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Executive Office of Energy & Environmental Affairs

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Ambient Air Toxics Guidelines

The Department of Environmental Protection (MassDEP) Office of Research and Standards (ORS) develops health-based air guidelines - Ambient Air Limits (AALs) and Threshold Effect Exposure Limits (TELs) - that are used to evaluate potential human health risks from exposures to chemicals in air. These guidelines are set at concentrations intended to protect the general population, including sensitive populations such as children, from adverse health effects over a lifetime of continuous exposure.

Background

To determine the AALs and TELs for individual chemicals, MassDEP first develops:

- **Non-Threshold Effects Exposure Limits (NTELs)** based on known or suspected carcinogenic health effects. The NTEL is a concentration associated with a one in a million excess lifetime cancer risk over a lifetime of continuous exposure; and

- **Threshold Effects Exposure Limits (TELs)** based on non-cancer health effects. The TEL is a concentration intended to protect the general population, including sensitive populations such as children, from adverse health effects over a lifetime of continuous exposure. TELs take into account the fact that people may be exposed to a chemical from other sources, including indoor air, food, soil and water.

MassDEP compares the NTEL and the TEL and designates the lower concentration as the AAL. Since, in general, NTELs are lower than TELs, most AALs are based on the NTEL, or risk of excess cancer. For chemicals that do not pose cancer risks, the AAL is based on the TEL, and in this case the published AAL and TEL values are the same.

Use of AALs & TELs

MassDEP uses AALs and TELs primarily in its air pollution control permitting program. The agency also uses AALs and TELs to evaluate the potential for health effects from chemicals present in ambient and indoor air.

It should be noted that exposure above an AAL or TEL does not automatically mean an individual will develop cancer or experience non-cancer health effects. However, the risk or probability of developing adverse effects increases with intensity and frequency of exposure.

MassDEP Methods for Deriving AALs & TELs

MassDEP updated its methods for deriving AALs and TELs in 2011 following a scientific peer review of the new updating methodology. MassDEP's new method makes use of existing peer reviewed air guidance levels developed by the U.S. Environmental Protection Agency (EPA), California Environmental Protection Agency (CalEPA) and other agencies. The Air Guidelines continue to consider cancer and non-cancer health effects. AALs and TELs for chemicals listed with evaluation dates of 1990 and 1995 were developed using the 1990 and 1995 methods respectively. AALs and TELs derived by earlier methods and published on this web site remain the state air guidelines until MassDEP updates them.

- 2011 Guidelines. See the Air Guidelines Table below and the Methodology for Updating Air Guidelines: Allowable Ambient Limits (AALs) & Threshold Effects Exposure Limits (TELs).

- 1995 Guidelines. A revised list of Ambient Air Exposure Limits (AALs) for Chemicals in Massachusetts was released in December 1995. The TELs for 14 chemicals were derived for the first time or updated from the values in the 1990 air guidelines, using peer reviewed EPA reference concentration (RfC) values. The method for deriving the TELs using the RfC is described on pages 7 through 10 ("Incorporation of Inhalation Reference Concentrations into the CHEM/AAL Process") of this document: Summary of 1994 Updates: Chemical Health Effects Assessment Methodology & Method To Derive Allowable Ambient Limits (Superseded)

- 1990 Guidelines. MassDEP introduced its CHEM/AAL process in the mid 1980s to develop ambient air toxics exposure limits. The CHEM/AAL methodology was built upon occupational literature along with other sources of information to identify and evaluate the potential adverse health effects of chemicals and to develop chemical-specific ambient air limits. See the two-volume report, file size2MB all appendices file size3MB and the summary of 1994 updates to the methodology for additional information.

Current AALs & TELs

MassDEP releases AALs and TELs to the public by adding or updating guidelines and supporting information on its Air Guideline Values web page. You may sign up to be notified when new values are published.

AALs and TELs are health-based ambient air guidelines used to evaluate potential human health risks from exposures to chemicals in ambient air.

Air guideline values are set at concentrations intended to protect the general population, including sensitive populations such as children, from adverse health effects over a lifetime of continuous exposure.

AIR GUIDELINES TABLE - JANUARY 2015					
CHEMICAL NAME & CAS NUMBER	**THRESHOLD EFFECTS EXPOSURE LIMIT (TEL) (24-Hour Average)**		**ALLOWABLE AMBIENT LIMIT (AAL) (Annual Average)**		**LAST UPDATE**
	ug/m³	**ppb[1]**	**ug/m³**	**ppb[1]**	
Acetaldehyde 75070	30	20	0.4	0.2	2015
Acrolein 107028	0.07	0.03	0.07	0.03	2014
Acetone 67641	160.54	68.03	160.54	68.03	1990
Acrylonitrile 107131	0.4	0.18	0.01	0.0046	1995
Alkanes/Alkenes (not to exceed 25% n-hexane)	95.24	-	47.62	-	1990

AIR GUIDELINES TABLE - JANUARY 2015					
Ammonia 7664417	100	100	100	100	2011
Aniline 62533	0.2	0.053	0.1	0.026	1995
Antimony 7440360	0.02	-	0.02	-	2015
Arsenic 7440382	0.003	-	0.0003	-	2011
Asbestos 1332214	0.0002 f/cm^3	-	0.000004 f/cm^3	-	1990
Benzene 71432	0.6	0.2	0.1	0.03	2015
Benzyl Chloride 100447	14.08	2.72	0.94	0.18	1990
Beryllium 7440417	0.001	-	0.0004	-	1990
1,3-Butadiene 106990	1.20	0.54	.003	0.002	1990
n-Butyl Alcohol 71363	412.24	136.05	412.24	136.05	1990
Cadmium 7440439	0.002	-	0.0002	-	2014
Calcium Chromate 13765190	0.003	-	0.0001	-	1990
Carbon Disulfide 75150	0.1	0.032	0.1	0.032	1995
Carbon Tetrachloride 56235	85.52	13.61	0.07	0.01	1990

AIR GUIDELINES TABLE - JANUARY 2015					
Carbonyl Sulfide 463581	0.1	0.041	0.1	0.041	1995
Chlordane 57749	0.14	0.008	0.03	0.002	1990
Chlorine 7782505	3.95	1.36	3.95	1.36	1990
Chlorobenzene 108907	93.88	20.41	6.26	1.36	1990
Chloroethane 75003	717.55	272.11	358.78	136.05	1990
Chloroform 67663	132.76	27.21	0.04	0.01	1990
Chloroprene 126998	0.98	0.27	0.98	0.27	1990
Chromic Acid 7738945	0.003	-	0.0001	-	1990
Chromium (metal) 7440473	1.36	-	0.68	-	1990
Chromium (VI) Compounds	0.003	-	0.0001	-	1990
Copper 7440508	0.54	-	0.54	-	1990
p-Cresol 106445	24.05	5.44	12.02	2.72	1990
Cyclohexane 110827	280.82	81.63	280.82	81.63	1990
o-Dichlorobenzene 95501	81.74	13.61	81.74	13.61	1990
p-Dichlorobenzene 106467	122.61	20.41	0.18	0.03	1990
1,2-Dichloroethane 107062	11.01	2.72	0.04	0.01	1990

AIR GUIDELINES TABLE - JANUARY 2015					
1,2-Dichloroethylene 540590	215.62	54.42	107.81	27.21	1990
Dichloromethane (Methylene Chloride) 75092	100	30	60	20	2014
1,2-Dichloropropane 78875	0.9	0.19	0.05	0.01	1995
Diethylamine 109897	8.13	2.72	4.07	1.36	1990
Di(2-ethylhexyl)phthalate 117817	1.36	0.09	0.77	0.05	1990
Dimethylformamide 68122	6	2.01	3	1.004	1995
1,4-Dioxane 123911	24.49	6.80	0.24	0.07	1990
Diphenyl 92524	0.34	0.05	0.09	0.01	1990
Diphenylamine 122394	2.72	0.39	0.68	0.10	1990
Epichlorohydrin 106898	0.08	0.021	0.08	0.021	1995
Ethanol 64175	51.24	27.21	51.24	27.21	1990
Ethyl Acetate 141786	391.84	108.84	391.84	108.84	1990
Ethyl Acrylate 140885	0.56	0.14	0.28	0.07	1990
Ethylbenzene 100414	300	69.09	300	69.09	1995
Ethylene Glycol 107211	34.50	13.61	34.50	13.61	1990

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Ethyl Ether 60297	329.80	108.84	164.90	54.42	1990
Fluoride 16984488	6.80	8.76	6.80	8.76	1990
Formaldehyde 50000	2	2	0.08	0.06	2011
Furan 110009	0.40	0.14	0.02	0.007	1990
Heptachlor 76448	0.14	0.009	0.001	0.0001	1990
Hexachlorocyclopentadiene 77474	0.006	0.0005	0.006	0.0005	1990
Hexachloroethane 67721	0.53	0.05	0.25	0.03	1990
2-Hexanone 591786	10.88	2.66	10.88	2.66	1990
Hydrazine 302012	0.04	0.03	0.0002	0.0002	2011
Hydrogen Bromide 10035106	5	1.51	5	1.51	1995
Hydrogen Chloride 7647010	7	4.69	7	4.69	1995
Hydrogen Cyanide 74908	0.6	0.54	0.3	0.27	1995
Hydrogen Fluoride 7664393	0.68	0.83	0.34	0.42	1990
Hydrogen Sulfide 7783064	0.9	0.65	0.9	0.65	1995

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Isoamyl Acetate 123922	144.76	27.21	144.76	27.21	1990
Isobutyl Acetate 110190	193.77	40.82	193.77	40.82	1990
Isobutyl Alcohol 78831	41.22	13.61	41.22	13.61	1990
Isopropyl Acetate 108214	283.81	68.03	283.81	68.03	1990
Lead 7439921	0.14	-	0.07	-	1990
Lead Subacetate 1335326	0.14	-	0.01	-	1990
Lindane 58899	0.14	0.11	0.003	0.0002	1990
Maleic Anhydride 108316	0.1	0.02	0.1	0.02	2011
Mercury (elemental) 7439976	0.14	-	0.07	-	1990
Mercury (inorganic)	0.14	-	0.01	-	1990
Mercury (methyl-) 22967926	0.003	-	0.0014	-	1990
Methanol 67561	7.13	5.44	7.13	5.44	1990
2-Methoxy Ethanol 109864	3	0.96	2	0.64	1995
Methyl Acrylate 96333	9.57	2.72	4.79	1.36	1990
Methyl Bromide 74839	5.28	1.36	2.64	0.68	1990
Methyl Ethyl Ketone (MEK) 78933	200	67.82	10	3.39	1995

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Methyl Isobutyl Ketone (MIBK) 108101	55.70	13.61	55.70	13.61	1990
Methyl Methacrylate 80626	22.27	5.44	22.27	5.44	1990
Naphthalene (including 2-methylnaphthalene) 91203	14.25	2.72	14.25	2.72	1990
Nickel (metal) 7440020	0.27	-	0.18	-	1990
Nickel Oxide 1313991	0.27	-	0.01	-	1990
Nitrobenzene 98953	13.69	2.72	6.84	1.36	1990
Pentachlorophenol 87865	0.01	0.001	0.01	0.001	1990
Phenol 108952	52.33	13.61	52.33	13.61	1990
Phosphoric Acid 7664382	0.27	0.07	0.27	0.07	1990
Phthalic Anhydride 85449	1.65	0.27	0.82	0.14	1990
PCBs 1336363	0.003	-	0.0005	-	1990
Propyl Alcohol 71238	133.63	54.42	133.63	54.42	1990
Propylene Oxide 75569	6	2.53	0.3	0.13	1995
Resorcinol 108463	12.24	2.72	3.06	0.68	1990
Selenium 7782492	0.54	-	0.54	-	1990

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Selenium Sulfide 7446346	0.54	-	0.05	-	1990
Styrene 100425	200	46.96	2	0.47	1995
Sulfuric Acid 7664939	2.72	0.68	2.72	0.68	1990
1,1,2,2-Tetrachloro- 1,2-Difluoroethane 76120	1133.33	136.05	566.67	68.03	1990
1,1,2,2-Tetrachloroethane 79345	18.67	2.72	0.02	0.003	1990
Tetrachloroethylene 127184	8	1	0.3	0.04	2015
Tetrahydrofuran 109999	160.35	54.42	80.18	27.21	1990
Toluene 108883	80	21.23	20	5.31	1995
Toluene Diisocyanate 584849	0.10	0.01	0.10	0.01	1990
o-Toluidine 95534	2.38	0.54	0.17	0.04	1990
1,1,1-Trichloroethane 71556	1038.37	190.48	1038.37	190.48	1990
1,1,2-Trichloroethane 79005	14.84	2.72	0.06	0.01	1990
Trichloroethylene 79016	36.52	6.80	0.61	0.11	1990
2,4,6-Trichlorophenol 88062	-	-	0.16	-	1990
Triethylamine 121448	1	0.24	0.7	0.17	1995
Vanadium 1314621	0.27	-	0.27	-	1990

AIR GUIDELINES TABLE - JANUARY 2015					
Vanadium Pentoxide 1314621	0.14	0.02	0.03	0.005	1990
Vinyl Acetate 108054	30	8.52	8	2.27	1995
Vinyl Chloride 75014	3.47	1.36	0.38	0.15	1990
Vinylidene Chloride 75354	1.08	0.27	0.02	0.01	1990
Xylenes (m-,o-,p- isomers) 1330207	11.80	2.72	11.80	2.72	1990

[1] All new and revised values are expressed in ug/m^3 to one significant figure. Values are also presented in units of ppb for the convenience of users. From 2011 forward, values in units of ppb are calculated from the value in units of ug/m^3 after it has been rounded to one significant figure. Concentrations measured in units of ppb can be transformed to ug/m^3 using all significant figures applicable to the measured concentration in ppb, assuming the molecular conversion factor has an infinite number of significant figures, and then rounded to one significant figure for comparison to the Air Guidelines. Values derived in 1995 are presented in ppb without rounding.

For More Information

How AALs & TELs are Derived:
Contact Sandra Baird of the MassDEP Office of Research & Standards, 617-654-6587
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Potential Health Effects from Individual Chemicals

- U.S. Agency for Toxic Substances & Disease Registry (ATSDR)
- ATSDR Toxic Substances Portal
- U.S. Environmental Protection Agency (EPA) Integrated Risk Information System (IRIS)
- EPA Health Effects Notebo