Fraction</b>		—	<b>5</b>	

Substance	CAS No.(c)	ppm <sup>(a)</sup>	mg/m <sup>3</sup> <sup>(b)</sup>	Skin
Coal Dust			(See Oregon Table Z-3)	
Coal tar pitch volatiles (Benzene soluble fraction) anthracene, BaP, phenanthrene, acridine, chrysene, pyrene	65966-93-2	—	0.2 (See 1910.1002)	
Cobalt metal, fume & dust	7440-48-4	—	0.1	
Coke oven emissions			(See 1910.1029)	
Copper fume	7440-50-8	—	0.1	
Dusts and Mists	7440-50-8	—	1	
<b>Corundum (A1203)</b>	<b>1302-74-5</b>	<b>—</b>	<b>10</b>	
Cotton dust			(See 1910.1043)	
Cotton dust (raw)		—	1 <sup>(e)</sup>	
<b>Crag® herbicide (Sesone)</b>	<b>136-78-7</b>			
<b>Total Dust</b>		—	<b>10</b>	
<b>Respirable Fraction</b>		—	<b>5</b>	
Cresol (all isomers)	1319-77-3	5	22	X
Crotonaldehyde	123-73-9/ 4170-30-3	2	6	
Cumene	98-82-8	50	245	X
Cyanides (as CN)		—	5	X
<b>Cyanogen</b>	<b>460-19-5</b>	<b>10</b>	<b>—</b>	
Cyclohexane	110-82-7	300	1,050	
Cyclohexanol	108-93-0	50	200	
Cyclohexanone	108-94-1	50	200	
Cyclohexene	110-83-8	300	1,015	
Cyclopentadiene	542-92-7	75	200	
2,4-D (Dichlorophenoxyacetic acid)	94-75-7	—	10	
DDT	50-29-3	—	1	X
DDVP, see Dichlorvos				
Decaborane	17702-41-9	0.05	0.3	X
Demeton® (Systox)	8065-48-3	—	0.1	X
Diacetone alcohol (4-hydroxy-4-methyl-2-pentanone)	123-42-2	50	240	
1, 2-Diaminoethane, see Ethylenediamine				
<b>Diazinon</b>	<b>333-41-5</b>	<b>—</b>	<b>0.1</b>	<b>X</b>
Diazomethane	334-88-3	0.2	0.4	
Diborane	19287-45-7	0.1	0.1	
<b>Dibrom®</b>	<b>300-76-5</b>	<b>—</b>	<b>3</b>	
1,2-Dibromo-3-chloropropane (DBCP)	96-12-8	0.001	(See 1910.1044)	
1,2-Dibromoethane, see Ethylene dibromide				

Substance	CAS No. <sup>(c)</sup>	ppm <sup>(a)</sup>	mg/m <sup>3</sup> <sup>(b)</sup>	Skin
<b>2-N-Dibutylaminoethanol</b>	<b>102-81-8</b>	<b>2</b>	<b>14</b>	<b>X</b>
Dibutyl phosphate	107-66-4	1	5	
Dibutyl phthalate	84-74-2	—	5	
<b>Dichloroacetylene</b>	<b>7572-29-4</b>	<b>(C) 0.1</b>	<b>(C) 0.4</b>	
o-Dichlorobenzene	95-50-1	(C) 50	(C) 300	
p-Dichlorobenzene	106-46-7	75	450	
3,3-Dichlorobenzidine	91-94-1		(See 1910.1003)	X
Dichlorodifluoromethane	75-71-8	1,000	4,950	
1,3-Dichloro-5, 5-dimethyl hydantoin	118-52-5	—	0.2	
Dichlorodiphenyltrichloroethane (DDT)	50-29-3	—	1	X
1, 1-Dichloroethane	75-34-3	100	400	
1, 2-Dichloroethane, see Ethylene dichloride				
1, 2-Dichlorethylene	540-59-0	200	790	
<b>Dichloroethyl Ether</b>	<b>111-44-4</b>	<b>5</b> <b>(C) 15</b>	<b>30</b> <b>(C) 90</b>	<b>X</b>
Dichloromethane, see Methylene chloride				
Dichloromonofluoromethane	75-43-4	1,000	4,200	
1, 1-Dichloro-1-nitroethane	594-72-9	(C) 10	(C) 60	
1, 2-Dichloropropane, see Propylene dichloride				
Dichlorotetrafluoroethane	76-14-2	1,000	7,000	
Dichlorvos (DDVP)	62-73-7	0.1	1	X
<b>Dicyclohexylmethane 4,4'-diisocyanate (hydrogenated MDI, see Oregon Table Z-2 (Diisocyanates))</b>	<b>5124-30-1</b>			
<b>Dicyclopentadienyl iron</b>	<b>102-54-5</b>			
<b>Total Dust</b>		—	<b>10</b>	
<b>Respirable Fraction</b>		—	<b>5</b>	
Dieldrin	60-57-1	—	0.25	X
Diethylamine	109-89-7	25	75	
2-Diethylaminoethanol	100-37-8	10	50	X
<b>Diethylene triamine</b>	<b>111-40-0</b>	<b>(C) 1</b>	<b>(C) 4</b>	<b>X</b>
Diethylether, see Ethyl ether				
Difluorodibromomethane	75-61-6	100	860	
Diglycidyl ether (DGE)	2238-07-5	(C) 0.5	(C) 2.8	
Dihydroxybenzene, see Hydroquinone				
<b>Diisobutyl ketone</b>	<b>108-83-8</b>	<b>25</b>	<b>150</b>	
Diisopropylamine	108-18-9	5	20	X
Dimethoxymethane, see Methylal				
Dimethyl acetamide	127-19-5	10	35	X

Substance	CAS No. <sup>(c)</sup>	ppm <sup>(a)</sup>	mg/m <sup>3</sup> <sup>(b)</sup>	Skin
Dimethylamine	124-40-3	10	18	
4-Dimethylaminoazobenzene	60-11-7		(See 1910.1003)	
Dimethylaminobenzene, see Xylidene				
Dimethylaniline (N,N-Dimethylaniline)	121-69-7	5	25	X
Dimethylbenzene, see Xylene				
Dimethyl-1,2-dibromo-2, 2-dichloroethyl phosphate	300-76-5		3	
Dimethylformamide	68-12-2	10	30	X
2,6-Dimethylheptanone, see Diisobutyl ketone				
1,1-Dimethylhydrazine	57-14-7	0.5	1	X
Dimethylphthalate	131-11-3		5	
Dimethyl sulfate	77-78-1	1	5	X
Dinitrobenzene (all isomers)			1	X
(ortho)	528-29-0			
(meta)	99-65-0			
(para)	100-25-4			
Dinitro-o-cresol	534-52-1	—	0.2	X
Dinitrotoluene	25321-14-6	—	1.5	X
Dioxane (Diethylene dioxide)	123-91-1	100	360	X
Diphenyl (Biphenyl)	92-52-4	0.2	1	
<b>Diphenylamine</b>	<b>122-39-4</b>	<b>—</b>	<b>10</b>	
<b>Diphenylmethane diisocyanate (MDI), see Oregon Table Z-2 (Diisocyanates)</b>				
Dipropylene glycol methyl ether	34590-98-8	100	600	X
<b>Diquat</b>	<b>231-36-7</b>	<b>—</b>	<b>0.5</b>	
Di-sec, octyl phthalate (Di-2-ethylhexylphthalate)	117-81-7	—	5	
<b>Emery</b>	<b>12415-34-8</b>			
<b>Total Dust</b>		<b>—</b>	<b>10</b>	
<b>Respirable Fraction</b>		<b>—</b>	<b>5</b>	
<b>Endosulfan (Thiodan®)</b>	<b>115-29-7</b>	<b>—</b>	<b>0.1</b>	<b>X</b>
Endrin	72-20-8	—	0.1	X
Epichlorohydrin	106-89-8	5	19	X
EPN	2104-64-5	—	0.5	X
1,2-Epoxypropane, see Propylene oxide				
2,3-Epoxy-1-propanol, see Glycidol				
<b>Ethane</b>	<b>74-84-0</b>	<b>1,000</b>	<b>—</b>	
Ethanethiol, see Ethyl mercaptan				
Ethanolamine	141-43-5	3	6	
<b>2-Ethoxyethanol (Cellosolve)</b>	<b>110-80-5</b>	<b>100</b>	<b>370</b>	<b>X</b>

Substance	CAS No. <sup>(c)</sup>	ppm <sup>(a)</sup>	mg/m <sup>3</sup> <sup>(b)</sup>	Skin
2-Ethoxyethylacetate (Cellosolve acetate)	111-15-9	100	540	X
Ethyl acetate	141-78-6	400	1,400	
Ethyl acrylate	140-88-5	25	100	X
Ethyl alcohol (ethanol)	64-17-5	1,000	1,900	
Ethylamine	75-04-7	10	18	
Ethyl amyl ketone (5-methyl-3-heptanone)	541-85-5	25	130	
Ethyl benzene	100-41-4	100	435	
Ethyl bromide	74-96-4	200	890	
Ethyl butyl ketone (3-Heptanone)	106-35-4	50	230	
Ethyl chloride	75-00-3	1,000	2,600	
Ethyl ether	60-29-7	400	1,200	
Ethyl formate	109-94-4	100	300	
<b>Ethyl mercaptan</b>	<b>75-08-1</b>	<b>0.5</b> <b>(C) 10</b>	<b>1</b> <b>(C) 25</b>	
Ethyl silicate	78-10-4	100	850	
<b>Ethylene</b>	<b>74-85-1</b>	<b>1,000</b>	<b>—</b>	
Ethylene chlorohydrin	107-07-3	5	16	X
Ethylenediamine	107-15-3	10	25	
Ethylene dibromide	106-93-4		(See Oregon Table Z-2)	
Ethylene dichloride	107-06-2		(See Oregon Table Z-2)	
<b>Ethylene glycol particulate</b>		<b>—</b>	<b>10</b>	
<b>Ethylene glycol, Vapor</b>	<b>107-21-1</b>	<b>100</b>	<b>260</b>	
Ethylene glycol dinitrate	628-96-6	(C) 0.2	(C) 1	X
Ethylene glycol methyl acetate (Methyl cellosolve acetate) (2-Methoxy-ethyl acetate)	110-49-6	25	120	X
Ethylenimine	151-56-4		(See 1910.1003)	
Ethylene oxide	75-21-8	1	(See 1910.1047)	
Ethylidene chloride, see 1, 1-Dichloroethane				
N-Ethylmorpholine	100-74-3	20	94	X
<b>Ferbam</b>	<b>14484-64-1</b>			
<b>Total Dust</b>		<b>—</b>	<b>10</b>	
<b>Respirable Fraction</b>		<b>—</b>	<b>5</b>	
Ferrovanadium dust	12604-58-9	—	1	
Fibrous glass, see Glass, Fibrous				

Substance	CAS No. <sup>(c)</sup>	ppm <sup>(a)</sup>	mg/m <sup>3</sup> <sup>(b)</sup>	Skin
Fluorides (As F)		—	2.5 (See Oregon Table Z-2)	
Fluorine	7782-41-4	0.1	0.2	
Fluorotrichloromethane (Trichlorofluoromethane)	75-69-4	1,000	5,600	
Formaldehyde	50-00-0	0.75	(See 1910.1048)	
Formic acid	64-18-6	5	9	
Furfural	98-01-1	5	20	X
<b>Furfuryl alcohol</b>	<b>98-00-0</b>	<b>5</b>	<b>20</b>	
<b>Gasoline</b>	<b>8006-61-9</b>	<b>—</b>	<b>(g)</b>	
<b>Germanium tetrahydride</b>	<b>7782-65-2</b>	<b>0.2</b>	<b>0.6</b>	
<b>Glass, Fibrous or dust</b>		<b>—</b>	<b>10</b>	
<b>Glycerin (mist)</b>	<b>56-81-5</b>	<b>—</b>	<b>10</b>	
<b>Total Dust</b>		<b>—</b>	<b>5</b>	
<b>Respirable Fraction</b>		<b>—</b>		
Glycidol	556-52-5	50	150	
Glycol momoethyl ether, see 2-Ethoxyethanol				
Grain dust (oat, wheat, barley)		—	10	
Graphite natural, respirable	7782-42-5		(See Oregon Table Z-3)	
<b>Graphite (Synthetic)</b>	<b>7782-42-5</b>	<b>—</b>	<b>10</b>	
<b>Total Dust</b>		<b>—</b>	<b>5</b>	
<b>Respirable Fraction</b>		<b>—</b>		
Guthion®, see Azinphosmethyl				
<b>Gypsum</b>	<b>13397-24-5</b>	<b>—</b>	<b>10</b>	
<b>Total Dust</b>		<b>—</b>	<b>5</b>	
<b>Respirable Fraction</b>		<b>—</b>		
Hafnium	7440-58-6	—	0.5	
Heptachlor	76-44-8	—	0.5	X
Heptane (n-heptane)	142-82-5	500	2,000	
<b>Hexachlorocyclopentadiene</b>	<b>77-47-4</b>	<b>0.1</b>	<b>1</b>	
Hexachloroethane	67-72-1	1	10	X
Hexachloronaphthalene	1335-87-1	—	0.2	X
<b>Hexafluoroacetone</b>	<b>684-16-2</b>	<b>0.1</b>	<b>0.7</b>	<b>X</b>
<b>Hexamethylene diisocyanate (HDI), see Oregon Table Z-2 (Diisocyanates)</b>	<b>822-06-0</b>			
1,6 Hexamethylene diisocyanate Based Adduct, see Oregon Table Z-2 (Diisocyanates)				
Hexane (n-hexane)	110-54-3	500	1,800	
2-Hexanone	591-78-6	100	410	

Substance	CAS No. <sup>(c)</sup>	ppm <sup>(a)</sup>	mg/m <sup>3</sup> <sup>(b)</sup>	Skin
Hexone (Methyl isobutyl ketone)	108-10-1	100	410	
sec-Hexyl acetate	108-84-9	50	300	
Hydrazine	302-01-2	1	1.3	X
Hydrogen	1333-74-0	1,000	—	
Hydrogen bromide	10035-10-6	3	10	
Hydrogen chloride	7647-01-0	(C) 5	(C) 7	
Hydrogen cyanide	74-90-8	10	11	X
Hydrogen fluoride (as F)	7664-39-3		(See Oregon Table Z-2)	
Hydrogen peroxide	7722-84-1	1	1.4	
Hydrogen selenide (as Se)	7783-07-5	0.05	0.2	
Hydrogen sulfide	7783-06-4		(See Oregon Table Z-2)	
Hydroquinone	123-31-9	—	2	
<b>Indene</b>	<b>95-13-6</b>	<b>10</b>	<b>45</b>	
<b>Indium and compounds (as In)</b>	<b>7440-74-6</b>	<b>—</b>	<b>0.1</b>	
Iodine	7553-56-2	(C) 0.1	(C) 1	
Iron oxide fume	1309-37-1	—	10	
<b>Iron pentacarbonyl</b>	<b>13463-40-6</b>	<b>0.1</b>	<b>0.23</b>	
<b>Iron salts, soluble, as Fe</b>		<b>—</b>	<b>1</b>	
Isoamyl acetate	123-92-2	100	525	
Isoamyl alcohol (primary and secondary)	123-51-3	100	360	
Isobutyl acetate	110-19-0	150	700	
Isobutyl alcohol	78-83-1	100	300	
<b>Isophorone</b>	<b>78-59-1</b>	<b>10</b>	<b>55</b>	
<b>Isophorone diisocyanate (IPDI), see Oregon Table Z-2 (Diisocyanates)</b>	<b>4098-71-9</b>			
Isopropyl acetate	108-21-4	250	950	
Isopropyl alcohol	67-63-0	400	980	
Isopropylamine	75-31-0	5	12	
<b>Isopropyl ether</b>	<b>108-20-3</b>	<b>250</b>	<b>1,050</b>	
Isopropyl glycidyl ether (IGE)	4016-14-2	50	240	
<b>Kaolin</b>	<b>1332-58-7</b>			
<b>Total Dust</b>		<b>—</b>	<b>10</b>	
<b>Respirable Fraction</b>		<b>—</b>	<b>5</b>	
Ketene	463-51-4	0.5	0.9	
Lead, inorganic (as Pb)	7439-92-1	(See 1910.1025 & 1926.62) 0.05		
<b>Lead arsenate</b>	<b>7784-40-9</b>	<b>(See 1910.1018)</b>	<b>0.01</b>	

Substance	CAS No. <sup>(c)</sup>	ppm <sup>(a)</sup>	mg/m <sup>3</sup> <sup>(b)</sup>	Skin
<b>Limestone</b>	<b>1317-65-3</b>			
<b>Total Dust</b>		—	<b>10</b>	
<b>Respirable Fraction</b>		—	<b>5</b>	
Lindane	58-89-9	—	0.5	X
Lithium hydride	7580-67-8	—	0.025	
L.P.G. (Liquified petroleum gas)	68476-85-7	1,000	1,800	
<b>Magnesite</b>	<b>546-93-0</b>			
<b>Total Dust</b>		—	<b>10</b>	
<b>Respirable Fraction</b>		—	<b>5</b>	
<b>Magnesium oxide fume</b>	<b>1309-48-4</b>			
<b>Total Dust</b>		—	<b>10</b>	
<b>Respirable Fraction</b>		—	<b>5</b>	
<b>Malathion</b>	<b>121-75-5</b>	—	<b>10</b>	<b>X</b>
Maleic anhydride	108-31-6	0.25	1	
Manganese Compounds (as Mn)	7439-96-5	—	(C) 5	
Manganese fume (as Mn)	7439-96-5	—	(C) 5	
<b>Marble</b>	<b>1317-65-3</b>			
<b>Total Dust</b>		—	<b>10</b>	
<b>Respirable Fraction</b>		—	<b>5</b>	
Mercury (aryl, inorganic, organo, and vapor) (as Hg)	7439-97-6		(See Oregon Table Z-2)	
Mesityl oxide	141-79-7	25	100	
<b>Methane</b>	<b>74-82-8</b>	<b>1,000</b>	—	
Methanethiol, see Methyl mercaptan				
<b>Methoxychlor</b>	<b>72-43-5</b>			
<b>Total Dust</b>		—	<b>10</b>	
<b>Respirable Fraction</b>		—	<b>5</b>	
2-Methoxyethanol (Methyl Cellosolve)	109-86-4	25	80	X
2-Methoxyethyl acetate (Methyl cellosolve acetate)	110-49-6	25	120	X
Methyl acetate	79-20-9	200	610	
Methyl acetylene (propyne)	74-99-7	1,000	1,650	
Methyl acetylene-propadiene mixture (MAPP)		1,000	1,800	
Methyl acrylate	96-33-3	10	35	X
<b>Methylacrylonitrile</b>	<b>126-98-7</b>	<b>1</b>	<b>3</b>	<b>X</b>
Methylal (dimethoxymethane)	109-87-5	1,000	3,100	
Methyl alcohol (methanol)	67-56-1	200	260	
Methylamine	74-89-5	10	12	
Methyl amyl alcohol, see Methyl isobutyl carbinol				
Methyl (n-amyl) ketone	110-43-0	100	465	
<b>Methyl bromide</b>	<b>74-83-9</b>	<b>15</b>	<b>60</b>	<b>X</b>
		(C) 20	(C) 80	

Substance	CAS No. <sup>(c)</sup>	ppm <sup>(a)</sup>	mg/m <sup>3</sup> <sup>(b)</sup>	Skin
Methyl butyl ketone, see 2-Hexanone				
Methyl cellosolve, see 2 Methoxy ethanol				X
Methyl cellosolve acetate (Ethylene glycol monomethyl ether acetate)	110-49-6	25	120	X
Methyl Chloride	74-87-3		(See Oregon Table Z-2)	
Methyl Chloroform (1,1,1-Trichloroethane)	71-55-6	350	1,900	
Methyl Chloromethyl ether			(See 1910.1003)	
<b>Methyl 2-cyanoacrylate</b>	<b>137-05-3</b>	<b>2</b>	<b>8</b>	
Methylcyclohexane	108-87-2	500	2,000	
<b>Methylcyclohexanol</b>	<b>25639-42-3</b>	<b>50</b>	<b>235</b>	
<b>o-Methylcyclohexanone</b>	<b>583-60-8</b>	<b>50</b>	<b>230</b>	X
<b>2-Methylcyclopentadienyl manganese tricarbonyl (as Mn)</b>	<b>12108-13-3</b>	<b>0.1</b>	<b>0.2</b>	X
<b>Methyl demeton</b>	<b>8022-00-2</b>	<b>—</b>	<b>0.5</b>	X
Methyl ethyl ketone (MEK), see 2-Butanone				
Methyl formate	107-31-3	100	250	
Methyl iodide	74-88-4	5	28	X
Methyl isoamyl ketone	110-12-3	100	475	
Methyl isobutyl carbinol	108-11-2	25	100	X
Methyl isobutyl ketone, see Hexone				
Methyl isocyanate	624-83-9	0.02	0.05	X
<b>Methyl mercaptan</b>	<b>74-93-1</b>	<b>0.5</b> <b>(C) 10</b>	<b>1</b> <b>(C) 20</b>	
Methyl methacrylate	80-62-6	100	410	
<b>Methyl parathion</b>	<b>298-00-0</b>	<b>—</b>	<b>0.2</b>	X
Methyl propyl ketone, see 2-Pentanone				
<b>Methyl silicate</b>	<b>681-84-5</b>	<b>(C) 5</b>	<b>(C) 30</b>	
a-Methyl styrene	98-83-9	(C) 100	(C) 480	
<b>Methylene bisphenyl isocyanate (MDI)</b>	<b>101-68-8</b>	<b>(See Oregon Table Z-2 (diisocyanates))</b>		
Methylenedianiline (MDA)		(See 1910.1050 & 1926.60) 0.01		
Methylene Chloride	75-09-2	25	(See 1910.1052)	
<b>Mineral Wool Fiber</b>		<b>—</b>	<b>10</b>	
<b>MOCA</b>	<b>101-14-4</b>		<b>(See 437-002-0346)</b>	

Substance	CAS No. <sup>(c)</sup>	ppm <sup>(a)</sup>	mg/m <sup>3</sup> <sup>(b)</sup>	Skin
<b>Molybdenum</b> (soluble compounds) (insoluble compounds)	<b>7439-98-7</b>	— —	<b>5</b> <b>10</b>	
Monomethyl aniline	100-61-8	2	9	X
Monomethyl hydrazine	60-34-4	(C) 0.2	(C) 0.35	X
Morpholine	110-91-8	20	70	X
Naphtha (coal tar)	8030-30-6	100	400	
Naphthalene	91-20-3	10	50	
<b>Naphthalene diisocyanate (NDI), see Oregon Table Z-2 (Diisocyanates)</b>	<b>3173-72-6</b>			
alpha-Naphthylamine	134-32-7		(See 1910.1003)	
beta-Naphthylamine	91-59-8		(See 1910.1003)	
Nickel carbonyl (as Ni)	13463-39-3	0.001	0.007	
Nickel, metal and insoluble compounds, as Ni	7440-02-0	—	1	
Nickel, soluble compounds, (as Ni)	7440-02-0	—	1	
<b>Nicotine</b>	<b>54-11-5</b>	<b>0.075</b>	<b>0.5</b>	<b>X</b>
Nitric acid	7697-37-2	2	5	
Nitric oxide	10102-43-9	25	30	
p-Nitroaniline	100-01-6	1	6	X
Nitrobenzene	98-95-3	1	5	X
4-Nitrodiphenyl	92-93-3		(See 1910.1003)	
p-Nitrochlorobenzene	100-00-5	—	1	X
Nitroethane	79-24-3	100	310	
Nitrogen dioxide	10102-44-0	(C) 5	(C) 9	
Nitrogen trifluoride	7783-54-2	10	29	
Nitroglycerin	55-63-0	(C) 0.2	(C) 2	X
Nitromethane	75-52-5	100	250	
1-Nitropropane	108-03-2	25	90	
2-Nitropropane	79-46-9	25	90	
N-Nitrosodimethylamine			(See 1910.1003)	
Nitrotoluene (all isomers)	88-72-2/ 99-08-1/ 99-99-0	5	30	X
Nitrotrichloromethane, see Chloropicrin				
<b>Nitrous oxide</b>	<b>10024-97-5</b>	<b>50</b>	<b>90</b>	

Substance	CAS No. <sup>(c)</sup>	ppm <sup>(a)</sup>	mg/m <sup>3</sup> <sup>(b)</sup>	Skin
Octachloronaphthalene	2234-13-1	—	0.1	X
<b>Octane</b>	<b>111-65-9</b>	<b>400</b>	<b>1,900</b>	
Oil mist (mineral)	8012-95-1	—	5	
<b>Oil mist, vapor</b>		—	<sup>(g)</sup>	
Osmium tetroxide (as Os)	20816-12-0		0.002	
Oxalic acid	144-62-7	—	1	
Oxygen difluoride	7783-41-7	0.05	0.1	
Ozone	10028-15-6	0.1	0.2	
<b>Parafin wax fume</b>	<b>8002-74-2</b>	—	<b>1</b>	
Paraquat respirable dust	4685-14-7/ 1910-42-5/ 2074-50-2	—	0.5	X
Parathion	56-38-2	—	0.1	X
<b>Particulates not otherwise regulated (PNOR)<sup>(f)</sup></b>				
<b>Total Dust</b>		—	<b>10</b>	
<b>Respirable Fraction</b>		—	<b>5</b>	
Pentaborane	19624-22-7	0.005	0.01	
Pentachloronaphthalene	1321-64-8	—	0.5	X
Pentachlorophenol	87-86-5	—	0.5	X
<b>Pentaerythritol</b>	<b>115-77-5</b>			
<b>Total Dust</b>		—	<b>10</b>	
<b>Respirable Fraction</b>		—	<b>5</b>	
<b>Pentane</b>	<b>109-66-0</b>	<b>500</b>	<b>1,500</b>	
2-Pentanone (Methyl propyl ketone)	107-87-9	200	700	
Perchloroethylene (tetrachloroethylene)	127-18-4		(See Oregon Table Z-2)	
Perchloromethyl mercaptan	594-42-3	0.1	0.8	
Perchloryl fluoride	7616-94-6	3	13.5	
<b>Perlite</b>	<b>93763-70-3</b>			
<b>Total Dust</b>		—	<b>10</b>	
<b>Respirable Fraction</b>		—	<b>5</b>	
Petroleum distillates (naphtha) (Rubber Solvent)		500	2,000 <sup>(g)</sup>	
Phenol	108-95-2	5	19	X
<b>Phenothiazine</b>	<b>92-84-2</b>	—	<b>5</b>	<b>X</b>
p-Phenylene diamine	106-50-3	—	0.1	X
Phenyl ether (vapor)	101-84-8	1	7	

Substance	CAS No. <sup>(c)</sup>	ppm <sup>(a)</sup>	mg/m <sup>3</sup> <sup>(b)</sup>	Skin
Phenyl ether – diphenyl mixture (vapor)	8004-13-5	1	7	
Phenylethylene, see Styrene				
Phenyl glycidyl ether (PGE)	122-60-1	10	60	
Phenylhydrazine	100-63-0	5	22	X
<b>Phenylphosphine</b>	<b>638-21-1</b>	<b>(C) 0.05</b>	<b>(C) 0.25</b>	
Phosdrin (Mevinphos®)	7786-34-7		0.1	X
Phosgene (carbonyl chloride)	75-44-5	0.1	0.4	
Phosphine	7803-51-2	0.3	0.4	
Phosphoric acid	7664-38-2	—	1	
Phosphorus (yellow)	7723-14-0	—	0.1	
Phosphorus pentachloride	10026-13-8	—	1	
Phosphorus pentasulfide	1314-80-3	—	1	
Phosphorus trichloride	7719-12-2	0.5	3	
Phthalic anhydride	85-44-9	2	12	
<b>Picloram</b>	<b>1918-02-1</b>			
<b>Total Dust</b>		—	<b>10</b>	
<b>Respirable Fraction</b>		—	<b>5</b>	
Picric acid	88-89-1	—	0.1	X
Pindone (2-Pivalyl-1, 3-indan-dione)	83-26-1	—	0.1	
<b>Plaster of Paris</b>	<b>26499-65-0</b>			
<b>Total Dust</b>		—	<b>10</b>	
<b>Respirable Fraction</b>		—	<b>5</b>	
Platinum (Soluble Salts) as Pt	7440-06-4	—	0.002	
Polychlorobiphenyls, see Chloro-diphenyls				
<b>Portland Cement</b>	<b>65997-15-1</b>			
<b>Total Dust</b>		—	<b>10</b>	
<b>Respirable Fraction</b>		—	<b>5</b>	
Propane	74-98-6	1,000	1,800	
Beta-Propiolactone	57-57-8		(See 1910.1003)	
<b>Propargyl alcohol</b>	<b>107-19-7</b>	<b>1</b>	<b>—</b>	<b>X</b>
n-Propyl acetate	109-60-4	200	840	
n-Propyl alcohol	71-23-8	200	500	
n-Propyl nitrate	627-13-4	25	110	
Propylene dichloride	78-87-5	75	350	

Substance	CAS No. <sup>(c)</sup>	ppm <sup>(a)</sup>	mg/m <sup>3</sup> <sup>(b)</sup>	Skin
<b>Propylene glycol monomethyl ether</b>	<b>107-98-2</b>	<b>100</b>	<b>360</b>	
Propylene imine	75-55-8	2	5	X
Propylene oxide	75-56-9	100	240	
Propyne, see Methyl acetylene				
Pyrethrum	8003-34-7	—	5	
Pyridine	110-86-1	5	15	
Quinone	106-51-4	0.1	0.4	
<b>RDX (Cyclonite)</b>	<b>121-82-4</b>	<b>—</b>	<b>1.5</b>	<b>X</b>
Rhodium, Metal fume and dusts, as Rh	7440-16-6	—	0.1	
Soluble salts	7440-16-6	—	0.001	
<b>Ronnel</b>	<b>299-84-3</b>	<b>—</b>	<b>10</b>	
<b>Rosin core solder pyrolysis products (as Formaldehyde)</b>		<b>—</b>	<b>0.1</b>	
Rotenone	83-79-4	—	5	
<b>Rouge</b>				
<b>Total Dust</b>		<b>—</b>	<b>10</b>	
<b>Respirable Fraction</b>		<b>—</b>	<b>5</b>	
Selenium compounds (as Se)	7782-49-2	—	0.2	
Selenium hexafluoride (as Se)	7783-79-1	0.05	0.4	
<b>Silica, crystalline, respirable dust<sup>(d)</sup></b>				
<b>Cristobalite</b>	<b>14464-46-1</b>			
<b>Quartz</b>	<b>14808-60-7</b>	<b>—</b>	<b>(See Division 2/Z-Silica)</b>	
<b>Tripoli (as quartz)</b>	<b>1317-95-9</b>			
<b>Tridamite</b>	<b>15468-32-3</b>			
<b>Silicon</b>	<b>7440-21-3</b>			
<b>Total Dust</b>		<b>—</b>	<b>10</b>	
<b>Respirable Fraction</b>		<b>—</b>	<b>5</b>	
<b>Silicon carbide</b>	<b>409-21-2</b>			
<b>Total Dust</b>		<b>—</b>	<b>10</b>	
<b>Respirable Fraction</b>		<b>—</b>	<b>5</b>	
Silver, metal and soluble compounds (as Ag)	7440-22-4	—	0.01	
Sodium fluoroacetate	62-74-8	—	0.05	X
Sodium hydroxide	1310-73-2	—	2	
<b>Starch</b>	<b>9005-25-8</b>			
<b>Total Dust</b>		<b>—</b>	<b>10</b>	
<b>Respirable Fraction</b>		<b>—</b>	<b>5</b>	
Stibine	7803-52-3	0.1	0.5	
<b>Stoddard solvent</b>	<b>8052-41-3</b>	<b>200</b>	<b>1,150</b>	

Substance	CAS No. <sup>(c)</sup>	ppm <sup>(a)</sup>	mg/m <sup>3</sup> <sup>(b)</sup>	Skin
Strychnine	57-24-9	—	0.15	
Styrene	100-42-5		(See Oregon Table Z-2)	
<b>Subtilisins (Proteolytic enzymes) (as 100% pure crystalline enzyme)</b>	<b>1395-21-7</b>	<b>—</b>	<b>(C) 0.0003</b>	
<b>Sucrose</b>	<b>57-50-1</b>			
<b>Total Dust</b>		<b>—</b>	<b>10</b>	
<b>Respirable Fraction</b>		<b>—</b>	<b>5</b>	
Sulfur dioxide	7446-09-5	5	13	
Sulfur hexafluoride	2551-62-4	1,000	6,000	
Sulfuric acid	7664-93-9	—	1	
Sulfur monochloride	10025-67-9	1	6	
Sulfur pentafluoride	5714-22-7	0.025	0.25	
<b>Sulfur tetrafluoride</b>	<b>7783-60-0</b>	<b>0.1</b>	<b>0.4</b>	
Sulfuryl fluoride	2699-79-8	5	20	
Systox, see Demeton®				
2, 4, 5-T	93-76-5	—	10	
Tantalum, metal and oxide dust	7440-25-7	—	5	
TEDP (Sulfotepp)	3689-24-5	—	0.2	X
Tellurium and compounds (as Te)	13494-80-9	—	0.1	
Tellurium hexafluoride (as Te)	7783-80-4	0.02	0.2	
<b>Temephos</b>	<b>3383-96-8</b>			
<b>Total Dust</b>		<b>—</b>	<b>10</b>	
<b>Respirable Fraction</b>		<b>—</b>	<b>5</b>	
<b>TEPP (Tetraethyl pyrophosphate)</b>	<b>107-49-3</b>	<b>0.004</b>	<b>0.05</b>	<b>X</b>
Terphenyls	26140-60-3	(C) 1	(C) 9	
1, 1, 1, 2-Tetrachloro-2, 2-difluoroethane	76-11-9	500	4,170	
1, 1, 2, 2-Tetrachloro-1, 2-difluoroethane	76-12-0	500	4,170	
1, 1, 2, 2-Tetrachloroethane	79-34-5	5	35	X
Tetrachloroethylene, see Perchloroethylene				
Tetrachloronaphthalene	1335-88-2	—	2	X
Tetrachloromethane, see Carbon tetrachloride				
Tetraethyl lead (as Pb)	78-0-2	—	.075	X
Tetrahydrofuran	109-99-9	200	590	

Substance	CAS No. <sup>(c)</sup>	ppm <sup>(a)</sup>	mg/m <sup>3</sup> <sup>(b)</sup>	Skin
Tetramethyl lead (as Pb)	75-74-1	—	0.075	X
Tetramethyl succinonitrile	3333-52-6	0.5	3	X
Tetranitromethane	509-14-8	1	8	
Tetryl (2, 4, 6-trinitro-phenyl-methylnitramine)	479-45-8	—	1.5	X
Thallium (soluble compounds) as TI	7440-28-0	—	0.1	X
<b>4,4'-Thiobis (6-tert, Butyl-m-cresol)</b>	<b>96-69-5</b>			
<b>Total Dust</b>		—	<b>10</b>	
<b>Respirable Fraction</b>		—	<b>5</b>	
<b>Thiram</b>	<b>137-26-8</b>		<b>(See 437-002 0373) 0.15</b>	
Tin (inorganic compounds, except oxides) as Sn	7440-31-5	—	2	
Tin (organic compounds)	7440-31-5	—	0.1	
<b>Tin oxide</b>	<b>1332-29-2</b>			
<b>Total Dust</b>		—	<b>10</b>	
<b>Respirable Fraction</b>		—	<b>5</b>	
Titanium dioxide	13463-67-7	—	10	
Toluene (toluol)	108-88-3		<b>(See Oregon Table Z-2)</b>	
<b>Toluene diisocyanate (TDI), See Oregon Table Z-2 (Diisocyanates)</b>	<b>584-84-9</b>			
o-Toluidine	95-53-4	5	22	X
Toxaphene, see Chlorinated camphene				
Tributyl phosphate	126-73-8	—	5	
1, 1, 1-Trichloroethane, see Methyl chloroform				
1, 1, 2-Trichloroethane	79-00-5	10	45	X
Trichloroethylene	79-01-6		<b>(See Oregon Table Z-2)</b>	
Trichloromethane, see Chloroform				
Trichloronaphthalene	1321-65-9	—	5	X
1, 2, 3-Trichloropropane	96-18-4	50	300	
1,1, 2-Trichloro 1, 2, 2-trifluoroethane	76-13-1	1,000	7,600	
Triethylamine	121-44-8	25	100	
Trifluorobromomethane	75-63-8	1,000	6,100	
<b>Trimethyl benzene</b>	<b>25551-13-7</b>	<b>25</b>	<b>120</b>	

Substance	CAS No. <sup>(c)</sup>	ppm <sup>(a)</sup>	mg/m3 <sup>(b)</sup>	Skin
2,4, 6-Trinitrophenol, see Picric acid				
2, 4, 6-Trinitrophenylmethyl-nitramine, see Tetryl				
Trinitrotoluene (TNT)	118-96-7		1.5	X
Triorthocresyl phosphate	78-30-8	—	0.1	
Triphenyl phosphate	115-86-6	—	3	
<b>Tungsten &amp; compounds, as W</b>	<b>7440-33-7</b>			
Soluble		—	1	
Insoluble		—	5	
Turpentine	8006-64-2	100	560	
Uranium (as U)	7440-61-1			
Soluble compounds		—	0.05	
Insoluble compounds		—	0.2	
Vanadium respirable dust (as V <sub>2</sub> O <sub>5</sub> )	1314-62-1	—	(C) 0.5	
Fume (as V <sub>2</sub> O <sub>5</sub> )	1314-62-1	—	(C) 0.05	
Vegetable oil mist				
Total Dust		—	10	
Respirable Fraction		—	5	
Vinyl acetate	108-05-4	10	30	
Vinyl benzene, see Styrene				
Vinyl bromide	593-60-2	250	1,100	
Vinyl chloride	75-01-4		(See 1910.1017)	
Vinyl cyanide, see Acrylonitrile				
Vinyl toluene	25013-15-4	100	480	
Warfarin	81-81-2	—	0.1	
<b>Wood Dust (non-allergenic)</b>		—	10	
Xylene (o-, m-, p-isomers)	1330-20-7	100	435	
Xylidine	1300-73-8	5	25	X
Yttrium	7440-65-5	—	1	
Zinc chloride fume	7646-85-7	—	1	
<b>Zinc oxide</b>	<b>1314-13-2</b>			
Total Dust		—	10	
Respirable Fraction		—	5	
Zinc oxide fume	1314-13-2	—	5	

Substance	CAS No. <sup>(c)</sup>	ppm <sup>(a)</sup>	mg/m <sup>3</sup> <sup>(b)</sup>	Skin
<b>Zinc stearate</b>	<b>557-05-1</b>			
<b>Total Dust</b>		—	<b>10</b>	
<b>Respirable Fraction</b>		—	<b>5</b>	
Zirconium compounds (as Zr)	7440-67-7	—	5	

**Note:** Bold print identifies substances for which the Oregon Permissible Exposure Limits (PELs) are different than the federal Limits.

**Note:** PNOR means "particles not otherwise regulated."

**Footnotes:**

(a) Parts of vapor or gas per million parts of contaminated air by volume at 25°C and 760 torr.

(b) Milligrams of substance per cubic meter of air. When entry is in this column only, the value is exact; when listed with a ppm entry, it is approximate.

(c) The CAS number is for information only. Enforcement is based on the substance name. For an entry covering more than one metal compound, measured as the metal, the CAS number for the metal is given – not CAS numbers for the individual compounds.

(d) The final benzene standard in 1910.1028 applies to all occupational exposures to benzene except in some circumstances the distribution and sale of fuels, sealed containers and pipelines, coke production, oil and gas drilling and production, natural gas processing, and the percentage exclusion for liquid mixtures; for the excepted subsegments, the benzene limits in Oregon Table Z-2 apply. See 1910.1028 for specific circumstances.

(e) This 8-hour TWA applies to respirable dust as measured by a vertical elutriator cotton dust sampler or equivalent instrument. The time weighted average applies to the cotton waste processing operations of waste recycling (sorting, blending, cleaning, and willowing) and garnetting. See also 1910.1043 for cotton dust limits applicable to other sectors.

(f) All inert or nuisance dusts, whether mineral, inorganic, or organic, not listed specifically by substance name are covered by the Particulates Not Otherwise Regulated (PNOR) limit which is the same as the inert or nuisance dust limit of Oregon Table Z-3.

(g) Usually a mixture, in general the aromatic hydrocarbon content will determine which TWA applies.

(h) If the exposure limit in 1910.1026 is stayed or is otherwise not in effect, the exposure limit is a ceiling of 0.1 mg/m<sup>3</sup>.

(i) See Table Z-2 for the exposure limit for any operations or sectors where the exposure limit in 1910.1026 is stayed or is otherwise not in effect.

(j) See Table Z-3 for the exposure limit for any operations or sectors where the exposure limit in Division 2/Z-Silica is stayed or is otherwise not in effect.

(k) See Table Z-2 for the exposure limits for any operations or sectors where the exposure limits in Division 2/Z Beryllium are stayed or otherwise not in effect.

Table Z-2

Substance	8-Hour Time-Weighted Average	Acceptable Ceiling Concentration	Acceptable Max. Peak Above the Acceptable Ceiling Concentration for an 8-hour Shift		Skin
			Concentration	Maximum Duration	
Benzene <sup>(a)</sup> (Z87.4-1969)	10 ppm	25 ppm	50 ppm	10 min.	
Beryllium, and beryllium compounds (Z37.29-1970) <sup>(d)</sup>	2 µg/m <sup>3</sup>	5 µg/m <sup>3</sup>	25 µg/m <sup>3</sup>	30 min.	
Cadmium fume <sup>(b)</sup> (Z37.5-1970)	0.1 mg/m <sup>3</sup>	0.3 mg/m <sup>3</sup>			
Cadmium dust <sup>(b)</sup> (Z37.5-1970)	0.2 mg/m <sup>3</sup>	0.6 mg/m <sup>3</sup>			
Carbon disulfide (Z37.3-1968)	20 ppm	30 ppm	100 ppm	30 min.	X
Carbon tetrachloride (Z37.17-1967)	10 ppm	25 ppm	200 ppm	5 min. in any 4 hrs	
Chromic acid and chromates (Z37.7-1971) (as CrO <sub>3</sub> ) <sup>c</sup>		0.1 mg/m <sup>3</sup>			
Ethylene dibromide (Z37.31-1970)	20 ppm	25 ppm	50 ppm	5 min.	X
Ethylene dichloride (Z37.21-1969)	50 ppm	100 ppm	200 ppm	5 min. in any 3 hrs	
Fluoride as dust (Z37.28-1969)	2.5 mg/m <sup>3</sup>				
Formaldehyde (see 1910.1048)					
Hydrogen fluoride (Z37.28-1969)	3 ppm				
Hydrogen sulfide (Z37.2-1966)		20 ppm	50 ppm	10 min. once, only if no other measurable exposure occurs	
<b>Mercury (Z37.8-1971)</b>	<b>0.05 mg/m<sup>3</sup></b>	<b>0.1 mg/m<sup>3</sup></b>			<b>X</b>
Methyl chloride (Z37.18-1969)	100 ppm	200 ppm	300 ppm	5 min. in any 3 hrs	
<b>Organo (alkyl) mercury (Z37.30-1969)</b>	<b>0.001 mg/m<sup>3</sup></b>	<b>0.01 mg/m<sup>3</sup></b>			<b>X</b>
Styrene (Z37.15-1969)	100 ppm	200 ppm	600 ppm	5 min. in any 3 hrs	

Substance	8-Hour Time-Weighted Average	Acceptable Ceiling Concentration	Acceptable Max. Peak Above the Acceptable Ceiling Concentration for an 8-hour Shift		Skin
			Concentration	Maximum Duration	
Tetrachloroethylene (Z37.22-1967)	100 ppm	200 ppm	300 ppm	5 min. in any 3 hrs	
<b>Toluene (Z37.12-1967)</b>	<b>100 ppm</b>	<b>300 ppm</b>	<b>500 ppm</b>	<b>10 min.</b>	
Trichloroethylene (Z37.19-1967)	100 ppm	200 ppm	300 ppm	5 min. in any 2 hrs	

Table 1 – Oregon Table Z-2 (Continued)

Substance	8-Hour Time-Weighted Average	Acceptable Ceiling Concentration	Acceptable Max. Peak Above the Acceptable Ceiling Concentration for an 8-hour Shift		Skin
			Concentration	Maximum Duration	
<b>Diisocyanates</b> Dicyclohexylmethane 4,4'-diisocyanate (hydrogenated MDI)	.055 mg/m <sup>3</sup> .005 ppm	0.210 mg/m <sup>3</sup> 0.02 ppm			
Diphenylmethane diisocyanate (MDI)	.050 mg/m <sup>3</sup> .005 ppm	0.200 mg/m <sup>3</sup> 0.02 ppm			
Hexamethylene diisocyanate (HDI)	.035 mg/m <sup>3</sup> .005 ppm	0.140 mg/m <sup>3</sup> 0.02 ppm			
1,6 Hexamethylene diisocyanated Based Adduct(includes HDI-Biuret trimer, and other polymeric forms of HDI, including isocyanurates)	0.5 mg/m <sup>3</sup>	1.0 mg/m <sup>3</sup>			
Isophorone diisocyanate (IPDI)	.045 mg/m <sup>3</sup> 005 ppm	0.180 mg/m <sup>3</sup> 0.02 ppm			
Napthalene diisocyanate (NDI)	.040 mg/m <sup>3</sup> .005 ppm	0.170 mg/m <sup>3</sup> 0.02 ppm			
Toluene diisocyanate (TDI)	.035 mg/m <sup>3</sup> .005 ppm	0.140 mg/m <sup>3</sup> 0.02 ppm			

**Note:** Bold print identifies substances for which the Oregon Permissible Exposure Limits (PELs) are different than the federal limits.

**Footnotes:**

(a) This standard applies to the industry segments exempt from the 1 ppm 8-hour TWA and 5 ppm STEL of the Benzene Standard, 1910.1028.

(b) This standard applies to any operations or sectors for which the Cadmium Standard, 1910.1027, is stayed or otherwise not in effect.

(c) This standard applies to any operations or sectors for which the exposure limit in the Chromium (VI) standard, 1910.1026, is stayed or is otherwise not in effect.

(d) This standard applies to any operations or sectors for which the exposure limits in the beryllium standard, Division 2/Z Beryllium, are stayed or is otherwise not in effect.

Oregon Table Z-3 Mineral Dusts

Substance	mppcf <sup>(a)</sup>	mg/m <sup>3</sup>
Silica: Crystalline Quartz (respirable)		0.1 mg/m <sup>3</sup>
Quartz (total dust)		<u>30 mg/m<sup>3(e)</sup></u> %SiO <sub>2</sub> + 2
Cristobalite (respirable) Tridymite: Use 1/2 the value calculated from the formulae for quartz.		0.05 mg/m <sup>3</sup>
Amorphous, including natural diatomaceous earth	20	<u>80 mg/m<sup>3(e)</sup></u> %SiO <sub>2</sub>
Silicates (less than 1% crystalline silica): Mica	20	
Soapstone	20	
Talc (not containing asbestos)	20 <sup>(c)</sup>	
Talc (containing asbestos) Use asbestos limit.	20	
Tremolite, asbestiform (see OAR 437, Div. 2/Z, 1910.1001, Asbestos).		
Portland cement	50	
Graphite (Natural)		5 mg/m <sup>3</sup>
Coal Dust: Respirable fraction less than 5% SiO <sub>2</sub>		2.4 mg/m <sup>3(e)</sup> <sup>(f)</sup>
Coal Dust: Respirable fraction greater than 5% SiO <sub>2</sub>		0.1 mg/m <sup>3(e)</sup>
<b>Inert or Nuisance Dust:</b> <sup>(d)</sup> <b>Respirable fraction</b>		<b>5 mg/m<sup>3</sup></b>
<b>Total dust</b>		<b>10 mg/m<sup>3</sup></b>

**Note:** Bold print identifies substances for which the Oregon Permissible Exposure Limits (PELs) are different than the federal limits.

**Note:** Conversion factors - mppcf x 35.3 = million particles per cubic meter = particles per c.c.

**Footnotes:**

<sup>(a)</sup> Millions of particles per cubic foot of air, based on impinger samples counted by light-field techniques.

<sup>(b)</sup> The percentage of crystalline silica in the formula is the amount determined from airborne samples, except in those instances in which other methods have been shown to be applicable.

<sup>(c)</sup> Containing less than 1% quartz; if 1% quartz or more, use quartz limit.

<sup>(d)</sup> All inert or nuisance dusts, whether mineral, inorganic, or organic, not listed specifically by substance name are covered by this limit, which is the same as the Particulates Not Otherwise Regulated (PNOR) limit in Oregon Table Z-1.

(e) Silica sampling methods must conform to OSHA or NIOSH sampling methods for respirable quartz silica.

(f) The measurements under this note refer to the use of an AEC (now NRC) instrument. If the respirable fraction of coal dust is determined with a MRE the figure corresponding to that of 2.4 mg/m<sup>3</sup> in the table for coal dust is 4.5 mg/m<sup>3</sup>.

Stat. Auth.: ORS 654.025(2) and 656.726(4).

Stats. Implemented: ORS 654.001 through 654.295.

Hist: WCB Admin. Order, Safety 3-1975, f. 10/6/75, ef. 11/1/75.

WCB Admin. Order, Safety 6-1978, f. 7/5/78, ef. 7/15/78.

WCD Admin. Order, Safety 12-1979, f. 12/21/79, ef. 3/1/80.

WCB Admin. Order, Safety 2-1980, f. 4/17/80, ef. 8/1/80.

WCB Admin. Order, Safety 1-1982, f. 3/4/82, ef. 5/5/82.

WCB Admin. Order, Safety 6-1983, f. 5/25/83, ef. 5/25/83.

WCB Admin. Order, Safety 21-1984, f. 12/20/84, ef. 1/1/85.

WCD Admin. Order, Safety 4-1986, f. 5/5/86, ef. 5/5/86.

WCB Admin. Order, Safety 5-1986, f. 5/20/86, ef. 6/13/86.

APD Admin. Order, Safety 13-1989, f. 7/17/89, ef. 7/17/89.

OR-OSHA Admin. Order 6-1993, f. 5/17/93, ef. 5/17/93 (temp).

OR-OSHA Admin. Order 17-1993, f. 11/15/93, ef. 11/15/93 (perm).

OR-OSHA Admin. Order 5-1997, f. 4/22/97, ef. 4/22/97.

OR-OSHA Admin. Order 6-1997, f. 5/2/97, ef. 5/2/97.

OR-OSHA Admin. Order 4-2001, f. 2/5/01, ef. 2/5/01.

OR-OSHA Admin. Order 6-2006, f. 8/30/06, ef. 8/30/06.

OR-OSHA Admin. Order 6-2008, f. 5/13/08, ef. 7/1/08.

OR-OSHA Admin. Order 5-2016, f. 9/23/16, ef. 7/1/18.

OR-OSHA Admin. Order 3-2017, f. 07/07/17, ef. 03/12/18.



## Historical Notes for Subdivision Z, Air Contaminants

**Note:** OR-OSHA rules for Air Contaminants were adopted or repealed temporarily on 5/17/93 in OAR 437, Division 2/Z, Toxic and Hazardous Substances, by OR-OSHA Admin. Order 6-1993 (temp.). At the same time, a Notice of Rulemaking was filed to adopt the rule changes permanently. Revised rules for Air Contaminants have now been adopted PERMANENTLY by OROSHA Admin. Order 17-1993, filed 11/15/93, EFFECTIVE 11/15/93.

Due to the July 1992 decision by the U. S. Court of Appeals for the 11th Circuit (AFL-CIO v. OSHA, 15 OSHC 1729), it became necessary for Federal OSHA to first vacate and subsequently to revise its Air Contaminant Standard. To ensure adequate protection for Oregon workers during the interim, OR-OSHA temporarily readopted Oregon Air Contaminant rules (in former Division 114) that were in place prior to OR-OSHA's adoption of the now-vacated federal standard. In this Permanent Adoption, OR-OSHA has combined the former Oregon Air Contaminant standard with the recently revised federal standard, in order to maintain the level of protection historically provided in Oregon.

Oregon-initiated Rule 437-002-0360 is the rule which adopts by reference the federal standards in Division 2/Z. Federal standard 29 CFR 1910.1000 has been repealed because OAR 437-002-0382 now contains Air Contaminants rules effective in Oregon. OAR 437-002-0381 has also been repealed because it pertains to the now-vacated 1910.1000. OAR 437-002-0385 has been repealed because its provisions are now included in 437-002-0382.

**Note:** The definition for Excursion Limits from the booklet "1993-1994 Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices" published by the American Conference of Governmental Industrial Hygienists (ACGIH), is used in lieu of an older definition in OAR 437-002-0382(1)(c).

**Note:** Changes to Oregon-initiated rule OAR 437-002-0382 and 437-005-0030, Oregon Rules for Air Contaminants, are adopted by OR-OSHA Admin. Order 5-1997, filed and effective 4/22/97.

These rules are located in Division 2/Z and 5/Z, Toxic and Hazardous Substances.

The changes correct clerical errors; add language to clarify the requirements of Oregon Table Z-2; readopt permissible limits for zinc oxide total particulates; and, adopt permissible limits for zinc oxide respirable dust and soluble nickel compounds from federal OSHA's final rule on Air Contaminants.

**Note:** Federal OSHA amended the standards that regulate employee exposure to 1,3-Butadiene and Methylene Chloride. Oregon OSHA adopts these standards by reference into Oregon's Division 2, General Occupational Safety and Health Rules; Division 3, Construction; Division 5, Maritime Activities; and amend Oregon's Air Contaminants, by OR-OSHA Admin. Order 6-1997, filed and effective 5/2/97.

Federal OSHA has determined, based on studies and tests, that the current permissible exposure limits (PELs) do not properly protect workers. Both final standards have reduced PELs.

In order to reduce exposures and protect employees, OSHA's 1,3-Butadiene and Methylene Chloride standards include requirements such as engineering controls, work practices and personal protective equipment, measurement of employee exposures, training, medical surveillance, hazard communication, regulated areas, emergency procedures and recordkeeping.

**Note:** Oregon OSHA standards must be as effective as federal OSHA. There were slight differences in the air contaminants rules. Therefore, OR-OSHA has modified three substances: Carbon disulfide; Ethylene dibromide; and Mercury and Mercury organo (alkyl), to match federal OSHA's standard in construction and maritime. For uniformity, Oregon initiated air contaminant rules in general industry, construction and agriculture will all reflect the amendments.

Oregon added the skin designation to the three substances listed above. Also, Oregon changed the PEL to 25 ppm ceiling value for Ethylene dibromide (currently at 30 ppm).

This is Oregon OSHA Administrative Order number 4-2001, Adopted and effective February 5, 2001.

**Note:** This rule adds new requirements for exposures to hexavalent chromium, including a lower airborne permissible exposure limit, an action level, airborne exposure assessments, regulated areas, change and washing facilities, medical surveillance, and training.

These changes are required to keep OR-OSHA standards as effective as Federal OSHA. Oregon OSHA did not adopt the exception for pesticide use. Federal OSHA does not regulate the use of pesticides because the Environmental Protection Agency (EPA) regulates these exposures through the Worker Protection Standard (WPS). However, since Oregon OSHA enforces the WPS this exemption does not apply in Oregon.

Oregon OSHA adopted these changes into general industry, construction, agriculture, and maritime.

The proposed amendments to the permissible limit for airborne concentrations of respirable silica were not adopted in this rulemaking.

This is Oregon OSHA Administrative Order 6-2006, adopted and effective August 30, 2006.

**Note:** On March 25, 2016, federal OSHA adopted final rules for crystalline silica for general industry, construction, and maritime. Before these rules, the only specific rule for crystalline silica was an airborne permissible exposure limit (PEL) of 100 micrograms per cubic meter of air ( $\mu\text{g}/\text{m}^3$ ). With the adoption of these rules, federal OSHA lowered the PEL from 100  $\mu\text{g}/\text{m}^3$  to 50  $\mu\text{g}/\text{m}^3$ , and instituted an action level of 25  $\mu\text{g}/\text{m}^3$ . These rules require an exposure assessment, with periodic monitoring under certain circumstances, requires engineering and work practice controls to reduce exposure levels, institutes a written exposure control plan, requires provisions for regulating employee access to certain areas, respiratory protection, medical surveillance, and employee training and information. The construction rule also lists specific tasks with engineering controls, work practice controls, and respiratory protection for specific tasks that do not require an exposure assessment, and requires that a competent person ensure that the written program and specific tasks are followed.

On July 15, 2016 Oregon OSHA proposed to combine the requirements of the general industry and construction rules into one set of rules applicable to both industries, as new Oregon-initiated rules OAR 437-002-1053 through 437-002-1065. These Oregon-initiated rules provide the same options for construction employers to use certain specified methods in lieu of an exposure assessment as the federal rules, and a note was added at Table 1 in 437-002-1057 Specified exposure control methods, to remind employers that the rest of the rules still apply.

Oregon OSHA amended the compliance dates to July 1, 2018 for both general industry and construction. The one effective date, paired with education and outreach, will help increase employer understanding and compliance with the new silica standard. The effective date for medical evaluations for employees exposed to airborne levels above the action level but below the PEL is July 1, 2020.

This is Oregon OSHA Administrative Order 5-2016, adopted September 23, 2016, and effective July 1, 2018.

**Note:** On January 9, 2017, federal OSHA adopted final rules for beryllium for general industry, construction, and maritime. Before these rules, the only specific rule for beryllium was an airborne permissible exposure limit (PEL) of 2 micrograms per cubic meter of air ( $\mu\text{g}/\text{m}^3$ ). With the adoption of these rules, federal OSHA lowered the PEL from 2  $\mu\text{g}/\text{m}^3$  to 0.2  $\mu\text{g}/\text{m}^3$ , and instituted an action level of 0.1  $\mu\text{g}/\text{m}^3$ . These rules require an exposure assessment, with periodic monitoring under certain circumstances, requires engineering and work practice controls to reduce exposure levels, institutes a written exposure control plan, requires provisions for regulating employee access to certain areas, respiratory protection, medical surveillance, and employee training and information.

Oregon OSHA combined the requirements of the general industry and construction rules into one set of rules applicable to both industries, as new Oregon-initiated rules OAR 437-002-2024 through 437-002-2026, 437-002-2028 through 437-002-2030, 437-002-2032 through 437-002-2038, 437-002-2040, and 437-002-2045.

Oregon OSHA also updated the air contaminants rules for general industry and construction, OAR 437-002-0382 and 437-003-1000, to reflect the new beryllium rules.

Two public hearings were held during June of 2017. Oregon OSHA did not receive any comments at these hearings. We received one written comment in support of this rulemaking.

This is Oregon OSHA Administrative Order 3-2017, adopted July 7, 2017 and effective March 12, 2018.

**Note:** Oregon OSHA is adopting changes to their administrative (recordkeeping), general industry, and construction standards, and updating references in the maritime activity standards in response to federal OSHA's adoption of final rules published in the May 14, 2019 Federal Register. This is Phase IV of federal OSHA's Standards Improvement Project (SIP-IV), the fourth in a series of rulemakings to improve and streamline workplace safety and health standards. Oregon's response removes or revises rules or requirements within our corresponding rules that are outdated, duplicative, or inconsistent. This rulemaking is anticipated to reduce regulatory burden and compliance costs while maintaining or enhancing worker safety and health as well as worker privacy protections.

In Division 2Z, Air Contaminants, Oregon OSHA updated the adopt by reference rule for air contaminants rules.

This is Oregon OSHA Administrative Order 3-2019, filed and effective October 29, 2019.