State of Florida
DEPARTMENT OF ENVIRONMENTAL REGULATION

Interoffice Memorandum

For Routing To Other Than The Addressee	
To:	Location:
To:	Location:
To:	Location:
From:	Date:

TO: District Managers
John Ruddell
John Gentry

THRU: Randy Armstrong
Howard Rhodes
Richard Wilkins

FROM: C H. Fancy

DATE: October 20, 1987

SUBJECT: Final Air Stripper Review Procedures

Attached is the Bureau of Air Quality Management's (BAQM) final policy on the air quality analysis of air strippers. In 1986, the BAQM held a rule workshop regarding a similar approach, but the participants objected to this being a rule since the BAQM was trying to develop a toxic rule. The participants did, however, agree to the BAQM setting guidelines and procedures to allow evaluation of emissions and ambient impacts. A final draft was distributed in December, 1986.

A large number of air strippers operating in Florida will be portable units. These units may operate for a couple years and then may be transferred to another location. These portable units will be exempt from the standard permitting procedure but will be subject to the limitations outlined in this package. Each portable air stripper will be evaluated with the enclosed worksheet. This will expedite the review of these units.

As the Division of Waste Management is responsible for the contracts and approvals of these units, the personnel in the Division should evaluate each air stripper using the enclosed procedures and form. Any conditions that are required to ensure that the acceptable ambient concentrations are met must be written in the approval document.

Upon completion of the review, a copy of the worksheet should be sent to Barry Andrews in the BAQM and to the district office and local program. The list of specific individuals is attached. If information is needed on TLVs, contact John Glunn, Air Toxics Specialist, in the BAQM. If additional modeling is required, contact Larry George or Tom Rogers in the BAQM. On other issues regarding this procedure, contact Barry Andrews or Clair Fancy in the BAQM.

If an air stripper will be a permanent installation at a facility, then an air construction/operation permit will be required. The district office air staff should permit these under normal procedures. However, if the permanent unit is at a facility with emissions over 100 tons per year, it should be permitted by Central Air Permitting.

CHF/ks

cc: District Air Engineers
Local Program Air Engineers

attachments

Air Stripping

Abstract

Air stripping, a process by which contaminated water is cleansed in a tower (packed or unpacked) with a counter-current flow of air, is gaining widespread popularity and use in the State of Florida. Many of Florida's groundwater supplies have been contaminated with volatile organic compounds (VOCs) resulting from storing and using pesticides, petroleum based products and other chemicals. The air stripping process releases to the air a high percentage of the VOCs contained in the water supplies. Some of these VOCs are potential human carcinogens, have relatively long atmospheric residence times, and could pose public health risks if they are released in sufficient quantities during a long period of time. The Bureau of Air Quality Management is concerned about the emissions resulting from air stripping operations. This paper addresses the subject of air stripping and outlines the Bureau's policy on how air impacts from air strippers should be evaluated.

Introduction

Ninety-two percent of Florida's residents depend on groundwater for their drinking water. Many of Florida's aquifers lie very close to the surface and are overlain by porous surfaces, thus being very susceptible to contamination. There are 40,000 underground storage tanks in service stations alone, and over 60,000 statewide in all locations. Many of these are believed to be leaking.

In order to meet the stringent groundwater protection rules and standards that have been adopted by the state, it is necessary to purify the contaminated supplies. Although there are many ways to treat contaminated groundwater, with today's technology there are essentially only two ways that are effective in removing volatile organic compounds. These methods are carbon adsorption and air stripping.

Granulated activated carbon adsorption is often used when organic contaminants need to be removed to nondetectable levels, and should be a part of the process if nonvolatile contaminants are present. Air stripping is capable of 95-99 percent reduction of volatile contaminants and can be a cost effective treatment technology if nondetectable contaminant levels are not required. Due to the cost effectiveness of air stripping the trend is toward increased use of this technology.

Air Stripping Technology

Air stripping is a simple and effective method of removing VOCs from water. Contaminated water is dispersed in a stripping tower through a bed of packing which provides large void volumes and a large surface area. At the same time, air is counter flowed through the column from the bottom in a forced draft.

Due to the large surface area, the water disperses into a thin layer over the packing. This enhances the efficiency of the air stripping process by providing increased contact time. Even though packed towers are the preferred method, some do not have the packing, but instead use water sprays spraying countercurrent to the air flows.

Emissions

The quantity and type of VOC emissions from air stripping operations are dependent largely upon the nature of the contaminated supply and the throughput to the air stripper. Both the concentration of the contaminants (VOCs) and throughput rate are needed to determine the emission rate to the atmosphere. It is not unusual for the emissions from a small portable unit (capacity of 10 gallons per minute) cleansing a very contaminated supply (1,000 ppm) to be much greater than that of a large stationary system (42,000 gallons per minute) cleansing a slightly contaminated supply (10 ppb). Assuming a typical removal efficiency of 96% and 24 hours per day operation, the VOC emissions from the two operations described would be approximately 115 lbs/day and 5 lbs/day respectively.

The calculation of the 115 lbs/day unit is shown as follows:

liter = ℓ

$$(1{,}000\ \text{ppm}) \times \left(1\ \frac{\text{mg/liter}}{\text{ppm}}\right) \times \left(3.785\ \frac{\text{liters}}{\text{gal}}\right) \times \left(\frac{1\ \text{gram}}{1{,}000\ \text{mg}}\right) \times$$

$$\left(\frac{1\ \text{lb}}{453.6\ \text{grams}}\right) \times \left(10\ \frac{\text{gal}}{\text{min}}\right) \times \left(60\ \frac{\text{min}}{\text{hr}}\right) \times \left(\frac{24\ \text{hr}}{\text{day}}\right) \times (.96) = 115.4\ \frac{\text{lbs}}{\text{day}}$$

The various VOCs in a contaminated water supply are not removed with the same efficiency. Highly volatile compounds with very low solubility in water are most easily stripped.

Acceptable Ambient Concentration (AAC)

It is not uncommon for air stripping operations to emit VOCs which are listed as being very toxic or are known or suspected to

be carcinogenic. Because of this, each air stripper needs to be evaluated to insure that adverse air impacts do not occur.

The Bureau of Air Quality Management has developed a list of substances not regulated by National or State Ambient Air Quality Standards. The list is divided into two categories (A and B). Category A (CAT-A) consists of substances which are known or suspected to be carcinogenic or are considered highly toxic. Category B (CAT-B) consists of moderately toxic substances. Both lists will be updated periodically by the Bureau of Air Quality Management.

The Acceptable Ambient Concentration (AAC) for a contaminant on a presumed 168 hour per week operation is calculated as follows:

$$AAC\ (mg/m^3) = 0.238\ (TLV/A)$$ Where: A=100(CAT A)
A= 50(CAT B)

The TLV values for a number of compounds are enclosed. If a compound that is not listed in the attachment will be stripped from a water supply, the Air Toxics Specialist in the Bureau of Air Quality Management should be contacted so an Acceptable Ambient Concentration can be established for that compound.

For chemicals with TLVs which are criteria pollutants and have a national ambient air quality standard, the limitation will be set equal to the NAAQS. For the criteria pollutant particuates and hydrocarbons, the specific chemical species of each pollutant would have an acceptable ambient concentration limitation.

Calculation of Maximum Ambient Concentration

In order to expedite the approval of air strippers, the following equation can be used to obtain a conservative estimate of the maximum ambient concentration resulting from the air stripping operation.

$$\text{Maximum Ambient Concentration } (mg/m^3) = ACH^b$$

Where A = 327.84

C = emission rate (lb/hr)

H = stack height (Ft.)

b = -2.264

The equation above was derived by assuming that the plume rise from air strippers is negligible, which is a valid assumption for these units since stack velocities are low and stack temperature is essentially the same as the ambient temperature. The result obtained from the equation should be directly compared to the appropriate factor of the TLV for the contaminant being evaluated.

Approval Criteria

If the maximum ambient concentration is less than the Acceptable Ambient Level, then the air stripper is approvable. If, on the other hand, it is higher, then one of the following five measures needs to be taken.

1. Additional Modeling. As the assumptions in the simplified equations are conservative, the utilization of more detailed modeling may result in lower calculated maximum ambient concentrations. The Modeling and Data Analysis Section in The Bureau of Air Quality will assist in this should the need arise.

2. Reduction in Hours of Operation: The AAC can be increased by assuming an operating schedule of less than 168 hrs/wk by using the following formula:

$$AAC = \frac{40}{\text{hrs weekly}} \times TLV/A =$$

where:
the hours of weekly operation cannot be less than 40
A is 100 for CAT A or 50 for CAT B
TLV is the Threshold Limit Value

3. Reduce Water Flow to Air Stripper. The maximum ambient concentration can be reduced by a reduction in the flow of contamanated water to the air stripper.

4. Elevation of Stack Height. The maximum ambient concentration can be reduced by raising the point of air discharge from the air stripper by raising the stack height.

5. Addition of Carbon Absorption to Air Stripper Discharge.

In the event that the four above measures cannot bring the maximum ambient impact values below the acceptable ambient concentration, then add on air pollution controls must be considered. These controls, if required, must be specified in the approval document. This is a last resort method, as the addition of carbon absorption approximately doubles the cost of the air stripper.

AIR STRIPPING EVALUATION WORKSHEET

Source Identification _____

Source Location _____

Manufacturer _____

Model Number _____

Maximum Influent Flow Rate (GPM) _____

Maximum Air Flow Rate (CFM) _____

Emission Point Height (Ft) _____

Maximum Hours of Operation (Hrs/Wk) _____

Contaminant Name	Max. Conc. (ppb)	Max. Emission Rate (lb/hr)(1)	Max. Ambient Impact (mg/m^3)(2)	TLV (mg/m^3)	Category (A or B)	AAC (mg/m^3)
1.						
2.						
3.						
4.						
5.						
6.						
7.						
8.						
9.						
10.						
11.						
12.						

(1) Calculated on reverse side of this worksheet (Equation (1)).
(2) Calculated on reverse side of this worksheet (Equation (2)).

Calculation of Emission Rate

___ ppb x (ppm / 10^3ppb)(mg/liter / ppm)(60 min / hr)(lb / 453.6 g) x (1 gram / 1000 mg) x

(3.785 liter / gal) x _____ Influent flow Rate (GPM) = _____ lb/hr

or _____ ppb x _____ GPM x 5×10^{-7} = _____ lb/hr (1)

Calculation of Maximum Ambient Impact

Maximum Ambient Concentration =

(_____ lb/hr) x (327.84) x [Stack Height (Feet)]$^{-2.264}$ _____ mg/m^3 (2)

Calculation of Acceptable Ambient Impact (AAC)

0.238 (TLV/A) = _____ mg/m^3 (3)

Where A = 100 for CAT-A substances
= 50 for CAT-B substances

Do the impacts from any of the contaminants exceed the AAC? _____
If yes, list the contaminants which have exceedances.

_____ _____ _____

_____ _____ _____

List the conditions to be incorporated into approval document to insure that the AAC will not be exceeded.

_____

_____

_____

_____

Reviewed by: _____ Title: _____

Date: _____ Phone: _____

Organization Unit: _____ Signature: _____

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Category A High Toxicity Air Contaminants

Compound Chemical Name	CAS Registry Number	Threshold Limit Value(1) (TLV's) PPM	mg/m^3
Acrolein	107-02-8	0.1	0.25
Acrylonitrile	107-13-1	2.0	4.5
Aldicarb	116-06-3	-	-
p-Aminodiphenyl	92-67-1	-	-
Arsenic	7440-38-2	-	0.2
Arsenic pentoxide	1303-28-2	-	-
Arsenic trioxide	1327-53-3	-	-
Asbestos (5)	1332-21-4	2 Fibers > 5 um/cc	
Auramine	2465-27-2	-	-
Benzene	71-43-1	1ø	3ø
Benzidine	92-87-5	-	-
Beryllium oxide (As Beryllium.)	1304-56-9	-	.002
Beryllium sulfate	13510-49-1	-	.002
Cadmium (dust and salts) as Cd	7440-43-9	-	0.05
Cadmium oxide	1306-19-0	-	0.05
Cadmium sulfate	10124-36-4	-	0.005
Carbon tetrachloride	56-23-5	5	30
bis-Chloromethyl ether	542-88-1	0.001	0.005
Chromium VI Compounds (note: CAS listed assigned to metallic chromium)	7440-47-3	-	0.05
Dibromoethane (Ethylene dibromide)	106-93-4	-	-
3,3'-Dichlorobenzidine	91-94-1	-	-

High Toxicity Air Contaminants (cont.)

Compound Chemical Name	CAS Registry Number	Threshold Limit Value(1) (TLV's) PPM	mg/m^3
Dimethyl sulfate	77-78-1	0.1	0.5
Ethyleneimine	151-56-4	0.5	1.0
Ethylene oxide	75-21-8	1.0	2.0
Formaldehyde	50-00-0	1	1.5
Hydrazine and its acid salts	302-01-2	0.1	0.1
Lead arsenate	7784-40-9	-	0.15
Methylene bisphenyl isocyanate, (Diphenylmethane-4, 4-diisocyanate) (DMI)	101-68-8	CO.02	CO.2(7)
Methyl isocyanate(MIC)	624-83-9	0.02	0.05
B-Naphthylamine	91-59-8	-	-
Nickel (metal and insoluble compounds)	7440-02-2	-	1.0
Nickel carbonyl	13463-39-3	0.05	0.35
Nickel oxide	1313-99-1	-	1.0
Nickel sulfide, as Ni	12035-72-2	-	1.0
4-Nitrodiphenyl	92-93-3	-	-
Nitrogen mustard	51-75-2	-	-
Nitrosodimethylamine (dimethylnitrosoamine)	62-75-9	-	-
Parathion	56-38-2	-	0.1
Polychlorinated biphenyls (PCBs) (TLV assigned to Aroclor 1254)	1336-36-3	-	0.5
Polycyclic Organic Matter (8) (includes Benzo(a)Pyrene)	50-32-8	-	-

High Toxicity Air Contaminants (cont.)

Compound Chemical Name	CAS Registry Number	Threshold Limit Value(1) PPM	(TLV's) mg/m^3
2,3,7,8-Tetrachloro-dibenzofuran	51207-31-0	-	-
Total Tetrachlorinated dibenzo-p-dioxins (includes 2,3,7,8TCDD)	1745-01-7	-	-
Toluene-(2,4)-diisocyanate (TDI)	584-84-0	0.005	0.04
Vinyl chloride (Chloroethylene)	75-01-4	-	-
Vinylidene chloride (1,1-Dichloroethylene)	75-35-4	5	20

Footnotes:

[1] 1984-85 ACGIH values.

[3] (HAZ) - "Human Carcinogens. Substances, or substances associated with industrial processesses recognized to have carcinogenic potential without an assigned TLV... for (these note) substances,... no exposure or contact by any route - respiratory, skin or oral, as detected by the most sensitive methods - shall be permiteed." From: "TLV's, Threshold Limit Values for Chemical Substances...ACGIH for 1984-85", Appendix A - Carcinogens, Table Alb., page 41.

[4] No chemical specific TLV or AAL available at this time, see "High Toxicity Air Contaminants," pages 2 and 3, for guidance.

[5] OSHA Temporary Standard: 0.5 fibers per c.c. (see Fed. Reg., 48, No. 215, page 51086, 1983). Not applicable to sources subject to NESHAPS.

6 Interim formaldehyde AAL of 5 ug/m^3 calculated from AG-a guidance for High Toxicity Air Contaminants, section I, paragraph B, page 3. This interim value replaces previously listed AAL of 2.0 ug/m^3. NYSDOH to provide a chemical specific formaldehyde AAL by 4/1/86.

7 "C" denotes ACGIH TLV-C,"ceiling limit". The concentration that should not be exceeded even instantaneously".

8 Containing large amounts of naphthalene, fluorene, anthracene, and acridine.

9 NOTE: NYSDON has determined that for "AAL's for dioxins... Basing an acceptable ambient level on only total TCDD's as is now done in 'Air Guide-1' (1984 and earlier editions) does not adequately represent public health risks for the dixin compounds... Health risks posed by emissions of chlorinated dioxins and the closely related chlorinated furans should be evaluated on a case by case basis taking into consideration specific isomers of each family of compounds."

Based on the above satement by NYSDOH; noting the legislative mandate for DOH to develop resource recovery related standards (including TCDD & TCDF); and DOH's April 1, 1986 deadline for such standards, DEC is withdrawing the 9.2×10^{-8} ug/m^5, "hernandez," TCDD interim AAL* at this time.

Emission sources of chlorinated dibenzofurans and dibenzodioxins will be reviewed on a case by case basis by DOH until the standards are promulgated. Direct all inquiries on this matter to the Toxics Management Section of DEC.

* EPA's Interim Evaluation of Health Risks Associated with Emissions of Tetrachlorinated Dioxins from Municipal Waste Recovery Facilities, November 1981.

DRAFT

Category A Moderate Toxicity Air Contaminants

Compound (ORGANICS) Chemical Name	CAS Registry Number	Threshold Limit Value(1) (TLV's) PPM	mg/m^3
Acetaldehyde	75-07-0	100	180
Acetamide	60-35-5	-	-
Acetic anhydride	108-24-7	C5 (4)	C20
2-Acetylaminofluorene	53-96-3	-	-
Acrylamide	79-06-1	-	0.3
Acrylic acid	79-10-3	10	30
Allyl chloride (3-Chloro-1-Propene)	107-05-1	1	3
Aniline	62-53-3	2	10
p-Anisidine	104-94-9	0.1	0.5
Arsine	7784-42-1	0.05	0.2
Benzyl chloride	100-44-7	1	5
Biphenyl	92-52-4	0.2	1.5
Butanethiol	109-79-9	0.5	1.5
n-Butylamine	109-73-9	C5	C15
Carbon black	1333-86-4	-	3.5
Carbon disulfide	75-15-0	10	30
Chlordane	57-74-9	-	0.5
Chlordecone (Kepone)	143-50-0	-	-
-Chloroacetophenone (Phenacyl chloride)	532-27-4	0.05	0.3
p-Chloroaniline	106-47-8	-	-
Chlorobenzene (monochlorobenzene)	108-90-7	75	350
Chloroform	67-66-3	10	50

Category A Moderate Toxicity Air Contaminants

Compound (ORGANICS) Chemical Name	CAS Registry Number	Threshold Limit Value(1) (TLV's) PPM	mg/m^3
p-Chloronitrobenzene	100-00-5	(see p-Nitrochloro-benzene below)	
o-Cresol	95-48-7	5.0	22
m-Cresol	108-39-4	5.0	22
p-Cresol	106-44-5	5.0	22
Cyanamide	420-04-2	-	2
Cyanides (As CN)	57-12-5	-	5
Cyanic acid (Sodium Salt)	917-61-3	see Cyanogen below	
Cyanic acid (Potassium Salt)	590-28-3	see Cyanogen below	
Cyanoacetamide	107-91-5	see Cyanides above	
Cyanogen (Oxalonitrile)	460-19-5	10	20
Diallylamaleate	999-21-3	-	-
2,5-Diamino toluene	95-70-5	-	-
Diazomethane	334-88-3	0.2	0.4
o-Dichlorobenzene	95-50-1	C50	C300
1,2-Dichloroethane (Ethylene Dichloride)	107-06-2	10	40
Dichloromethane (Methylene Chloride)	75-09-2	100	350
Diethyl phthalate	84-66-2	-	5
Diisodecyl phthalate	26761-40-0	see Diethyl phathalate above	
3,3'-Dimethoxybenzidine (o-Dianisidine)	119-90-4	-	-
4-Dimethylaminoazobenzene	60-11-7	-	-

Category Moderate Toxicity Air Contaminants

Compound (ORGANICS) Chemical Name	CAS Registry Number	Threshold Limit Value(1) PPM	(TLV's) mg/m^3
Dimethyl carbamoyl chloride	79-44-7	-	-
1,1-Dimethyl hydrazine	57-14-7	0.5	1
m-Dinitrobenzene	99-65-0	0.15	1
Dioctyl phthalate (DOP)	117-81-7	see Diethylphtalate above	
p-Dioxane	123-91-1	25	90
Diphenyl hydrazine	122-66-7	see Dimethyl hydrazine above	
Epichlorohydrin (1-Chloro-2,3-epoxy propane)	106-89-8	2	10
Epoxypropane (Propylene oxide)	75-56-9	20	50
Ethanethiol (Ethyl mercaptan)	75-08-1	0.5	1
Ethanolamine	141-43-5	3	8
Ethyl benzene	100-41-4	100	435
Ethyleneglycol Monopropyl ether	2807-30-9	-	-
Formamide	75-12-7	20	30
Formic acid	64-18-6	5	9
Furfural	98-01-1	2	8
Furfuryl alcohol	98-00-0	10	40
Gylcidaldehyde	765-34-4	-	-
Heptachlor	76-44-8	-	0.5
Hexachlorobenzene	118-74-1	-	-
Hexachlorobutadiene	87-68-3	0.02	0.24
Hexachlorocyclohexane (1,2,3,4,5,6, Hexachlorocyclohexane)	319-84-6	See a Lindane, page 36	

Category A Moderate Toxicity Air Contaminants

Compound (ORGANICS) Chemical Name	CAS Registry Number	Threshold Limit Value(1) (TLV's) PPM	mg/m^3
Hexachlorocyclopentadiene	77-47-4	0.01	0.1
Hexachloronapthalene	1335-87-1	-	0.2
Hexamethyl phosphoramide	680-31-9	-	-
Hydrogen cyanide (Hydrocyanic acid)	74-90-8	C10	C10
Hydrogen Fluoride	7664-39-3	C3	C2.5
Hydroquinone	123-31-9	-	2
Isophorone	78-59-1	C5	C25
Isopropyl Alcohol(5)	67-63-0	400	980
Isopropylamine	75-31-0	5	12
Ketene	463-51-4	0.5	0.9
a-Lindane	319-84-6	-	0.5
g-Lindane	58-89-9	-	0.5
Malathion	121-75-5	-	10
Maleic anhydride	108-31-6	0.25	1
Mercury (organic) (nonNESHAPS sources)	7439-97-6	-	0.05
2-Methoxyethanol (Methyl cellosolve)	109-86-4	5	16
Methylamine	74-89-5	10	12
Methyl chloromethylether	107-30-2	-	-
4,4'-Methylene dianiline	101-77-9	0.1	0.8
Methylethyl ketone (MEK)	78-93-3	200	590

Category A Moderate Toxicity Air Contaminants

Compound (ORGANICS) Chemical Name	CAS Registry Number	Threshold Limit Value(1) (TLV's) PPM	mg/m^3
Methyl hydrazine (monomethyl hydrazine)	60-34-4	C0.2	C0.35
Methyl isobutyl ketone	108-10-1	50	205
Methyl mercaptan	74-93-1	0.5	1.0
Methyl methacrylate	80-62-6	100	410
Mirex	2385-85-5	-	-
Monochlorobenzene	108-90-7	see chlorobenzene above	
Monomethyl hydrazine	60-34-4	see methyl hydrazine above	
Naphthalene	91-20-3	10	50
a-Naphthylamine	134-32-7	-	-
Nitrilotriacetic acid	139-13-9	-	-
p-Nitroaniline	100-01-6	-	3
Nitrobenzene	98-95-3	1	5
Nitroglycerine	55-63-0	0.5	0.5
p-Nitrochlorobenzene	100-00-5	-	1
p-Nitrophenol	100-02-7	-	-
1-Nitropropane	108-03-2	25	90
Nitroso-n-methylurea	684-93-5	-	-
p-Nitrosophenol	104-91-6	-	-
p-Nitrotoluene	99-99-0	2	11
Octachloronaphthalene	2234-13-1	-	0.1
Oil Mist (Mineral)	8012-95-1	-	5(6)
Oxalic acid	144-62-7	-	1

Category A Moderate Toxicity Air Contaminants

Compound (INORGANICS) Chemical Name	CAS Registry Number	Threshold Limit Value(1) PPM	(TLV's) mg/m^3
Paraquat	1910-42-5	-	0.1
Pentachlorophenol	87-86-5	-	0.5
Perchloroethylene	127-18-4	see tetrachloroethylene below	
Petroleum distillates	8002-05-9	-	-
Phenol	108-95-2	5	19
p-Phenylene diamine	106-50-3	-	0.1
Phenylhydrazine	100-63-0	5	20
Phosgene	75-44-5	0.1	0.4
Phosphine	7803-51-2	0.3	0.4
Picric acid	88-89-1	-	0.1
Propane sultone	1120-71-4	-	-
B-Propiolactone	57-57-8	0.5	1.5
Pyrethrin	121-29-9	See Pyrethrum	
Pyrethrum	8003-34-7	-	5.
Quinoline	91-22-5	-	-
Quinone	106-51-4	0.1	0.4
Rotenone (commercial)	83-79-4	0	5
Styrene, monomer	100-42-5	50	215
1,1,2,2-Tetrachloroethane	79-34-5	1	7
Tetrachloroethylene (Perchloroethylene)	127-18-4	50	335
Thiourea	62-56-6	-	-
Toluene-(2,4)-diamine	95-80-7	-	-

Category A Moderate Toxicity Air Contaminants

Compound (~~IN~~ORGANICS) Chemical Name	CAS Registry Number	Threshold Limit Value(1) (TLV's) PPM	mg/m^3
o-Toluidine	95-53-4	2	9
Toxaphene (chlorinated camphene)	8001-35-2	-	0.5
1,2,4-Trichlorobenzene	120-82-1	C5	C40
1,1,2-Trichloroethane	79-00-5	10	45
Trichloroethylene	79-01-6	50	270
Urethane (Carbamic acid)	51-79-6	-	-
Vinylbromide	593-60-2	5	20
Vinyl fluoride	75-02-2	see Vinyl bromide	
o-Xylene (note: CAS 1300-20-7 assigned to mixed isomer xylenes)	95-47-6	100	435
m-Xylene	108-38-3	100	435
p-Xylene	106-42-3	100	435
Xylidine	1300-73-8	2.0	10

Category A Moderate Toxicity Air Contaminants

Compound (INORGANICS) Chemical Name	CAS Registry Number	Threshold Limit Value(1) PPM	(TLV's) mg/m^3
Ammonium bromide	12124-97-9	-	-
Antimony	7440-36-0	-	0.5
Antimony trioxide	1309-64-4	-	0.5
Barium	7440-39-3	-	0.5
Barium Sulfate	7727-43-7	-	-
Bromine	7726-95-6	0.1	0.7
Cadmium chloride (as Cd salt)	10108-64-2	-	0.05
Chlorine	7782-50-5	1	3
Chlorine dioxide	10049-04-4	0.1	0.3
Cobalt	7440-48-4	-	0.1
Cobalt oxide	1307-96-6	-	-
Cobalt sulfide	1317-42-6	-	-
Fluorine	7782-41-4	1	2
Lead acetate	1335-32-6	-	-
Mercury (inorganic) (non-NESHAPS sources)	7439-97-6	-	0.1
Phosphorous (yellow)	7723-14-0	-	0.1
Selenium	7782-49-2	-	0.2
Selenium sulfide	7488-56-4	-	0.2
Thallium(7)	7440-28-0	-	0.1
Thallium oxide	1314-32-5	-	0.1

Category A Moderate Toxicity Air Contaminants

Compound (INORGANICS) Chemical Name	CAS Registry Number	Threshold Limit Value(1) PPM	(TLV's) mg/m^3
Thallium (I) selenite	12039-52-0	-	0.1
Thallium sulfate	7446-18-6	-	0.1
Zinc bromide	7699-45-8	-	-
Zinc chloride (fume)	7646-85-7	-	1
Zinc oxide (fume)	1314-13-2	-	5

(1) 1984-85 ACGIH values

(3) (DM) denotes "de minimus" Interim AAL of 0.03 ug/m^3 is recommended for use with Appendix A screening methodology. No chemical specific TLV or AAL is available at this time.

(4) "C" denotes ACGIH TLV-C, "ceiling limit". "The concentration that should not be exceeded even instantaneously."

(5) The higher degree of toxicity is due to isopropyl oil, a common manufacturing by-product.

(6) Oil Mist (mineral) as sampled by a method which does not collect vapor.

(7) The TLV of 0.1 mg/m^3 is for soluble thallium compounds, as Tl. Thallium readily oxidizes in air at room temperature.

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CAT B

Category B Low Toxicity Air Contaminants

Compound (ORGANICS) Chemical Name	CAS Registry Number	Threshold Limit Value(1) (TLV's) PPM	mg/m^3
Acetone	67-64-1	750	1780
Acetonitrile	75-05-8	40	70
n-Butyl acetate	123-86-4	150	710
n-Butyl alcohol	71-36-3	C50 (3)	C150
Butyl benzyl phthalate	85-68-7	-	5(4)
Chloromethane (Methyl chloride)	74-87-3	50	105
Cyclohexane	110-82-7	300	1050
Diethyl ether (1,1'-Oxybis-ethane)	60-29-7	(See Ethyl ether, below)	
Dioctyl sebacate	122-62-3	-	-
Ethyl acetate	141-78-6	400	1400
Ethyl chloride	75-00-3	1000	2600
Ethyl ether (Diethyl ether, ethers)	60-29-7	400	1200
Glycerin Mist(5)	56-81-5	-	10
Glycol monoethylether (2-Ethoxyethanol)	110-80-5	5	9
n-Heptane	142-82-5	400	1600
Isoamyl acetate	123-92-2	100	525
Isoamyl alcohol	123-51-3	100	360
Isobutyl acetate	110-19-0	150	700
Pyridine	110-86-1	5	15
Resorcinol	108-46-3	10	45

Category B Low Toxicity Air Contaminants

Compound (~~B~~ORGANICS) Chemical Name	CAS Registry Number	Threshold Limit Value(1) PPM	(TLV's) mg/m^3
Tetrahydrafuran	109-99-9	200	590
Toluene (Toluol)	108-88-3	100	375
1,1,1-Trichloroethane (Methylchloroform)	71-55-6	350	1900
Turpentine	8006-64-2	100	560
Urea	57-13-6	-	-

* NOTE: 1000 ug/m^3 = 1 mg/m^3

Category B Low Toxicity Air Contaminants

Compound (INORGANICS) Chemical Name	CAS Registry Number	Threshold Limit Value(1) PPM	(TLV's) mg/m^3
Ammonia	7664-41-7	25	18
Copper, (fume)	7440-50-8	-	0.2
Copper, (dusts and mists, as Cu)	7440-50-8	-	1
Hydrogen bromide	10035-10-6	C3	C10
Hydrogen chloride	7647-01-0	C5	C7
Iodine	7553-56-2	C0.2	C1
Nitric acid	7697-37-2	2	5
Zinc	7440-66-6	-	-

NOTE: If you need categories for other compounds not found in these lists please call Ligia Mora-Applegate or Barry Andrews. SunCom 278-1344.

Reference: New York State Air Guide -1

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