JUL 19 1983

DOW CHEMICAL U.S.A.

TEXAS DIVISION
FREEPORT, TEXAS 77541

July 14, 1983

Fred Williams
Union Carbide Corporation
P. O. Box 2831
Charleston, WV 25330

CMA BENZENE EPIDEMIOLOGY STUDY - UNIFORM TASKS

Dear Fred:

Enclosed is a copy of a letter regarding benzene exposure by job task. The epidemiology task group identified 34 tasks that were characteristic of our collective direct exposure operations. You will notice that the combined company data contained exposure information on 31 of the job tasks.

If I can assist you in understanding this uniform task approach to exposure classification, please give me a call.

Very truly yours,

Roger L. Daniel

Roger L. Daniel
Environmental Health Services
(409) 238-2121

cc: Harry Keating - Monsanto
Tom Collins - Union Carbide

dsp

Attachment

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ESTIMATE OF HISTORIC BENZENE EXPOSURES AT TWO PETROLEUM REFINERIES

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TASK DESCRIPTIONS FOR HISTORIC EXPOSURE STUDY

Task No.	TASK TITLE
2A	Conduct process reviews for units containing benzene
2B	Identify benzene related jobs
2C	Identify benzene related work practices
2D	Develop occupational personal histories of diagnosed leukemia cases
3	Perform historic exposure study

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BENZENE SENSORY DATA

	BENZENE CONC., PPM	DURATION OF EXPOSURE	EFFECT
(1)	1.5	Immediate	Odor Threshold
(2)	25	8 Hours	None
(3)	50-150	6 Hours	Headache, Lassitude, Weariness
(4)	100	Several Hours	Headache, Fatigue
(5)	500	1 Hour	Headache
(6)	1500	1 Hour	Depression
(7)	3000	Few Minutes	Eye/Nose Irritation (Tolerated for 30-60 Minutes)

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BASIS FOR SENSORY PERCEPTION
BENZENE EXPOSURE ESTIMATES

	DESCRIPTION OF ODOR EVENT	PPM ESTIMATE TO BE USED
A.	NO LIQUID VISIBLE BUT ODOR OF BENZENE IS DETECTABLE EXAMPLES DOWNWIND ODORS FUGITIVE EMISSIONS	1.5 - 5.0 PPM (3.0)
B.	NO LIQUID VISIBLE BUT AN OBVIOUS SOURCE OF BENZENE VAPOR IS NEARBY EXAMPLES VESSELS, TANKS VENTS	5.0 - 10.0 PPM (7.5)
C.	NO LIQUID VISIBLE, POSSIBLY STRONG ODOR AT TIMES	10 - 25 PPM 17.5
D.	LIQUID VISIBLE AND ODOR OF BENZENE IS PRESENT, POSSIBLY STRONG AT TIMES EXAMPLES T.T. LOADING GAUGING SAMPLE COLLECTION	25 - 50 PPM (37.5)
E.	LIQUID VISIBLE, STRONG ODOR PRESENT, CONTACT WITH LIQUID	50 - 100 PPM (75.0)
F.	ODOR AND/OR LIQUID CONTACT SO SIGNIFICANT SO AS TO REQUIRE "BACKING OUT OF IT" OR GETTING FRESH AIR	100 PPM + (200)
G.	NO DETECTABLE ODOR	< 1.5 PPM

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BASIS FOR SENSORY PERCEPTION
BENZENE EXPOSURE ESTIMATES

		PPM ESTIMATE TO BE USED
1. NO LIQUID VISIBLE BUT ODOR OF BENZENE IS DETECTABLE. EXAMPLES: DOWNWIND ODORS, FUGITIVE EMISSIONS		1.5 - 5.0 PPM (3.0)
2. NO LIQUID VISIBLE BUT AN OBVIOUS SOURCE OF BENZENE VAPOR IS NEARBY. EXAMPLES: VESSELS, TANKS, VENTS		5.0 - 10.0 PPM (7.5)
3. NO LIQUID VISIBLE, POSSIBLY STRONG ODOR AT TIMES.		10 - 25 PPM (17.5)
4. LIQUID VISIBLE AND ODOR OF BENZENE IS PRESENT, POSSIBLY STRONG AT TIMES	4A.	25 - 50 PPM (37.5)
	4B.	25 - 75 PPM (50.0)
5. LIQUID VISIBLE, STRONG ODOR PRESENT, CONTACT WITH LIQUID.	5A.	50 - 100 PPM (75.0)
	5B.	50 - 100 PPM (100.0)
6. ODOR AND/OR LIQUID CONTACT SO SIGNIFICANT SO AS TO REQUIRE "BACKING OUT OF IT" OR GETTING FRESH AIR.	6A.	150 - 200 PPM (175.0)
	6B.	150 - 400 PPM (275.0)
7. NO DETECTABLE ODOR.		< 1.5 PPM

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VALIDATION

JOB	ESTIMATED DATA: TIME PERIOD	ESTIMATED DATA: 2B DOSE RANGE PPM-DAYS/YR	ESTIMATED DATA: CALC. TWA RANGE PPM	MONITORING DATA: SAMPLES: TIME PERIOD	SAMPLES: NUMBER	SAMPLES: ARITH. AVG.	SAMPLES: MEDIAN	SAMPLES: TWA RANGE	$\bar{X}$ GEO. MEAN	SD GEO. STD. DEV.	UPPER RANGE $\bar{X}$ + 2SD	95% UPPER CONF. LIMIT OF $\bar{X}$
Deer Park:												
BEU Operator	76-81	197-386	0.78-1.52	77-81	76	0.46	0.3	0.1-2.7	0.31	2.31	4.9	0.37
Cumene Operator	77-78	150-586	0.6-14.8	77-78	20	0.65	0.1	0.1-9.5	0.18	2.99	6.2	0.28
Cumene Operator	79-83	106-393	0.3-8.6	79-83	102	0.25	0.1	0.1-2.6	0.17	2.11	4.4	0.19
Dockman (Benzene)	75-83	157-362	0.4-8.0	76-81	15	3.01	1.85	0.2-10.0	1.96	2.86	7.7	3.07
Dockman (Pry. Gas.)	79-83	9-53	0.42-2.75	80-83	20	0.63	0.1	0.1-5.4	0.19	3.40	7.0	0.30
ACU Gauger	75-83	36-275	0.14-1.10	77-83	94	0.27	0.2	0.1-1.5	0.20	2.16	4.5	0.23
Bottlewasher	77-83	12-78	0.09-0.60 0.05-0.31	78-83	40	0.11	0.1	0.1-0.2	0.11	1.23	2.6	0.11
Wood River:												
BEU Operator	75-79	1,089-2,666	4.2-10.3	76-79	14	1.24	0.38	0.1-7.66	0.49	4.04	8.6	0.91
BEU Operator	80-83	195-648	0.75-2.5	80	2	0.35	0.35	0.1-0.6	0.24	3.55	7.3	1.07
Barge Load Oper.	66-79	158-472	0.63-1.89	77-80	5	1.24	1.1	0.7-1.8	1.16	1.50	4.2	1.57
Op. Load Benz. Trucks	66-79	1,406-3,281	5.6-13.1	77-78	4	0.23	0.15	0.1-0.5	0.18	2.14	4.5	0.33
I/C Load Rack Operator	63-78/79	960-1709	3.8-6.8	76-79	4	1.32	1.22	0.66-2.2	1.21	1.64	4.5	1.82
Spec. Testers I A	60/66-83	67-134 25-70	0.1-0.54	77-83	8	0.41	0.3	0.1-1.0	0.30	2.39	5.1	0.50

SHELL-BISHOP-044828

VALIDATION

JOB	ESTIMATED DATA: TIME PERIOD	ESTIMATED DATA: 2B DOSE RANGE PPM-DAYS/YR	ESTIMATED DATA: CALC. TWA RANGE PPM	MONITORING DATA: SAMPLES: TIME PERIOD	MONITORING DATA: SAMPLES: NUMBER	MONITORING DATA: SAMPLES: ARITH. AVG.	MONITORING DATA: SAMPLES: MEDIAN	MONITORING DATA: SAMPLES: TWA RANGE
Deer Park:								
BEU Operator	76-81	197-386	0.78-1.52	77-81	76	0.46	0.3	0.1-2.7
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Cumene Operator	79-83	106-393	0.3-8.6	79-83	102	0.25	0.1	0.1-2.6
Dockman (Benzene)	75-83	157-362	0.4-8.0	76-81	15	3.01	1.85	0.2-10.0
Dockman (Pry. Gas.)	79-83	9-53	0.42-2.75	80-83	20	0.63	0.1	0.1-5.4
ACU Gauger	75-83	36-275	0.14-1.10	77-83	94	0.27	0.2	0.1-1.5
Bottlewasher	77-83	12-78	0.09-0.60 0.05-0.31	78-83	40	0.11	0.1	0.1-0.2
Wood River:								
BEU Operator	75-79	1,089-2,666	4.2-10.3	76-79	14	1.24	0.38	0.1-7.66
BEU Operator	80-83	195-648	0.75-2.5	80	2	0.35	0.35	0.1-0.6
Barge Load Oper.	66-79	158-472	0.63-1.89	77-80	5	1.24	1.1	0.7-1.8
Op. Load Benz. Trucks	66-79	1,406-3,281	5.6-13.1	77-78	4	0.23	0.15	0.1-0.5
I/C Load Rack Operator	63-78/79	960-1709	3.8-6.8	76-79	4	1.32	1.22	0.66-2.2
Spec. Testers I A	60/66-83	67-134 25-70	0.1-0.54	77-83	8	0.41	0.3	0.1-1.0

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Deer Park:							
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Bottlewasher	77-83	12-78	0.09-0.60 0.05-0.31	0.11	1.23	2.6	0.11
Wood River:							
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Barge Load Oper.	66-79	158-472	0.63-1.89	1.16	1.50	4.2	1.57
Op. Load Benz. Trucks	66-79	1,406-3,281	5.6-13.1	0.18	2.14	4.5	0.33
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Spec. Testers I A	60/66-83	67-134 25-70	0.1-0.54	0.30	2.39	5.1	0.50

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TASK 2(A) WORKSHEET
(Suggested Format)

(1) Unit: _____

Start-up: _____

Shutdown: _____

(2) Major Modifications: (List with relevant date of change.)

(3) Benzene Sources: (Equipment or Section) | % Bz | (List with relevant dates of any significant changes in benzene concentrations or process changes.)

(4) Major Emissions:

	% Bz	Relevant Dates

(5) Equipment Change:

	Date of Change

(6) Maintenance Turnarounds -- Estimated Frequency:

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