UC 149

UNION CARBIDE INTERNAL CORRESPONDENCE

CHEMICALS AND PLASTICS

P. O. BOX 471, TEXAS CITY, TEXAS 77590

TO (NAME) Mr. J. F. Erdmann
COMPANY Mr. W. A. Mazzolini
LOCATION Ms. A. P. Yalcinkaya

DATE April 9, 1979

COPY TO Mr. W. T. Gray
Dr. D. H. Glenn
Mr. R. L. Frantz
Mr. J. B. Leverton
Mr. F. S. Provenzano
Mr. R. J. Taylor

SUBJECT March 29, 1979 Vinyl Chloride Safety Association Meeting New Orleans, La.

This meeting was called based on some safety related problems that member companies had reported with their "Final Control Devices". Attached are my notes on the meeting.

P. D. Smith

P. D. Smith

PDS/st
Attachments

UCC 093504

NOTES

VINYL CHLORIDE SAFETY ASSOCIATION MEETING

MARCH 29, 1979

NEW ORLEANS, LA.

I. MORNING SESSION - FINAL CONTROL DEVICES

Dave Loll - Diamond Shamrock

Diamond Shamrock uses carbon adsorbtion, with an incinerator as a backup, for control of VCM emissions. The carbon beds are 4' OD x 18' high and contain 5,000 pounds of carbon. Breakthrough is monitored using three thermocouples to track the heat front generated by the heat of adsorbtion. The bed is regenerated to 300°F with 150 psi steam. The bed is then dried with hot nitrogen to 340°F. This step is required to prevent the significant activity loss experienced with wet carbon. The bed is cooled to less than 100°F with cool nitrogen and is ready for re-use.

Other problems they have encountered include:

1. Hot spots due to liquid carryover. One one occasion they suspect the bed actually caught fire.

2. Corrosion, especially of the bottom support grid in vertical units.

3. Carbon carryover as a result of (2).

4. Cross-contamination of the beds due to Operator error and valve leaks.

Their solutions were:

1. Deluge the hot spots internally and eliminate feed cooling to eliminate liquid.

2. Provide nitrogen purge to assure positive flow at all times. This also helped rid the system of inerts.

3. Provide Hastelloy support grids.

Capital costs for the Unit were estimated to be $2 MM.

Marcus Smith - Georgia Pacific

Georgia Pacific has horizontal carbon beds with the bed effluent going to a boiler. They report channeling problems in the horizontal bed.

Breakthrough is monitored with an on-line gas chromatograph. They also regenerate with steam. Drying, however, is done with the bed under a vacuum with an external heater. A nitrogen purge precedes vacuum breaking and re-use.

Dave Becker - Diamond Shamrock

Diamond receives wet and dry streams from various plant units and incinerates them with the VCM streams following liquid knockout. Most of the equipment is protected with 15 psi carbon rupture discs and flame arrestors. It was pointed out that Conoco and Amoco research indicated that conventional flame arrestors (Shand and Jurs, Varac) have been found to pass flame when tested. The biggest problem to date has been flame arrestors in process lines.

Dick Holiday - PPG

PPG uses incineration for final control. The common vendor seems to be Trane. Dick reported that PPG asked EPA what they should do if their final control device failed. They have been told to shutdown within 40 minutes. No other company has such a limit of any of those attending. No fines or serious citations have been reported by anyone to date.

Al Godfried - Borden

Borden spent $1 - $1.5 MM to install a Trane Subex Unit which has run well.

W. C. Holbrook - B. F. Goodrich

Goodrich has recently installed six solvent absorbers, five of which work well. Their emissions compare well with SVR's. They declined, however, to disclose what solvent they use.

Control Device Breakdown

Carbon Bed	-	6 plants
Incinerators	-	9 VCM plants 15 PVC plants
Solvent Absorbtion	-	3 plants

II. AFTERNOON SESSION

Q & A - Bob Inlincci - Georgia Pacific

Bob took an oral survey on several points. The responses of interest follow:

1. Everyone is reporting massive releases, but few, if any, companies report suspected exposures if the person was not being monitored at the time.

2. The 3M badges for monitoring VCM were reported to have OSHA approval. Both Conoco and Dow are using them with good acceptance. Cost is approximately $5 per badge.

3. Of the companies present at this meeting, we were the only ones allowing women in the Regulated Area. This poses a problem for the other companies based on one statement that half the OSHA inspectors are women.

4. It is becoming more common for government agencies to employ contractors to perform inspections. The vast majority of companies required the contractor to sign a secrecy agreement concerning their process before admitting him to the plant.

5. Items mentioned in EPA inspections --

   a. Leak detection procedures.

   b. Frequency of emergency releases (only problem has been with a plant averaging one release per month).

   c. Residual VCM levels after stripping.

   d. Definition of "leak", e.g. 25 ppm - 3 feet from the source or 1,000 ppm in contact with the source. Experience at other companies suggests this is a good place to fight for a reasonable limit.

6. All but one or two companies had been inspected at least once since October 21, 1978.

III. TRUE CONFESSIONS

The only incident reported was the failure of a safety valve due to stress cracking of the spring. At the time the plant had no PM or RM program. They have gone to a lower tensile strength steel for the spring and will also evaluate coatings.

IV. NEXT MEETING

The Annual Meeting will be held in San Francisco on Sept. 13-14, 1979.

Georgia-Pacific Corporation
P.O. Box 629
Plaquemine, Louisiana 70764
Telephone (504) 687-6321

June 6, 1979

MEMBERS OF THE VINYL CHLORIDE SAFETY ASSOCIATION

The next Vinyl Chloride Safety Association meeting will be held at the Hyatt n Union Square Hotel in San Francisco on September 13 and 14, 1979. Arrival in San Francisco should be scheduled for September 12.

In order to expedite programming, please indicate on the attached form topics which would be of principle interest to you or your company. It is necessary that these areas be limited to about five topics. Also, since this list is not intended to cover the complete spectrum of vinyl chloride safety, note any other subject of interest in space provided on the questionnaire or by separate communication.

Also, with regard to potential social programming, please indicate on the attached form whether your wife plans to accompany you on your visit to San Franicsco.

Those who wish to actively participate by presenting a paper, or acting as a discussion leader should contact me as quickly as possible by return mail or by telephone.

Our target date for completion of a preliminary agenda has been set for the third week of July. In order that we meet this date, and that this year's meeting continues to be of safety value to those who produce and use vinyl chloride, your cooperation and assistance is requested.

Very truly yours,

Jim Gabbett
Program Chairman

JFG:ddg

Attachments

ETHYL CORPORATION

MANUFACTURING DEPARTMENT

PLEASE ADDRESS REPLY
TO--BOX 341
BATON ROUGE, LA 70821

August 7, 1979

MEMBERS OF THE VINYL CHLORIDE SAFETY ASSOCIATION

Preparations for the fall meeting in San Francisco are essentially complete. Attached is a copy of the agenda reflecting the results of the recent poll of membership. Since all speakers have not been confirmed a final copy of the agenda will be available at the meeting registration desk.

The meeting will be held September 13 and 14 at the Hyatt on Union Square, San Francisco. The hotel is holding a block of rooms for us for September 12 and 13. The rates range from $75 - $95 for a single and from $95 to $115 for a double. Reservations should be made by calling the hotel directly at 415 - 398-1234.

Many wives are planning to accompany their husbands. There will be an interesting program planned for the ladies during the day Thursday. (Note: If your wife plans to attend please inform Jim Gabbett, Georgia Pacific, Plaquemine, La.).

We will follow the usual format of registration and social hour between 8 - 9 a.m., Thursday, September 13. Registration fee will be $30 per person and will include the cost of lunch Thursday. A short business meeting will be held to decide, among other things, 1980 officers, location of the 1980 meeting and an up-to-date treasurers report.

See you in San Francisco.

Sincerely,

H. G. Olson

H. G. Olson, Secretary,
Vinyl Chloride Safety Association

Attachment

VINYL CHLORIDE SAFETY ASSOCIATION MEETING AGENDA

SEPTEMBER 13 & 14, 1979

HYATT ON UNION SQUARE, SAN FRANCISCO, CALIFORNIA 94108

September 13, 1979

	Time	Subject	Discussion Leader
A.M.	8:00 - 9:00	Registration & Coffee Social Hour	
	9:00 - 9:30	Chairman's Welcome Official Business	Art Gellner CertainTeed
	9:30 - 10:15	(CIIT - Its contribution to business which handles toxic chemicals)	Dick Fleming Ex. Vice President Air Products
	10:15 - 10:30	Coffee Break	
	10:30 - 11:15	Risk Analysis of Runaway Reaction Occurring in a Solvent Autoclave	D. C. Wobser Union Carbide
	11:15 - 12:00	Training New Plant Forces for Safety	Roy Henderson Diamond Shamrock
P.M.	12:00 - 1:00	Lunch	
	1:00 - 1:45	Pros & Cons of Computer Control Relative to Safety	( )
	1:45 - 2:30	Explosion in VCM Recovery Compressor	B. Terwiesch Chemische Werke Hüls
	2:30 - 3:00	Placing Explosive Charge on a Burning Tank Car	H. Waltemate B. F. Goodrich
	3:00 - 3:15	Coffee Break	
	3:15 - 4:00	Major VCM Excursions & How They are Handled	( )
	4:00 - 4:30	Data Reporting on VCM Monitoring Equipment	W. Clark Dow Chemical
	4:30 - 5:00	Solvent Absorption as a Final Control Device	G. Schaaf B. F. Goodrich
	5:00	Adjourn	

Parenthesis indicate that the Subject or Discussion Leader have not been finalized at this time.

September 14, 1979

Time	Subject	Discussion Leader
A.M. 8:00 - 8:30	Chloride Stress Cracking (Update)	J. Wallace Esso
8:30 - 10:15	An Update of Regulatory Agencies Activity & Their Effect on Our Industry. Including: New Regulations Present Reporting Required Present Reporting Results Other Agencies, etc.	J. T. Barr Air Products & R. Laundrie General Tire
10:15 - 10:30	Coffee Break	
10:30 - 12:00	True Confessions	
12:00	Adjourn Meeting	

MEMBERS OF THE VINYL CHLORIDE SAFETY ASSOCIATION

Attached are EPA survey forms which will provide useful information at our San Francisco meeting. The data will be compiled by Jim Klupar of B. F. Goodrich. It is necessary that they be received by August 31 at the address shown on the bottom of the form.

Please note the company replying can remain anonymous by clipping off the top of the form before mailing. A blank form and a sample form are included.

Your cooperation will be appreciated.

Jim Gabbett ddg

Jim Gabbett

JFG:ddg

Attachments

UCC 093512

VCM NESHAP SURVEY-VCM SAFETY ASSOCIATION - PERIOD 3/1/79 THRU 7/31/79 EPA REGION VIII

VINYL CHLORIDE PLANT 61.62 and 61.63

	OXYCHLORINTION REACTOR	INCINERATOR	OTHER CONTROL (Describe)
Total Hours of Plant Operation	3600		
Hours Not in Compliance	400		
% Hours in Compliance	89		
Relief Valve Discharges			
No. of Releases			2
Total Lbs. Released			2000

POLYVINYL CHLORIDE PLANT

	SUSPENSION	DISPERSION	BULK	LATEX	SOLUTION	COPOLYMER
1. Reactor Openings 61.64(a)						
Total No. of Openings	50		50			
No. in Compliance	40		49			
% in Compliance	80		98			
Measured or Calculated	MEASURED		CALCULATED			
2. Resin Stripping - 24 Hr. TWA RVCM 61.64(e)						
Total Days Operating	153		100			
Days in Compliance	153		97			
% in Compliance	100		97			
3. Relief Valve Discharges						
No. of Reactor Discharges	1		1			
No. of Other Discharges	1					
Total Lbs. Released	300		50			

	Incinerator	Charcoal Adsorber	Liquid Absorber	Furnace	Other (Describe)
4. Monomer Recovery Discharge 61.64(d)					
Total Hours of Plant Operation	3600				
Hours Control System Bypassed	36				
Emission Measurement Frequency	HOURLY				
Hours Non-Compliance	36				
% Hours in Compliance	98				

5. Has your plant received a Notice of Violation ✓ or Enforcement Order ____?

The period 3/1/79 thru 7/31/79 has 153 days (3,672 hours).

For Further Explanation
Please Call:
(216) 524-0200 ext. 7808

PLEASE COMPLETE AND MAIL TO:
J. A. Klupar
BFGoodrich Chemical Company
6100 Oak Tree Boulevard
Cleveland, Ohio 44131
BEFORE August 31, 1979

UCC 093513

COMPANY NAME_____ PLANT LOCATION_____

VCM NESHAP SURVEY-VCM SAFETY ASSOCIATION - PERIOD 3/1/79 THRU 7/31/79 EPA REGION___.

. VINYL CHLORIDE PLANT 61.62 and 61.63

	OXYCHLORINTION REACTOR	INCINERATOR	OTHER CONTROL (Describe)
Total Hours of Plant Operation			
Hours Not in Compliance			
% Hours in Compliance			
Relief Valve Discharges			
No. of Releases			
Total Lbs. Released			

. POLYVINYL CHLORIDE PLANT

	SUSPENSION	DISPERSION	BULK	LATEX	SOLUTION	COPOLYMER
1. Reactor Openings 61.64(a)						
Total No. of Openings						
No. in Compliance						
% in Compliance						
Measured or Calculated						
2. Resin Stripping - 24 Hr. TWA RVCM 61.64(e)						
Total Days Operating						
Days in Compliance						
% in Compliance						
3. Relief Valve Discharges						
No. of Reactor Discharges						
No. of Other Discharges						
Total Lbs. Released						

	Incinerator	Charcoal Adsorber	Liquid Absorber	Furnace	Other (Describe)
4. Monomer Recovery Discharge 61.64(d)					
Total Hours of Plant Operation					
Hours Control System Bypassed					
Emission Measurement Frequency					
Hours Non-Compliance					
% Hours in Compliance					

5. Has your plant received a Notice of Violation_____or Enforcement Order_____?

The period 3/1/79 thru 7/31/79 has 153 days (3,672 hours).

For Further Explanation
Please Call:
(216) 524-0200 ext. 7808

PLEASE COMPLETE AND MAIL TO:
J. A. Klupar
BFGoodrich Chemical Company
9100 Oak Tree Boulevard
Cleveland, Ohio 44131
BEFORE August 31, 1979

UCC 093514

PART 1910

OCCUPATIONAL SAFETY AND HEALTH STANDARDS

SUBPART G—OCCUPATIONAL HEALTH AND ENVIRONMENTAL CONTROL

SUBPART G—OCCUPATIONAL HEALTH AND ENVIRONMENTAL CONTROL

1910.93—AIR CONTAMINANTS

An employee's exposure to any material listed in table G–1, G–2, or G–3 of this section shall be limited in accordance with the requirements of the following paragraphs of this section.

(a) Table G–1:

(1) Materials with names preceded by "C"—ceiling values. An employee's exposure to any material in table G–1, the name of which is preceded by a "C" (e.g., C Boron trifluoride), shall at no time exceed the ceiling value given for that material in the table.

(2) Other materials—8-hour time weighted averages. An employee's exposure to any material in table G–1, the name of which is not preceded by "C," in any 8-hour work shift is preceded by a "C" (e.g., C Boron trifluoride), shall at no time exceed the ceiling value given for that material in the table.

TABLE G–1

Substance	p.p.m.[a]	mg./M³ [b]
Acetaldehyde	200	360
Acetic acid	10	25
Acetic anhydride	5	20
Acetone	1,000	2,400
Acetonitrile	40	70
Acetylene dichloride, see 1, 2-Dichloroethylene		
Acetylene tetrabromide	1	14
Acrolein	0.1	0.25
Acrylamide—Skin		0.3
Acrylonitrile—Skin	20	45
Aldrin—Skin		0.25
Allyl alcohol—Skin	2	5
Allyl chloride	1	3
**C Allyl glycidyl ether (AGE)	10	45
Allyl propyl disulfide	2	12
2-Aminoethanol, see Ethanolamine		
2-Aminopyridine	0.5	2
**Ammonia	50	35
Ammonium sulfamate (Ammate)		15
n-Amyl acetate	100	525
sec-Amyl acetate	125	650
Aniline—Skin	5	19
Anisidine (o, p-isomers)—Skin		0.5
Antimony and compounds (as Sb)		0.5
ANTU (alpha naphthyl thiourea)		0.3
Arsenic and compounds (as As)		0.5
Arsine	0.05	0.2
Azinphos-methyl—Skin		0.2
Barium (soluble compounds)		0.5
p-Benzoquinone, see Quinone		
Benzoyl peroxide		5
Benzyl chloride	1	5
Biphenyl, see Diphenyl		
Bisphenol A, see Diglycidyl ether		
Boron oxide		15
C Boron trifluoride	1	3
Bromine	0.1	0.7
Bromoform—Skin	0.5	5
Butadiene (1, 3-butadiene)	1,000	2,200
Butanethiol, see Butyl mercaptan		
2-Butanone	200	590
2-Butoxy ethanol (Butyl Cellosolve)—Skin	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
C Butylamine—Skin	5	15
C tert-Butyl chromate (as CrO_3)—Skin		0.1
n-Butyl glycidyl ether (BGE)	50	270
*Butyl mercaptan	10	35
p-tert-Butyltoluene	10	60
Calcium arsenate		1
Calcium oxide		5
**Camphor	2	
Carbaryl (Sevin ®)		5
Carbon black		3.5
Carbon dioxide	5,000	9,000
Carbon monoxide	50	55
Chlordane—Skin		0.5
Chlorinated camphene—Skin		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
α-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		
Chlorodiphenyl (42 percent Chlorine)—Skin		1
Chlorodiphenyl (54 percent Chlorine)—Skin		0.5
1-Chloro,2,3-epoxypropane, see Epichlorhydrin		

TABLE G-1—Continued

Substance	p.p.m.[a]	mg./M³ [b]
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
Chloroprene (2-chloro-1,3-butadiene)—Skin	25	90
Chromium, sol. chromic, chromous salts as Cr		0.5
Metal and insol. salts		1
Coal tar pitch volatiles (benzene soluble fraction) anthracene, BaP, phenanthrene, acridine, chrysene, pyrene		0.2
Cobalt, metal fume and dust		0.1
Copper fume		0.1
Dusts and Mists		1
Cotton dust (raw)		1
Crag® herbicide		15
Cresol (all isomers)—Skin	5	22
Crotonaldehyde	2	6
Cumene—Skin	50	245
Cyanide (as CN)—Skin		5
Cyclohexane	300	1,050
Cyclohexanol	50	200
Cyclohexanone	50	200
Cyclohexene	300	1,015
Cyclopentadiene	75	200
2, 4-D		10
DDT—Skin		1
DDVP, see Dichlorvos		
Decaborane—Skin	0.05	0.3
Demeton®—Skin		0.1
Diacetone alcohol (4-hydroxy-4-methyl-2-pentanone)	50	240
1,2-diaminoethane, see Ethylenediamine		
Diazomethane	0.2	0.4
Diborane	0.1	0.1
Dibutylphthalate		5
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-Dichloroethylene	200	790
C Dichloroethyl ether—Skin	15	90
Dichloromethane, see Methylenechloride		
Dichloromonofluoromethane	1,000	4,200
C 1,1-Dichloro-1-nitroethane	10	60
1,2-Dichloropropane, see Propylenedichloride		
Dichlorotetrafluoroethane	1,000	7,000
Dichlorvos (DDVP)—Skin		1
Dieldrin—Skin		0.25
Diethylamine	25	75
Diethylamino ethanol—Skin	10	50
Diethylether, see Ethyl ether		
Difluorodibromomethane	100	860
C Diglycidyl ether (DGE)	0.5	2.8
Dihydroxybenzene, see Hydroquinone		
Diisobutyl ketone	50	290
Diisopropylamine—Skin	5	20
Dimethoxymethane, see Methylal		
Dimethyl acetamide—Skin	10	35
Dimethylamine	10	18
Dimethylaminobenzene, see Xylidene		
Dimethylaniline(N-dimethyl-aniline)—Skin	5	25
Dimethylbenzene, see Xylene		
Dimethyl 1,2-dibromo-2,2-dichloroethyl phosphate, (Dibrom)		3
Dimethylformamide—Skin	10	30
2,6-Dimethylheptanone, see Diisobutyl ketone		
1,1-Dimethylhydrazine—Skin	0.5	1
Dimethylphthalate		5
Dimethylsulfate—Skin	1	5
Dinitrobenzene (all isomers)—Skin		1
Dinitro-o-cresol—Skin		0.2
Dinitrotoluene—Skin		1.5
Dioxane (Diethylene dioxide)—Skin	100	360
Diphenyl	0.2	1
Diphenylmethane diisocyanate (see Methylene bisphenyl isocyanate (MDI)		
Dipropylene glycol methyl ether—Skin	100	600
Di-sec, octyl phthalate (Di-2-ethylhexylphthalate)		5
Endrin—Skin		0.1
Epichlorhydrin—Skin	5	19
EPN—Skin		0.5
1,2-Epoxypropane, see Propyleneoxide		
2,3-Epoxy-1-propanol, see Glycidol		
Ethanethiol, see Ethylmercaptan		
Ethanolamine	3	6
2-Ethoxyethanol—Skin	200	740
2-Ethoxyethylacetate (Cellosolve acetate)—Skin	100	540
Ethyl acetate	400	1,400
Ethyl acrylate—Skin	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
C Ethyl mercaptan	10	25
Ethyl silicate	100	850
Ethylene chlorohydrin—Skin	5	16
Ethylenediamine	10	25
Ethylene dibromide, see 1,2-Dibromoethane		
Ethylene dichloride, see 1,2-Dichloroethane		
C Ethylene glycol dinitrate and/or Nitroglycerin—Skin	[d] 0.2	1

See footnotes at end of table.

STANDARDS AND INTERPRETATIONS

TABLE G-1—Continued

Substance	p.p.m.[a]	mg./M³ [b]
Ethylene glycol monomethyl ether acetate, see Methyl cellosolve acetate		
Ethylene imine—Skin	0.5	1
Ethylene oxide	50	90
Ethylidine chloride, see 1,1-Dichloroethane		
N-Ethylmorpholine—Skin	20	94
Ferbam		15
Ferrovanadium dust		1
Fluoride (as F)		2.5
Fluorine	0.1	0.2
Fluorotrichloromethane	1,000	5,600
Formic acid	5	9
Furfural—Skin	5	20
Furfuryl alcohol	50	200
Glycidol (2,3-Epoxy-1-propanol)	50	150
Glycol monoethyl ether, see 2-Ethoxyethanol		
Guthion ®, see Azinphosmethyl		
Hafnium		0.5
Heptachlor—Skin		0.5
Heptane (n-heptane)	500	2,000
Hexachloroethane—Skin	1	10
Hexachloronaphthalene—Skin		0.2
Hexane (n-hexane)	500	1,800
2-Hexanone	100	410
Hexone (Methyl isobutyl ketone)	100	410
sec-Hexyl acetate	50	300
Hydrazine—Skin	1	1.3
Hydrogen bromide	3	10
C Hydrogen chloride	5	7
Hydrogen cyanide—Skin	10	11
Hydrogen peroxide (90%)	1	1.4
Hydrogen selenide	0.05	0.2
Hydroquinone		2
C Iodine	0.1	1
Iron oxide fume		10
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
Isopropylether	500	2,100
Isopropyl glycidyl ether (IGE)	50	240
Ketene	0.5	0.9
Lead arsenate		0.15
Lindane—Skin		0.5
Lithium hydride		0.025
L.P.G. (liquified petroleum gas)	1,000	1,800
Magnesium oxide fume		15
Malathion—Skin		15
Maleic anhydride	0.25	1
C Manganese		5
Mesityl oxide	25	100
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
Methyl acrylate—Skin	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
C Methyl bromide—Skin	20	80
Methyl butyl ketone, see 2-Hexanone		
Methyl cellosolve—Skin	25	80
Methyl cellosolve acetate—Skin	25	120
Methyl chloroform	350	1,900
Methylcyclohexane	500	2,000
Methylcyclohexanol	100	470
o-Methylcyclohexanone—Skin	100	460
Methyl ethyl ketone (MEK), see 2-Butanone		
Methyl formate	100	250
Methyl iodide—Skin	5	28
Methyl isobutyl carbinol—Skin	25	100
Methyl isobutyl ketone, see Hexone		
Methyl isocyanate—Skin	0.02	0.05
C Methyl mercaptan	10	20
Methyl methacrylate	100	410
Methyl propyl ketone, see 2-Pentanone		
C α Methyl styrene	100	480
C Methylene bisphenyl isocyanate (MDI)	0.02	0.2
Molybdenum:		
Soluble compounds		5
Insoluble compounds		15
Monomethyl aniline—Skin	2	9
C Monomethyl hydrazine—Skin	0.2	0.35
Morpholine—Skin	20	70
Naphtha (coaltar)	100	400
Naphthalene	10	50
Nickel carbonyl	0.001	0.007
Nickel, metal and soluble cmpds, as Ni		1
Nicotine—Skin		0.5
Nitric acid	2	5
Nitric oxide	25	30
p-Nitroaniline—Skin	1	6
Nitrobenzene—Skin	1	5
p-Nitrochlorobenzene—Skin		1
Nitroethane	100	310
Nitrogen dioxide	5	9
Nitrogen trifluoride	10	29
Nitroglycerin—Skin	0.2	2
Nitromethane	100	250
1-Nitropropane	25	90
2-Nitropropane	25	90
Nitrotoluene—Skin	5	30
Nitrotrichloromethane, see Chloropicrin		
Octachloronaphthalene—Skin		0.1
*Octane	500	2,350
*Oil mist, mineral		*5
Osmium tetroxide		0.002
Oxalic acid		1
Oxygen difluoride	0.05	0.1
Ozone	0.1	0.2
Paraquat—Skin		0.5
Parathion—Skin		0.1 1
Pentaborane	0.005	0.01

TABLE G-1—Continued

Substance	p.p.m.[a]	mg./M³ [b]
Pentachloronaphthalene—Skin		0.5
Pentachlorophenol—Skin		0.5
*Pentane	1,000	2,950
2-Pentanone	200	700
Perchloromethyl mercaptan	0.1	0.8
Perchloryl fluoride	3	13.5
Petroleum distillates (naphtha)	500	2,000
Phenol—Skin	5	19
p-Phenylene diamine—Skin		0.1
Phenyl ether (vapor)	1	7
Phenyl ether-biphenyl mixture (vapor)	1	7
Phenylethylene, see Styrene		
Phenyl glycidyl ether (PGE)	10	60
Phenylhydrazine—Skin	5	22
Phosdrin (Mevinphos ®)—Skin		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
Picric acid—Skin		0.1
Pival ® (2-Pivalyl-1,3-indandione)		0.1
Platinum (Soluble Salts) as Pt		0.002
Propargyl alcohol—Skin	1	
Propane	1,000	1,800
n-Propyl acetate	200	840
Propyl alcohol	200	500
n-Propyl nitrate	25	110
Propylene dichloride	75	350
Propylene imine—Skin	2	5
Propylene oxide	100	240
Propyne, see Methylacetylene		
Pyrethrum		5
Pyridine	5	15
Quinone	0.1	0.4
RDX—Skin		1.5
Rhodium, Metal fume and dusts, as Rh		0.1
Soluble salts		0.001
Ronnel		10
Rotenone (commercial)		5
Selenium compounds (as Se)		0.2
Selenium hexafluoride	0.05	0.4
Silver, metal and soluble compounds		0.01
Sodium fluoroacetate (1080)—Skin		0.05
Sodium hydroxide		2
Stibine	0.1	0.5
*Stoddard solvent	500	2,950
Strychnine		0.15
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
TEDP—Skin		0.2
Tellurium		0.1
Tellurium hexafluoride	0.02	0.2
TEPP—Skin		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
1,1,2,2-Tetrachloroethane—Skin	5	35
Tetrachloroethylene, see Perchloroethylene		
Tetrachloromethane, see Carbon tetrachloride		
Tetrachloronaphthalene—Skin		2
Tetraethyl lead (as Pb)—Skin		0.075
Tetrahydrofuran	200	590
Tetramethyl lead (as Pb)—Skin		0.07
Tetramethyl succinonitrile—Skin	0.5	3
Tetranitromethane	1	8
Tetryl (2,4,6-trinitrophenylmethylnitramine)—Skin		1.5
Thallium (soluble compounds)—Skin as Tl		0.1
Thiram		5
Tin (inorganic cmpds, except oxides		2
Tin (organic cmpds)		0.1
C Toluene-2,4-diisocyanate	0.02	0.14
o-Toluidine—Skin	5	22
Toxaphene, see Chlorinated camphene		
Tributyl phosphate		5
1,1,1-Trichloroethane see Methyl chloroform		
1,1,2-Trichloroethane—Skin	10	45
Titaniumdioxide		15
Trichloromethane, see Chloroform		
Trichloronaphthalene—Skin		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
2,4,6-Trinitrophenol, see Picric acid		
2,4,6-Trinitrophenylmethylnitramine, see Tetryl		
Trinitrotoluene—Skin		1.5
Triorthocresyl phosphate		0.1
Triphenyl phosphate		3
Turpentine	100	560
Uranium (soluble compounds)		0.05
Uranium (insoluble compounds)		0.25
C Vanadium:		
V_2O_5 dust		0.5
V_2O_5 fume		0.1
Vinyl benzene, see Styrene		
**C Vinyl chloride	500	1,300
Vinylcyanide, see Acrylonitrile		
Vinyl toluene	100	480
Warfarin		0.1
Xylene (xylol)	100	435
Xylidine—Skin	5	25
Yttrium		1
Zinc chloride fume		1
Zinc oxide fume		5
Zirconium compounds (as Zr)		5

*1970 Addition.

[a] Parts of vapor or gas per million parts of contaminated air by volume at 25° C. and 760 mm. Hg pressure.

[b] Approximate milligrams of particulate per cubic meter of air.

STANDARDS AND INTERPRETATIONS

TABLE G-1—Continued

Substance	p.p.m.[a]	mg./M³ [b]

(No footnote "c" is used to avoid confusion with ceiling value notations.)

[d] An atmospheric concentration of not more than 0.02 p.p.m., or personal protection may be necessary to avoid headache.

[e] As sampled by method that does not collect vapor.

[f] For control of general room air, biologic monitoring is essential for personnel control.

(b) Table G-2:

(1) **8-hour time weighted averages.** An employee's exposure to any material listed in table G-2, in any 8-hour work shift of a 40-hour work week, shall not exceed the 8-hour time weighted average limit given for that material in the table.

(2) **Acceptable ceiling concentrations.** An employee's exposure to a material listed in table G-2 shall not exceed at any time during an 8-hour shift the acceptable ceiling concentration limit given for the material in the table, except for a time period, and up to a concentration not exceeding the maximum duration and concentration allowed in the column under "acceptable maximum peak above the acceptable ceiling concentration for an 8-hour shift."

(3) **Example.** During an 8-hour work shift, an employee may be exposed to a concentration of Benzene above 25 p.p.m. (but never above 50 p.p.m.) only for a maximum period of 10 minutes. Such exposure must be compensated by exposures to concentrations less than 10 p.p.m. so that the cumulative exposure for the entire 8-hour work shift does not exceed a weighted average of 10 p.p.m.

TABLE G-2

Material	8-hour time weighted average	Acceptable ceiling concentration	Acceptable maximum peak above the acceptable ceiling concentration for an 8-hour shift.	
			Concentration	Maximum duration
Benzene (Z37.4-1969)	10 p.p.m	25 p.p.m	50 p.p.m	10 minutes.
Beryllium and beryllium compounds (Z37.29-1970).	2 μg./M³	5 μg./M³	25 μg./M³	30 minutes.
Cadmium fume (Z37.5-1970)	0.1 mg./M³	3 mg./M³		
Cadmium dust (Z37.5-1970)	0.2 mg./M³	0.6 mg./M³		
Carbon disulfide (Z37.3-1968)	20 p.p.m	30 p.p.m	100 p.p.m	Do.
Carbon tetrachloride (Z37.17-1967)	10 p.p.m	25 p.p.m	200 p.p.m	5 minutes in any 4 hours.
Ethylene dibromide (Z37.31-1970)	20 p.p.m	30 p.p.m	50 p.p.m	5 minutes.
Ethylene dichloride (Z37.21-1969)	50 p.p.m	100 p.p.m	200 p.p.m	5 minutes in any 3 hours.
Formaldehyde (Z37.16-1967)	3 p.p.m	5 p.p.m	10 p.p.m	30 minutes.
Hydrogen fluoride (Z37.28-1969)	do			
Fluoride as dust (Z37.28-1969)	2.5 mg./M³			
Lead and its inorganic compounds (Z37.11-1969).	0.2 mg./M³			
Methyl chloride (Z37.18-1969)	100 p.p.m	200 p.p.m	300 p.p.m	5 minutes in any 3 hours.
Methylene Chloride (Z37.3-1969)	500 p.p.m	1,000 p.p.m	2,000 p.p.m	5 minutes in any 2 hours.
Organo (alkyl) mercury (Z37.30-1969)	0.01 mg./M³ [c]	0.04 mg./M³ [c]		
Styrene (Z37.15-1969)	100 p.p.m	200 p.p.m	600 p.p.m	5 minutes in any 3 hours.
Trichloroethylene (Z37.19-1967)	do	do	300 p.p.m	5 minutes in any 2 hours.
Tetrachloroethylene (Z37.22-1967)	do	do	do	5 minutes in any 3 hours.
Toluene (Z37.12-1967)	200 p.p.m	300 p.p.m	500 p.p.m	10 minutes.
Hydrogen sulfide (Z37.2-1966)		20 p.p.m	50 p.p.m	10 minutes once only if no other measurable exposure occurs.
Mercury (Z37.8-1971)		1 mg./10M³ [c]		
Chromic acid and chromates (Z37.7-1971)		do [c]		

(c) Table G–3: An employee's exposure to any material listed in table G–3, in any 8-hour work shift of a 40-hour work week, shall not exceed the 8-hour time weighted average limit given for that material in the table.

TABLE G–3—MINERAL DUSTS

Substance	Mppcf [e]	Mg/M³
Silica:		
Crystalline:		
Quartz (respirable)	250 [f]	10mg/M³ [m]
	%SiO_2+5	%SiO_2+2
Quartz (total dust)		30mg/M³
		%SiO_2+2
Cristobalite: Use ½ the value calculated from the count or mass formulae for quartz.		
Tridymite: Use ½ the value calculated from the formulae for quartz.		
Amorphous, including natural diatomaceous earth	20	80mg/M³
		%SiO_2
Silicates (less than 1% crystalline silica):		
Mica	20	
Soapstone	20	
Talc (non-asbestos-form)	20[n]	
Talc (fibrous). Use asbestos limit		
Tremolite (see talc, fibrous)		
Portland cement	50	
Graphite (natural)	15	
Coal dust (respirable fraction less than 5% SiO_2)		2.4mg/M³ or
For more than 5% SiO_2		10mg/M³
		%SiO_2+2
Inert or Nuisance Dust:		
Respirable fraction	15	5mg/M³
Total dust	50	15mg/M³

NOTE: Conversion factors—
mppcf×35.3=million particles per cubic meter
=particles per c.c.

[e] Millions of particles per cubic foot of air, based on impinger samples counted by light-field technics.

[f] The percentage of crystalline silica in the formula is the amount determined from air-borne samples, except in those instances in which other methods have been shown to be applicable.

[i] As determined by the membrane filter method at 430×phase contrast magnification.

[m] Both concentration and percent quartz for the application of this limit are to be determined from the fraction passing a size-selector with the following characteristics:

[n] Containing < 1% quartz; if > 1% quartz, use quartz limit.

(d) Computation formulae:

(1)

(i) The cumulative exposure for an 8-hour work shift shall be computed as follows:

$$E = \frac{C_a T_a + C_b T_b + \ldots C_n T_n}{8}$$

where:

E is the equivalent exposure for the working shift.

C is the concentration during any period of time T where the concentration remains constant.

T is the duration in hours of the exposure at the concentration C.

The value of E shall not exceed the 8-hour time weighted average limit in table G–1, G–2, or G–3 for the material involved.

(ii) To illustrate the formula prescribed in subdivision (i) of this subparagraph, note that isoamyl acetate has an 8-hour time weighted average limit of 100 p.p.m. (table G–1). Assume that an employee is subject to the following exposure:

Two hours exposure at 150 p.p.m.
Two hours exposure at 75 p.p.m.
Four hours exposure at 50 p.p.m.

Substituting this information in the formula, we have

$$\frac{2 \times 150 + 2 \times 75 + 4 \times 50}{8} = 81.25 \text{ p.p.m.}$$

Since 81.25 p.p.m. is less than 100 p.p.m., the 8-hour time weighted average limit, the exposure is acceptable.

(2)

(i) In case of a mixture of air contaminants an employer shall compute the equivalent exposure as follows:

$$E_m = \frac{C_1}{L_1} + \frac{C_2}{L_2} + \ldots \frac{C_n}{L_n}$$

where:

E_m is the equivalent exposure for the mixture.

C is the concentration of a particular contaminant.

L is the exposure limit for that contaminant, from table G–1, G–2, or G–3.

The value of E_m shall not exceed unity (1).

(ii) To illustrate the formula prescribed in subdivision (i) of this subparagraph, consider the following exposures:

Material	Actual concentration of 8-hour exposure	8-hour time weighted average exposure limit
Acetone (Table G-1)	500 p.p.m.	1,000 p.p.m.
2-Butanone (Table G-1)	45 p.p.m.	200 p.p.m.
Toluene (Table G-2)	40 p.p.m.	200 p.p.m.

Substituting in the formula, we have:

$$E_m = \frac{500}{1,000} + \frac{45}{200} + \frac{40}{200}$$
$$E_m = 0.500 + 0.225 + 0.200$$
$$E_m = 0.925$$

Since E_m is less than unity (1), the exposure combination is within acceptable limits.

(e) To achieve compliance with paragraph (a) through (d) of this section, administrative or engineering controls must first be determined and implemented whenever feasible. When such controls are not feasible to achieve full compliance, protective equipment or any other protective measures shall be used to keep the exposure of employees to air contaminants within the limits prescribed in this section. Any equipment and/or technical measures used for this purpose must be approved for each particular use by a competent industrial hygienist or other technically qualified person. Whenever respirators are used, their use shall comply with § 1910.134.

1910.93a—ASBESTOS

(a) Definitions.

For the purpose of this section.

(1) "Asbestos" includes chrysotile, amosite, crocidolite, tremolite, anthophyllite, and actinolite.

(2) "Asbestos fibers" means asbestos fibers longer than 5 micrometers.

(b) Permissible exposure to airborne concentrations of asbestos fibers.

(1) **Standard effective July 7, 1972.** The 8-hour time-weighted average airborne concentrations of asbestos fibers to which any employee may be exposed shall not exceed five fibers, longer than 5 micrometers, per cubic centimeter of air, as determined by the method prescribed in paragraph (e) of this section.

(2) **Standard effective July 1, 1976.** The 8-hour time-weighted average airborne concentrations of asbestos fibers to which any employee may be exposed shall not exceed two fibers, longer than 5 micrometers, per cubic centimeter of air, as determined by the method prescribed in paragraph (e) of this section.

(3) **Ceiling concentration.** No employee shall be exposed at any time to airborne concentrations of asbestos fibers in excess of 10 fibers, longer than 5 micrometers, per cubic centimeter of air, as determined by the method prescribed in paragraph (e) of this section.

(c) Methods of compliance.

(1) Engineering methods.

(i) **Engineering controls.** Engineering controls, such as, but not limited to, isolation, enclosure, exhaust ventilation, and dust

UC 149-2

UNION CARBIDE INTERNAL CORRESPONDENCE

CHEMICALS AND PLASTICS

P. O. BOX 471, TEXAS CITY, TEXAS 77590

TO (NAME) Dr. R. J. Anderson, 312
COMPANY Mr. M. E. Eisenhour
LOCATION Dr. D. H. Glenn
Mr. J. L. Hockersmith
Mr. J. B. Leverton
Dr. W. R. Manning, 511
Mr. W. A. Mazzolini
Mr. C. E. Moyer
Mr. F. S. Provenzano
Mr. M. E. Sutherland, 511
Mr. G. F. Tacquard
Mr. R. J. Taylor
Mr. R. N. Wheeler, 514
Suspension Vinyls Staff

DATE October 31, 1977

SUBJECT Vinyl Chloride Safety Association Meeting - October 6 & 7, 1977 Valley Forge, Pennsylvania

From: R. L. Frantz

This regular meeting of the Association had a record attendance of eighty-three members from virtually all of the domestic VCM and PVC producers as well as representatives from several foreign countries, including Canada, Mexico, U.K., Germany, Italy and Norway. Union Carbide was represented by Mr. R. N. Wheeler and the writer. A complete attendance list will be mailed to me; if any of you are interested in receiving a copy, let me know.

The first item on the agenda was a discussion of the physiological effects of VCM by Dr. R. W. McBurney, a physician from Diamond Shamrock. Some highlights of his presentation were: VCM is a relatively non-toxic chemical - it can cause narcosis and even death by asphyxiation. It is detoxified in the liver. Its target is the lining of small blood vessels and can cause Reynaud's phenoma by plugging up the blood vessels in the end of the fingers which can lead to AOL (loss of bone structure in the end of the fingers). It can also cause cirrhosis of the liver, enlargement of the spleen and of course angiosarcoma of the liver. Angio is Greek for worms (small blood vessels) and sarcoma is cancer. All of these effects are rare. VCM is a very weak carcinigen - only one in 3400 of those who've had prolonged, extended high exposure to VCM developed angiosarcoma. It is not a risk for workers exposed to from one to twenty-five ppm (his opinion, of course). VCM is picked up in the blood and transferred to the liver and lungs - is expelled through the lungs. A question from Herm Waltemate of B. F. Goodrich to Dr. McBurney was of perhaps more interest than Dr. McBurney's answer. It was "Is it more likely to get angiosarcoma from ingestion than from breathing?" The answer was "No". It was pointed out that there have been sixty-four deaths attributed to angiosarcoma over the last twenty-five years.