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July 26, 1974

Analysis of Vinyl Chloride Personal Monitor Samples

The carbon tube personal monitor samples which arrived on June 28 and July 17, 1974 have been analyzed. Corporate Environmental Services Lab has measured each amount of adsorbed vinyl chloride. These samples have been given log numbers of 48 and 77. Please state the log numbers in any inquiry about them.

The attached table gives the results of the analyses. The ppm values are based on the specific air volume sampled. The results have not been extrapolated to 8-hour time-weighted average values. Any inquiries about the sampling details of carbon tube exposures will be referred to you.

John W. Born

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cad

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R&D Files

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Sample Number	Sampling Location	Job Class	Sampling Time (min)	Vinyl Chloride Concentration	
				mg	ppm
32	Bldg. 515	Paste Drier Technician	250	1.6	2.6
33	Compound	Rover Technician	240	0.59	0.93
34	Bldg. 512	Utility Technician	25	0.90	14.
35	Bldg. 513	Lead Technician	245	0.85	1.3
36	Bldg. 513	Paste Technician	250	8.6	14.
37	Bldg. 513	Rover Technician	240	16.	26.
38	Bldg. 512	Utility Technician	24	1.7	29.
39	Bldg. 512	Utility Technician	220	2.9	5.4
40	Bldg. 512	Operator	220	0.51	0.97
41	Bldg. 513	Paste Technician	245	4.6	7.8
42	Bldg. 513	Pearl Technician	230	4.6	8.0
43	Bldg. 513	Rover Technician	240	4.6	7.9
54	Bldg. 513	Pearl Technician	240	7.6	13.
55	Bldg. 513	Paste Technician	240	10.	18.
56	Bldg. 513	Rover Technician	240	3.4	5.6
57	Bldg. 512	Operator	235	5.9	10.
58	Bldg. 512	Utility Technician	235	8.6	15.
59	Bldg. 512	Utility Technician	235	39.	67.
60	Bldg. 513	Rover Technician	245	2.6	4.4
61	Bldg. 513	Pearl Technician	240	2.3	3.9
62	Bldg. 513	Paste Technician	240	2.8	4.6

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FILE: C

COVER EACH MAJOR PROCESS USING A SEPARATE QUESTIONNAIRE

2. Define the number of workers involved in the manufacture of VC or PVC by specific job classification and by process.

<u>Job Classification</u>	<u>Number</u>	<u>Process</u>
<u>Production</u>		
Lead technician	3	Pearl
" "	2	Paste
" "	5	Mass
Console technician	4	Pearl, paste, mass
Technician	12	Pearl/paste poly
"	8	" " driver
"	2	" " relief
"	1	" " catalyst
"	4	Mass
Serviceman	8	Mass
<u>Maintenance</u>		
Mechanics	14	Pearl/paste, mass
Maintenance supervisor	2	" " "
<u>Supervisor and Support</u>		
Plant Manager	1	-
Plant Engineer	1	-
Professional Service Mgr.	1	-
Area Manager	1	Pearl/paste
" "	1	Mass
Chemists	3	Laboratory
Lead technicians	4	"
Technicians	6	"
Area engineers	3	Pearl/paste
" "	2	Mass
Design engineers	5	Engineering
<u>Other</u>		
Technician	1	Tank farm
Technician trainee	4	Warehouseman
" "	4	Pearl/mass bagger
Serviceman	4	" " "

Foster D. Shell, Inc.

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III. PERSONAL PROTECTIVE EQUIPMENT

1. What are you currently using under the 50 ppm emergency standard and describe the operating conditions?

I. Air-Purifying RespiratorsA. Combination vinyl service and PVC dust service(1.) American Optical 5000-R55 Cartridge

- a. Cartridge replacement daily or on high exposure.

(2.) Application

- a. Use when concentration of VCL in work area is between 25 and 50 ppm and/or dust protection is needed.
- b. Vessel entry as specified in SA-4 Vessel Entry Procedure.

B. PVC dust service

- (1.) American Optical 5000- R 30 filter
American Optical 2000- R 90 filter
MSA Dustfoe 66- MSA 66 filter

- a. Filter replacement daily or if air-flow becomes restricted.

(2.) Application

- a. Pearl/paste and mass resin bagging operations
- b. Bulk loading and unloading tank cars and trucks
- c. Dusty housekeeping operations.
- d. Any excessively dusty area
- e. Vessel entry as specified in SA-4 Vessel Entry Procedure.

II. Scott Air Paks and Air-Line RespiratorsA. Use in any area contaminated with:(1) Vinyl chlorideB. Examples of Scott Air Pak or air-line mask usage for vinyl chloride are as follows:

- (1.) Vessel entry as specified in SA-4 Vessel Entry Procedure
- (2.) Building atmosphere above 50 ppm VCL
- (3.) Making and breaking connections during loading and unloading operations
- (4.) VCL sampling or gauging
- (5.) Breaking into vinyl lines or equipment
- (6.) Changing VCL filters.

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III. Protective Clothing

- A. Daily changes of clothing will be provided to all direct employees assigned to production and warehousing operations, and to maintenance employees assigned to jobs in those areas where exposure to vinyl chloride monomer or PVC could occur.

These areas include: Pearl/paste resin polymerization
Mass resin polymerization
Resin bagging
Resin drying
Tank farm

Clothing contaminated by accidental spills of VCL or PVC will be changed as soon as possible.

- B. Protective gloves, suits, and head covers

- (1.) Protective gloves will be worn by workers exposed to VCL or PVC during routine operations and excessively wet or dusty operations.
- (2.) Protective Tyvek disposable suits will be worn by workers exposed to excessive dry PVC.
- (3.) Protective plastic disposable suits and rubber footwear will be worn by workers exposed to excessive wet PVC.
- (4.) Protective head covers will be worn by workers exposed to excessive wet or dry PVC when hard hats cannot be worn.

Examples of the above are: cleaning autoclaves and polys, cleaning accumulated PVC from overhead structures, changing dustex bags, cleaning in the silo area, cleaning drivers, any excessively wet or dusty housekeeping operations, etc.

After the above type of operations, the worker should remove the protective gear and wash his hands and face.

2. What was the purchased cost of this equipment and what are their operation and maintenance costing?

Respiratory protection	\$21,188/year
Supplies (replacement parts, filters)	\$25,800/year
Maintenance material	\$ 5,000/year
Work clothing	\$50,000/year
Disposable clothing (and plastic suits)	\$ 6,000/year

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3. What equipment and at what approximate purchased, operating and maintenance costs would you use assuming best effort to reduce exposure through other means?

- To comply with a 25 ppm (ceiling) limit

Ans.: Canister and air-line mask combination.

- "No detectable" limit

Ans.: Not applicable.

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Redirection

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QUESTIONNAIRE: VINYL CHLORIDE (VC) AND POLYVINYL CHLORIDE (PVC) FACILITIES

B. F. GOODRICH CHEMICAL COMPANY.

1. General Plant Layout:

- a. Is it an outdoor facility? NO
- b. How long has the plant been in operation? 5 YEARS
- c. Is the equipment corroded? NO
- d. Is the equipment in need of maintenance? NO Specify: _____
- e. Is the housekeeping good? YES Poor? _____ In which aspects? _____
- f. Where is the control room located? 200' AWAY FROM ANY OPERATING ROOM - FACILITY
- g. Other pertinent details re general plant layout: CONTROL ROOM IS REINFORCED CONCRETE 1' FOOT THICK WALLS

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2. Raw Materials

- a. Indicate the raw materials: VINYL CHLORIDE
MONOMER.
- b. How are these handled? V.C. COMES IN IN RAIL TANK
CARS & TANK TRUCKS, UNLOADED AS A
CLOSED LOOP SYSTEM.
- c. What provisions is made for their storage? IN PRESSURE SPHERE
Silo? _____ Tank? _____ Car? _____
Bags? _____ Pressure area? _____ Other? _____
- d. What controls are enforced while these materials are in storage?
CHECK INTO 1% LOSS ON REGULAR
INVENTORY PROCESS - 96%
EFFICIENT BOTH WET & DRY.
- e. Is entry to storage facilities accomplished with an air supplied
mask? ONLY WHEN LOADING OR UNLOADING
If not, how? _____
- f. How are withdrawals of raw materials controlled? _____
Closed system? YES Exhaust system? _____
Out of doors? _____ Other? _____
EVACUATION OF PIPING ETC AFTER COM-
PLETION OF LOADING OR UNLOADING IN ORDER
TO RECOVER V.C. MONOMER.

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3. Manufacturing Process

a. What process is used? _____

VC: Direct chlorination? _____

Oxychlorination? _____

Other? _____

NOT DONE

AT THIS PLANT.

PVC: Polymerization? _____

Wet? 8 PEARL REACTORS & 2 PASTE REACTORS

Dry? LICENSED UNDER THE FRENCH PROCESS.

Other? 1 PRE POLY & 4 AUTO CLAVES

POST POLYMERIZATION

b. What is the method of recycle for the unreacted vinyl chloride?

V.C. COLLECTED AND CONDENSED AND RE-
CYCLED WITH COMPRESSION AS NECESSARY

c. In what form is the finished product?

Powder? _____

Gas? _____

Pellets? _____

Other? _____

P/ES.

PEARL RESIN 125H -

PARTICLES

PASTE BAGS only

d. How is it shipped?

TRUCKS,

BAGS - BULK - RAIL

e. What are the container sizes?

50# BAGS -
TRUCKS - 41,000, 42,000 #
RAIL CARS. 180,000 #

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4. Controls for the Containment of VC and/or Control of Reaction

- a. What controls are utilized? COOLING WATER
Describe: REFRIGERATED OR TOWER COOLED,
AGITATORS & BAFFLES INSIDE REACTORS

Are the controls arranged to fail-safe? YES

- b. Are two sources of supply provided for? YES. AUTOMATIC

Cooling water? DEEP WELLS AND STAND BY STEAM TURBINE.

Electricity? ATLANTIC CITY ELECTRIC AUTOMATIC SWITCH TO SECOND SOURCE

Compressed air? _____

Refrigeration? _____

Are they automatic? COMPUTER CONTROL SYSTEM.

BOILER HOUSE RUNS ON STEAM TURBINE.

- c. Where is the control room/area located? 150' AWAY
FROM OPERATING AREAS.

Is it at positive pressure with respect to contaminated areas?

YES POSITIVE PRESSURE

Is it at least 200 feet from major VC storage or processing? 150'

- d. Are written control/startup/shutdown procedures available to operating personnel? YES IN DETAIL -

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5. Ventilation

a. What is the type of ventilation system? WINTER SUMMER
AND EMERGENCY WINTER 12 PER HOUR
SUMMER 12 - EMERGENCY 20 AIR
CHANGES PER HOUR.
Is it adequate? _____

b. Where is the air exhausted? TO ATMOSPHERE

Is the air treated before exhaustion? NO How? _____

c. Is makeup air introduced in sufficient volume to maintain correct operation? OPEN LOUVERS

Where does the makeup air come from? OUTSIDE

Is it treated? NO How? _____

Is it heated in the winter? YES

MORE TEMPERING OF THE AIR.

d. Is the entry air to the control room treated? NO

How? _____

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6. Waste Materials

a. What is the disposition of waste materials? COMPLETE
LIQUID WASTE SUSPENSION. TREATMENT SYSTEM
PRIMARY & SECONDARY SYSTEM - STATE & FED.
AND DELAWARE BASIN APPROVED.
 Buried? _____ Burned? _____
 Where? LEVEL 0.2 PPM to 11 PPM V.C. IN WASTE
 How? _____
 City dump? _____ Other? DISCHARGE TO
DELAWARE RIVER
 Describe: _____

Treated? _____ How? _____

Specify: 1/3 to 1/2 WATER IS RECYCLED

STATE APPROVED PHYSICAL BREAK
BETWEEN TWO SYSTEMS

b. Other pertinent specifics relative waste materials: _____

WASTE TREATMENT SEMI SOLID
TRUCKED TO SANITARY LAND
FILL IN EDISON, N.J.

SANITARY WASTE SYSTEM -
SEPARATE BIOLOGICAL SYSTEM
~~CHLORINATED~~ / CHLORINATED
AND COMBINED WITH INDUSTRIAL
WASTE - DESIGNED FOR 40,000 GPD
NOW OPERATING 25,000 GPD.

INDUSTRIAL SYSTEM DESIGNED 800,000 G.P.D.
TREATING - 600,000 G.P.D.

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7. Sanitation

a. What sanitation facilities are provided? _____

Shower? YES

Washroom? YES

Change room? YES

Individual lockers? YES

Lunchroom? 2 LUNCH ROOMS -

Drinking fountains? NUMEROUS

Toilets? MET CODES

b. Comment on location, accessibility, adequacy, utilization, condition, etc. of pertinent sanitation facilities: _____

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8. Exposure to VC

- a. In which activities is there a potential for exposure to VC? _____

620+H REACTOR AREAS BLDG 512
& 513.

How many employees are involved in each activity? 40-45

What is the length of the potential exposure time? VARIES

FROM A FEW MINUTES TO FULL SHIFT

- b. Are the activity areas regulated? NOT REGULATED

Indicate which: FOR EMPLOYEES CLOTHING
AND RESPIRATOR REQUIREMENTS

Give the rationale for establishing these: POTENTIAL
EXPOSURE TO V. C.

- c. Are all employees generally aware of the hazards presented by VC or PVC? YES.

To what extent is labeling or posting of signs used to appropriately inform or warn employees? SIGNS NO EATING

IN AREAS.

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9. Protective Clothing and Equipment*

- a. What articles of protective clothing and equipment are the employees provided? PANTS AND SHIRT PROVIDED.
HARD HATS AND SAFETY GLASSES. AND
IMPERVIOUS GLOVES. IN ADDITION IN DUSTY
AREA WERE TIEK THROWAWAY COVERALLS.
Are they required to wear or use these? YES.

Do they wear or use these? Specify YES

- b. Do employees change into work clothes upon arrival at the plant and back into street clothes before departing? YES

- c. Do they shower at the end of the day? YES IN REGULATED
AREAS

- d. Do they wash hands and face before eating lunch? YES

Where do they eat lunch? LUNCH ROOMS, DESIGNATED
AREAS

- f. How are clothing and equipment articles cared for? COLLECTED

DAILY

- (1) How often cleaned? DAILY

How? OUTSIDE COMMERCIAL SERVICE

Where? SERVICE RENTAL FOR INDUSTRY
4041 RIDGE AVE, PHILADELPHIA, PA. 19129

- (2) Are they decontaminated after use? NOT BEFORE THEY

GO INTO LAUNDRY.

Which use? _____

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When? _____

Where? _____

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9. Protective Clothing and Equipment*--Continued

8. How often are the articles replaced? HANDLED BY
SUPPLIER OF SERVICE

What determines replacement? WHEN NO LONGER
SERVICEABLE.

* Respiratory protection devices are covered in question 10--omit here.

LABORATORY COAT TYPE PROTECTIVE
CLOTHING IS WORN BY INFREQUENT
PERSONNEL. COATS CHANGED THREE
TIMES A WEEK.

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10. Respiratory Protection

a. What kind of respiratory protection devices are provided? 12 -

20 SCOTT AIR PACKS AMERICAN OPTICAL
SERIES 5000 CARTRIDGE RESPIRATORS WITH
ORGANIC VAPOR-DUST CARTRIDGES, BM APPROVED
FOR DUST AS SAME WITH R30 DUST FILTER.
Are the respirators provided specific for protection from VC or

PVC? YES. BOTH.

Explain: AT SPECIFIED LEVELS OF CONCENTRATION

ALSO THE AIR LINE RESPIRATORS ABOUT
30 PROVIDED.

What respirators are utilized by the employees? ALL OF
THE ABOVE AS APPROPRIATE.

b. Is there a training program for employees which includes the
proper wearing of respiratory protection devices? YES

ALL NEW EMPLOYEES. AND REBRIEFINGS

c. How often are the respiratory protection devices checked for
efficiency and effectiveness? DAILY

If applicable, how often are cartridges or cannisters replaced?

DAILY AS APPLICABLE.

d. Other comments: AIR SYSTEM. 1600 CFM.

1250 CFM. CENTRIFUGAL OIL FREE.

350 CFM. RECIP. COMP. TEFLON RINGS

OIL FREE TURBINE DRIVEN STANDBY
EMERGENCY.

INST. AIR. 350 CFM. ALSO BREATHING
TURB DRIER. AND AN IMMOB
PARTICLE FILTER. CHECK.
LOG OF ANALYSIS.

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900 CFM FACTORY AIR SYSTEM.
INCREASE INST AIR 350-TO 500 CFM BY 1975.
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THERE ARE
24 STATIONS
FOR AIR LINE
RESPIRATORS
4 TAKE OFFS
PER STATION.

INSTRUMENT
AIR QUAL
CHECKED
LOG.
EXAMINED
CO-8 CO.
OK.

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11. Maintenance and Decontamination Activities

- a. What procedures are established for maintenance and decontamination

ALL FUNCTIONS ARE PERFORMED BY
OUTSIDE CONTRACTORS AT THE FACILITY
AROUND THE CLOCK.

Are there periodic inspections for the:

Ventilation system? CHECKED ^{THREE} ~~ONCE~~ TIMES A SHIFT

Process equipment? WRITE MAINT. REQUESTS FOR REPAIR.
WEEKLY CHECK.

Piping and fittings? DAILY BY OVA TEST.

Other? _____

- b. What transpires when leakage occurs? TRY TO STOP LEAKAGE
LOCATE EXACT LEAK BY OVA TEST.

- c. What provisions are there for the protection of employees in
cleanup of leaks or spills; maintenance or repair operations
on contaminated systems or equipment? WEAR PROTECTIVE
CLOTHING AND AIR MASKS.

What protective clothing and equipment are utilized? _____

Air supplied suits? NONE Gloves? YES

Respirators? YES Others? TYVEK

IMPERVIOUS SUIT, & YELLOW SLICKER SUIT.

- d. How are employees decontaminated after work is completed? _____

SHOWER AFTER REMOVAL OF CLOTHING.
IF EMPLOYEE IS EXPOSED TO A
LEAK HE IS REQUIRED TO SHOWER IMMEDIATELY.

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11. Maintenance and Decontamination Activities--Continued

e. Are maintenance repair cleanup crews available during all shifts?

YES:

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12. Fire Protection

a. What provisions are made for fire protection? SEVERAL
IN PLANT
SYSTEMS. HYDRAUNTS, HOSE STATIONS
AUTOMATIC SPRINKLER. FOG SYSTEMS
IN PAINTS AREAS. 1,000,000 GALLONS
IN TWO 500,000 GALLON OPEN TOP

Who approves the fire protection plan? F.I.A. APPROVED

b. Who conducts fire inspections? BART JOHNSON
~~JOHN JOHNSON~~

What is the frequency of the inspections? MONTHLY
PUMPING EQUIPMENT WEEKLY. OPERATORS EVERY
4 HOURS.

c. Are there fire insurance engineers? FIA ENGS. TWICE YR

Give particulars:

PUMPING 4 PUMPS + JOCKEY PUMP
115-125 #/D 2 ELECTRIC
1500 GPM. @ 125 P.S.I. CENTRIFUGAL
105 P.S.I. and 85 P.S.I. ON
DIESEL DRIVEN. 1500 GPM @ 11
P.S.I. @ 85 P.S.I. PRESSURE
AUTOMATICALLY IN POWER FAILURE
WEEKLY TESTS LOGGED.
ANNUAL FIA TESTS.

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13. Employer's Monitoring Program

BENDIX MICRON
AIR #2 PERSONNEL
SAMPLING PUMP
ONE TO 2 LPM.
AIR FLOW USING
THE CHARCOAL
TUBE.

a. What is the nature of sampling? ENVIRONMENTAL ORGANIC

BENDIX FIXED INSTALLATION

TOTAL HYDROCARBON ANALYZERS RECORDING

MSL - COMBUSTIBLE ALARM SYSTEM SET FOR
7.5% TO 10% LFL EXPOSURE

Are gas samples taken? NUMEROUS How? WITH BURINGE

Are continuous samples taken? YES How? PERMANENTLY

If sensors are used, where are they located? TOTAL HYDROCARBON
THROUGHOUT

PROCESS AREAS

b. Are personal samples taken? YES

How? ENVIRONMENTAL PUMP For how long? 4 HOURS

What is the sampling rate? 1 LITER PER MINUTE

What types of activity are the employees in when monitored? NORMAL

PROCESS OPERATIONS

What percentage of employees are monitored in each area? 25%

What is the frequency of monitoring? NOT YET ESTABLISHED

c. What method is used to analyze the samples collected in the
monitoring program? CHAR COAL TUBES. USE GAS CHROMATOGRAPH.

What is the sensitivity? 1 PPM.

What is the accuracy? ± 10%

d. What is the disposition of the results of sample analyses?

RESULTS ARE BEING USED FOR EVALUATING
PROGRESS TO ESTABLISH A CONTROL PROGRAM

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13. Employer Monitoring--Continued

Are the employees informed?

YES

Are the results recorded?

YES

Where are the records kept?

LOCALLY IN OFFICE FILES

How long are records of the results maintained?

FOR 20 YRS

Are the results available at all times to the employees?

YES

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14. Medical Program

a. What does the in-house medical program consist of? SINCE
FIRST OF FEBRUARY ALL EMPLOYEES HAVE BEEN
BLOOD TESTED
PLANT HAS A DISPENSARY.

Are physical examinations of employees required? YES

Preplacement? YES

Periodical? YES

What does the physical examination include? BLOOD TESTS,

Is there a medical surveillance program in effect? YES

What does it consist of? LIVER FUNCTION TESTS AND MORE EXP-
ANDED

Does the employee have access to his medical records? YES

Is there a physician and nurse on duty at all times? NO

PHYSICIAN VISITS ONCE A WEEK AND ON CALL

If not, when? NURSE ON DUTY NORMAL DAY SHIFT

How many employees are trained in first aid? 43 PEOPLE REDCROSS
FIRST AID COURSE.

b. What satellite-support medical facilities are readily available?

ALSO HAVE
STAND BY
PHYSICIAN IN
ABSENCE OF
CONTRACT
PHYSICIAN

SALEM COUNTY HOSPITAL.

What is the distance to the nearest hospital which would be
readily available at any time? 13 MILES AWAY

Would adequate, appropriate, medical services be available
there? YES

Is there a contract or working agreement in force with this
facility? CONTRACT WITH PLANT PHYSICIAN WHO
HAS ALL PRIVILEGES AT THE HOSPITAL

Other comments: MEDICAL PROTOCOL HAS BEEN
ESTABLISHED FOR TESTING OF ALL EMPLOYEES
AT LEAST ANNUAL

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15. Emergency

In the event an emergency should occur for any reason within the operation whereby employees are involved, what plan would be implemented? GAS ALARM WOULD BE SOUNDED

AND THE BUILDING EVACUATED.

a. Is there an evacuation plan? YES PERSONNEL GO TO A SPECIFIC ZONE.

b. Are there definite emergency procedures established to include authorization for individual control of assigned personnel?

YES - WRITTEN PROCEDURES CARRIED BY EACH EMPLOYEE

c. Is there a mutual support plan for outside assistance in the event of a catastrophic incident such as fire, explosion, massive spill?

YES. TRI STATE MUTUAL AID.

Explain: LOCAL FIRE COMPANY IS INVOLVED.

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