DEPARTMENT OF LICENSING AND REGULATORY AFFAIRS

DIRECTOR'S OFFICE

OCCUPATIONAL HEALTH STANDARDS

(By authority conferred on the director of the department of licensing and regulatory affairs by sections 14 and 24 of 1974 PA 154, MCL 408.1014 and 408.1024; and Executive Reorganization Orders Nos. 1996-1, 1996-2, 2003-1, 2008-4, and 2011-4, MCL 330.3101, 445.2001, 445.2011, 445.2025 and 445.2030)

PART 601. AIR CONTAMINANTS FOR CONSTRUCTION

R 325.60151 Construction air contaminants; scope; applicability; replacement of O.H. rules.

Rule 1. (1) An employer shall ensure that employee exposures to inhalation, ingestion, skin absorption, or contact with any material or substance at a concentration above those specified in the "Threshold Limit Values of Airborne Contaminants for 1970" of the American Conference of Governmental Industrial Hygienists, as listed in R 325.60154 to R 325.60161, are avoided.

(2) To achieve compliance with subrule (1) of this rule, an employer shall ensure that administrative or engineering controls are implemented whenever feasible. If administrative or engineering controls are not feasible to achieve full compliance, then protective equipment or other protective measures shall be used to keep the exposure of employees to air contaminants within the limits prescribed in this rule. Any equipment and technical measures used for this purpose shall first be approved for each particular use by a competent industrial hygienist or other technically qualified person. Respirators shall be used in a manner that is in compliance with occupational health standard part 451 “Respiratory Protection,” R 325.60051 to R 325.60052.

(3) Occupational health standard part 302 “Vinyl Chloride,” R 325.51401 to R 325.51414, applies to the exposure of every employee to vinyl chloride in every employment and place of employment covered by these rules in place of any different standard on exposure to vinyl chloride that would otherwise be applicable by virtue of subrule (1) of this rule.

(4) The “Threshold Limit Values (TLV) of the American Conference of Governmental Industrial Hygienists (A.C.G.I.H.) for 1970” appear in R 325.60153 to R 325.60161. The Threshold Limit Values identified in these rules as Maximum Allowable Concentrations (MAC) are specified in the rules that follow.

(5) These rules do not apply to the following types of employment:

(a) Agriculture.

(b) Domestic.

(c) Mining.

(d) General industry work.

Exposure to air contaminants in general industry work is covered by occupational health standard part 301 "Air Contaminants for General Industry," R 325.51101 to R 325.51108.

(6) These rules replace O.H. rule 6201.

History: 2002 AACS; 2013 AACS.

R 325.60151a Availability of referenced standards.

Rule 1a. The following Michigan occupational safety and health standards are referenced in these rules. Up to 5 copies of these standards may be obtained at no charge from the Michigan Department of Licensing and Regulatory Affairs, MIOSHA Standards Section, 7150 Harris Drive, P.O. Box 30643, Lansing, Michigan, 48909-8143 or via the internet at website: www.michigan.gov/mioshastandards. For quantities greater than 5, the cost, as of the time of adoption of these rules, is 4 cents per page.

(a) Occupational health standard part 301 "Air Contaminants for General Industry," R 325.51101 to R 325.51108.

(b) Occupational health standard part 302 "Vinyl Chloride," R 325.51401 to R 325.51414.

(c) Occupational health standard part 303 "Methylenedianiline," R 325.50051 to R 325.50076.

(d) Occupational health standard part 304 "Ethylene oxide," R 325.51151 to R 325.51177.

(e) Occupational health standard part 306 "Formaldehyde," R 325.51451 to R 325.51477.

(f) Occupational health standard part 307 "Acrylonitrile," R 325.51501 to R 325.51527.

(g) Occupational health standard part 308 "Inorganic Arsenic," R 325.51601 to R 325.51628.

(h) Occupational health standard part 309 "Cadmium," R 325.51851 to R 325.51886.

(i) Occupational health standard part 311 "Benzene," R 325.77101 to R 325.77115.

(j) Occupational health standard part 312 "1,3-Butadiene," R 325.50091 to R 325.50092.

(k) Occupational health standard part 313 "Methylene Chloride," R 325.51651 to R 325.51652.

(l) Occupational health standard part 314 "Coke Oven Emissions," R 325.50101 to R 325.50136.

(m) Occupational health standard part 451 "Respiratory Protection," R 325.60051 to R 325.60052.

(n) Occupational health standard part 602 "Asbestos Standards for Construction," R 325.51301 to R 325.51302.

(o) Occupational health standard part 603 "Lead Exposure in Construction," R 325.51991 to R 325.51992.

(p) Occupational health standard part 604 "Chromium (VI) in Construction," R 325.51995 to R 325.51997.

History: 2013 AACS.

R 325.60152 Definitions pertaining to contaminants.

Rule 2. As used in these rules:

(a) "Maximum allowable concentration" or "MAC" means the threshold limit value or the time-weighted average 8-hour airborne concentration of a contaminant to which a person may be safely exposed.

(b) "Mg/m3" means milligrams of particulate per cubic meter of air.

(c) "Mppcf" means millions of particulates per cubic foot of air based on impinger samples counted by light field microscopic techniques.

(d) "Non-respirable atmosphere" means an atmosphere which contains insufficient oxygen, or an elevated level of contaminants which may render a person incapable of self-rescue.

(e) "Ppm" means parts of vapor or gas per million parts of air by volume at 25 degrees Celsius and 760 millimeters of mercury pressure.

(f) "Source" means a process or equipment that releases a contaminant into the air in concentrations exceeding the MAC.

History: 2002 AACS.

R 325.60153 Contaminants; exposures; MAC.

Rule 3. (1) An employer shall not allow an employee to be exposed to a contaminant at concentrations in excess of the MAC as listed in R 325.60154 to R 325.60161.

(2) An employer shall not allow an employee to be exposed to a contaminant or combination of contaminants in concentrations that are hazardous or injurious to the person's health.

History: 2002 AACS.

R 325.60154 Maximum allowable concentrations.

Rule 4. (1) Maximum allowable concentrations of air contaminants based on a repeated 8-hour work day exposure are listed in tables 1 to 7 in R 325.60155 to R 325.60161.

(2) A substance in tables 1 to 6 that is preceded by the letter A, C, ~~or~~ S, or STEL is an especially hazardous contaminant and all the following precautions shall be taken:

(a) If the substance is preceded by the letter "A", then an employer shall ensure that an employee or any part of an employee's anatomy is not exposed to, or allowed to come in contact with, the substance by means of any respiratory, oral, or skin route.

(b) If the substance is preceded by the letter "C", then its MAC means the highest concentration at which an employer may allow a person to be exposed at any time unless noted otherwise. This concentration is commonly referred to as a "ceiling."

(c) If the substance is preceded by the letter "S", then an employer shall ensure that precautions are taken to prevent skin absorption.

(d) If the substance is preceded by "STEL", then it means the STEL listed. For example, an employee's 15-minute, time-weighted average exposure, shall not be exceeded at any time during a work day. The STEL is commonly referred to as the "short-term exposure limit."

History: 2002 AACS; 2013 AACS.

R 325.60155 Maximum allowable concentrations for substances; A and B.

Rule 5. Table 1. Substances A and B

TABLE 1			
	Substance	MAC/Ceiling/STEL	
		ppm	mg/m^3
	Abate	---	15
	Acetaldehyde	200	360
	Acetic acid	10	25
	Acetic anhydride	5	20
	Acetone	1,000	2,400
	Acetonitrile	40	70
	Acetylene	Inert gas	
	Acetylene dichloride, see 1,2-Dichloroethylene		
	Acetylene tetrabromide	1	14
	Acrolein	0.1	0.25
S	Acrylamide	---	0.3
~~S~~	Acrylonitrile, see OH Part 307, R 325.51501 to R 325.51527*		
S	Aldrin	---	0.25
S	Allyl alcohol	2	5
	Allyl chloride	1	3
C	Allyl glycidyl ether (AGE)	10	45
	Allyl propyl disulfide	2	12
	Alundum (Al_20_3)	Inert dust	
	2-Aminoethanol, see Ethanolamine		
	2-Aminopyridine	0.5	2
	Ammonia	50	35
	Ammonium sulfamate (amate)	---	15
	n-Amyl acetate	100	525
	sec-Amyl acetate	125	650
S	Aniline	5	19
S	Anisidine (o,p-isomers)	---	0.5
	Antimony & compounds (as Sb)	---	0.5
	ANTU (alpha naphthyl thiourea)	---	0.3
	Argon	Inert gas	
	Arsenic, inorganic compounds, see OH Part 308, R 325.51601 to R 325.51628*		
	Arsenic, organic compounds (as As)	---	0.5
	Arsine	0.05	0.2
S	Azinphos-methyl	---	0.2

	Barium (soluble compounds)	---	0.5
	Benzene (benzol), see OH Part 311, R 325.77101 to R 325.77115*		
A,S	Benzidine	---	---
	p-Benzoquinone, see Quinone		
	Benzoyl peroxide	---	5
	Benzyl chloride	1	5
	Beryllium	---	0.002
	Biphenyl, see Diphenyl		
	Bisphenol A, see Diglycidyl ether		
	Boron oxide	---	15
	Boron tribromide	1	10
C	Boron trifluoride	1	3
	Bromine	0.1	0.7
	Bromine pentafluoride	0.1	0.7
S	Bromoform	0.5	5
	Butadiene (1,3-butadiene), see OH Part 312, R 325.50091 to R 325.50092*		
	Butanethiol, see Butyl mercaptan		
	2-Butanone	200	590
S	2-Butoxy ethanol (butyl cellosolve)	50	240
	Butyl acetate (n-butyl acetate)	150	710
	sec-Butyl acetate	200	950
	tert-Butyl acetate	200	950
	Butyl alcohol	100	300
	sec-Butyl alcohol	150	450
	tert-Butyl alcohol	100	300
S,C	Butylamine	5	15
	tert-Butyl chromate (as Cr+6), See OH Part 604, R 325.51995 to R 325.51997*, **	---	---
	n-Butyl glycidyl ether (BGE)	50	270
	Butyl mercaptan	0.5	1.5
	p-tert-Butyltoluene	10	60

A --- See R 325.60154(2)(a).

C --- See R 325.60154(2)(b).

S --- See R 325.60154(2)(c).

* Caution--these rules contain extensive requirements for exposure to these substances.

** If the exposure limit in 29 C.F.R. §1926.1126 (adopted by reference in OH Part 604, R 325.51995 to R 325.51997) is stayed or is otherwise not in effect, the exposure limit is a ceiling of 0.1 mg/m^3 and has an "S" notation.

History: 2002 AACS; 2013 AACS.

R 325.60156 Maximum allowable concentrations for substances; C and D.

Rule 6. Table 2. Substances C and D

TABLE 2			
Substance		MAC/Ceiling/STEL	
		ppm	mg/m^3
	Cadmium and cadmium compounds, see OH Part 309, R 325.51851 to R 325.51886*		
	Calcium arsenate	---	1
	Calcium carbonate	Inert dust	
	Calcium oxide	---	5
	Camphor (synthetic)	2	---
	Carbaryl (Sevin®)	---	5
	Carbon black	---	3.5
	Carbon dioxide	5,000	9,000
S	Carbon disulfide	20	60
	Carbon monoxide	50	55
S,C	Carbon tetrachloride	10	65
	Cellulose (paper fiber)	Inert dust	
S	Chlordane	---	0.5
S	Chlorinated camphene	---	0.5
	Chlorinated diphenyl oxide	---	0.5
	Chlorine	1	3
	Chlorine dioxide	0.1	0.3
C	Chlorine trifluoride	0.1	0.4
C	Chloroacetaldehyde	1	3
	alpha-Chloroacetophenone (phenacylchloride)	0.05	0.3
	Chlorobenzene (monochlorobenzene)	75	350
	o-Chlorobenzylidene malononitrile (OCBM)	0.05	0.4
	Chlorobromomethane	200	1,050
	2-Chloro-1,3-butadiene, see Chloroprene		
S	Chlorodiphenyl (42% Chlorine)	---	1
S	Chlorodiphenyl (54% Chlorine)	---	0.5
	1-Chloro-2,3-epoxypropane, see Epichlorohydrin		
	2-Chloroethanol, see Ethylene chlorohydrin		
	Chloroethylene, see Vinyl chloride		
C	Chloroform (trichloromethane)	50	240
	1-Chloro-1-nitropropane	20	100
	Chloropicrin	0.1	0.7
S	Chloroprene (2-chloro-1,3-butadiene)	25	90
	Chromic acid and chromates (as Cr+6) see OH Part 604, R 325.51995 to R 325.51997*, ***	---	---

	Chromium (VI) compounds, see OH Part 604, R 325.51995 to R 325.51997*, ***		
	Chromium, sol. chromic & chromous salts (as Cr) Metal & insol. Salts	--- ---	0.5 1
	Coal tar pitch volatiles (benzene soluble fraction: anthracene, BaP, phenanthrene, acridine, chrysene, pyrene)	---	0.2
	Cobalt, metal fume & dust	---	0.1
	Coke oven emissions, see OH Part 314, R 325.50101 to R 325.50136*		
	Copper fume Dusts and mists	--- ---	0.1 1
	Corundum (Al_20_3)	Inert dust	
	Cotton dust (raw)	---	1
	Crag® herbicide	---	15
S	Cresol (all isomers)	5	22
	Crotonaldehyde	2	6
S	Cumene	50	245
S	Cyanide (as CN)	---	5
	Cyanogen	10	---
	Cyclohexane	300	1,050
	Cyclohexanol	50	200
	Cyclohexanone	50	200
	Cyclohexene	300	1,015
	Cyclopentadiene	75	200
	2,4-D	---	10
S	DDT (Dichlorodiphenyl-trichloroethane)	---	1
	DDVP, see Dichlorvos		
S	Decaborane	0.05	0.3
S	Demeton®	---	0.1
	Diacetone alcohol (4-hydroxy-4-methyl-2-pentanone)	50	240
	1,2-Diainoethane, see Ethylenediamine		
	Diazomethane	0.2	0.4
	Diborane	0.1	0.1
S,C	1,2-Dibromoethane (ethylene dibromide)	25	190
	Dibutyl phosphate	1	5
	Dibutyl phthalate	---	5
C	Dichloroacetylene	0.1	0.4
C	o-Dichlorobenzene	50	300
	p-Dichlorobenzene	75	450
	Dichlorodifluoromethane	1,000	4,950
	1,3-Dichloro-5,5-dimethyl hydantoin	---	0.2

	1,1-Dichloroethane	100	400
	1,2-Dichloroethane	50	200
	1,2-Dichloroethylene	200	790
S,C	Dichloroethyl ether	15	90
	Dichloromethane, see Methylene chloride		
	Dichloromonofluoromethane	1,000	4,200
C	1,1-Dichloro-1-nitroethane	10	60
	1,2-Dichloropropane, see Propylene dichloride		
	Dichlorotetrafluoroethane	1,000	7,000
S	Dichlorvos (DDVP)	---	1
S	Dieldrin	---	0.25
	Diethylamine	25	75
S	Diethylamino, ethanol	10	50
S,C	Diethylene triamine	10	42
	Diethyl ether, see Ethyl ether		
	Difluorodibromomethane	100	860
C	Diglycidyl ether (DGE)	0.5	2.8
	Dihydroxybenzene, see Hydroquinone		
	Diisobutyl ketone	50	290
S	Diisopropylamine	5	20
	Dimethoxymethane, see Methylal		
S	Dimethyl acetamide	10	35
	Dimethylamine	10	18
	Dimethylaminobenzene, see Xylidene		
S	Dimethylaniline (N-dimethylaniline)	5	25
	Dimethylbenzene, see Xylene		
	Dimethyl-1,2-dibromo-2,2-dichloroethylphosphate (Dibrom®)	---	3
S	Dimethylformamide	10	30
	2,6-Dimethylheptanone, see Diisobutyl ketone		
S	1,1-Dimethylhydrazine	0.5	1
	Dimethylphthalate	---	5
S	Dimethylsulfate	1	5
S	Dinitrobenzene (all isomers)	---	1
S	Dinitro-o-cresol	---	0.2
S	Dinitrotoluene	---	1.5
S	Dioxane (diethylene dioxide)	100	360
	Diphenyl	0.2	1
	Diphenyl amine	---	10
	Diphenylmethane diisocyanate, see Methylene bisphenyl isocyanate (MDI)		
S	Dipropylene glycol methyl ether	100	600

	Di-sec, octyl phthalate (di-2-ethylhexylphthalate)	---	5

A --- See R 325.60154(2)(a).

C --- See R 325.60154(2)(b).

S --- See R 325.60154(2)(c).

* Caution--these rules contain extensive requirements for exposure to these substances.

*** If the exposure limit in 29 C.F.R. §1926.1126 (adopted by reference in OH Part 604, R 325.51995 to R 325.51997) is stayed or is otherwise not in effect, the exposure limit is 0.1 mg/m^3 for chromic acid and chromates (Cr+6) as an 8-hour TWA.

History: 2002 AACS; 2013 AACS.

R 325.60157 Maximum allowable concentrations for substances; E to H.

Rule 7. Table 3. Substances E to H

TABLE 3

	Substance	MAC/Ceiling/STEL	
		ppm	mg/m^3
	Emery	Inert dust	
S	Endosulfan (Thiodan®)	---	0.1
S	Endrin	---	0.1
S	Epichlorohydrin	5	19
S	EPN	---	0.5
	1,2-Epoxypropane, see Propylene oxide		
	2,3-Epoxy-1-propanol, see Glycidol		
	Ethane	Inert gas	
	Ethanethiol, see Ethyl mercaptan		
	Ethanolamine	3	6
S	2-Ethoxyethanol	200	740
S	2-Ethoxyethylacetate (cellosolve acetate)	100	540
	Ethyl acetate	400	1,400
S	Ethyl acrylate	25	100
	Ethyl alcohol (ethanol)	1,000	1,900
	Ethylamine	10	18
	Ethyl sec-amyl ketone (5-methyl-3-heptanone)	25	130
	Ethyl benzene	100	435
	Ethyl bromide	200	890
	Ethyl butyl ketone (3-heptanone)	50	230
	Ethyl chloride	1,000	2,600
	Ethyl ether	400	1,200
	Ethyl formate	100	300
	Ethyl mercaptan	0.5	1
	Ethyl silicate	100	850

	Ethylene	Inert gas	
S	Ethylene chlorohydrin	5	16
	Ethylenediamine	10	25
	Ethylene dibromide, see 1,2-Dibromoethane		
	Ethylene dichloride, see 1,2-Dichloroethane		
S,C	Ethylene glycol dinitrate and/or Nitroglycerin	0.2	
	Ethylene glycol monomethyl ether acetate, see Methyl cellosolve acetate		
S	Ethyleneimine	0.5	1
	Ethylene oxide, see OH Part 304, R 325.51151 to R 325.51177*		
	Ethylidine chloride, see 1,1-Dichloroethane		
S	N-Ethylmorpholine	20	94
	Ferbam	---	15
	Ferrovanadium dust	---	1
	Fibrous glass	Inert dust	
	Fluoride (as F)	---	2.5
	Fluorine	0.1	0.2
	Fluorotrichloromethane	1,000	5,600
~~C~~	Formaldehyde, see OH Part 306, R 325.51451 to R 325.51477*		
	Formic acid	5	9
S	Furfural	5	20
	Furfuryl alcohol	50	200
	Gasoline (limits will be based on aromatic hydrocarbons in mixture)		
	Glycerine mist	Inert mist	
	Glycidol (2,3-epoxy-1-propanol)	50	150
	Glycol monoethyl ether, see 2-Ethoxyethanol		
	Graphite (synthetic)	Inert dust	
	Guthion®, see Azinphos-methyl		
	Gypsum	Inert dust	
	Hafnium	---	0.5
	Helium	Inert gas	
S	Heptachlor	---	0.5
	Heptane (n-heptane)	500	2,000
S	Hexachloroethane	1	10
S	Hexachloronaphthalene	---	0.2
	Hexane (n-hexane)	500	1,800
	2-Hexanone	100	410
	Hexone (methyl isobutyl ketone)	100	410
	sec-Hexyl acetate	50	300
S	Hydrazine	1	1.3
	Hydrogen	Inert gas	
	Hydrogen bromide	3	10

C	Hydrogen chloride	5	7
S	Hydrogen cyanide	10	11
	Hydrogen fluoride	3	2
	Hydrogen peroxide	1	1.4
	Hydrogen selenide	0.05	0.2
	Hydrogen sulfide	10	15
	Hydroquinone	---	2

A --- See R 325.60154(2)(a).

C --- See R 325.60154(2)(b).

S --- See R 325.60154(2)(c).

* Caution--these rules contain extensive requirements for exposure to these substances.

History: 2002 AACS; 2013 AACS.

R 325.60158 Maximum allowable concentrations for substances; I to M.

Rule 8. Table 4. Substances I to M

TABLE 4

	Substance	MAC/Ceiling/STEL	
		ppm	mg/m^3
	Indene	10	45
	Indium and compounds (as In)	---	0.1
C	Iodine	0.1	1
	Iron oxide fume	---	10
	Iron salts, soluble (as Fe)	---	1
	Isoamyl acetate	100	525
	Isoamyl alcohol	100	360
	Isobutyl acetate	150	700
	Isobutyl alcohol	100	300
	Isophorone	25	140
	Isopropyl acetate	250	950
	Isopropyl alcohol	400	980
	Isopropylamine	5	12
	Isopropyl ether	500	2,100
	Isopropyl glycidyl ether (IGE)	50	240
	Kaolin	Inert dust	
	Ketene	0.5	0.9
	Lead and lead compounds, see OH Part 603, R 325.51991 to R 325.51992*		
	Limestone	Inert dust	
S	Lindane	---	0.5
	Lithium hydride	---	0.025

	L.P.G. (liquified petroleum gas)	1,000	1,800
	Magnesite	Inert dust	
	Magnesium oxide fume	15	
S	Malathion	---	15
	Maleic anhydride	0.25	1
C	Manganese and compounds (as Mn)	---	5
	Marble	Inert dust	
S	Mercury	---	0.1
S	Mercury (organic compounds)	---	0.01
	Mesityl oxide	25	100
	Methane	Inert gas	
	Methanethiol, see Methyl mercaptan		
	Methoxychlor	---	15
	2-Methoxyethanol, see Methyl cellosolve		
	Methyl acetate	200	610
	Methyl acetylene (propyne)	1,000	1,650
	Methyl acetylene-propadiene mixture (MAPP)	1,000	1,800
S	Methyl acrylate	10	35
	Methylal (dimethoxymethane)	1,000	3,100
	Methyl alcohol (methanol)	200	260
	Methylamine	10	12
	Methyl amyl alcohol, see Methyl isobutyl carbinol		
	Methyl (n-amyl) ketone (2-heptanone)	100	465
S,C	Methyl bromide	20	80
	Methyl butyl ketone, see 2-Hexanone		
S	Methyl cellosolve	25	80
S	Methyl cellosolve acetate	25	120
C	Methyl chloride	100	210
	Methyl chloroform	350	1,900
	Methylcyclohexane	500	2,000
	Methylcyclohexanol	100	470
S	o-Methylcyclohexanone	100	460
	Methylenedianiline (MDA), see OH Part 303, R 325.50051 to R 325.50076*		
	Methyl ethyl ketone (MEK), see 2-Butanone		
	Methyl formate	100	250
S	Methyl iodide	5	28
	Methyl isoamyl ketone	100	475
S	Methyl isobutyl carbinol	25	100
	Methyl isobutyl ketone, see Hexone		
S	Methyl isocyanate	0.02	0.05
	Methyl mercaptan	0.5	1

	Methyl methacrylate	100	410
	Methyl propyl ketone, see 2-Pentanone		
C	Methyl silicate	5	30
C	alpha-Methyl styrene	100	480
C	Methylene bisphenyl isocyanate (MDI)	0.02	0.2
	Methylene chloride (dichloromethane), see OH Part 313, R 325.51651 to R 325.51652*		
	Molybdenum (soluble compounds) (insoluble compounds)	--- ---	5 15
S	Monomethyl aniline	2	9
S,C	Monomethyl hydrazine	0.2	0.35
S	Morpholine	20	70

A --- See R 325.60154(2)(a).
C --- See R 325.60154(2)(b).
S --- See R 325.60154(2)(c).
STEL --- See R 325.60154(d).

* Caution--these rules contain extensive requirements for exposure to these substances.

History: 2002 AACS; 2013 AACS.

R 325.60159 Maximum allowable concentrations for substances; N to P.

Rule 9. Table 5. Substances N to P

TABLE 5

	Substance	MAC/Ceiling/STEL	
		ppm	mg/m^3
	Naphtha (coal tar)	100	400
	Naphtha (petroleum) (MAC will be based on aromatic hydrocarbons in mixture)		
	Naphthalene	10	50
A	beta-Naphthylamine	---	
	Neon	Inert gas	
	Nickel carbonyl	0.001	0.007
	Nickel, metal and soluble compounds (as Ni)	---	1
S	Nicotine	---	0.5
	Nitric acid	2	5
	Nitric oxide	25	30
S	p-Nitroaniline	1	6
S	Nitrobenzene	1	5
S	p-Nitrochlorobenzene	---	1
	Nitroethane	100	310
	Nitrogen	Inert gas	

	Nitrogen dioxide	5	9
	Nitrogen trifluoride	10	29
S	Nitroglycerin	0.2	2
	Nitromethane	100	250
	1-Nitropropane	25	90
	2-Nitropropane	25	90
S,A	N-Nitrosodimethylamine (dimethylnitrosomine)	---	
S	Nitrotoluene	5	30
	Nitrotrichloromethane, see Chloropicrin		
	Nitrous oxide	Inert gas	
S	Octachloronaphthalene	---	0.1
	Octane	400	1,900
	Oil mist, particulate	---	5
	Oil mist, vapor (MAC will be based on aromatic hydrocarbons in mixture)		
	Osmium tetroxide	---	0.002
	Oxalic acid	---	1
	Oxygen difluoride	0.05	0.1
	Ozone	0.1	0.2
S	Paraquat	---	0.5
S	Parathion	---	0.1
	Pentaborane	0.005	0.01
S	Pentachloronaphthalene	---	0.5
S	Pentachlorophenol	---	0.5
	Pentaerythritol	Inert particulate	
	Pentane	500	1,500
	2-Pentanone	200	700
	Perchloroethylene	100	670
	Perchloromethyl mercaptan	0.1	0.8
	Perchloryl fluoride	3	13.5
	Petroleum distillates (naphtha) (MAC will be based on aromatic hydrocarbons in mixture)		
S	Phenol	5	19
S	p-Phenylene diamine	---	0.1
	Phenyl ether (vapor)	1	7
	Phenyl ether-biphenyl mixture (vapor)	1	7
	Phenylethylene, see Styrene		
	Phenyl glycidyl ether (PGE)	10	60
S	Phenylhydrazine	5	22
S	Phosdrin (Mevinphos®)	---	0.1
	Phosgene (carbonyl chloride)	0.1	0.4
	Phosphine	0.3	0.4

	Phosphoric acid	---	1
	Phosphorus (yellow)	---	0.1
	Phosphorus pentachloride	---	1
	Phosphorus pentasulfide	---	1
	Phosphorus trichloride	0.5	3
	Phthalic anhydride	2	12
S	Picric acid	---	0.1
	Pival® (2-pivalyl-1,3-indandione)	---	0.1
	Plaster of Paris	Inert dust	
	Platinum, soluble salts (as Pt)	---	0.002
	Polytetrafluoroethylene decomposition products, see Teflon® decomposition products		
	Propane	Inert gas	
S	Propargyl alcohol	1	---
A	beta-Propiolactone	---	
	n-Propyl acetate	200	840
	Propyl alcohol	200	500
	n-Propyl nitrate	25	110
	Propylene bichloride	75	350
S	Propylene imine	2	5
	Propylene oxide	100	240
	Propyne, see Methyl acetylene		
	Pyrethrum	---	5
	Pyridine	5	15

A --- See R 325.60154(2)(a).
C --- See R 325.60154(2)(b).
S --- See R 325.60154(2)(c).

History: 2002 AACS; 2013 AACS.

R 325.60160 Maximum allowable concentrations for substances; Q to Z.

Rule 10. Table 6. Substances Q to Z

TABLE 6

	Substance	MAC/Ceiling/STEL	
		ppm	mg/m^3
	Quinone	0.1	0.4
S	RDX	---	1.5
	Rhodium, metal fume, dusts, and insoluble compounds (as Rh)	---	0.1
	Rhodium, soluble compounds (as Rh)	---	0.001
	Ronnel	---	10
	Rotenone (commercial)	---	5

	Rouge	Inert dust	
	Selenium compounds (as Se)	---	0.2
	Selenium hexafluoride	0.05	0.4
	Silicon carbide	Inert dust	
	Silver, metal and soluble compounds	---	0.01
S	Sodium fluoroacetate (1080)	---	0.05
	Sodium hydroxide	---	2
	Starch	Inert dust	
	Stibine	0.1	0.5
	Stoddard solvent	200	1,150
	Strychnine	---	0.15
C	Styrene monomer (phenylethylene)	100	420
	Sucrose	Inert dust	
	Sulfur dioxide	5	13
	Sulfur hexafluoride	1,000	6,000
	Sulfuric acid	---	1
	Sulfur monochloride	1	6
	Sulfur pentafluoride	0.025	0.25
	Sulfuryl fluoride	5	20
	Systox, see Demeton®		
	2,4,5T	---	10
	Tantalum	---	5
S	TEDP	---	0.2
	Teflon® decomposition products (maintain minimal air concentration)		
	Tellurium	---	0.1
	Tellurium hexafluoride	0.02	0.2
S	TEPP	---	0.05
C	Terphenyls	1	9
	1,1,1,2-Tetrachloro-2,2-difluoroethane	500	4,170
	1,1,2,2-Tetrachloro-1,2-difluoroethane	500	4,170
S	1,1,2,2-Tetrachloroethane	5	35
	Tetrachloroethylene, see Perchloroethylene		
	Tetrachloromethane, see Carbon tetrachloride		
S	Tetrachloronaphthalene	---	2
S	Tetraethyl lead (as Pb)	---	0.075[a]
	Tetrahydrofuran	200	590
S	Tetramethyl lead (TML) (as Pb)	---	0.150
S	Tetramethyl succinonitrile	0.5	3
	Tetranitromethane	1	8
S	Tetryl (2,4,6-trinitrophenylmethyl-nitramine)	---	1.5
S	Thallium, soluble compounds (as Tl)	---	0.1

	Thiram	---	5
	Tin (inorganic compounds, except SnH_4 and SnO_2) (organic compounds)	--- ---	2 0.1
	Tin oxide	Inert particulate	
	Titanium dioxide	Inert particulate	
	Toluene (toluol)	200	750
C	Toluene-2,4-diisocyanate	0.02	0.14
S	o-Toluidine	5	22
	Toxaphene, see Chlorinated camphene		
	Tributyl phosphate	---	5
	1,1,1-Trichloroethane, see Methyl chloroform		
S	1,1,2-Trichloroethane	10	45
	Trichloroethylene	100	535
	Trichloromethane, see Chloroform		
S	Trichloronaphthalene	---	5
	1,2,3-Trichloropropane	50	300
	1,1,2-Trichloro-1,2,2-trifluoroethane	1,000	7,600
	Triethylamine	25	100
	Trifluoromonobromomethane	1,000	6,100
	Trimethyl benzene	25	120
	2,4,6-Trinitrophenol, see Picric acid		
	2,4,6-Trinitrophenylmethylnitramine, see Tetryl		
S	Trinitrotoluene	---	1.5
	Triorthocresyl phosphate	---	0.1
	Triphenyl phosphate	---	3
	Tungsten and compounds (as W) Insoluble Soluble	--- ---	5 1
	Turpentine	100	560
	Uranium (natural) soluble & insoluble compounds (as U)	---	0.2
C	Vanadium (V_2O_5 dust) (V_2O_5 fume)	--- ---	0.5 0.1
	Vinyl benzene, see Styrene		
C	Vinyl chloride, see OH Part 302, R 325.51401 to R 325.51414*		
	Vinyl cyanide, see Acrylonitrile		
	Vinyl toluene	100	480
	Warfarin	---	0.1
	Xylene (xylol)	100	435
S	Xylidine	5	25

	Yttrium	---	1
	Zinc chloride fume	---	1
	Zinc oxide fume	---	5
	Zirconium compounds (as Zr)	---	5

A --- See R 325.60154(2)(a).
C --- See R 325.60154(2)(b).
S --- See R 325.60154(2)(c).
STEL --- See R 325.60154(2)(d)

[a] The 1970 ACGIH standard for Tetraethyl lead is 0.100 mg/m^3.

* Caution--these rules contain extensive requirements for exposure to these substances.

History: 2002 AACS; 2013 AACS.

R 325.60161 Maximum allowable concentrations for mineral dusts.

Rule 11. Table 7. Mineral dusts

TABLE 7

Substance		MAC	
		mppcf	mg/m^3
Silica			
	Crystalline *		
	Quartz (respirable)	250 % SiO_2+5	10 mg/m^3 %SiO_2+2
	Cristobalite, see crystalline quartz		
	Amorphous, including natural diatomaceous earth	20	80 mg/m^3 %SiO_2
Silicates (less than 1% crystalline silica)			
	Asbestos, all types, see OH Part 602, R 325.51301 to R 325.51302		
	Mica	20	
	Portland cement	50	
	Soapstone	20	
	Talc (non-asbestiform)	20	
	Talc (fibrous), see OH Part 602, R 325.51301 to R 325.51302		
	Tremolite, see OH Part 602, R 325.51301 to R 325.51302		
Graphite (natural)		15	
Inert or nuisance particles **		50 of total dust less than 1% SiO_2 (or 15 mg/m^3, whichever is the smaller)	

* The percentage of crystalline silica, SiO_2, in the formula is the amount determined from airborne samples.

** The following are some examples of inert or nuisance particulates when toxic impurities are not present; e.g. quartz less than 1%.

Alundum ($A1_20_3$)	Gypsum	Rouge
Calcium carbonate	Limestone	Silicon carbide
Cellulose	Magnesite	Starch
Corundum ($A1_20_3$)	Marble	Sucrose
Emery	Pentaerythritol	Tin oxide
Glycerine mist	Plaster of Paris	Titanium dioxide
Graphite (synthetic)	Portland cement	Vegetable oil mists (except castor, cashew nut, or similar irritant oils)

History: 2002 AACS; 2013 AACS.