

WI Vapor Quick Look-Up Table (1, 2, 3)
Indoor Air Vapor Action Levels and Vapor Risk Screening Levels
Based on **May 2016** USEPA Regional Screening Level Tables

CHEMICAL	RESIDENTIAL				SMALL COMMERCIAL				LARGE COMMERCIAL/INDUSTRIAL				MOLECULAR WEIGHT	U.S.EPA RSL BASIS
	AF = 0.03				AF = 0.03				AF = 0.01					
	INDOOR AIR VAL		SUB-SLAB VAPOR VRSL		INDOOR AIR VAL		SUB-SLAB VAPOR VRSL		INDOOR AIR VAL		SUB-SLAB VAPOR VRSL			
	µg/m ³	ppbV	µg/m ³	ppbV	µg/m ³	ppbV	µg/m ³	ppbV	µg/m ³	ppbV	µg/m ³	ppbV	g/mole	
Benzene	3.6	1.1	120	37	16	4.9	530	160	16	4.9	1,600	490	78.11	c
Carbon Tetrachloride	4.7	0.73	160	24	20	3.1	670	100	20	3.1	2,000	310	153.82	c
Chloroform	1.2	0.24	40	8.0	5.3	1.1	180	37	5.3	1.1	530	110	119.38	c
Chloromethane	94	45	3,100	1,500	390	190	13,000	6,300	390	190	39,000	19,000	50.49	n
Dichlorodifluoromethane	100	20	3,300	670	440	88	15,000	2,900	440	88	44,000	8,800	120.91	n
1,1-Dichloroethane (1,1-DCA)	18	4.4	600	150	77	19	2,600	630	77	19	7,700	1,900	98.96	c
1,2-Dichloroethane (1,2-DCA)	1.1	0.27	37	9.0	4.7	1.1	160	37	4.7	1.1	470	110	98.96	c
1,1-Dichloroethylene (1,1-DCE)	210	52	7,000	1,700	880	220	29,000	7,300	880	220	88,000	22,000	96.94	n
1,2-Dichloroethylene (cis and trans)	--	--	--	--	--	--	--	--	--	--	--	--	96.94	--
Ethylbenzene	11	2.5	370	83	49	11	1,600	370	49	11	4,900	1,100	106.17	c
Methylene Chloride	630	180	21,000	6,000	2,600	740	87,000	25,000	2,600	740	260,000	74,000	84.93	n
Methyl Tert-Butyl Ether (MTBE)	110	30	3,700	1,000	470	130	16,000	4,300	470	130	47,000	13,000	88.15	c
Naphthalene	0.83	0.16	28	5.3	3.6	0.68	120	23	3.6	0.68	360	68	128.18	c
Tetrachloroethylene (PCE)	42	6.2	1,400	210	180	27	6,000	900	180	27	18,000	2,700	165.83	n
Toluene	5,200	1,400	170,000	47,000	22,000	5,700	730,000	190,000	22,000	5,700	2,200,000	570,000	92.14	n
1,1,1-Trichloroethane (1,1,1-TCA)	5,200	940	170,000	31,000	22,000	4,000	730,000	130,000	22,000	4,000	2,200,000	400,000	133.41	n
Trichloroethylene (TCE)	2.1	0.39	70	13	8.8	1.6	290	53	8.8	1.6	880	160	131.39	n
Trichlorofluoromethane	--	--	--	--	--	--	--	--	--	--	--	--	137.37	--
1,2,4 -Trimethylbenzene	7.3	1.5	240	50	31	6.2	1,000	210	31	6.2	3,100	620	120.20	n
1,3,5- Trimethylbenzene	--	--	--	--	--	--	--	--	--	--	--	--	120.20	--
Vinyl Chloride	1.7	0.65	57	22	28	11	930	370	28	11	2,800	1,100	62.50	c
Xylene (mix)	100	23	3,300	770	440	100	15,000	3,300	440	100	44,000	10,000	106.17	n
Xylene (n,m,o separately)	100	23	3,300	770	440	100	15,000	3,300	440	100	44,000	10,000	106.17	n

Notes

AF = Attenuation Factor VAL = Vapor Action Level VRSL = Vapor Risk Screening Level RSL = Regional Screening Level n= non-carcinogen; c = carcinogen
-- No Inhalation Toxicity Info Available

- USEPA RSL Tables: <http://www.epa.gov/risk/risk-based-screening-table-generic-tables>
- Only common VOCs** listed in this Quick Look-up Table. Refer to Notes on next page to determine VALs and VRSLs for other VOCs.
- Values reported to two significant digits.

SEE NEXT PAGE

CONVERT USEPA RSLs to WI VALs

- Look up current USEPA Regional Screening Levels (RSLs) for Indoor Air at <http://www.epa.gov/risk/risk-based-screening-table-generic-tables>
 - Residential Setting per Wisc. Admin. § NR 700.03(49g): Use RSL Residential Ambient Air Table
 - Commercial/Industrial Setting per Wisc. Admin. § NR 700.03(39m): Use RSL Composite Worker Ambient Air Table
- In Wisconsin Vapor Action Levels (VALs) are based on a **Hazard Index (HI) = 1** and/or **cRCL = 1x 10⁻⁵** for carcinogens.
 - Multiply the USEPA cRCL by 10 for carcinogens (to convert from 10⁻⁶ to 10⁻⁵ excess lifetime cancer risk).
 - Use RSL equivalent to HI=1 for non-carcinogens
- When compound has carcinogenic target and a hazard index, use the smaller of two to set the VAL.

CONVERT ppbv to µg/m³

- In vapor phase ppbv is *not* equivalent to µg/m³. A conversion is required.
- Use on-line calculator for conversion: http://www3.epa.gov/ceampubl/learn2model/part-two/onsite/ia_unit_conversion.html
- ...Or use formula below. (The conversion factor of **24.05** is based on T = 20°C and P = 1 atm or 101.325 kPa.)

$$\text{ppbv} = \frac{\mu\text{g}/\text{m}^3}{\text{molecular weight}} \times (24.05) = \frac{\mu\text{g}/\text{m}^3}{\text{molecular weight}} \times \left(8.3144 \left[\frac{\text{L} \cdot \text{kPa}}{\text{mol} \cdot ^\circ\text{K}} \right] \times [T_{\text{C}} + 273.15]^\circ\text{K} \times \left[\frac{1}{101.325 \text{ kPa}} \right] \right)$$

SELECT ATTENUATION FACTORS & CALCULATE VRSLs

- Attenuation factors are used to estimate indoor air concentrations (C_{IA}) based on samples from other media (C_{Media} = sub-slab vapor, soil gas, or groundwater).
- Dilution Factor is inverse of the attenuation factor
 - **Attenuation factor**_{Media} = C_{IA}/C_{Media} OR (**Dilution Factor**_{Media} = C_{Media} /C_{IA})
- Below are the default attenuation factors and the dilution factors for different media.
 - Vapor Risk Screening Levels **VRSLs** = (VAL/Attenuation factor_{Media}) or (VAL * Dilution factor_{Media})

Media	Residential / Small Commercial Buildings		Large Commercial / Industrial Buildings	
	<i>Attenuation Factor</i>	<i>Dilution Factor</i>	<i>Attenuation Factor</i>	<i>Dilution Factor</i>
Crawl space	1	1	1	1
Sub-slab vapor	0.03	33	0.01	100
Deep soil gas	0.01	100	0.001	1000
Groundwater	0.001	1000	0.0001	10,000

GROUNDWATER VRSLs:

- Use the following calculation to estimate groundwater concentrations that could cause VAL exceedance in indoor air.
- **Do NOT** use to screen for vapor risk from **PCE and TCE**. Use the **NR 140 Enforcement Standard** to screen for vapor risk for PCE and TCE in groundwater.
- If the contaminated groundwater is located near the building foundation, the AF_{groundwater} increases to equal the AF_{sub-slab}.

$$C_{\text{gw}} = \frac{C_{\text{IA}}}{H \times \text{AF}_{\text{groundwater}} \times 1000 \text{ L}/\text{m}^3}$$

Where: C_{gw} = Groundwater Concentration (µg/L)
 C_{IA} = Indoor Air (Vapor Action Level) (µg/m³)
 AF_{groundwater} = attenuation factor between groundwater and indoor air
 H = Henry's Law constant (dimensionless) from Chemical Specific Parameter Table:
<http://www.epa.gov/risk/risk-based-screening-table-generic-tables>