Oregon OSHA – Adopted Changes to Occupational Exposure to Beryllium in General Industry, Construction, and Maritime

May 2017

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Text added is in **bold and underline**.

DIVISION 2, GENERAL INDUSTRY

Division 2/Z, Toxic and Hazardous Substances

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 expo- sure 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.

Oregon Table Z-2					
Substance	8-Hour Time-Weighted Average	Acceptable Ceiling Concen-tration	Acceptable Max. Peak Above the Acceptable Ceiling Concentration for an 8-hour Shift		Skin
			Concen-tration	Maximum Duration	
Benzene (a) (Z87.4-1969)	10 ppm	25 ppm	50 ppm	10 min.	
Beryllium and beryllium compounds (Z37.17-1970)	2 µg/m^3	5 µg/m^3	25 µg/m^3	30 min.	
Carbon tetrachloride (Z37.19-1967)	10 ppm	25 ppm	200 ppm	5 min. in any 4 hours	

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:

$$E = (C_aT_a + C_bT_b + ...C_nT_n) \div 8$$

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:

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

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.

Oregon Table Z-1 - Adopted Values (In Alphabetical Order)				
Substance	CAS No. [c]	ppm [a]	mg/m^3 [b]	Skin
Abate	3383-96-8	—	10	
Acetaldehyde	75-07-0	100	180	
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)	
Acetylene	74-86-2	1,000	—	
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	
Allyn glycidyl ether (AGE)	106-92-3	5 (C) 10	22 (C) 45	
Allyl propyl disulfide	2179-59-1	2	12	
alpha Alumina Total Dust Respirable Fraction	1344-28-1	 — —	 10 5	
Aluminum Metal Dust Total Dust Respirable Fraction	7429-90-5	 — —	 10 5	
Alundum (A1203)		—	10	
4-Aminodiphenyl	92-67-1		(See 1910.1003)	
2-Aminoethanol, see Ethanolamine				
2-Aminopyridine	504-29-0	0.5	2	
Ammonia	7664-41-7	25	18	
Ammonium Chloride Fumes	12125-02-9	—	10	
Ammonium sulfamate Total Dust Respirable Fraction	7773-06-0	 — —	 10 5	
n-Amyl acetate	628-63-7	100	525	
sec-Amyl acetate	626-38-0	125	650	
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	

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Substance	CAS No. [c]	ppm [a]	mg/m^3 [b]	Skin
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)		
Asphalt (petroleum) Fumes	8052-42-4	—	5	
Azinphos-methyl	86-50-1	—	0.2	X
Barium (soluble compounds)	7440-39-3	—	0.5	
Barium Sulfate	7727-43-7			
Total Dust		—	10	
Respirable Fraction		—	5	
Benomyl	17804-35-2			
Total Dust		—	10	
Respirable Fraction		—	5	
Benzene See Oregon Table Z-2 for the limits applicable in the operations or sectors excluded in 1910.1028 [d]	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[k]**	7440-41-7		(See Oregon Table Z-2)	
Biphenyl, see Diphenyl				
Bismuth telluride (undoped)	1304-82-1			
Total Dust		—	10	
Respirable Fraction		—	5	
Bismuth telluride (Se-doped)		—	5	
Bisphenol A, see Diglycidyl ether				
Boron oxide	1303-86-2	—	10	
Boron tribromide	10294-33-4	1	10	
Boron trifluoride	7637-07-2	(C) 1	(C) 3	
Bromine	7726-95-6	0.1	0.7	
Bromine pentafluoride	7789-30-2	0.1	0.7	
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))	
Butane	106-97-8	800	1,900	
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	

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Substance	CAS No. [c]	ppm [a]	mg/m^3 [b]	Skin
tert-Butyl alcohol	75-65-0	100	300	
Butyl lactate	138-22-7	1	5	
Butylamine	109-73-9	(C) 5	(C) 15	X
tert-Butyl chromate (as CrO_3)	1189-85-1	(See 1910.1026)[g]		
n-Butyl glycidyl ether (BGE)	2426-08-6	50	270	
Butyl mercaptan	109-79-5	0.5	1.5	
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		
Calcium carbonate Total Dust Respirable Fraction	1317-65-3	 — —	 10 5	
Calcium hydroxide Total Dust Respirable Fraction	1305-62-0	 — —	 10 5	
Calcium oxide	1305-78-8	—	5	
Calcium silicate Total Dust Respirable Fraction	1344-95-2	 — —	 10 5	
Calcium sulfate Total Dust Respirable Fraction	7778-18-9	 — —	 10 5	
Camphor, synthetic	76-22-2	—	2	
Caprolactam (2-Oxonexa-methylenimine)	105-60-2	—	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)	
Cellulose Total Dust Respirable Fraction	9006-34-6	 — —	 10 5	
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				

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Substance	CAS No. [c]	ppm [a]	mg/m^3 [b]	Skin
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				
Chloroform (Trichloromethane)	67-66-3	(C) 25	(C) 120	
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
2-Chloro-6-(trichloromethyl) pyridine Total Dust Respirable Fraction	1929-82-4	 — —	 10 5	
Chromic acid and chromates (as CrO_3)			(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	
Clopidol Total Dust Respirable Fraction	2971-90-6	 — —	 10 5	
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 Dusts and Mists	7440-50-8 7440-50-8	— —	0.1 1	
Corundum (A1203)	1302-74-5	—	10	
Cotton dust			(See 1910.1043)	
Cotton dust (raw)		—	1 [e]	
Crag® herbicide (Sesone) Total Dust Respirable Fraction	136-78-7	 — —	 10 5	
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
Cyanogen	460-19-5	10	—	
Cyclohexane	110-82-7	300	1,050	

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Substance	CAS No. [c]	ppm [a]	mg/m^3 [b]	Skin
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				
Diazinon	333-41-5	—	0.1	X
Diazomethane	334-88-3	0.2	0.4	
Diborane	19287-45-7	0.1	0.1	
Dibrom®	300-76-5	—	3	
1,2-Dibromo-3-chloropropane (DBCP)	96-12-8	0.001	(See 1910.1044)	
1,2-Dibromoethane, see Ethylene dibromide				
2-N-Dibutylaminoethanol	102-81-8	2	14	X
Dibutyl phosphate	107-66-4	1	5	
Dibutyl phthalate	84-74-2	—	5	
Dichloroacetylene	7572-29-4	(C) 0.1	(C) 0.4	
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	
Dichloroethyl Ether	111-44-4	5 (C) 15	30 (C) 90	X
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
Dicyclohexylmethane 4,4'-diisocyanate (hydrogenated MDI, see Oregon Table Z-2 (Diisocyanates)	5124-30-1			
Dicyclopentadienyl iron	102-54-5			

Oregon Table Z-1 - Adopted Values (In Alphabetical Order)				
Substance	CAS No. [c]	ppm [a]	mg/m^3 [b]	Skin
Total Dust Respirable Fraction		— —	10 5	
Dieldrin	60-57-1	—	0.25	X
Diethylamine	109-89-7	25	75	
2-Diethylaminoethanol	100-37-8	10	50	X
Diethylene triamine	111-40-0	(C) 1	(C) 4	X
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				
Diisobutyl ketone	108-83-8	25	150	
Diisopropylamine	108-18-9	5	20	X
Dimethoxymethane, see Methylal				
Dimethyl acetamide	127-19-5	10	35	X
Dimethylamine	124-40-3	10	18	
4-Dimethylaminoazobenzene	60-11-7		(See 1910.1003)	
Dimethylaminobenzene, see Xylidene				
Dimethylaniline (N,N-Dimethy-laniline)	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) (ortho) (meta) (para)	 528-29-0 99-65-0 100-25-4		1	X
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	
Diphenylamine	122-39-4	—	10	
Diphenylmethane diisocyanate (MDI), see Oregon Table Z-2 (Diisocyanates)				
Dipropylene glycol methyl ether	34590-94-8	100	600	X
Diquat	231-36-7	—	0.5	
Di-sec, octyl phthalate (Di-2-ethyl-hexylphthalate	117-81-7	—	5	
Emery Total Dust Respirable Fraction	12415-34-8	 — —	 10 5	
Endosulfan (Thiodan®)	115-29-7	—	0.1	X
Endrin	72-20-8	—	0.1	X

Oregon Table Z-1 - Adopted Values (In Alphabetical Order)				
Substance	CAS No. [c]	ppm [a]	mg/m^3 [b]	Skin
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				
Ethane	74-84-0	1,000	—	
Ethanethiol, see Ethyl mercaptan				
Ethanolamine	141-43-5	3	6	
2-Ethoxyethanol (Cellosolve)	110-80-5	100	370	X
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	
Ethyl mercaptan	75-08-1	0.5 (C) 10	1 (C) 25	
Ethyl silicate	78-10-4	100	850	
Ethylene	74-85-1	1,000	—	
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)	
Ethylene gylcol particulate		—	10	
Ethylene glycol, Vapor	107-21-1	100	260	
Ethylene glycol dinitrate	628-96-6	(C) 0.2	(C) 1	X
Ethylene gylcol methyl acetate (Methyl cellosolve acetate) (2-Methoxy-ethel acetate)	110-49-6	25	120	X
Ethylenimine	151-56-4		(See 1910.1003)	
Ethylene oxide	75-21-8	1	(See 1910.1047)	
Ethylidine chloride, see 1, 1-Dichloroethane				
N-Ethylmorpholine	100-74-3	20	94	X
Ferbam Total Dust Respirable Fraction	14484-64-1	 — —	 10 5	
Ferrovanadium dust	12604-58-9	—	1	
Fibrous glass, see Glass, Fibrous				

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Substance	CAS No. [c]	ppm [a]	mg/m^3 [b]	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
Furfuryl alcohol	98-00-0	5	20	
Gasoline	8006-61-9	—	[g]	
Germanium tetrahydride	7782-65-2	0.2	0.6	
Glass, Fibrous or dust		—	10	
Glycerin (mist) Total Dust Respirable Fraction	56-81-5	 — —	 10 5	
Glycidol	556-52-5	50	150	
Glycol momoethyl ether, see 2-Ethoxythanol				
Grain dust (oat, wheat, barley)		—	10	
Graphite natural, respirable	7782-42-5		(See Oregon Table Z-3)	
Graphite (Synthetic) Total Dust Respirable Fraction	7782-42-5	 — —	 10 5	
Guthion®, see Azinphosmethyl				
Gypsum Total Dust Respirable Fraction	13397-24-5	 — —	 10 5	
Hafnium	7440-58-6	—	0.5	
Heptachlor	76-44-8	—	0.5	X
Heptane (n-heptane)	142-82-5	500	2,000	
Hexachlorocyclopentadiene	77-47-4	0.1	1	
Hexachloroethane	67-72-1	1	10	X
Hexachloronaphthalene	1335-87-1	—	0.2	X
Hexafluoroacetone	684-16-2	0.1	0.7	X
Hexamethylene diisocyanate (HDI), see Oregon Table Z-2 (Diisocyanates)	822-06-0			
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	
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	

Oregon Table Z-1 - Adopted Values (In Alphabetical Order)				
Substance	CAS No. [c]	ppm [a]	mg/m^3 [b]	Skin
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	
Indene	95-13-6	10	45	
Indium and compounds (as In)	7440-74-6	—	0.1	
Iodine	7553-56-2	(C) 0.1	(C) 1	
Iron oxide fume	1309-37-1	—	10	
Iron pentacarbonyl	13463-40-6	0.1	0.23	
Iron salts, soluble, as Fe		—	1	
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	
Isophorone	78-59-1	10	55	
Isophorone diisocyanate (IPDI), see Oregon Table Z-2 (Diisocyanates)	4098-71-9			
Isopropyl acetate	108-21-4	250	950	
Isopropyl alcohol	67-63-0	400	980	
Isopropylamine	75-31-0	5	12	
Isopropyl ether	108-20-3	250	1,050	
Isopropyl glycidyl ether (IGE)	4016-14-2	50	240	
Kaolin Total Dust Respirable Fraction	1332-58-7	 — —	 10 5	
Ketene	463-51-4	0.5	0.9	
Lead, inorganic (as Pb)	7439-92-1	(See 1910.1025 & 1926.62) 0.05		
Lead arsenate	7784-40-9	(See 1910.1018)	0.01	
Limestone Total Dust Respirable Fraction	1317-65-3	 — —	 10 5	
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	
Magnesite Total Dust Respirable Fraction	546-93-0	 — —	 10 5	
Magnesium oxide fume Total Dust Respirable Fraction	1309-48-4	 — —	 10 5	
Malathion	121-75-5	—	10	X
Maleic anhydride	108-31-6	0.25	1	

Oregon Table Z-1 - Adopted Values (In Alphabetical Order)				
Substance	CAS No. [c]	ppm [a]	mg/m^3 [b]	Skin
Manganese Compounds (as Mn)	7439-96-5	—	(C) 5	
Manganese fume (as Mn)	7439-96-5	—	(C) 5	
Marble Total Dust Respirable Fraction	1317-65-3	 — —	 10 5	
Mercury (aryl, inorganic, organo, and vapor) (as Hg)	7439-97-6		(See Oregon Table Z-2)	
Mesityl oxide	141-79-7	25	100	
Methane	74-82-8	1,000	—	
Methanethiol, see Methyl mercaptan				
Methoxychlor Total Dust Respirable Fraction	72-43-5	 — —	 10 5	
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
Methylacrylonitrile	126-98-7	1	3	X
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	
Methyl bromide	74-83-9	15 (C) 20	60 (C) 80	X
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)	
Methyl 2-cyanoacrylate	137-05-3	2	8	
Methylcyclohexane	108-87-2	500	2,000	
Methylcyclohexanol	25639-42-3	50	235	
o-Methylcyclohexanone	583-60-8	50	230	X
2-Methylcyclopentadienyl manganese tricarbonyl (as Mn)	12108-13-3	0.1	0.2	X
Methyl demeton	8022-00-2	—	0.5	X
Methyl ethyl ketone (MEK), see 2-Butanone				
Methyl formate	107-31-3	100	250	
Methyl iodide	74-88-4	5	28	X

Oregon Table Z-1 - Adopted Values (In Alphabetical Order)				
Substance	CAS No. [c]	ppm [a]	mg/m^3 [b]	Skin
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
Methyl mercaptan	74-93-1	0.5 (C) 10	1 (C) 20	
Methyl methacrylate	80-62-6	100	410	
Methyl parathion	298-00-0	—	0.2	X
Methyl propyl ketone, see 2-Pentanone				
Methyl silicate	681-84-5	(C) 5	(C) 30	
a-Methyl styrene	98-83-9	(C) 100	(C) 480	
Methylene bisphenyl isocyanate (MDI)	101-68-8	(See Oregon Table Z-2 (diisocyanates)		
Methylenedianiline (MDA)		(See 1910.1050 & 1926.60) 0.01		
Methylene Chloride	75-09-2	25	(See 1910.1052)	
Mineral Wool Fiber		—	10	
MOCA	101-14-4		(See 437-002-0346)	
Molybdenum (soluble compounds) (insoluble compounds)	7439-98-7	 — —	 5 10	
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	
Naphthalene diisocyanate (NDI), see Oregon Table Z-2 (Diisocyanates)	3173-72-6			
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	
Nicotine	54-11-5	0.075	0.5	X
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	

Oregon Table Z-1 - Adopted Values (In Alphabetical Order)				
Substance	CAS No. [c]	ppm [a]	mg/m^3 [b]	Skin
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				
Nitrous oxide	10024-97-5	50	90	
Octachloronaphthalene	2234-13-1	—	0.1	X
Octane	111-65-9	400	1,900	
Oil mist (mineral)	8012-95-1	—	5	
Oil mist, vapor		—	[g]	
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	
Parafin wax fume	8002-74-2	—	1	
Paraquat respirable dust	4685-14-7/ 1910-42-5/ 2074-50-2	—	0.5	X
Parathion	56-38-2	—	0.1	X
Particulates not otherwise regulated (PNOR) [f] Total Dust Respirable Fraction		 — —	 10 5	
Pentaborane	19624-22-7	0.005	0.01	
Pentachloronaphthalene	1321-64-8	—	0.5	X
Pentachlorophenol	87-86-5	—	0.5	X
Pentaerythritol Total Dust Respirable Fraction	115-77-5	 — —	 10 5	
Pentane	109-66-0	500	1,500	
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	
Perlite Total Dust Respirable Fraction	93763-70-3	 — —	 10 5	
Petroleum distillates (naphtha) (Rubber Solvent)		500	2,000 [g]	
Phenol	108-95-2	5	19	X
Phenothiazine	92-84-2	—	5	X
p-Phenylene diamine	106-50-3	—	0.1	X
Phenyl ether (vapor)	101-84-8	1	7	
Phenyl ether – diphenyl mixture (vapor)	8004-13-5	1	7	

Oregon Table Z-1 - Adopted Values (In Alphabetical Order)				
Substance	CAS No. [c]	ppm [a]	mg/m^3 [b]	Skin
Phenylethylene, see Styrene				
Phenyl glycidyl ether (PGE)	122-60-1	10	60	
Phenylhydrazine	100-63-0	5	22	X
Phenylphosphine	638-21-1	(C) 0.05	(C) 0.25	
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	
Picloram Total Dust Respirable Fraction	1918-02-1	 — —	 10 5	
Picric acid	88-89-1	—	0.1	X
Pindone (2-Pivalyl-1, 3-indan-dione)	83-26-1	—	0.1	
Plaster of Paris Total Dust Respirable Fraction	26499-65-0	 — —	 10 5	
Platinum (Soluble Salts) as Pt	7440-06-4	—	0.002	
Polychlorobiphenyls, see Chloro-diphenyls				
Portland Cement Total Dust Respirable Fraction	65997-15-1	 — —	 10 5	
Propane	74-98-6	1,000	1,800	
Beta-Propiolactone	57-57-8		(See 1910.1003)	
Propargyl alcohol	107-19-7	1	—	X
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	
Propylene glycol monomethyl ether	107-98-2	100	360	
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	
RDX (Cyclonite)	121-82-4	—	1.5	X
Rhodium, Metal fume and dusts, as Rh Soluble salts	 7440-16-6 7440-16-6	 — —	 0.1 0.001	
Ronnel	299-84-3	—	10	

Oregon Table Z-1 - Adopted Values (In Alphabetical Order)				
Substance	CAS No. [c]	ppm [a]	mg/m^3 [b]	Skin
Rosin core solder pyrolysis products (as Formaldehyde)		—	0.1	
Rotenone	83-79-4	—	5	
Rouge Total Dust Respirable Fraction		— —	10 5	
Selenium compounds (as Se)	7782-49-2	—	0.2	
Selenium hexafluoride (as Se)	7783-79-1	0.05	0.4	
Silica, crystalline, respirable dust(j) Cristobalite Quartz Tripoli (as quartz) Tridamite	 14464–46–1 14808–60–7 1317–95–9 15468–32–3	—	(See Division 2/Z-Silica)	
Silicon Total Dust Respirable Fraction	7440-21-3	— —	10 5	
Silicon carbide Total Dust Respirable Fraction	409-21-2	— —	10 5	
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	
Starch Total Dust Respirable Fraction	9005-25-8	— —	10 5	
Stibine	7803-52-3	0.1	0.5	
Stoddard solvent	8052-41-3	200	1,150	
Strychnine	57-24-9	—	0.15	
Styrene	100-42-5		(See Oregon Table Z-2)	
Subtilisins (Proteolytic enzymes) (as 100% pure crystalline enzyme)	1395-21-7	—	(C) 0.0003	
Sucrose Total Dust Respirable Fraction	57-50-1	— —	10 5	
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	
Sulfur tetrafluoride	7783-60-0	0.1	0.4	
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	

Oregon Table Z-1 - Adopted Values (In Alphabetical Order)				
Substance	CAS No. [c]	ppm [a]	mg/m^3 [b]	Skin
Temephos Total Dust Respirable Fraction	3383-96-8	 — —	 10 5	
TEPP (Tetraethyl pyrophosphate)	107-49-3	0.004	0.05	X
Terphenyls	26140-60-3	(C) 1	(C) 9	
1, 1, 1, 2-Tetrachloro-2, 2-difluoro-ethane	76-11-9	500	4,170	
1, 1, 2, 2-Tetrachloro-1, 2-difluoro-ethane	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	
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 Tl	7440-28-0	—	0.1	X
4,4'-Thiobis (6-tert, Butyl-m-cresol) Total Dust Respirable Fraction	96-69-5	 — —	 10 5	
Thiram	137-26-8		(See 437-002-0373) 0.15	
Tin (inorganic compounds, except oxides) as Sn	7440-31-5	—	2	
Tin (organic compounds)	7440-31-5	—	0.1	
Tin oxide Total Dust Respirable Fraction	1332-29-2	 — —	 10 5	
Titanium dioxide	13463-67-7	—	10	
Toluene (toluol)	108-88-3		(See Oregon Table Z-2)	
Toluene diisocyanate (TDI), See Oregon Table Z-2 (Diisocyanates)	584-84-9			
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		(See Oregon Table Z-2)	
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-trifluoro-ethane	76-13-1	1,000	7,600	

Oregon Table Z-1 - Adopted Values (In Alphabetical Order)				
Substance	CAS No. [c]	ppm [a]	mg/m^3 [b]	Skin
Triethylamine	121-44-8	25	100	
Trifluorobromomethane	75-63-8	1,000	6,100	
Trimethyl benzene	25551-13-7	25	120	
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	
Tungsten & compounds, as W Soluble Insoluble	7440-33-7	 — —	 1 5	
Turpentine	8006-64-2	100	560	
Uranium (as U) Soluble compounds Insoluble compounds	7440-61-1	 — —	 0.05 0.2	
Vanadium respirable dust (as V_2O_5) Fume (as V_2O_5)	 1314-62-1 1314-62-1	 — —	 (C) 0.5 (C) 0.05	
Vegetable oil mist Total Dust Respirable Fraction		 — —	 10 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	
Wood Dust (non-allergenic)		—	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	
Zinc oxide Total Dust Respirable Fraction	1314-13-2	 — —	 10 5	
Zinc oxide fume	1314-13-2	—	5	
Zinc stearate Total Dust Respirable Fraction	557-05-1	 — —	 10 5	
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^3.

(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.

Oregon Table Z-2					
Substance	8-Hour Time-Weighted Average	Acceptable Ceiling Concen-tration	Acceptable Max. Peak Above the Acceptable Ceiling Concentration for an 8-hour Shift		Skin
			Concen-tration	Maximum Duration	
Benzene [a] (Z87.4-1969)	10 ppm	25 ppm	50 ppm	10 min.	
Beryllium, and beryllium compounds (Z37.29-1970)[d]	2 µg/m^3	5 µg/m^3	25 µg/m^3	30 min.	
Cadmium fume [b] (Z37.5-1970)	0.1 mg/m^3	0.3 mg/m^3			
Cadmium dust [b] (Z37.5-1970)	0.2 mg/m^3	0.6 mg/m^3			
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_3) [c]		0.1 mg/m^3			
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^3				
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	
Mercury (Z37.8-1971)	0.05 mg/m^3	0.1 mg/m^3			X
Methyl chloride (Z37.18-1969)	100 ppm	200 ppm	300 ppm	5 min. in any 3 hrs	
Organo (alkyl) mercury (Z37.30-1969)	0.001 mg/m^3	0.01 mg/m^3			X
Styrene (Z37.15-1969)	100 ppm	200 ppm	600 ppm	5 min. in any 3 hrs	
Tetrachloroethylene (Z37.22-1967)	100 ppm	200 ppm	300 ppm	5 min. in any 3 hrs	
Toluene (Z37.12-1967)	100 ppm	300 ppm	500 ppm	10 min.	
Trichloroethylene (Z37.19-1967)	100 ppm	200 ppm	300 ppm	5 min. in any 2 hrs	

Oregon Table Z-2 (Continued)

Substance	8-Hour Time-Weighted Average	Acceptable Ceiling Concen-tration	Acceptable Max. Peak Above the Acceptable Ceiling Concentration for an 8-hour Shift		Skin
			Concen-tration	Maximum Duration	
Diisocyanates					
Dicyclohexylmethane 4,4'-diisocyanate (hydrogenated MDI)	.055 mg/m .005 ppm	0.210 mg/m^3 0.02 ppm			
Diphenylmethane diisocyanate (MDI)	.050 mg/m^3 .005 ppm	0.200 mg/m^3 0.02 ppm			
Hexamethylene diisocyanate (HDI)	.035 mg/m^3 .005 ppm	0.140 mg/m^3 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^3	1.0 mg/m^3			
Isophorone diisocyanate (IPDI)	.045 mg/m^3 .005 ppm	0.180 mg/m^3 0.02 ppm			
Napthalene diisocyanate (NDI)	.040 mg/m^3 .005 ppm	0.170 mg/m^3 0.02 ppm			
Toluene diisocyanate (TDI)	.035 mg/m^3 .005 ppm	0.140 mg/m^3 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 on 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 (a)	mg/m 3
Silica:		
Crystalline		
Quartz (respirable)		$0.1\ mg/m^3$
Quartz (total dust)		$\frac{30\ mg/m^{3(e)}}{\%SiO_2 + 2}$
Cristobalite (respirable)		$0.05\ mg/m^3$
Tridymite: Use 1/2 the value calculated from the formulae for quartz.		
Amorphous, including natural diatomaceous earth	20	$\frac{80\ mg/m^{3(e)}}{\%SiO_2}$
Silicates (less than 1% crystalline silica):		
Mica	20	
Soapstone	20	
Talc (not containing asbestos)	20 (c)	
Talc (containing asbestos) Use asbestos limit.	20	
Tremolite, asbestiform (see OAR 437, Div. 2/Z, 1910.1001, Asbestos).		
Portland cement	50	
Graphite (Natural)		$5\ mg/m^3$
Coal Dust:		
Respirable fraction less than 5% SiO_2		**$2.4\ mg/m^{3(e)\ (f)}$**
Coal Dust:		
Respirable fraction greater than 5% SiO_2		$0.1\ mg/m^{3\ (e)}$
Inert or Nuisance Dust: (d)		
Respirable fraction		$5\ mg/m^3$
Total dust		$10\ mg/m^3$

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:

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

(b) 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.

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

(d) 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^3 in the table for coal dust is 4.5 mg/m^3.

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.

Division 2/Z Beryllium

437-002-2024 Scope and application. This subdivision applies to all occupational exposures to beryllium in all forms, compounds, and mixtures in general industry and construction activities, except for the following:

(1) This subdivision does not apply to articles, as defined in the Hazard Communication standard (HCS) (OAR 437-002-1910.1200(c)), that contain beryllium and that the employer does not process.

(2) This subdivision does not apply to materials containing less than 0.1% beryllium by weight where the employer has objective data demonstrating that employee exposure to beryllium will remain below the action level as an 8-hour TWA under any foreseeable conditions.

Stat. Auth.: ORS 654.025(2) and 656.726(4).
Stats. Implemented: ORS 654.001 through 654.295.
Hist: OR-OSHA Admin. Order 3-2017, f. 07/07/17, ef. 03/12/18.

437-002-2025 Definitions. For the purposes of this subdivision the following definitions apply:

Action level means a concentration of airborne beryllium of 0.1 micrograms per cubic meter of air (µg/m3), calculated as an 8-hour TWA.

Airborne exposure and airborne exposure to beryllium mean the exposure to airborne beryllium that would occur if the employee were not using a respirator.

Beryllium lymphocyte proliferation test (BeLPT) means the measurement of blood lymphocyte proliferation in a laboratory test when lymphocytes are challenged with a soluble beryllium salt.

Beryllium work area means any work area containing a process or operation that can release beryllium where employees are, or can reasonably be expected to be, exposed to airborne beryllium at any level or where there is the potential for dermal contact with beryllium.

CBD diagnostic center means a medical diagnostic center that has an on-site pulmonary specialist and on-site facilities to perform a clinical evaluation for the presence of chronic beryllium disease (CBD). This evaluation must include pulmonary function testing (as outlined by the American Thoracic Society criteria), bronchoalveolar lavage (BAL), and transbronchial biopsy. The CBD diagnostic center must also have the capacity to transfer BAL samples to a laboratory for appropriate diagnostic testing within 24 hours. The on-site pulmonary specialist must be able to interpret the biopsy pathology and the BAL diagnostic test results.

Chronic beryllium disease (CBD) means a chronic lung disease associated with airborne exposure to beryllium.

Competent person means an individual who is capable of identifying existing and foreseeable beryllium hazards in the workplace and who has authorization to take prompt corrective measures to eliminate or minimize them. The competent person must have the knowledge and ability necessary to fulfill the responsibilities set forth in this subdivision.

Confirmed positive means the person tested has beryllium sensitization, as indicated by two abnormal BeLPT test results, an abnormal and a borderline test result, or three borderline test results. It also means the result of a more reliable and accurate test indicating a person has been identified as having beryllium sensitization.

Emergency means any uncontrolled release of airborne beryllium.

High-efficiency particulate air [HEPA] filter means a filter that is at least 99.97 percent efficient in removing particles of 0.3 micrometers in diameter.

Objective data means information, such as air monitoring data from industry-wide surveys or calculations based on the composition of a substance, demonstrating employee exposure to beryllium associated with a particular product or material or a specific process, task, or activity. The data must reflect workplace conditions closely resembling or with a higher exposure potential than the processes, types of material, control methods, work practices, and environmental conditions in the employer's current operations.

Permissible exposure limit (PEL) means a concentration of airborne beryllium of 0.1 µg/m3, calculated as an 8-hour TWA.

Physician or other licensed health care professional [PLHCP] means an individual whose legally permitted scope of practice (i.e., license, registration, or certification) allows him or her to independently provide or be delegated the responsibility to provide some or all of the particular health care services required by 437-002-2034.

Regulated area means an area, including temporary work areas where maintenance or non-routine tasks are performed, where an employee's airborne exposure exceeds, or can reasonably be expected to exceed, either the time-weighted average (TWA) permissible exposure limit (PEL) or short term exposure limit (STEL).

Stat. Auth.: ORS 654.025(2) and 656.726(4).
Stats. Implemented: ORS 654.001 through 654.295.
Hist: OR-OSHA Admin. Order 3-2017, f. 07/07/17, ef. 03/12/18.

437-002-2026 Permissible exposure limit (PEL).

(1) Time-weighted average (TWA) PEL. The employer must ensure that no employee is exposed to an airborne concentration of beryllium in excess of 0.2 µg/m3 calculated as an 8-hour TWA.

(2) Short-term exposure limit (STEL). The employer must ensure that no employee is exposed to an airborne concentration of beryllium in excess of 2.0 µg/m3 as determined over a sampling period of 15 minutes.

Stat. Auth.: ORS 654.025(2) and 656.726(4).
Stats. Implemented: ORS 654.001 through 654.295.
Hist: OR-OSHA Admin. Order 3-2017, f. 07/07/17, ef. 03/12/18.

437-002-2040 Exposure assessment. This rule requires an evaluation of employee exposure to beryllium using air monitoring or objective data as described in the performance or scheduled monitoring options.

(1) Assess the exposure of each employee who is or may reasonably be expected to be exposed to beryllium in accordance with either the performance option in paragraph (2) or the scheduled monitoring option in paragraph (3).

(2) Performance option. Assess the 8-hour TWA exposure and 15-minute short-term exposure for each employee on the basis of any combination of air monitoring data or objective data sufficient to accurately characterize employee exposures to beryllium.

(3) Scheduled monitoring option.

- **(a) Perform initial monitoring to assess the 8-hour TWA exposure for each employee on the basis of one or more personal breathing zone air samples that reflect the exposures of employees on each shift, for each job classification, in each work area.**
- **(b) Perform initial monitoring to assess the short-term exposure from 15-minute personal breathing zone air samples measured in operations that are likely to produce airborne exposure above the STEL for each work shift, for each job classification, and in each work area.**
- **(c) Where several employees perform the same tasks on the same shift and in the same work area, you may sample a representative fraction of these employees in order to meet this requirement. In representative sampling, sample the employee(s) who are expected to have the highest exposure to beryllium.**
- **(d) If initial monitoring indicates that employee exposures are below the action level and at or below the STEL, you may discontinue monitoring for those employees whose exposures are represented by such monitoring.**
- **(e) Where the most recent exposure monitoring indicates that employee exposures are at or above the action level but at or below the PEL, repeat such monitoring within six months of the most recent monitoring.**
- **(f) Where the most recent exposure monitoring indicates that employee exposures are above the PEL, repeat such monitoring within three months of the most recent monitoring.**
- **(g) Where the most recent (non-initial) exposure monitoring indicates that employee exposures are below the action level, repeat such monitoring within six months of the most recent monitoring until two consecutive measurements, taken 7 or more days apart, are below the action level, at which time you may discontinue**

monitoring for those employees whose exposures are represented by such monitoring, except as otherwise provided in paragraph (4).

(h) Where the most recent exposure monitoring indicates that airborne exposure is above the STEL, repeat such monitoring within three months of the most recent short-term exposure monitoring until two consecutive measurements, taken 7 or more days apart, are below the STEL, at which time you may discontinue short-term exposure monitoring for those employees whose exposure is represented by such monitoring, except as otherwise provided in paragraph (4).

(4) Reassess exposures whenever a change in the production, process, control equipment, personnel, or work practices may reasonably be expected to result in new or additional exposures at or above the action level or STEL, or when there is any reason to believe that new or additional exposures at or above the action level or STEL have occurred.

(5) Ensure that all air monitoring samples used to satisfy the monitoring requirements of this rule are evaluated by a laboratory that can measure beryllium to an accuracy of plus or minus 25 percent within a statistical confidence level of 95 percent for airborne concentrations at or above the action level.

(6) Employee notification of assessment results.

(a) Within 15 working days after completing an exposure assessment in accordance with this rule, notify each employee whose airborne exposure is represented by the assessment of the results of that assessment individually in writing or post the results in an appropriate location that is accessible to each of these employees.

(b) Whenever an exposure assessment indicates that employee exposure is above the PEL or STEL, describe in the written notification the corrective action being taken to reduce employee exposure to or below the exposure limit(s) exceeded where feasible corrective action exists but had not been implemented when the monitoring was conducted.

(7) Observation of monitoring.

(a) Where air monitoring is performed to comply with the requirements of this rule, provide affected employees or their designated representatives an opportunity to observe any monitoring of employee exposure to beryllium.

(b) When observation of monitoring requires entry into an area where the use of protective clothing or equipment (which may include respirators) is required, provide the observer with protective clothing and equipment at no cost, ensure that the observer uses such clothing and equipment, and ensure that each observer follows all other applicable safety and health procedures.

Stat. Auth.: ORS 654.025(2) and 656.726(4).
Stats. Implemented: ORS 654.001 through 654.295.
Hist: OR-OSHA Admin. Order 3-2017, f. 07/07/17, ef. 03/12/18.

437-002-2028 Regulated and restricted access areas. This rule applies to fixed site beryllium work areas and regulated areas, and restricted access areas for construction activities.

(1) Fixed sites.

(a) Beryllium work area.

(A) Establish and maintain a beryllium work area in work area containing a process or operation that can release beryllium where employees are, or can reasonably be expected to be, exposed to airborne beryllium at any level or where there is the potential for dermal contact with beryllium.

(B) Identify each beryllium work area through signs or any other methods that adequately establish and inform each employee of the boundaries of each beryllium work area.

(b) Regulated areas.

(A) Establish a regulated area wherever an employee's exposure to airborne concentrations of beryllium is, or can reasonably be expected to be, in excess of the PEL.

(B) Demarcate regulated areas from the rest of the workplace in a manner that minimizes the number of employees exposed to beryllium within the regulated area. Post legible and easily visible signs at all entrances to regulated areas that bear the following legend.

DANGER
REGULATED AREA
BERYLLIUM
MAY CAUSE CANCER
AUTHORIZED PERSONNEL ONLY
WEAR RESPIRATORY PROTECTION AND PERSONAL PROTECTIVE CLOTHING AND EQUIPMENT IN THIS AREA

(C) Limit access to regulated areas to:

(i) Persons authorized by the employer and required by work duties to be present in the regulated area;
(ii) Any person entering such an area as a designated representative of employees for the purpose of exercising the right to observe monitoring procedures under 437-002-2040; and
(iii) Any person authorized by law to be in a regulated area.

(D) Provide and ensure each employee and the employee's designated representative entering a regulated area uses:

(i) Appropriate respiratory protection in accordance with 437-002-2030,

(ii) Appropriate personal protective equipment in accordance with 437-002-2045.

(2) Restricted access for construction activities. For employers engaged in construction activities;

(a) Written procedures. Develop and implement written procedures to restrict access to work areas, airborne exposures are, or can reasonably be expected to be, above the TWA PEL or STEL, to minimize the number of employees exposed to beryllium and their level of exposure, including exposures generated by other employers or sole proprietors. Procedures must be part of the written exposure control plan required by 437-002-2029.

(b) Competent person. Designate a competent person to ensure the procedures are followed.

Stat. Auth.: ORS 654.025(2) and 656.726(4).
Stats. Implemented: ORS 654.001 through 654.295.
Hist: OR-OSHA Admin. Order 3-2017, f. 07/07/17, ef. 03/12/18.

437-002-2029 Methods of Compliance. This rule describes the engineering and work practice controls you must use.

(1) Establish and implement a written exposure control plan that contains at least the following elements:

(a) A list of operations and job titles reasonably expected to involve airborne exposure to or dermal contact with beryllium;
(b) A list of operations and job titles reasonably expected to involve airborne exposure at or above the action level;
(c) A list of operations and job titles reasonably expected to involve airborne exposure above the TWA PEL or STEL;
(d) Procedures for minimizing cross-contamination, including preventing the transfer of beryllium between surfaces, equipment, clothing, materials, and articles within beryllium work areas;
(e) Procedures for minimizing the migration of beryllium from beryllium work areas to other locations within or outside the workplace;
(f) A list of engineering controls, work practices, and respiratory protection required by this subdivision;
(g) A list of personal protective clothing and equipment required by 437-002-2045 of this subdivision; and
(h) Procedures for removing, laundering, storing, cleaning, repairing, and disposing of beryllium-contaminated personal protective clothing and equipment, including respirators.

(2) On fixed sites, the exposure control plan must also include procedures for keeping surfaces as free as practicable of beryllium.

(3) Review and evaluate the effectiveness of each written exposure control plan at least annually and update it, as necessary, when:

(a) Any change in production processes, materials, equipment, personnel, work practices, or control methods results, or can reasonably be expected to result, in new or additional airborne exposure to beryllium;
(b) You are notified that an employee is eligible for medical removal in accordance with OAR 437-002-2035, referred for evaluation at a CBD diagnostic center, or shows signs or symptoms associated with airborne exposure to or dermal contact with beryllium; or
(c) You have any reason to believe that new or additional airborne exposure is occurring or will occur.

(4) Make a copy of the written exposure control plan accessible to each employee who is, or can reasonably be expected to be, exposed to airborne beryllium in accordance with Oregon OSHA's Access to Employee Exposure and Medical Records (Records Access) rule (437-002-1910.1020(e)).

(5) Engineering and work practice controls.

(a) For each operation in a beryllium work area that releases airborne beryllium, and where exposures are, or can reasonably be expected to be, at or above the action level, ensure that at least one of the following is in place to reduce airborne exposure:

(A) Material and/or process substitution;
(B) Isolation, such as ventilated partial or full enclosures;
(C) Local exhaust ventilation, such as at the points of operation, material handling, and transfer; or
(D) Process control, such as wet methods and automation.

(b) You are exempt from using the controls listed above to the extent that:

(A) You can establish that such controls are not feasible; or

(B) You can demonstrate that airborne exposure is below the action level, using no fewer than two representative personal breathing zone samples taken at least 7 days apart, for each affected operation.

(c) If airborne exposure exceeds the PEL or STEL after implementing the control(s) required by paragraph (5)(a) of this rule, implement additional or enhanced engineering and work practice controls to reduce airborne exposure to or below the exposure limit(s) exceeded.

(d) When you demonstrate that it is not feasible to reduce airborne exposure to or below the PELs by the engineering and work practice controls required by this rule, implement and maintain engineering and work practice controls to reduce airborne exposure to the lowest levels feasible and supplement these controls by using respiratory protection in accordance with OAR 437-002-2030.

(6) Prohibition of rotation. Do not rotate employees to different jobs to achieve compliance with the PELs.

Stat. Auth.: ORS 654.025(2) and 656.726(4).
Stats. Implemented: ORS 654.001 through 654.295.
Hist: OR-OSHA Admin. Order 3-2017, f. 07/07/17, ef. 03/12/18.

437-002-2030 Respiratory protection. This rule applies to all respirator use.

(1) Where respiratory protection is required by this subdivision, provide each employee an appropriate respirator that complies with the requirements of this rule and OAR 437-002-1910.134. Respiratory protection is required:

- **(a) Where exposures exceed the PEL or STEL during periods necessary to install or implement feasible engineering and work practice controls;**
- **(b) Where exposures exceed the PEL or STEL during tasks, such as certain maintenance and repair tasks, for which engineering and work practice controls are not feasible;**
- **(c) During tasks for which an employer has implemented all feasible engineering and work practice controls and such controls are not sufficient to reduce exposures to or below the PEL or STEL;**
- **(d) During emergencies;**
- **(e) When an employee who is eligible for medical removal under OAR 437-002-2035 chooses to remain in a job with airborne exposure at or above the action level, as permitted by that rule.**

(2) Where respirator use is required by this rule, institute a respiratory protection program in accordance with OAR 437-002-1910.134.

(3) Provide a powered air-purifying respirator (PAPR) instead of a negative pressure respirator at no cost to the employee when:

- **(a) Respiratory protection is required by this rule;**
- **(b) An employee entitled to such respiratory protection requests a PAPR; and**
- **(c) The PAPR provides adequate protection to the employee.**

Stat. Auth.: ORS 654.025(2) and 656.726(4).
Stats. Implemented: ORS 654.001 through 654.295.
Hist: OR-OSHA Admin. Order 3-2017, f. 07/07/17, ef. 03/12/18.

437-002-2045 Personal protective clothing and equipment. This rule applies to all personal protective equipment and clothing.

(1) Provide appropriate personal protective clothing and equipment at no cost to employees in accordance with the written exposure control plan required under OAR 437-002-2029 and 437-002-0134:

(a) Where airborne exposure exceeds, or can reasonably be expected to exceed, the TWA PEL or STEL; or
(b) Where there is a reasonable expectation of dermal contact with beryllium.

(2) Ensure employees use provided protective clothing and equipment.

(3) Removal and storage.

(a) Ensure that each employee removes all beryllium-contaminated personal protective clothing and equipment at the end of the work shift, at the completion of tasks involving beryllium, or when personal protective clothing or equipment becomes visibly contaminated with beryllium, whichever comes first.

(b) Ensure that each employee removes beryllium-contaminated personal protective clothing and equipment as specified in the written exposure control plan required by 437-002-2029.

(c) Ensure that each employee stores and keeps beryllium-contaminated personal protective clothing and equipment separate from street clothing and that storage facilities prevent cross-contamination as specified in the written exposure control plan required by 437-002-2029

(d) Ensure that no employee removes beryllium-contaminated personal protective clothing or equipment from the workplace, except for employees authorized to do so for the purposes of laundering, cleaning, maintaining or disposing of beryllium-contaminated personal protective clothing and equipment at an appropriate location or facility away from the workplace.

(e) When personal protective clothing or equipment required by this rule is removed from the workplace for laundering, cleaning, maintenance or disposal, ensure that personal protective clothing and equipment are stored and transported in sealed bags or other closed containers that are impermeable and are labeled in accordance with 437-002-2036 and the hazard communication standard (HCS) (437-002-1910.1200).

(4) Cleaning and replacement.

(a) Ensure that all reusable personal protective clothing and equipment required by this rule is cleaned, laundered, repaired, and replaced as needed to maintain its effectiveness.

(b) Ensure that beryllium is not removed from personal protective clothing and equipment by blowing, shaking or any other means that disperses beryllium into the air.

(c) Inform in writing the persons or the business entities who launder, clean or repair the personal protective clothing or equipment required by this rule of the potentially harmful effects of airborne exposure to and dermal contact with beryllium and that the personal protective clothing and equipment must be handled in accordance with this rule.

Stat. Auth.: ORS 654.025(2) and 656.726(4).
Stats. Implemented: ORS 654.001 through 654.295.
Hist: OR-OSHA Admin. Order 3-2017, f. 07/07/17, ef. 03/12/18.

437-002-2032 Hygiene areas and practices. This rule covers hygiene requirements for all employers covered under the beryllium rule scope, 437-002-2024.

(1) For each employee working in a beryllium work area or required to use personal protective clothing or equipment by this subdivision, you must:

(a) Provide readily accessible washing facilities in accordance with this rule and the Sanitation standards (437-002-1910.141 and 437-003-1926.51) to remove beryllium from the hands, face, and neck; and

(b) Ensure that employees who have dermal contact with beryllium wash any exposed skin at the end of the activity, process, or work shift and prior to eating, drinking, smoking, chewing tobacco or gum, applying cosmetics, or using the toilet.

(c) Provide employees with a designated change room where employees are required to remove their personal clothing.

(2) Wherever the employer allows employees to consume food or beverages at a worksite where beryllium is present, you must ensure that:

(a) Surfaces in eating and drinking areas are as free as practicable of beryllium:

(b) Employees do not enter any eating or drinking area with personal protective clothing or equipment unless, prior to entry, surface beryllium has been removed from the clothing or equipment by methods that do not disperse beryllium into the air or onto an employee's body; and

(c) Eating and drinking facilities provided by the employer are in accordance with the Sanitation standards (§ 1910.141 or 437-003-1926.51).

(3) Ensure that employees do not eat, drink, smoke, chew tobacco or gum, or apply cosmetics in regulated areas or work areas where there is a reasonable expectation of exposure above the TWA PEL or STEL.

(4) On fixed sites, provide showers when:

(a) Airborne exposures exceed or can reasonably be expected to exceed, the PEL or STEL.

(b) Beryllium can reasonably be expected to contaminate employees' hair or body parts other than hands, face, and neck.

(5) When showers are required, ensure that each employee showers at the end of the work shift or work activity if:

(a) The employee reasonably could have had airborne exposure above the TWA PEL or STEL; and

(b) Beryllium could reasonably have contaminated the employee's hair or body parts other than hands, face, and neck.

Stat. Auth.: ORS 654.025(2) and 656.726(4).
Stats. Implemented: ORS 654.001 through 654.295.
Hist: OR-OSHA Admin. Order 3-2017, f. 07/07/17, ef. 03/12/18.

437-002-2033 Housekeeping. This rule covers housekeeping requirements for all employers covered under the beryllium rule scope, 437-002-2024.

(1) Do not allow dry sweeping or dry brushing where such activity could contribute to employee exposure to beryllium unless wet sweeping, HEPA-filtered vacuuming or other methods that minimize the likelihood of exposure are not feasible.

(2) Do not allow compressed air to be used to clean clothing or surfaces where such activity could contribute to employee exposure to beryllium unless:

(a) The compressed air is used in conjunction with a ventilation system that effectively captures the dust cloud created by the compressed air; or
(b) No alternative method is feasible.

Stat. Auth.: ORS 654.025(2) and 656.726(4).
Stats. Implemented: ORS 654.001 through 654.295.
Hist: OR-OSHA Admin. Order 3-2017, f. 07/07/17, ef. 03/12/18.

437-002-2034 Medical surveillance. This rule describes the medical monitoring requirements of this subdivision.

(1) Make medical surveillance available to each employee:

(a) Who is or can be reasonably expected to exposed to beryllium at or above the action level for 30 or more days per year;

(b) Who shows signs or symptoms of CBD or other beryllium-related health effects;

(c) Who is exposed to beryllium during an emergency.

(2) You must also make medical surveillance available to each employee whose most recent written medical opinion required by this rule recommends periodic medical surveillance.

NOTE: The medical evaluation requirements of the respiratory protection rule, OAR 437-002-1910.134, still apply for employees wearing respiratory protection.

(3) Medical surveillance must be provided at no cost to the employee and at a reasonable time and place.

(4) Ensure that all medical examinations and procedures required by this rule are performed by a PLHCP as defined in 437-002-2025.

(5) Provide a medical examination:

(a) Initially within 30 days for every employee covered by paragraph (1) of this rule, except for any employee who has received a medical examination, provided in accordance with this rule, within the last two years;

(b) Every two years for each employee covered by paragraphs (1)(a), (1)(b), and (2) of this rule; and

(c) At the termination of employment for each employee who meets any of the criteria of paragraph (1)(a) of this rule at the time the employee's employment terminates, unless an examination has been provided in accordance with this rule during the six months prior to the date of termination.

(6) Ensure that the PLHCP conducting the examination advises the employee of the risks and benefits of participating in the medical surveillance program and the employee's right to opt out of any or all parts of the medical examination.

(7) The examination must include:

(a) A medical and work history, with emphasis on past and present airborne exposure to or dermal contact with beryllium, smoking history, and any history of respiratory system dysfunction;
(b) A physical examination with emphasis on the respiratory system;
(c) A physical examination for skin rashes;
(d) Pulmonary function tests, performed in accordance with the guidelines established by the American Thoracic Society including forced vital capacity (FVC) and forced expiratory volume in one second (FEV1);
(e) A standardized BeLPT or equivalent test, upon the first examination and at least every two years thereafter, unless the employee is confirmed positive. If the results of the BeLPT are other than normal, a follow-up BeLPT must be offered within 30 days, unless the employee has been confirmed positive. Samples must be analyzed in a laboratory certified under the College of American Pathologists/Clinical Laboratory Improvement Amendments (CLIA) guidelines to perform the BeLPT.
(f) A low dose computed tomography (LDCT) scan, when recommended by the PLHCP after considering the employee's history of exposure to beryllium along with other risk factors, such as smoking history, family medical history, sex, age, and presence of existing lung disease; and
(g) Any other test deemed appropriate by the PLHCP.

(8) Ensure that the examining PLHCP (and the agreed-upon CBD diagnostic center, if an evaluation is required under paragraph (15) of this rule) has a copy of this subdivision and provide the following information, if known:

(a) A description of the employee's former and current duties that relate to the employee's airborne exposure to and dermal contact with beryllium;

(b) The employee's former and current levels of airborne exposure;

(c) A description of any personal protective clothing and equipment, including respirators, used by the employee, including when and for how long the employee has used that personal protective clothing and equipment; and

(d) Information from records of employment-related medical examinations previously provided to the employee, currently within the control of the employer, after obtaining written consent from the employee.

(9) Ensure that the employee receives a written medical report from the licensed physician within 45 days of the examination (including any follow-up BeLPT required under paragraph (7)(e) of this rule) and that the PLHCP explains the results of the examination to the employee. Ensure the written report contains:

(a) A statement indicating the results of the medical examination, including the licensed physician's opinion as to whether the employee has:
(A) Any detected medical condition, such as CBD or beryllium sensitization (i.e., the employee is confirmed positive, as defined in OAR 437-002-2025), that may place the employee at increased risk from further airborne exposure, and
(B) Any medical conditions related to airborne exposures that require further evaluation or treatment.
(b) Any recommendations on:
(A) The employee's use of respirators, protective clothing, or equipment; or
(B) Limitations on the employee's airborne exposure to beryllium.

(c) If the employee is confirmed positive or diagnosed with CBD or if the licensed physician otherwise deems it appropriate, the written report must also contain a referral for an evaluation at a CBD diagnostic center.
(d) If the employee is confirmed positive or diagnosed with CBD the written report must also contain a recommendation for continued periodic medical surveillance.
(e) If the employee is confirmed positive or diagnosed with CBD the written report must also contain a recommendation for medical removal from airborne exposure to beryllium, as described in OAR 437-002-2035.

(10) Obtain a written medical opinion from the licensed physician within 45 days of the medical examination (including any follow-up BeLPT required by this rule). The written opinion must contain only the following:

(a) The date of the examination;
(b) A statement that the examination has met the requirements of this rule; and
(c) Any recommended limitations on the employee's use of respirators, protective clothing, or equipment; and

(d) A statement that the PLHCP has explained the results of the medical examination to the employee, including any tests conducted, any medical conditions related to airborne exposure that require further evaluation or treatment, and any special provisions for use of personal protective clothing or equipment.

(11) If the employee provides written authorization, the written opinion must also contain any recommended limitations on the employee's airborne exposure to beryllium.

(12) If the employee is confirmed positive or diagnosed with CBD or if the licensed physician otherwise deems it appropriate, and the employee provides written authorization, the written opinion must also contain a referral for an evaluation at a CBD diagnostic center.

(13) If the employee is confirmed positive or diagnosed with CBD and the employee provides written authorization, the written opinion must also contain a recommendation for continued periodic medical surveillance.

(14) If the employee is confirmed positive or diagnosed with CBD and the employee provides written authorization, the written opinion must also contain a recommendation for medical removal from airborne exposure to beryllium, as described in 437-002-2035.

(15) When a physician's written medical report indicates that the employee has been confirmed positive or diagnosed with CBD, or recommends referral to a CBD diagnostic center, provide an evaluation to the employee at a CBD diagnostic center that is mutually agreed upon by the employer and the employee. This evaluation must be provided within 30 days of receiving the written opinion, and at no cost to the employee.

(a) Ensure the employee receives a written medical report within 30 days of the medical examination from the CBD diagnostic center that includes:

(A) A statement indicating the results of the medical examination, including the licensed physician's opinion as to whether the employee has:

(i) Any detected medical condition, such as CBD or beryllium sensitization (i.e., the employee is confirmed positive, as defined in OAR 437-002-2025), that may place the employee at increased risk from further airborne exposure, and
(ii) Any medical conditions related to airborne exposure that require further evaluation or treatment.

(B) Any recommendations on:
(i) The employee's use of respirators, protective clothing, or equipment; or
(ii) Limitations on the employee's airborne exposure to beryllium.

(b) If the employee is confirmed positive or diagnosed with CBD the written report must also contain a recommendation for continued periodic medical surveillance.

(c) If the employee is confirmed positive or diagnosed with CBD the written report must also contain a recommendation for medical removal from airborne exposure

to beryllium, as described in OAR 437-002-2035.

(16) Obtain a written medical opinion from CBD diagnostic center within 30 days of the medical examination. The written opinion must contain only the following:

(a) The date of the examination;

(b) A statement that the examination has met the requirements of this rule; and

(c) Any recommended limitations on the employee's use of respirators, protective clothing, or equipment; and

(d) A statement that the PLHCP has explained the results of the medical examination to the employee, including any tests conducted, any medical conditions related to airborne exposure that require further evaluation or treatment, and any special provisions for use of personal protective clothing or equipment.

(e) If the employee provides written authorization, the written opinion must also contain:
(A) Any recommended limitations on the employee's airborne exposure to beryllium
(B) A recommendation for continued periodic medical surveillance if the employee is confirmed positive or diagnosed with CBD;
(C) A recommendation for medical removal from airborne exposure to beryllium, as described in 437-002-2035, if the employee is confirmed positive or diagnosed with CBD.

(17) After an employee has received the initial clinical evaluation at a CBD diagnostic center, the employee may choose to have any subsequent medical examinations for which the employee is eligible performed at a CBD diagnostic center mutually agreed upon by the employer and the employee. Provide such examinations at no cost to the employee.

Stat. Auth.: ORS 654.025(2) and 656.726(4).
Stats. Implemented: ORS 654.001 through 654.295.
Hist: OR-OSHA Admin. Order 3-2017, f. 07/07/17, ef. 03/12/18.

437-002-2035 Medical removal. This rule describes the medical removal requirements of this subdivision.

(1) An employee is eligible for medical removal, if the employee works in a job with airborne exposure at or above the action level and either:

(a) The employee provides the employer with:
(A) A written medical report indicating a confirmed positive finding or CBD diagnosis; or
(B) A written medical report recommending removal from airborne exposure to beryllium in accordance OAR 437-002-2034; or

(b) **The employer receives a written medical opinion recommending removal from airborne exposure to beryllium in accordance with 437-002-2034.**

(2) **If an employee is eligible for medical removal, provide the employee with the employee's choice of:**

(a) **Removal as described in paragraph (3) of this rule; or**

(b) **Remaining in a job with airborne exposure at or above the action level, provided that the employer provides, and ensures that the employee uses, respiratory protection that complies with OAR 437-002-2030 whenever airborne exposures are at or above the action level.**

(3) **If the employee chooses removal:**

(a) **If a comparable job is available where airborne exposures to beryllium are below the action level, and the employee is qualified for that job or can be trained within one month, the employer must remove the employee to that job. The employer must maintain for six months from the time of removal the employee's base earnings, seniority, and other rights and benefits that existed at the time of removal.**

(b) **If comparable work is not available, the employer must maintain the employee's base earnings, seniority, and other rights and benefits that existed at the time of removal for six months or until such time that comparable work described in paragraph (3)(a) of this rule becomes available, whichever comes first.**

(4) **Your obligation to provide medical removal protection benefits to a removed employee must be reduced to the extent that the employee receives compensation for earnings lost during the period of removal from a publicly or employer-funded compensation program, or receives income from another employer made possible by virtue of the employee's removal.**

Stat. Auth.: ORS 654.025(2) and 656.726(4).
Stats. Implemented: ORS 654.001 through 654.295.
Hist: OR-OSHA Admin. Order 3-2017, f. 07/07/17, ef. 03/12/18.

437-002-2036 Communication of beryllium hazards to employees.

(1) **Chemical manufacturers, importers, distributors, and employers must ensure that compliance with the requirements of the hazard communication rule (OAR 437-002-1910.1200) for beryllium. In classifying the hazards of beryllium, the following hazards must be addressed:**
(a) **Cancer;**
(b) **Lung effects (CBD and acute beryllium disease);**
(c) **Beryllium sensitization;**
(d) **Skin sensitization; and**

(e) **Skin, eye, and respiratory tract irritation.**

(2) **Include beryllium in the hazard communication program established to comply with the hazard communication rule. Ensure that each employee has access to labels on containers of beryllium and to safety data sheets, and is trained in accordance with the requirements of the hazard communication standard (OAR 437-002-1910.1200) and paragraph (4) of this rule.**

(3) **Label each bag and container of clothing, equipment, and materials contaminated with beryllium, and, at a minimum, include the following on the label:**

DANGER
CONTAINS BERYLLIUM
MAY CAUSE CANCER
CAUSES DAMAGE TO LUNGS
AVOID CREATING DUST
DO NOT GET ON SKIN

(4) **For each employee who has, or can reasonably be expected to have, airborne exposure to or dermal contact with beryllium:**

(a) **Provide initial training to each employee by the time of initial assignment; and**
(b) **Repeat the training required under this rule annually for each employee.**

(5) **Ensure that each employee who is, or can reasonably be expected to be, exposed to airborne beryllium can demonstrate knowledge and understanding of the following:**

(a) **The health hazards associated with airborne exposure to and contact with beryllium, including the signs and symptoms of CBD;**
(b) **The written exposure control plan, with emphasis on the location(s) of beryllium work areas, including any regulated areas, and the specific nature of operations that could result in airborne exposure, especially airborne exposure above the TWA PEL or STEL;**
(c) **The purpose, proper selection, fitting, proper use, and limitations of personal protective clothing and equipment, including respirators;**
(d) **Applicable emergency procedures;**
(e) **Measures employees can take to protect themselves from airborne exposure to and contact with beryllium, including personal hygiene practices;**
(f) **The purpose and a description of the medical surveillance program required by OAR 437-002-2034 including risks and benefits of each test to be offered;**
(g) **The purpose and a description of the medical removal protection provided under OAR 437-002-2035;**
(h) **The contents of the standard; and**
(i) **The employee's right of access to records under the Records Access standard (OAR 437-002-1910.1020).**

(6) When a workplace change (such as modification of equipment, tasks, or procedures) results in new or increased airborne exposure that exceeds, or can reasonably be expected to exceed, either the TWA PEL or the STEL, provide additional training to those employees affected by the change in airborne exposure

(7) Make a copy of this subdivision and its appendices readily available at no cost to each employee and designated employee representative(s).

Stat. Auth.: ORS 654.025(2) and 656.726(4).
Stats. Implemented: ORS 654.001 through 654.295.
Hist: OR-OSHA Admin. Order 3-2017, f. 07/07/17, ef. 03/12/18.

437-002-2037 Recordkeeping.

(1) Air monitoring data.

(a) Make and maintain an accurate record of all exposure measurements taken to assess employee exposure to beryllium, as prescribed in 437-002-2040.

(b) This record must include at least the following information:

(A) The date of measurement for each sample taken;
(B) The task monitored;
(C) Sampling and analytical methods used;
(D) Number, duration, and results of samples taken;
(E) Identity of the laboratory that performed the analysis;
(F) Type of personal protective equipment, including respirators, worn by the employees monitored; and
(G) Name, social security number, and job classification of all employees represented by the monitoring, indicating which employees were actually monitored.

(c) Ensure that exposure records are maintained and made available in accordance with OAR 437-002-1910.1020.

(2) Objective data.

(a) Make and maintain an accurate record of all objective data relied upon to comply with the requirements of this subdivision.

(b) This record must include at least the following information:

(A) The beryllium-containing material in question;
(B) The source of the objective data;
(C) The testing protocol and results of testing;
(D) A description of the process, task, or activity on which the objective data were based; and

(E) Other data relevant to the process, task, activity, material, or exposures on which the objective data were based.

(c) Ensure that objective data are maintained and made available in accordance with OAR 4374-002-1910.1020.

(3) Medical surveillance.

(a) Make and maintain an accurate record for each employee covered by medical surveillance under 437-002-2034.

(b) The record must include the following information about the employee:

(A) Name and social security number;
(B) A copy of the PLHCPs' and specialists' written medical opinions;
(C) A copy of the information provided to the PLHCPs and specialists.

(c) Ensure that medical records are maintained and made available in accordance with 437-002-1910.1020.

(4) Training.

(a) At the completion of any training required by this standard, the employer must prepare a record that indicates the name, social security number, and job classification of each employee trained, the date the training was completed, and the topic of the training.

(b) **This record must be maintained for three years after the completion of training.**

(5) Upon request, you must make all records maintained as a requirement of this subdivision available for examination and copying to the Director of the Oregon Department of Consumer and Business Services, or designee, and the Director of the National Institute for Occupational Safety and Health (NIOSH), U.S. Department of Health and Human Services, or designee, each employee, and each employee's designated representative(s) in accordance the Records Access standard 437-002-1910.1020).

(6) Comply with the requirements involving transfer of records set forth in the Records Access standard (437-002-1910.1020).

Stat. Auth.: ORS 654.025(2) and 656.726(4).
Stats. Implemented: ORS 654.001 through 654.295.
Hist: OR-OSHA Admin. Order 3-2017, f. 07/07/17, ef. 03/12/18.

437-002-2038 Dates. This rule is effective March 12, 2018, except:

(1) Change rooms and showers required by 437-002-2032 must be provided by March 11, 2019; and

(2) Engineering controls required by OAR 437-002-2029 must be implemented by March 10, 2020.

Stat. Auth.: ORS 654.025(2) and 656.726(4).
Stats. Implemented: ORS 654.001 through 654.295.
Hist: OR-OSHA Admin. Order 3-2017, f. 07/07/17, ef. 03/12/18.

DIVISION 3, CONSTRUCTION

Division 3/Z, Toxic and Hazardous Substances

437-003-1000 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.

Oregon 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	
			Concentra-tion	Maximum Duration
Benzene (a) (Z87.4-1969)	10 ppm	25 ppm	50 ppm	10 min.
Beryllium and beryllium compounds (Z37.17-1970)	2 $\mu g/m^3$	5 $\mu g/m^3$	25 $\mu g/m^3$	30 min.
Carbon tetrachloride (Z37.19-1967)	10 ppm	25 ppm	200 ppm	5 min. in any 4 hours

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.

(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:

$E = (CaTa + Cb\ Tb + ... CnTn) \div 8$

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
$[(2x150) + (2x75) + (4x50)] \div 8 = 81.25$ 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:

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

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.

Oregon Table Z-1 - Adopted Values (In Alphabetical Order)				
Substance	CAS No. [c]	ppm [a]	mg/m^3 [b]	Skin
Abate	3383-96-8	—	10	
Acetaldehyde	75-07-0	100	180	
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		(See 1910.1003)	
Acetylene	74-86-2	1,000	—	
Acetylene dichloride, see 1,2-Dichloro-ethylene				
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)	X
Aldrin	309-00-2	—	0.25	X
Allyl alcohol	107-18-6	2	5	X
Allyl chloride	107-05-1	1	3	
Allyl glycidyl ether (AGE)	106-92-3	5 (C) 10	22 (C) 45	
Allyl propyl disulfide	2179-59-1	2	12	
alpha Alumina Total Dust Respirable Fraction	1344-28-1	 — —	 10 5	
Aluminum Metal Dust Total Dust Respirable Fraction	7429-90-5	 — —	 10 5	
Alundum (A1203)		—	10	
4-Aminodiphenyl	92-67-1		(See 1910.1003)	
2-Aminoethanol, see Ethanolamine				
2-Aminopyride	504-29-0	0.5	2	
Ammonia	7664-41-7	25	18	
Ammonium Chloride Fumes	12125-02-9	—	10	
Ammonium sulfamate Total Dust Respirable Fraction	7773-06-0	 — —	 10 5	
n-Amyl acetate	628-63-7	100	525	
sec-Amyl Acetate	626-38-0	125	650	
Aniline and homologs	62-53-3	5	19	X
Anisidine (o, p-isomers)	29191-52-4	0.1	0.5	X
Antimony & Compounds (as Sb)	7440-36-0	—	0.5	
ANTU (alpha naphthyl-thiourea)	86-88-4	—	0.3	
Arsenic Inorganic Compounds (as As)	7440-38-2		(See 1910.1018) 0.01	
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)		
Asphalt (petroleum) Fumes	8052-42-4	—	5	
Azinphos-methyl	86-50-1	—	0.2	X
Barium (soluble compounds)	7440-39-3	—	0.5	
Barium Sulfate Total Dust Respirable Fraction	7727-43-7	 — —	 10 5	
Benomyl Total Dust Respirable Fraction	17804-35-2	 — —	 10 5	
Benzene See Oregon Table Z-2 for the limits applicable in the operations or sectors excluded in 1910.1028 [(d)]	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[(k)]**	7440-41-7		(See Oregon Table Z-2)	
Biphenyl, see Diphenyl				
Bismuth telluride (undoped) Total Dust Respirable Fraction	1304-82-1	 — —	 10 5	
Bismuth telluride (Se-doped)		—	5	
Bisphenol A, see Diglycidyl ether				
Boron oxide	1303-86-2	—	10	
Boron tribromide	10294-33-4	1	10	
Boron trifluoride	7637-07-2	(C) 1	(C) 3	
Bromine	7726-95-6	0.1	0.7	
Bromine pentafluoride	7789-30-2	0.1	0.7	
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))	
Butane	106-97-8	800	1,900	
Butanethiol, see Butyl mercaptan				
2-Butanone (Methyl Ethyl Ketone)	78-93-3	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	
Butyl lactate	138-22-7	1	5	
Butylamine	109-73-9	(C) 5	(C) 15	X
tert-Butyl chromate (as CrO_3)	1189-85-1	(See 1926.126)[(h)]		
n-Butyl glycidyl ether (BGE)	2426-08-6	50	270	

Butyl mercaptan	109-79-5	0.5	1.5	
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		
Calcium carbonate Total Dust Respirable Fraction	1317-65-3	 — —	 10 5	
Calcium hydroxide Total Dust Respirable Fraction	1305-62-0	 — —	 10 5	
Calcium oxide	1305-78-8	—	5	
Calcium silicate Total Dust Respirable Fraction	1344-95-2	 — —	 10 5	
Calcium sulfate Total Dust Respirable Fraction	7778-18-9	 — —	 10 5	
Camphor, synthetic	76-22-2	—	2	
Caprolactam (2-Oxonexa-methylenimine)	105-60-2	—	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)	
Cellulose Total Dust Respirable Fraction	9006-34-6	 — —	 10 5	
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-Chloro-prene				
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				
Chloroform (trichloromethane)	67-66-3	(C) 25	(C) 120	

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
2-Chloro-6-(trichloromethyl) pyridine Total Dust Respirable Fraction	1929-82-4	 — —	 10 5	
Chromic acid and chromates (as CrO_3)			(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 1926.1126)[(i)]		
Chromium metal & insol. salts	7440-47-3	—	1	
Clopidol Total Dust Respirable Fraction	2971-90-6	 — —	 10 5	
Coal Dust			(See Oregon Table Z-3)	
Coal tar pitch volatiles (Benzene soluble fraction) anthracene, BaP, phenanthracene, 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 Dusts and Mists	7440-50-8 7440-50-8	— —	0.1 1	
Corundum (A1203)	1302-74-5	—	10	
Cotton dust			(See 1910.1043)	
Cotton dust (raw)		—	1 [(e)]	
Crag® herbicide (Sesone) Total Dust Respirable Fraction	136-78-7	 — —	 10 5	
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
Cyanide (as CN)		—	5	X
Cyanogen	460-19-5	10	—	
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				
Diazinon	333-41-5	—	0.1	X
Diazomethane	334-88-3	0.2	0.4	
Diborane	19287-45-7	0.1	0.1	
Dibrom®	300-76-5	—	3	
1,2-Dibromo-3-chloropropane (DBCP)	96-12-8	0.001	(See 1910.1044)	
1,2-Dibromoethane, see Ethylene dibromide				
2-N-Dibutylaminoethanol	102-81-8	2	14	X
Dibutyl phosphate	107-66-4	1	5	
Dibutyl phthalate	84-74-2	—	5	
Dichloroacetylene	7572-29-4	(C) 0.1	(C) 0.4	
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	
Dichloroethyl Ether	111-44-4	5 (C) 15	30 (C) 90	X X
Dichloromethane, see Methylenechloride				
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
Dicyclohexylmethane 4,4'-diisocyanate (hydrogenated MDI, see Oregon Table Z-2 (Diisocyanates)	5124-30-1			
Dicyclopentadienyl iron Total Dust Respirable Fraction	102-54-5	 — —	 10 5	
Dieldrin	60-57-1	—	0.25	X
Diethylamine	109-89-7	25	75	
2-Diethylaminoethanol	100-37-8	10	50	X
Diethylene triamine	111-40-0	(C) 1	(C) 4	X
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				
Diisobutyl ketone	108-83-8	25	150	
Diisopropylamine	108-18-9	5	20	X

Dimethoxymethane, see Methylal				
Dimethyl acetamide	127-19-5	10	35	X
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)	528-29-0/ 99-65-0/ 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	
Diphenylamine	122-39-4	—	10	
Diphenylmethane diisocyanate (MDI), see Oregon Table Z-2 (Diisocyanates)				
Dipropylene glycol methyl ether	34590-94-8	100	600	X
Diquat	231-36-7	—	0.5	
Di-sec, octyl phthalate (Di-2-ethyl-hexyl-phthalate)	117-81-7	—	5	
Emery Total Dust Respirable Fraction	12415-34-8	 — —	 10 5	
Endosulfan (Thiodan®)	115-29-7	—	0.1	X
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				
Ethane	74-84-0	1,000	—	
Ethanethiol, see Ethyl mercaptan				
Ethanolamine	141-43-5	3	6	
2-Ethoxyethanol (Cellosolve)	110-80-5	100	370	
2-Ethoxyethyl acetate (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	
Ethyl mercaptan	75-08-1	0.5 (C) 10	1 (C) 25	
Ethyl silicate	78-10-4	100	850	
Ethylene	74-85-1	1,000	—	
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)	
Ethylene glycol particulate		—	10	
Ethylene glycol, Vapor	107-21-1	100	260	
Ethylene glycol dinitrate	628-96-6	(C) 0.2	(C) 1	X
Ethylene glycol methyl acetate (Methyl cellosolve acetate) (2-Methoxy-ethel acetate)	110-49-6	25	120	
Ethylenimine	151-56-4		(See 1910.1003)	
Ethylene oxide	75-21-8		(See 1910.1047)	
Ethylidine chloride, see 1,1-Dichloroethane				
N-Ethylmorpholine	100-74-3	20	94	X
Ferbam Total Dust Respirable Fraction	14484-64-1	 — —	 10 5	
Ferrovanadium dust	12604-58-9	—	1	
Fibrous glass, see Glass, Fibrous				
Fluorides (As F)		—	2.5 (See Oregon Table Z-2)	
Fluorine	7782-41-4	0.1	0.2	
Fluorotrichloromethane (Trichlorofluoro-methane)	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
Furfuryl alcohol	98-00-0	5	20	
Gasoline	8006-61-9	—	[g]	
Germanium tetrahydride	7782-65-2	0.2	0.6	
Glass, Fibrous or dust		—	10	
Glycerin (mist) Total Dust Respirable Fraction	56-81-5	 — —	 10 5	
Glycidol	556-52-5	50	150	

Glycol monoethyl ether, see 2-Ethoxythanol				
Grain dust (oat, wheat, barley)		—	10	
Graphite natural, respirable	7782-42-5		(See Oregon Table Z-3)	
Graphite (Synthetic) Total Dust Respirable Fraction	7782-42-5	 — —	 10 5	
Guthion®, see Azinphosmethyl				
Gypsum Total Dust Respirable Fraction	13397-24-5	 — —	 10 5	
Hafnium	7440-58-6	—	0.5	
Heptachlor	76-44-8	—	0.5	X
Heptane (n-heptane)	142-82-5	500	2,000	
Hexachlorocyclopentadiene	77-47-4	0.1	1	
Hexachloroethane	67-72-1	1	10	X
Hexachloronaphthalene	1335-87-1	—	0.2	X
Hexafluoracetone	684-16-2	0.1	0.7	X
Hexamethylene diisocyanate (HDI), see Oregon Table Z-2 (Diisocyanates)	822-06-01			
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	
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	
Indene	95-13-6	10	45	
Indium and compounds (as In)	7440-74-6	—	0.1	
Iodine	7553-56-2	(C) 0.1	(C) 1	
Iron oxide fume	1309-37-1	—	10	
Iron pentacarbonyl	13463-40-6	0.1	.23	
Iron salts, soluble, as Fe		—	1	
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	
Isophorone	78-59-1	10	55	
Isophorone diisocyanate (IPDI), see Oregon Table Z-2 (Diisocyanates)	4098-71-9			
Isopropyl acetate	108-21-4	250	950	
Isopropyl alcohol	67-63-0	400	980	
Isopropylamine	75-31-0	5	12	
Isopropyl ether	108-20-3	250	1,050	
Isopropyl glycidyl ether (IGE)	4016-14-2	50	240	
Kaolin Total Dust Respirable Fraction	1332-58-7	 — —	 10 5	
Ketene	463-51-4	0.5	0.9	
Lead, inorganic (as Pb)	7439-92-1	(See 1910.1025 & 1926.62)		
Lead arsenate	7784-40-9	(See 1910.1018)	0.01	
Limestone Total Dust Respirable Fraction	1317-65-3	 — —	 10 5	
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	
Magnesite Total Dust Respirable Fraction	546-93-0	 — —	 10 5	
Magnesium oxide fume Total Dust Respirable Fraction	1309-48-4	 — —	 10 5	
Malathion	121-75-5	—	10	X
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	
Marble Total Dust Respirable Fraction	1317-65-3	 — —	 10 5	
Mercury (aryl, inorganic, organo, and vapor) (as Hg)	7439-97-6		(See Oregon Table Z-2)	
Mesityl oxide	141-79-7	25	100	
Methane	74-82-8	1,000	—	
Methanethiol, see Methyl mercaptan				
Methoxychlor Total Dust Respirable Fraction	72-43-5	 — —	 10 5	
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
Methylacrylonitrile	126-98-7	1	3	X

Methylal (dimethoxy-methane)	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	
Methyl bromide	74-83-9	15 (C) 20	60 (C) 80	X
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)	
Methyl 2-cyanoacrylate	137-05-3	2	8	
Methylcyclohexane	108-87-2	500	2,000	
Methycyclohexanol	25639-42-3	50	235	
o-Methylcyclohexanone	583-60-8	50	230	X
2-Methylcyclopentadienyl manganese tricarbonyl (as Mn)	12108-13-3	0.1	0.2	X
Methyl demeton	8022-00-2	—	0.5	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
Methyl mercaptan	74-93-1	0.5 (C) 10	1 (C) 20	
Methyl methacrylate	80-62-6	100	410	
Methyl parathion	298-00-0	—	0.2	X
Methyl propyl ketone, see 2-Pentanone				
Methyl silicate	681-84-5	(C) 5	(C) 30	
a-Methyl styrene	98-83-9	(C) 100	(C) 480	
Methylene bisphenyl isocyanate (MDI)	101-68-8	(See Oregon Table Z-2 (diisocyanates)		
Methylenedianiline (MDA)		(See 1910.1050 & 1926.60) 0.01		
Methylene Chloride	75-09-2	25	(See 1910.1052)	
Mineral Wool Fiber		—	10	
MOCA	101-14-4		(See 437-002-0346)	
Molybdenum (soluble compounds) (insoluble compounds)	7439-98-7	 — —	 5 10	
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	
Naphthalene diisocyanate (NDI), see Oregon Table Z-2 (Diisocyanates)	3173-72-6			
Alpha naphthylamine	134-32-7		(See 1910.1003)	
B-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	
Nicotine	54-11-5	0.075	0.5	X
Nitric acid	7697-37-2	2	5	
Nitric oxide	10102-43-9	25	30	
p-Nitroaniline	100-01-6	1	6	
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				
Nitrous oxide	10024-97-2	50	90	
Octachloronaphthalene	2234-13-1	—	0.1	X
Octane	111-65-9	400	1,900	
Oil mist (mineral)	8012-95-1	—	5	
Oil mist, vapor		—	[g]	
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	
Parafin wax fume	8002-74-2	—	1	
Paraquat respirable dust	4685-14-7/ 1910-42-5/ 2074-50-2	—	0.5	X
Parathion	56-38-2	—	0.1	X
Particulates not otherwise regulated (PNOR)[f] Total Dust		—	10	

Respirable Fraction		—	5	
Pentaborane	19624-22-7	0.005	0.01	
Pentachloronaphthalene	1321-64-8	—	0.5	X
Pentachlorophenol	87-86-5	—	0.5	X
Pentaerythritol Total Dust Respirable Fraction	115-77-5	 — —	 10 5	
Pentane	109-66-0	500	1,500	
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	
Perlite Total Dust Respirable Fraction	93763-70-3	 — —	 10 5	
Petroleum distillates (naphtha) (Rubber Solvent)		500	2,000 [(g)]	
Phenol	108-95-2	5	19	X
Phenothiazine	92-84-2	—	5	X
p-Phenylene diamine	106-50-3	—	0.1	X
Phenyl ether (vapor)	101-84-8	1	7	
Phenyl ether - biphenyl 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
Phenylphosphine	638-21-1	(C) 0.05	(C) 0.25	
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	
Picloram Total Dust Respirable Fraction	1918-02-1	 — —	 10 5	
Picric acid	88-89-1	—	0.1	X
Pindone (2-Pivalyl-1, 3-indandione)	83-26-1	—	0.1	
Plaster of Paris Total Dust Respirable Fraction	26499-65-0	 — —	 10 5	
Platinum (Soluble Salts) as Pt	7440-06-4	—	0.002	
Polychlorobiphenyls, see Chlorodiphenyls				
Portland Cement Total Dust Respirable Fraction	65997-15-1	 — —	 10 5	

Propane	74-98-6	1,000	1,800	
Beta-Propiolactone	57-57-8		(See 1910.1003)	
Propargyl alcohol	107-19-7	1	—	X
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	
Propylene glycol monomethyl ether	107-98-2	100	360	
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	
RDX (Cyclonite)	121-82-4	—	1.5	X
Rhodium, Metal fume and dusts, as Rh Soluble salts	7440-16-6 7440-16-6	— —	0.1 0.001	
Ronnel	299-84-3	—	10	
Rosin core solder pyrolysis Products (as Formaldehyde)		—	0.1	
Rotenone	83-79-4	—	5	
Rouge Total Dust Respirable Fraction		 — —	 10 5	
Selenium compounds (as Se)	7782-49-2	—	0.2	
Selenium hexafluoride (as Se)	7783-79-1	0.05	0.4	
Silica, crystalline, respirable dust(j) Cristobalite Quartz Tripoli (as quartz) Tridamite	 14464–46–1 14808–60–7 1317–95–9 15468–32–3	 — 	(See Division 2/Z Silica)	
Silicon Total Dust Respirable Fraction	7440-21-3	 — —	 10 5	
Silicon carbide Total Dust Respirable Fraction	409-21-2	 — —	 10 5	
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	
Starch Total Dust Respirable Fraction	9005-25-8	 — —	 10 5	
Stibine	7803-52-3	0.1	0.5	
Stoddard solvent	8052-41-3	200	1,150	
Strychnine	57-24-9	—	0.15	
Styrene	100-42-5		(See Oregon Table Z-2)	
Subtilisins (Proteolytic enzymes) (as 100% pure crystalline enzyme)	1395-21-7	—	(C) 0.0003	

Sucrose Total Dust Respirable Fraction	57-50-1	 — —	 10 5	
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	
Sulfur tetrafluoride	7783-60-0	0.1	0.4	
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	
Temephos Total Dust Respirable Fraction	3383-96-8	 — —	 10 5	
TEPP (Tetraethyl pyrophosphate)	107-49-3	0.004	0.05	X
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 tetra-chloride				
Tetraethyl lead (as Pb)	78-00-2	—	0.075	X
Tetrahydrofuran	109-99-9	200	590	
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-methyl-nitramine)	479-45-8	—	1.5	X
Thallium (soluble compounds) as Tl	7440-28-0	—	0.1	X
4,4'-Thiobis (6-tert, Butyl-m-cresol) Total Dust Respirable Fraction	96-69-5	 — —	 10 5	
Thiram	137-26-8		(See 437-002-0373) 0.15	
Tin (inorganic compounds, except oxides) as Sn	7440-31-5	—	2	
Tin (organic compounds)	7440-31-5	—	0.1	
Tin oxide Total Dust Respirable Fraction	1332-29-2	 — —	 10 5	
Titanium dioxide	13463-67-7	—	10	
Toluene (toluol)	108-88-3		(See Oregon	

			Table Z-2)	
Toluene diisocyanate (TDI), See Oregon Table Z-2 (Diisocyanates)	584-84-9			
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		(See Oregon Table Z-2)	
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	
Trimethyl benzene	25551-13-7	25	120	
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	
Tungsten & compounds, as W Soluble Insoluble	7440-33-7	 — —	 1 5	
Turpentine	8006-64-2	100	560	
Uranium (as U) Soluble compounds Insoluble compounds	7440-61-1	 — —	 0.05 0.2	
Vanadium respirable dust (as V_2O_5) Fume (as V_2O_5)	 1314-62-1 1314-62-1	 — —	 (C) 0.5 (C) 0.05	
Vegetable oil mist Total Dust Respirable Fraction		 — —	 10 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	
Wood Dust (non-allergenic)		—	10	
Xylene (o-, m-, p-isomers)	1330-20-7	100	435	
Xylidine	1300-73-8	5	25	X
Yttrim	7440-65-5	—	1	
Zinc chloride fume	7646-85-7	—	1	

Zinc oxide Total Dust Respirable Fraction	1314-13-2	 — —	 10 5	
Zinc oxide fume	1314-13-2	—	5	
Zinc stearate Total Dust Respirable Fraction	557-05-1	 — —	 10 5	
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 1926.1126 is stayed or is otherwise not in effect, the exposure limit is a ceiling of 0.1 mg/m^3.

(i) If the exposure limit in 1926.1126 is stayed or is otherwise not in effect, the exposure limit is 0.1 mg/m^3 (as CrO_3) as an 8-hour TWA.

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

OREGON 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
			Concen-tration	Maximum Duration	
Benzene [a] (Z87.4-1969)	10 ppm	25 ppm	50 ppm	10 min.	
Beryllium, and beryllium compounds (Z37.29-1970)	2 µg/m^3	5 µg/m^3	25 µg/m^3	30 min.	
Cadmium fume [b] (Z37.5-1970)	0.1 mg/m^3	0.3 mg/m^3			
Cadmium dust [b] (Z37.5-1970)	0.2 mg/m^3	0.6 mg/m^3			
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_3) [c]		0.1 mg/m^3			
Ethylene dibromide (Z37.31-1970)	20 ppm	30 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^3				
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 measureable exposure occurs	
Mercury (Z37.8-1971)	0.05 mg/m^3	0.1 mg/m^3			X
Methyl chloride (Z37.18-1969)	100 ppm	200 ppm	300 ppm	5 min. in any 3 hrs	
Organo (alkyl) mercury (Z37.30-1969)	0.001 mg/m^3	0.01 mg/m^3			X
Styrene (Z37.15-1969)	100 ppm	200 ppm	600 ppm	5 min. in any 3 hrs	
Tetrachloroethylene (Z37.22-1967)	100 ppm	200 ppm	300 ppm	5 min. in any 3 hrs	
Toluene (Z37.12-1967)	100 ppm	300 ppm	500 ppm	10 min.	
Trichloroethylene (Z37.19-1967)	100 ppm	200 ppm	300 ppm	5 min. in any 2 hrs	

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	
			Concen-tration	Maximum Duration
Diisocyanates				
Dicyclohexylmethane 4,4'-diiso-cyanate (hydrogenated MDI)	.055 mg/m .005 ppm	.210 mg/m^3 .02 ppm		
Diphenylmethane diisocyanate (MDI)	.050 mg/m^3 .005 ppm	.200 mg/m^3 .02 ppm		
Hexamethylene diisocyanate (HDI)	.035 mg/m^3 .005 ppm	.140 mg/m^3 .02 ppm		
1,6 Hexamethylene diisocyanated Based Adduct (includes HDI-Biuret trimer, and other polymeric forms of HDI, including isocyanurates)	0.5 mg/m^3	1.0 mg/m^3		
Isophorone diisocyanate (IPDI)	.045 mg/m^3 .005 ppm	.180 mg/m^3 .02 ppm		
Napthalene diisocyanate (NDI)	.040 mg/m^3 .005 ppm	.170 mg/m^3 .02 ppm		
Toluene diisocyanate (TDI)	.035 mg/m^3 .005 ppm	.140 mg/m^3 .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 on 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, 1926.1126, is stayed or is otherwise not in effect.

OREGON TABLE Z-3 – MINERAL DUSTS		
Substance	mppcf [(a)]	mg/m ^{3}
Silica:		
Crystalline		
Quartz (respirable) ……		0.1 mg/m^3
Quartz (total dust) ……..		$\frac{30 \text{ mg/m}^3}{\%SiO_2 + 2}$
Cristobalite (respirable)		0.05 mg/m^3
Tridymite: Use 1/2 the value calculated from the formulae for quartz.		
Amorphous, including natural diatomaceous earth ……..	20	$\frac{80 \text{ mg/m}^3}{\%SiO_2}$
Silicates (less than 1% crystalline silica):		
Mica …….	20	
Soapstone ……...	20	
Talc (not containing asbestos) …….	20 [(c)]	
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^3
Coal Dust:		
Respirable fraction less than 5% SiO_2 ……..		2.4 mg/m^3 [(e) (f)]
Coal Dust:		
Respirable fraction greater than 5% SiO_2 ……		0.1 mg/m^3 [(e)]
Inert or Nuisance Dust: [(d)]		
Respirable fraction ……..		5 mg/m^3
Total dust ……...		10 mg/m^3

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:

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

(b) 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.

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

(d) 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/m3 in the table for coal dust is 4.5 mg/m^3.

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 13-1989, f. 7/17/89, ef. 7/17/89.
OR-OSHA Admin. Order 6-1997, f. 5/2/97, ef. 5/2/97.
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.

DIVISION 5, MARITIME ACTIVITIES

Part 1915 – Occupational Safety and Health Standards For Shipyard Employment

437-005-0001
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 1915, in the Federal Register:
(1) Subdivision A
(a) 29 CFR 1915.1. Purpose and authority, published 4/20/82, Federal Register (FR) vol. 47, p. 16984.
(b) 29 CFR 1915.2. Scope and application, published 4/20/82, FR vol. 47, p. 16984.
(c) 29 CFR 1915.3. Responsibility, published 4/20/82, FR vol. 47, p. 16984.
(d) 29 CFR 1915.4. Definitions, published 7/3/02, FR vol. 67, no. 128, p. 44541.
(e) 29 CFR 1915.5. Incorporation by reference, published 3/25/16, Federal Register vol. 81, no. 58, p. 16085.
(f) 29 CFR 1915.6. Commercial diving operations, published 4/20/82, FR vol. 47, p. 16984.
(g) 29 CFR 1915.7. Competent person, published 7/25/94, FR vol. 59, p. 37856.
(h) 29 CFR 1915.9. Compliance duties owed to each employee, published 12/12/08, FR vol. 73, no. 240, pp. 75568-75589.
(2) Subdivision B
(a) 29 CFR 1915.11. Scope, application and definitions applicable to this Subpart, published 7/25/94, FR vol. 59, p. 37857.
(b) 29 CFR 1915.12. Precautions before entering confined and enclosed spaces and other dangerous atmospheres, published 3/16/95, FR vol. 60, no. 51, p. 14218.
(c) 29 CFR 1915.13. Cleaning and other cold work, published 7/25/94, FR vol. 59, p. 37859.
(d) 29 CFR 1915.14. Hot work, published 7/3/02, FR vol. 67, no. 128, p. 44541.
(e) 29 CFR 1915.15. Maintenance of safe conditions, published 6/22/12, FR vol. 77, no. 121, p. 37587.
(f) 29 CFR 1915.16. Warning signs and labels, published 7/25/94, FR vol. 59, p. 37861.
Appendix A to Subpart B published 6/8/11, Federal Register, vol. 76, no. 110, p. 33590.
Appendix B to Subpart B published 7/25/94, FR vol. 59, p. 37816.
(3) Subdivision C
(a) 29 CFR 1915.31. Scope & application of subdivision, published 4/20/82, FR vol. 47, p. 16984.
(b) 29 CFR 1915.32. Toxic cleaning solvents, published 5/24/96, FR vol. 61, no. 102, p. 26351.
(c) 29 CFR 1915.33. Chemical paint & preservative remover, published 5/24/96, FR vol. 61, no. 102, p. 26351.
(d) 29 CFR 1915.34. Mechanical paint removers, published 5/24/96, FR vol. 61, no. 102, p. 26351.
(e) 29 CFR 1915.35. Painting, published 7/3/02, FR vol. 67, no. 128, p. 44541.
(f) 29 CFR 1915.36. Flammable liquids, published 4/20/82, FR vol. 47, p. 16984.
(4) Subdivision D
(a) 29 CFR 1915.51. Ventilation & protection in welding, cutting and heating, published 7/3/02, FR vol. 67, no. 128, p. 44541.
(b) 29 CFR 1915.52. Fire prevention. REMOVED 9/15/04, FR vol. 69, p. 55667.

(c) 29 CFR 1915.53. Welding, cutting and heating of hollow metal containers & structure not covered by 1915.12, published 7/3/02, FR vol. 67, no. 128, p. 44541.
(d) 29 CFR 1915.55. Gas welding & cutting, published 4/20/82, FR vol. 47, p. 16984.
(e) 29 CFR 1915.56. Arc welding and cutting, published 4/20/82, FR vol. 47, p. 16984.
(f) 29 CFR 1915.57. Uses of fissionable material in ship repairing and shipbuilding, published 4/20/82, FR vol. 47, p. 16984.
(5) Subdivision E
(a) 29 CFR 1915.71. Scaffolds or staging, published 7/3/02, FR vol. 67, no. 128, p. 44541.
(b) 29 CFR 1915.72. Ladders, published 7/3/02, FR vol. 67, no. 128, p. 44541.
(c) 29 CFR 1915.73. Guarding of deck openings and edges, published 7/3/02, FR vol. 67, no. 128, p. 44541.
(d) 29 CFR 1915.74. Access to vessels, published 7/3/02, FR vol. 67, no. 128, p. 44541.
(e) 29 CFR 1915.75. Access to and guarding of dry docks and marine railways, published 7/3/02, FR vol. 67, no. 128, p. 44541.
(f) 29 CFR 1915.76. Access to cargo spaces and confined spaces, published 4/20/82, FR vol. 47, p. 16984.
(g) 29 CFR 1915.77. Working surfaces, published amended 7/3/02, FR vol. 67, no. 128, p. 44541.
(6) Subdivision F
(a) 29 CFR 1915.80 Scope, application, definitions and effective dates, published 5/2/11, Federal Register vol. 76, no. 84, p. 24576.
(b) 29 CFR 1915.81 Housekeeping, published 5/2/11, Federal Register vol. 76, no. 84, p. 24576.
(c) 29 CFR 1915.82 Lighting, published 5/2/11, Federal Register vol. 76, no. 84, p. 24576.
(d) 29 CFR 1915.83 Utilities, published 5/2/11, Federal Register vol. 76, no. 84, p. 24576.
(e) 29 CFR 1915.84 Working alone, published 5/2/11, Federal Register vol. 76, no. 84, p. 24576.
(f) 29 CFR 1915.85 Vessel radar and communication systems, published 5/2/11, Federal Register vol. 76, no. 84, p. 24576.
(g) 29 CFR 1915.86 Lifeboats, published 5/2/11, Federal Register vol. 76, no. 84, p. 24576.
(h) 29 CFR 1915.87 Medical services and first aid, published 5/2/11, Federal Register vol. 76, no. 84, p. 24576.
(i) 29 CFR 1915.88 Sanitation, published 5/2/11, Federal Register vol. 76, no. 84, p. 24576.
(j) 29 CFR 1915.89 Control of hazardous energy (lockout/tagout), published 5/2/11, Federal Register vol. 76, no. 84, p. 24576.
(k) 29 CFR 1915.90 Safety color code for marking physical hazards, published 5/2/11, Federal Register vol. 76, no. 84, p. 24576.
(l) 29 CFR 1915.91. Accident prevention signs and tags, published 5/2/11, Federal Register vol. 76, no. 84, p. 24576.
(m) 29 CFR 1915.92. Retention of DOT markings, placards, and labels, published 5/2/11, Federal Register vol. 76, no. 84, p. 24576.
(n) 29 CFR 1915.93. Motor vehicle safety equipment, operation, and maintenance, published 5/2/11, Federal Register vol. 76, no. 84, p. 24576.
(o) 29 CFR 1915.94. Servicing of multi-piece and single-piece rim wheels, published 5/2/11, Federal Register vol. 76, no. 84, p. 24576.
(7) Subdivision G
(a) 29 CFR 1915.111. Inspection, published 4/20/ 82, FR vol. 47, p. 16984.
(b) 29 CFR 1915.112. Ropes, chains and slings, published 6/8/11, Federal Register, vol. 76, no. 110, p. 33590.
(c) 29 CFR 1915.113. Shackles and hooks, published 6/8/11, Federal Register, vol. 76, no. 110, p. 33590.

(d) 29 CFR 1915.114. Chain falls and pull-lifts, published 4/20/82, FR vol. 47, p. 16984.
(e) 29 CFR 1915.115. Hoisting and hauling equipment, published 7/3/02, FR vol. 67, no. 128, p. 44541.
(f) 29 CFR 1915.116. Use of gear, published 7/3/02, FR vol. 67, no. 128, p. 44541.
(g) 29 CFR 1915.117. Qualifications of operators, published 4/20/82, FR vol. 47, p. 16984.
(h) 29 CFR 1915.118. Tables, published 7/3/02, FR vol. 67, no. 128, p. 44541.
(8) Subdivision H
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(b) 29 CFR 1915.132. Portable electric tools, published 4/20/82, FR vol. 47, p. 16984.
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(b) 29 CFR 1915.152. General requirements, published 6/8/11, Federal Register, vol. 76, no. 110, p. 33590.
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(12) Subdivision L

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(14) Subdivision P
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(b) 29 CFR 1915.502. Fire safety plan, published 9/15/04, FR vol. 69, p. 55667.
(c) 29 CFR 1915.503. Precautions for hot work, published 9/15/04, FR vol. 69, p. 55667.
(d) 29 CFR 1915.504. Fire watches, published 9/15/04, FR vol. 69, p. 55667.
(e) 29 CFR 1915.505. Fire response, published 10/17/06, FR vol. 71, no. 200, p. 60843.
(f) 29 CFR 1915.506. Hazards of fixed extinguishing systems on board vessels and vessel sections, published 9/15/04, FR vol. 69, p. 55667.
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(b) 29 CFR 1915.1001, Asbestos, published 2/8/13, FR vol. 78, no. 27, p. 9311.
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Appendix E to 1915.1001, published 6/29/95, FR vol. 60, p. 33972.
Appendix F to 1915.1001, published 6/29/95, FR vol. 60, p. 33972.
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Appendix H to 1915.1001, published 6/29/95, FR vol. 60, p. 33972.
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(d) 29 CFR 1915.1003. 13 Carcinogens (4-Nitrobiphenyl, etc.), published 6/20/96, FR vol. 61, p. 31427.
(e) 29 CFR 1915.1004. alpha-Naphthylamine, published 6/20/96, FR vol. 61, p. 31427.
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(g) 29 CFR 1915.1006. Methyl chloromethyl ether, published 6/20/96, FR vol. 61, p. 31427.
(h) 29 CFR 1915.1007. 3,3'Dichlorobenzidiene (and its salts), published 6/20/96, FR vol. 61, p. 31427.
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(j) 29 CFR 1915.1009. beta-Naphthylamine, published 6/20/96, FR vol. 61, p. 31427.
(k) 29 CFR 1915.1010. Benzidine, published 6/20/96, FR vol. 61, p. 31427.
(l) 29 CFR 1915.1011. 4-Aminodiphenyl, published 6/20/96, FR vol. 61, p. 31427.
(m) 29 CFR 1915.1012. Ethyleneimine, published 6/20/96, FR vol. 61, p. 31427.
(n) 29 CFR 1915.1013. beta-Propiolactone, published 6/20/96, FR vol. 61, p. 31427.
(o) 29 CFR 1915.1014. 2-Acetylaminofluorene, published 6/20/96, FR vol. 61, p. 31427.
(p) 29 CFR 1915.1015. 4-Dimethylaminoazobenzene, published 6/20/96, FR vol. 61, p. 31427.

(q) 29 CFR 1915.1016. N-Nitrosodimethylamine, published 6/20/96, FR vol. 61, p. 31427.
(r) 29 CFR 1915.1017. Vinyl chloride, published 6/20/96, FR vol. 61, p. 31427.
(s) 29 CFR 1915.1018. Inorganic arsenic, published 6/20/96, FR vol. 61, p. 31427.
(t) 29 CFR 1915.1020 Access to employee exposure and medical records, published 6/20/96, FR vol. 61, p. 31427.
(u) 29 CFR 1915.1024 Beryllium, published 1/9/17, FR vol. 82, no. 5, p. 2735.
([~~u~~]**v**) 29 CFR 1915.1025. Lead, published 6/20/96, FR vol. 61, p. 31427.
([~~v~~]**w**) 29 CFR 1915.1026 Chromium (VI), published 3/26/12, FR vol. 77, no. 58, p. 17574.
([~~w~~]**x**) 29 CFR 1915.1027. Cadmium, published 6/20/96, FR vol. 61, p. 31427.
([~~x~~]**y**) 29 CFR 1915.1028. Benzene, published 6/20/96, FR vol. 61, p. 31427.
([~~y~~]**z**) 29 CFR 1915.1030. Bloodborne pathogens, published 6/20/96, FR vol. 61, p. 31427.
([~~z~~]**aa**) 29 CFR 1915.1044. 1,2 dibromo-3-chloropropane, published 6/20/96, FR vol. 61, p. 31427.
([~~aa~~]**bb**) 29 CFR 1915.1045. Acrylonitrile, published 6/20/96, FR vol. 61, p. 31427.
([~~bb~~]**cc**) 29 CFR 1915.1047. Ethylene oxide, published 6/20/96, FR vol. 61, p. 31427.
([~~cc~~]**dd**) 29 CFR 1915.1048. Formaldehyde, published 6/20/96, FR vol. 61, p. 31427.
([~~dd~~]**ee**) 29 CFR 1915.1050. Methylenedianiline, published 6/20/96, FR vol. 61, p. 31427.
([~~ee~~]**ff**) 29 CFR 1915.1052 Methylene Chloride, published 1/10/97, Federal Register, vol. 62, no. 7, p. 1619.
([~~ff~~]**gg**) 29 CFR 1915.1053 Respirable Crystalline Silica, published 3/25/16, Federal Register, vol. 81, no. 58, p. 16286.
([~~gg~~]**hh**) 29 CFR 1915.1120 Access to employee exposure and medical records has been redesignated to §1915.1020.
(Note: 29 CFR 1915.99, Hazard Communication was redesignated as 1915.1200 on 7/1/93, FR vol. 58, no. 125, p. 35514.)
([~~hh~~]**ii**) 29 CFR 1915.1200. Hazard communication, published 6/20/96, FR vol. 61, p. 31427.
([~~ii~~]**jj**) 29 CFR 1915.1450. Occupational exposure to hazardous chemicals in laboratories, published 6/20/96, FR vol. 61, p. 31427.

Stat. Auth.: ORS 654.025(2) and 656.726(4).
Stats. Implemented: ORS 654.001 to 654.295.
Hist: OR-OSHA Admin. Order 9-1992, f. 9/24/92, ef. 11/1/92.
OR-OSHA Admin. Order 1-1993, f. 1/22/93, ef. 1/22/93.
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OR-OSHA Admin. Order 5-1996, f. 11/29/96, ef. 18/29/96.
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OR-OSHA Admin. Order 3-1997, f. 3/28/97, ef. 3/28/97.
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OR-OSHA Admin. Order 7-2012, f. 12/14/12, ef. 12/14/12.
OR-OSHA Admin. Order 4-2013, f. 7/19/13, ef. 7/19/13.
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OR-OSHA Admin. Order 3-2017, f. 07/07/17, ef. 03/12/18.