

Chapter Ind 20

DUSTS, FUMES, VAPORS AND GASES

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**Ind 20.001 Scope.** (1) The provisions of this code shall apply to all places of employment and public buildings as defined in the statutes.

**History:** Cr. Register, April, 1957, No. 16, eff. 5-1-57.

**Ind 20.01 Definitions.** (1) Ventilation is the process of supplying or removing air by natural or mechanical means to or from any space.

(2) A ventilation system is any combination of building construction, machinery, devices or equipment, so proportioned, arranged, installed, operated and maintained as to secure, with normal operation, the standard of ventilation required by this code.

(3) A heating system is any combination of building construction, machinery, devices or equipment, so proportioned, arranged, installed, operated and maintained as to produce and deliver in place the required amount and character of heating service.

(4) A gravity system of ventilation is any ventilation, the practical effectiveness of which depends wholly upon atmospheric conditions, such as relative density, temperature or wind motion.

(5) A mechanical system of ventilation is any ventilation, exhaust or heating system, the effectiveness of which depends upon the operation of power-driven fan equipment.

(6) An exhaust system of ventilation is any combination of building construction, machinery, devices or equipment, so proportioned, arranged, maintained and operated, that dusts, fumes, vapors, gases, vitiated air, or other materials injurious to health, are effectively withdrawn from the breathing zone of employes and frequenters and disposed of in an approved manner.

(7) Air supply is the delivery and distribution of the air required for ventilation.

(8) Outside air is air that is taken from outside the building and is free from contamination of any kind in proportions detrimental to the health or comfort of the persons exposed to it.

(9) The outside air intake includes the ducts and outdoor openings through which outside air is admitted to a ventilation or heating system.

(10) An outlet or supply opening is any opening, the sole purpose of which is to deliver air into any space to provide heating, ventilation or air conditioning.

(11) An exhaust or "return" opening is any opening, the sole purpose of which is to remove air from any space being heated, ventilated or air conditioned.

(12) A duct is any pipe, flue or channel used, or intended to be used, for the conveyance of air, gases or entrained materials pertaining to a heating or a ventilation system. An underground duct is any duct wholly, or in part, below the surface of the ground adjacent to the duct.

(13) A hood is the enlargement of an outlet, shaped and arranged in a manner to direct air motion to, or confine exhaust air currents at, the source of air contamination.

(14) Dust is an air suspension of solid particles of any material.

(15) Fumes are the products of combustion or of chemical action on matter such that it is held in suspension in air.

(16) Vapor is the gaseous form of substances which are normally in solid or liquid state and which can be changed to these states by increasing the pressure or decreasing the temperature.

(17) Gases are normally formless fluids which tend to occupy a space or enclosure completely and uniformly at ordinary temperatures and pressures.

(18) The term "harmful" as applied to the effect of dusts, fumes, vapors or gases means any mechanical or toxic action which in any way injures any part of the body or reduces in efficiency the normal function of any part of the body.

**History:** Cr. Register, April, 1957, No. 16, eff. 5-1-57.

**Ind 20.02 Harmful Exposure.** For the purpose of this code, concentrations that equal or exceed the following shall constitute harmful exposures or harmful concentrations.

(1) GASES AND VAPORS

<i>Substance</i>	<i>Maximum Concentration (Parts of Vapor or Gas Per Million Parts of Air by Volume)</i>	<i>Substance</i>	<i>Maximum Concentration (Parts of Vapor or Gas Per Million Parts of Air by Volume)</i>
Acetaldehyde -----	200	Amyl alcohol (iso-	
Acetic acid -----	10	amyl alcohol) ---	100
Acetic anhydride --	5	Aniline -----	5
Acetone -----	1,000	Arsine -----	0.05
Acrolein -----	0.5	Benzene (benzol) -	35
Acrylonitrile -----	20	Benzyl chloride ---	1
Allyl alcohol -----	5	Bromine -----	1
Allyl propyl disul-		Butadiene (1, 3-	
fide -----	2	butadiene) -----	1,000
Ammonia -----	100	Butanone (methyl	
Amyl acetate -----	200	ethyl ketone) ---	250

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Butyl acetate (n-butyl acetate) ---	200	Diethylamine -----	25
Butyl alcohol (n-butanol) -----	100	Difluorodibromomethane -----	100
Butylamine -----	5	Diisobutyl ketone -	50
Butyl cellosolve (2-butoxyethanol) ---	200	Dimethylaniline (N-dimethylaniline) -----	5
Carbon dioxide ----	5,000	Dimethylsulfate ---	1
Carbon disulfide ---	20	Dioxane (diethylene dioxide) -----	100
Carbon monoxide -	100	Ethyl acetate -----	400
Carbon tetrachloride -----	25	Ethyl alcohol (ethanol) -----	1,000
Cellosolve (2-ethoxyethanol) -----	200	Ethylamine -----	25
Cellosolve acetate (2-ethoxyethyl acetate) -----	100	Ethylbenzene -----	200
Chlorine -----	1	Ethyl bromide -----	200
Chlorine trifluoride	0.1	Ethyl chloride -----	1,000
Chlorobenzene (monochlorobenzene) -----	75	Ethyl ether -----	400
Chloroform (trichloromethane) ---	100	Ethyl formate -----	100
1-Chloro-1-nitropropane -----	20	Ethyl silicate -----	100
Chloroprene (2-chloro-1, 3-butadiene) -----	25	Ethylene Chlorohydrin -----	5
Cresol (all isomers)	5	Ethylenediamine ---	10
Cyclohexane -----	400	Ethylene dibromide (1, 2-dibromomethane) -----	25
Cyclohexanol -----	100	Ethylene dichloride (1, 2-dichloromethane) -----	100
Cyclohexanone ----	100	Ethylene imine ---	5
Cyclohexene -----	400	Ethylene oxide -----	100
Cyclopropane -----	400	Fluorine -----	0.1
Diacetone alcohol (4-hydroxy-4-methyl-2-pentanone) -----	50	Fluorotrichloromethane -----	1,000
Diborane -----	0.1	Formaldehyde -----	5
o-Dichlorobenzene -	50	Gasoline -----	500
Dichlorodifluoromethane -----	1,000	Heptane (n-heptane) -----	500
1, 1-Dichloroethane -	100	Hexane (n-hexane)	500
1, 2-Dichloroethylene -----	200	Hexanone (methyl butyl ketone) ---	100
Dichloroethyl ether -	15	Hexone (methyl isobutyl ketone) -	100
Dichloromonofluoromethane -----	1,000	Hydrazine -----	1
1, 1-Dichloro-1-nitroethane -----	10	Hydrogen bromide -	5
Dichlorotetrafluoroethane -----	1,000	Hydrogen chloride -	5
		Hydrogen cyanide -	10
		Hydrogen fluoride -	3
		Hydrogen peroxide, 90% -----	1
		Hydrogen selenide -	0.05
		Hydrogen sulfide --	20
		Iodine -----	0.1

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<i>Substance</i>	<i>Maximum Concentration (Parts of Vapor or Gas Per Million Parts of Air by Volume)</i>	<i>Substance</i>	<i>Maximum Concentration (Parts of Vapor or Gas Per Million Parts of Air by Volume)</i>
Isophorone -----	25	Ozone -----	0.1
Isopropylamine ----	5	Pentane -----	1,000
Mesityl oxide -----	50	Pentanone (Methyl propyl ketone) --	200
Methyl acetate -----	200	Perchloroethylene (tetrachloro- ethylene) -----	200
Methyl acetylene --	1,000	Phenol -----	5
Methyl alcohol (methanol) -----	200	Phenylhydrazine --	5
Methyl bromide ----	20	Phosgene (carbonyl chloride) -----	1
Methyl cellosolve (2-methoxy- ethanol) -----	25	Phosphine -----	0.05
Methyl cellosolve acetate (ethylene glycol monomethyl ether acetate) --	25	Phosphorus trichlo- ride -----	0.5
Methyl chloride ---	100	Propyl acetate ----	200
Methylal (dimeth- oxymethane) ---	1,000	Propyl alcohol (iso- propyl alcohol) -	400
Methyl chloroform (1, 1, 1-trichloro- ethane) -----	500	Propyl ether (iso- propyl ether) ---	500
Methylcyclohexane--	500	Propylene dichloride 1,2-dichloropro- pane) -----	75
Methylcyclohexanol	100	Propylene imine --	25
Methylcyclohexa- none -----	100	Pyridine -----	10
Methyl formate ----	100	Quinone -----	0.1
Methyl isobutyl car- binol (methylamyl alcohol) -----	25	Stibine -----	0.1
Methylene chloride (dichloro- methane) -----	500	Stoddard solvent --	500
Naphtha (coal tar)	200	Styrene monomer (phenylethylene) -	200
Naphtha (petro- leum) -----	500	Sulfur dioxide ----	10
Nickel carbonyl ----	0.001	Sulfur hexafluoride--	1,000
p-Nitroaniline ----	1	Sulfur monochloride	1
Nitrobenzene -----	1	Sulfur pentafluoride	0.025
Nitroethane -----	100	p-Tertiarybutyl- toluene -----	10
Nitrogen dioxide --	5	1, 1, 2, 2-Tetrachlo- roethane -----	5
Nitroglycerin -----	0.5	Tetranitromethane --	1
Nitromethane -----	100	Toluene (toluol) --	200
2-Nitropropane ----	50	o-Toluidine -----	5
Nitrotoluene -----	5	Trichloroethylene -	200
Octane -----	500	Trifluoromonobro- momethane -----	1,000
		Turpentine -----	100
		Vinyl chloride (chloroethylene) -	500
		Xylene (xylo) ----	200

(2) TOXIC DUSTS, FUMES, AND MISTS

<i>Substance</i>	<i>Milligrams of Dust, Fume or Mist Per Cubic Meter of Air</i>	<i>Substance</i>	<i>Milligrams of Dust, Fume or Mist Per Cubic Meter of Air</i>
Aldrin (1, 2, 3, 4, 10, 10-hexachloro-1, 4, 4a, 5, 8a-hexahydro-1, 4, 5, 8-dimethanonaphthalene) -----	0.25	Lindane (hexachlorocyclohexane, gamma isomer) -	0.5
Ammate (ammonium sulfamate) ..	15	Magnesium oxide fume -----	15
Antimony -----	0.5	Malathion (O,O-dimethyl dithiophosphate of diethyl mercaptosuccinate) -----	15
Arsenic -----	0.5	Manganese -----	6
Barium (soluble compounds) -----	0.5	Mercury -----	0.1
Cadmium oxide fume -----	0.1	Mercury (organic compounds) -----	0.01
Chlordane (1,2,4,5,6, 7,8,8-octachloro-3a,4,7,7a-tetrahydro-4, 7-methanoindane) -----	2	Methoxychlor (2,2-di-p-methoxyphenyl-1,1,1-trichloroethane) -	15
Chlorinated diphenyl oxide -----	0.5	Molybdenum (soluble compounds) - (insoluble compounds) -----	5 15
Chlorodiphenyl (42% chlorine) -	1	Parathion, (O,O-diethyl O-p-nitrophenyl thiophosphate) -----	0.1
Chromic acid and chromates (as CrO <sub>3</sub> ) -----	0.1	Pentachloronaphthalene -----	0.5
Crag herbicide (sodium 2-(2,4-dichlorophenoxy) ethanol hydrogen sulfate) -----	15	Pentachlorophenol -	0.5
Cyanide (as CN) -	5	Phosphorus (yellow) -----	0.1
2,4-D (2,4-dichlorophenoxyacetic acid) -----	10	Phosphorus pentachloride -----	1
Dieldrin (1,2,3,4,10, 10-hexachloro-6, 7-epoxy-1,4,4a,5,6, 7,8,8a-octahydro-1,4,5,8-dimethanonaphthalene) -----	0.25	Phosphorus pentasulfide -----	1
Dinitrotoluene -----	1.5	Picric acid -----	0.1
Dinitro-o-cresol -----	0.2	Selenium compounds (as Se) -----	0.1
EPN (O-ethyl O-p-nitrophenyl thionobenzenephosphonate) -----	0.5	Sodium hydroxide -	2
Ferrovandium dust	1	Sulfuric acid	1
Fluoride -----	2.5	TEDP (tetraethyl dithionopyrophosphate) -----	0.2
Hydroquinone -----	2	TEPP (tetraethyl pyrophosphate) -	0.05
Iron oxide fume -----	15	Tellurium -----	0.1
Lead -----	0.15	Tetryl (2,4,6-trinitrophenyl-methylnitramine) -----	1.5
		Titanium dioxide --	15
		Trichloronaphthalene -----	5

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<i>Substance</i>	<i>Milligrams of Dust, Fume or Mist Per Cubic Meter of Air</i>	<i>Substance</i>	<i>Milligrams of Dust, Fume or Mist Per Cubic Meter of Air</i>
Trinitrotoluene ---	1.5	Vanadium	
Uranium		( $V_8$ $O_5$ dust) ----	0.5
(soluble com- pounds) -----	0.5	( $V_2$ $O_5$ fume) ----	0.1
(insoluble com- pounds) -----	0.25	Zinc oxide fumes --	15
		Zirconium com- pounds (as Zr) -	5

## (3) MINERAL DUSTS

<i>Substance</i>	<i>Million Particles (Less Than 10 Microns in Longest Dimension) Per Cubic Foot of Air</i>	<i>Substance</i>	<i>Million Particles (Less Than 10 Microns in Longest Dimension) Per Cubic Foot of Air</i>
Aluminum oxide ---	50	low (below 5% free $SiO_2$ ) -----	50
Asbestos -----	5	Silicon carbide -----	50
Dust (no free silica)	50	Slate (below 5% free $SiO_2$ ) -----	50
Mica (below 5% free silica) -----	20	Soapstone (below 5% free $SiO_2$ ) -----	20
Portland cement ---	50	Total dust (below 5% free $SiO_2$ ) -----	50
Talc -----	20		
Silica			
high (above 50% free $SiO_2$ ) -----	5		
medium (5 to 50% free $SiO_2$ ) -----	20		

## (4) IONIZING RADIATION

<i>Type of Radiation</i>	<i>Permissible Total Weekly Dose For Whole Body Radiation</i>
Gamma Ray -----	300 milliroentgens per week
X-Ray -----	300 milliroentgens per week
Beta -----	300 milliroentgens equivalent man per week

*Note:* The dose is measured by an appropriate instrument in air in the region of highest dosage rate to be occupied by an individual, without the presence of the human body or other absorbing and scattering material. For beta radiation, this standard may be assumed to be met if the air dose does not exceed 300 milliroentgens per week.

**History:** Cr. Register, April, 1957, No. 16, eff. 5-1-57.

**Ind 20.03 General ventilation required.** Ventilation shall be provided and maintained for all occupied areas in places of employment as required under section Ind 58.53 of the Heating, Ventilation and Air Conditioning code issued by the industrial commission.

**History:** Cr. Register, April, 1957, No. 16, eff. 5-1-57.

**Ind 20.04 General ventilation equipment.** The nature and control of air supply, and the details of general ventilation equipment installation and maintenance, shall be in conformance with the requirements