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LOUISIANA DIVISION INDUSTRIAL HYGIENE REPORT AN OPERATING UNIT OF THE DOW CHEMICAL COMPANY

CHLORINE 1 PLANT
Department

LAD-CHLORINE 91.01
File Number

7/16/1991
Date

Title: Evaluation of employees' exposure to noise, asbestos, chlorine, and lead and associated Industrial Hygiene Activities at the Louisiana Division Chlorine 1 Plant, Plaquemine, Louisiana during 1990.

Author's Signature

Author's Signature

Reviewer's Signature

SUMMARY:

During 1990, personal time weighted average (TWA) exposures to noise and chlorine were evaluated. Excursion or short term exposures to asbestos during specific tasks were evaluated and area monitoring for lead exposures during non-routine maintenance was performed. A sound level survey was conducted throughout the plant.

Employee exposures to asbestos during task related activities ranged from <0.01 to 0.09 fibers per cc of air. Task involving glove bag asbestos removal ranged between 0.01 to 0.09 fibers per cc of air and were potential exposures because personnel wore North 7700 half-face respirators equipped with high efficiency filters during the job. The job task of pulping chlorine cells with wetted asbestos ranged from <0.01 to 0.04 fibers per cc of air. The job of pulping cells is handled in a closed system. This data is well within the OSHA short term excursion limit of 1.0 fibers per cc of air for a 30 minute duration. All results were reported based on the limit of detection of 7 fibers/mm².

(Continued on Page 2)

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SUMMARY: (CONT'D)

Personnel exposures to chlorine during normal 12-hour shift activities ranged from 0-0.3 ppm. The OSHA 8-hour time-weighted average limit is 0.5 ppm. Continued periodic monitoring for chlorine exposure is planned.

Personal audio dosimeter measurements of employee exposure to noise were collected and average results of the allowable daily dose corrected to an 8-hour or 12-hour full shift are listed below:

<u>8-Hour Shift</u>		<u>12-Hour Shift</u>	
Cell Treating Specialist	07%	Liquefaction Specialist	81%
Environmental Specialist	08%	Brine Operations Spec	36%
Safety Coordinator	33%	Cell Operations Spec.	19%
Day Shift Supervisor	16%		

All personnel received training and an annual audiogram. One Dow employee showed a unilateral standard threshold shift in hearing. He was evaluated by a consulting audiologist and his results reviewed. His shift in hearing was not felt to be related to on the job noise exposure. Additional noise monitoring will be collected to complete the evaluation of all job classifications. The chlorine drying train area compressors and pumps accounted for most area noise above 90 decibels. All areas of the plant with noise levels above 90 decibels are posted to require the use of hearing protection.

One area sample was collected downwind of a non-routine job during sandblasting of brine tanks coated with a lead-based paint. The lead level result was 5.8 micrograms per cubic meter which is well below the OSHA 8-hour time weighted average limit of 50 micrograms per cubic meter.

All quality control laboratory fume hoods were evaluated for face velocity and met the classification of an "A" class hood.

Hazard communication and respiratory protection training was given to all employees during the year. IPT modules are being developed in the Chlorine 1 Plant and will be used in employee training.

Radiation sealed sources located in the Chlorine 1 Plant were wipe tested. All results were below the minimum detection limit of <0.005 microcuries of removal activity. There are four sealed radiation sources located in the Chlorine 1 Plant. One source is an Ohmart level detector for the chlorine storage sphere T-56, another is an Ohmart density device for hydrochloric acid and the last two sources are Texas Nuclear lab analyzers. The required warning signs are posted

The Chlorine 1 Plant has an ongoing fugitive emission monitoring program which includes corrective action on any leaks. This preventive program is an effective measure to reduce potential employee exposure.

As part of the asbestos management program all asbestos-containing materials were inspected for condition, labeling and inventory accuracy. Any asbestos needing repair is handled by qualified asbestos abatement personnel and replaced with non-asbestos material where available.

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PURPOSE

As part of a continuous effort to provide a healthful and safe work environment for the personnel of Chlorine 1 Plant, a program to evaluate employee's exposure to asbestos, noise, chlorine and lead was conducted in 1990. This report addresses the work performed including recommendations for 1991.

CONCLUSIONS

1. Employee exposures to asbestos during task related activities ranged from <0.01 to 0.09 fibers per cc of air. These results are within the OSHA short term exposure limit of 1.0 fibers per cc of air for a 30 minute duration. Samples were collected during asbestos removal projects and pulping of the chlorine diaphragm cells using wetted asbestos in a closed system.
2. Chlorine exposures during normal 12-hour shift activities ranged from 0-0.3 ppm. These concentrations are to be compared with the OSHA 8-hour time-weighted average limit of 0.5 ppm. The Chlorine Plant block policy requires all personnel to carry a mouth-bit respirator to be used for escape from acid gases.
3. Results of employee full shift, eight and twelve hour, average noise exposure for each job assignment monitored in 1990 are listed below (expressed as a percent of the allowable daily dose):

Cell Treating Specialist	07%
Environmental Specialist	08%
Safety Coordinator	33%
Day Shift Supervisor	16%
Liquefaction Specialist	81%
Cell Operations Specialist	19%
Brine Operations Specialist	36%

These results represent potential rather than actual noise exposure because hearing protection is worn by all employees in posted high noise areas of the plant. Areas with noise levels greater than 90 dB(A) are posted to require hearing protection. The hearing protection will attenuate noise levels below the OSHA 8-hour time weighted average of 90 dB(A). Annual audiograms were performed on all employees. One Dow employee showed a unilateral standard threshold shift in hearing. He was evaluated by a consulting audiologist and his results reviewed. His shift in hearing was not felt to be related to on the job noise exposure.

4. Area air-borne lead concentrations were monitored during a non-routine maintenance task of sandblasting brine tanks coated with a lead-based paint. The downwind concentration was 5.8 micrograms per cubic meter which was well within the OSHA 8-hour permissible exposure limit of 50 micrograms per cubic meter of air.
5. An area sound level survey was conducted of the Chlorine 1 Plant during 1990. Area compressors and pumps in the chlorine drying train account for most noise levels above 90 decibels. These areas are posted with hearing protection required signs.
6. The control room lab, cell crew lab and main lab hoods were surveyed during 1990. Face velocity measurements and smoke capture performance met the requirements of an "A" classification rating. The main lab hood has a scrubber on the exhaust to avoid venting chlorine to the atmosphere. Weak caustic is used as the scrubbing solution.

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7. Radiation sealed sources located in the Chlorine 1 Plant were wipe tested. All results were below the minimum detection limit of <0.005 microcuries of removal activity. There are four sealed radiation sources located in the Chlorine 1 Plant. One source is an Ohmart level detector for the chlorine storage sphere T-56, another is an Ohmart density device for hydrochloric acid and the last two sources are Texas Nuclear lab analyzers. The required warning signs are posted
8. The Chlorine 1 Plant is in the process of developing IPT Modules to be utilized for training purposes. These modules will cover safety related subjects and be used in employee training.
9. Training on the hazards within the Chlorine 1 Plant was presented during Hazard Communication Training. This training is presented to both Dow and contract employees. A written Hazcom program manual exists in the plant and all material safety data sheets were updated during 1990.
10. Respiratory protection training was conducted on the respiratory protection available within the Chlorine 1 Plant. The training included proper use, limitations and donning procedures. The Louisiana Division Safety and Loss Prevention Standard S-206 and Chlorine block policy were reviewed.
11. Training on the hearing conservation program was presented and included the effects of excessive noise to the ear. Personnel were instructed in the proper use of hearing protection and the importance of using hearing protection in high noise areas.
12. The Chlorine 1 Plant has an ongoing fugitive emission program which includes corrective action for any leaks detected. This proactive program reduces potential employee exposures to chlorine, hydrochloric acid, and carbon tetrachloride.
13. The Chlorine 1 Plant has an asbestos management program which requires an annual inspection of all asbestos-containing materials. The inspection includes condition of material, labeling requirements and inventory accuracy. Any asbestos-containing material needing repair is handled by qualified asbestos abatement personnel and is replaced with non-asbestos material where available.

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RECOMMENDATIONS

1. Additional noise monitoring is needed to complete the evaluation of all job classifications potential exposure to noise including the contract jobs. Continue to perform the plant area noise survey and have an octave-band analysis performed to determine what engineering controls may be implemented to reduce noise levels.
2. Review and update the Chemical and Physical Agent Inventory for the Chlorine 1 Plant for all job classifications including an update of all job descriptions.
3. Develop a written Hearing Conservation Program for Chlorine 1 Plant and include in annual hearing conservation training along with effects of excessive noise exposure to the ear, and proper care, use and effective attenuation of hearing protectors.
4. Conduct personal monitoring for organic vapors, hydrochloric acid and sulphuric acid during appropriate task specific jobs to confirm that potential exposures are within OSHA limits.
5. Continue to perform annual Hazcom and Respiratory training. Update Hazcom training to include the effects of radiation.
6. Continue to monitor asbestos task specific jobs to confirm regulatory compliance.
7. Monitoring for chlorine exposure needs to be continued but at a reduced level due to the extensive amount of sampling data collected during the past seven years.
8. Update the contractor personnel indoctrination check sheets. Clarify item 7 on the contractor indoctrination check sheet which states "knowing area hazards" to specifically address Hazard Communication Training. Add to the indoctrination check sheet respirator fit-testing.
9. Update the Dow personnel training module to address initial training on hazard communication training, respiratory protection, block Industrial Hygiene policy, respirator fit-test, hearing conservation program and asbestos handling guidelines.
10. Evaluate the present use of Varsol as the cleaning solvent used for degreasing operations to determine if it is the best choice of solvent. Implement a procedure for changing and disposing of spent solvent.

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EVALUATION CRITERIA

Industrial Hygiene monitoring is performed to determine actual and potential exposure levels both as daily time-weighted averages (TWA) and peak or short-term excursion exposures. The results of personal monitoring are compared with recommended exposure guidelines determined by Dow or independent agencies to be the most appropriate guidelines for a health work environment. The guidelines used are at least as stringent, and in many cases are more stringent, than the Occupational Safety and Health Administration (OSHA) Permissible Exposure Levels (PEL's). The guidelines are developed using toxicology, epidemiology, and industry experience. They represent airborne concentrations of substances to which nearly all employees may be repeatedly exposed throughout a working lifetime without adverse effects. The exposure guidelines for the chemical and physical agents monitored in 1990 at the Chlorine 1 Plant are outlined below.

EXPOSURE GUIDELINES

Chemical Agent Physical Agent	-1 TWA	-2 Excursion	-3 Source	-5 T.I.M.E. Dow Registry Ref.
Noise -4	85 dB(A)	90 dB(A), C	Dow/OSHA	DR-8000-1032
Asbestos (A1)	0.2 Fib/cc	1.0	OSHA	DR-0027-0713
Chlorine	0.5 ppm	1.0	OSHA	DR-0006-7834
Lead	50 ug/m ³	----	OSHA	DR-0016-2005

1. TWA - 8-hour time weighted average Exposure Guidelines.
2. Excursion - Short-term Exposure Guidelines.
3. Source - Dow Industrial Hygiene Guidelines
ACGIH - American Conference of Governmental Industrial Hygienist -
Threshold Limit Value (TLV).
OSHA - Permissible Exposure Limit.
Supplier - Guideline recommended by the manufacturer.
4. See Noise section (C-ceiling level which should not be exceeded at any time).
5. (T.I.M.E. is a Dow internal hazard data system in which informational sheets are obtained covering Toxicology, Industrial Hygiene, Medical and Environmental elements).

A1 - Known Human Carcinogen

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NOISE

The current Dow exposure guideline for noise is a 90 dB(A) ceiling. In addition, the Hearing Conservation Amendment document (29CFR 1910.95) issued by the OSHA stated that the 8-hour TWA noise exposures should not exceed 90 decibels as measured on the A-scale [dB(A)] of a sound pressure level meter at the slow response setting. Dow Louisiana Division expresses the guidelines as an 8-hour TWA of 85 dB(A). A TWA exposure of 85 dB(A) or more requires participation in a hearing conservation program. Areas that exceed the 90 dB(A) ceiling are posted with signs and mandatory hearing protection is required. For simplification, a 100% dose is the maximum allowable dose for the workday regardless if it is in an 8 or 12-hour shift.

TOXICOLOGICAL INFORMATION

Toxicological data on the chemical and physical agents monitored at the Chlorine 1 Plant in 1990 are available on the T.I.M.E. system.

SAMPLING AND ANALYTICAL METHODS

NOISE

Personal noise dose measurements were taken using Dupont MK-2 audio dosimeters, serial number 14318, set at 80 dB(A) threshold, 90 dB(A) criterion, and 5 dB(A) doubling rate. Area sound level measurements were taken with a Bruel & Kjaer sound level meter, Type 2219, serial number 598847 calibrated at 94 dB(A).

AIRBORNE CHEMICALS

ASBESTOS

Employees breathing zone sampling for asbestos during task related activities were taken using Gilian high flow pumps serial numbers 5072 and 9796 calibrated at a flow rate between 2.0 and 2.5 liters per minute. An open faced Neuclepore 0.8 micron size 25 mm mixed cellulose filter cassette was used. Personnel involved in asbestos removal wore North 7700 half-face respirators equipped with high efficiency filters during the job. Analysis was performed by West-Paine, an outside laboratory, using NIOSH 7400A method.

CHLORINE

Chlorine vapors were collected using a Wolcott chlorine electrochemical sensor with a Metrosonics microprocessor datalogger. Each sensor was calibrated at several concentrations before and after sampling using a Metronics Dynacalibrator with certified chlorine permeation tubes. The datalogger provides a histogram of potential chlorine exposure in 30 second averages.

LEAD

Area sampling for lead was conducted using a Gilian high flow pump calibrated at a flow rate of 2.5 liters per minute with a closed-face 37 mm mixed cellulose filter cassette. Analysis was performed by R. Barber, Research Analytical Dept., using NIOSH P&CAM 173 Method for trace metals reported under reference number 5419-17.

VENTILATION

Laboratory hoods were assessed using smoke tubes and an Almar Model 8525 Thermo Anemometer air velocity meter to determine capture performance and hood face velocities.

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RESULTS AND DISCUSSION

Personal samples were taken at the Chlorine I Plant to assess potential exposure to Asbestos during task related activities. The results of the data as shown in Table 1 indicate that levels ranged from <0.01 to 0.09 fibers per cc of air. This data is to be compared to the short term exposure limit of 1.0 fiber per cc of air for a 30 minute duration. All samples collected were 30 minute duration. All results were reported based on the limit of detection of 7 fibers/mm².

Two specific tasks were being monitored. Asbestos removal abatement tasks performed by qualified asbestos abatement insulators ranged from 0.01 to 0.09 fibers per cc of air during a glove bag removal of asbestos insulation from a 1" pipe. These sample results indicate potential exposure because the insulators wore North 7700 half-face respirators equipped with high efficiency filters during the job. The other task monitored was the pulping of chlorine diaphragm cells by the operations specialist working on the cell crew. Sample results for this task ranged from <0.01 to 0.04 fibers per cc of air. The asbestos is handled in a wet slurry which is transferred from a holding tank through a connected hose which is placed into a stopper opening on top of the chlorine diaphragm cell.

The results of personal breathing zone sampling for chlorine is presented in Table 2. All samples were collected on operating personnel working 12-hour shifts during normal operating conditions. The results ranged from 0 -0.3 ppm time-weighted average with the average being 0.05 ppm. These concentrations are to be compared with the 8-hour time-weighted limit of 0.5 ppm. One sample collected by the cell operator specialist was reported at 80 percent of the time-weighted average limit. The Chlorine Plant block policy requires all personnel to carry either a MSA or American Optical R722 mouth-bit respirator to be used to escape from acid gases. The Chlorine Plant has been participating in the Dow-Tulane University Chlorine Epidemiology Study and as part of this study an extensive amount of sample collection has been done for chlorine exposure for the past seven years. Continued periodic monitoring for chlorine exposure is planned.

Personal noise monitoring results are presented in Table 3 for employees in the Chlorine Plant. Monitoring was conducted on both 8-hour shift and 12-hour shift operations. The data results were corrected to reflect the dose percent to either 8-hour or 12-hour depending on shift duration. One sample collected was above the 50% dose being calculated at 81% dose. This sample was collected from the liquefaction operation specialist. The allowable noise percent dose is 100 percent. All areas of the plant with noise levels above 90 decibels are posted to require the use of hearing protection. Further monitoring to characterize all job classifications in the Chlorine Plant is planned for 1991 sample collection.

One area sample was collected for air-borne lead concentrations during a non-routine job. The results are shown in Table 4. Several brine tanks coated with a lead based paint were sandblasted during maintenance. The sample was collected downwind of the operation. The result was 5.8 micrograms per cubic meter which is well below the 8-hour time weighted average limit of 50 micrograms per cubic meter.

Figure 1 shows a plot plan of the Chlorine 1 Plant denoting noise levels of area equipment throughout the plant taken during an area noise survey. Results are reported in decibel readings. Area compressors and pumps accounted for most noise above 90 dB with the chlorine drying train having the most sources. An octave band analysis is planned to determine what engineering controls may be implemented to reduce noise levels in the chlorine facility.

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Table 1: Results of Employee Breathing Zone Sampling for Asbestos During Task Related Activities at the Louisiana Division Chlorine I Plant, Plaquemine, Louisiana, 1990.

Sample No.	Master No.	Job Assign.	Date	Time (Min.)	Asbestos Concentration (Fibers/cc >5 micron LOD ^d)	Comments
10482	437-21-3070	Insulator	8/3	30	0.09 ^a	Glove Bag Removal Method of 1" Pipe
10483	433-23-2653	Insulator	8/3	30	0.03 ^a	Glove Bag Removal Method of 1" Pipe
10484	434-17-6970	Insulator	8/3	30	0.01 ^a	Glove Bag Removal Method of 1" Pipe
10903	434034	Operation Specialist Cell Crew	12/5	30	0.01	Pulping Cells
10904	433590	O. S. Cell Crew	12/6	30	<0.01 ^b	Pulping Cells
10901	433590	O. S. Cell Crew	12/7	30	0.04	Pulping Cells
10905	433590	O. S. Cell Crew	12/11	30	— ^c	Pulping Cells
10906	434034	O. S. Cell Crew	12/12	30	0.01	Pulping Cells
10907	433590	O. S. Cell Crew	12/13	30	<0.01 ^b	Pulping Cells

Industrial Hygiene Exposure Guidelines

OSHA - PEL Short Term Exposure Limit

1.0

Samples were collected on an open-face Neuclepore .8 micron 25 mm mixed cellulose cassette.

- a) Personnel wore North 7700 half-face respirator with high efficiency filters during the job.
- b) Not detected at the minimum analytical detection limit.
- c) Voided sample - could not be counted due to filter damage.
- d) All results are reported based on the limit of detection of 7 fibers/mm².

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Table 2: Results of Personal Breathing Zone Sampling for Chlorine at the Louisiana Division
Chlorine I Plant, Plaquemine, Louisiana, 1990.

Master Number	Job Assign.	Date	Sample Number	Time (Min.)	Conc.(PPM)	Comments
274450	Operation Specialist Cell Operator	10-24	CL-90001	635	0.3	12 Hour Shifts(1)
434041	O.S. Cell Operator	10-24	CL-90002	701	0.0	12 Hour Shifts(1)
098097	Operation Specialist Brine Operator	10-24	CL-90003	668	0.0	12 Hour Shifts(1)
434192	O. S. Brine Operator	10-30	CL-90007	621	0.0	12 Hour Shifts(1)
202696	Operation Specialist Salt Operator	10-30	CL-90006	858	0.1	12 Hour Shifts(1)
434201	Operation Specialist Liquefaction Operator	10-30	CL-90010	695	0.2	12 Hour Shifts(1)
433383	Sr. Opeation Specialist Board Opeator	10-24	CL-90004	514	0.0	12 Hour Shifts(1)
432922	S.O.S. Board Operator	10-30	CL-90008	693	0.0	12 Hour Shifts(1)
432021	Shift Supervisor	10-24	CL-90005	516	0.0	12 Hour Shifts(1)
430930	Shift Supervisor	10-30	CL-90009	746	0.0	12 Hour Shifts(1)
433-74-8170	Tank Car Loader	10-30	CL-90011	720	0.0	Contractor(1)
OSHA - PEL 8-Hour Time Weighted Avg.					0.5	

(1) All samples were collected on personnel working the 12 hour shifts.

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Table 3: Results of employee's personnel time weighted average noise exposure ** at the Louisiana Division Chlorine I Plant, Plaquemine, Louisiana, 1990.

Master Number	Job Assign.	Date	Time (Min)	L Ave dBA	% Dose	%Dose Calculated To Full 12 Hr. Shift(2)	Comments
433323	Cell Treating	12-5	495	65.9	7.4	7.2 8-hour shifts	
433825	Cell Treating	12-6	491	70.7	7.0	6.9 8-hour shifts	
431224	Environmental Specialist	12-7	485	72.1	7.8	7.7 8-hour shifts	
431654	Safety Coordinator	12-11	477	85.6	47.3	47.6 8-hour shifts	
432357	Safety Coordinator	12-13	462	77.6	17.2	17.9 8-hour shifts	
430475	Day Supervisor	12-14	458	76.9	15.6	16.3 8-hour shifts	
433632	Liquefaction Operator	12-11	737	85.4	83.4	81.4 12-hour shifts	
433588	Cell Operator	12-12	717	75.1	18.9	18.9 12-hour shifts	
098084	Brine Operator	12-14	735	79.7	36.5	35.7 12-hour shifts	

Industrial Hygiene Guidelines:

8 hr TWA	OSHA	90	
12 hr TWA	OSHA	87	100
90 dBA Ceiling(1)	DOW		

** Monitoring conducted with a Dupont MK-2 audio dosimeter serial #14318.

(1) Exposure should not exceed the ceiling limit at anytime unless hearing protection is worn.

(2) Precent dose expressed according to the Louisiana Division 85dB(A) TWA would be twice that shown in Table 3.

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Table 4: Results of Area Sampling for Lead at the Chlorine I Plant, Louisiana Division, Plaquemine, Louisiana, 1990.

Date	Area	Sample No.	Line (Min)	Conc. ug/m ³	Comments
8/17	Brine Tanks	10495	80	5.8	Downwind sampling while sandblasters were blasting lead based paint on brine tanks.

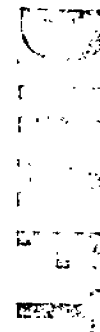
Industrial Hygiene Guidelines:

8-hour TWA OSHA

50

Samples was collected on a close-face 37 mm mixed cellulose cassette.

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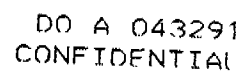


Figure 2

CHLORINE PLANT ANNUAL NOISE SURVEY

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The 1990 Chlorine Plant Noise Survey has been conducted. Acceptable noise exposure is 85 dB for eight hours. It is imperative that we require hearing protection to be worn in all areas 90 dB and higher.

C-100A	96
C-701A NORTH	94
C-701A NORTH	94
A-TRAIN RECYCLE	92
P-702'S	92
C-701A SOUTH	92
T-701B SECOND DECK	92
SOUTH AIR DRYER	91
C-40 A/B NORTH	91
C-90/91 AREA NORTH	91
D-100A	91
C-300A	90
P-260 AREA	90
C-52	90
E-65	88
C-90/91 AREA SOUTH	88
E-64/63 AREA	87
C-40A/B SOUTH	86
C-500B	86
VS-2 FIRST DECK	85
S-11/12 GRD LVL	84
DIST. DECK (GRD LVL)	84
BRINE HEATING AREA	84
S-3/4 GRD LVL	82
DIST. DECK (2ND LVL)	82
EC-65 (TOP DECK)	82
P-4'S	81
HYDROGEN COOLING TWR W	80
CAUSTIC SUMP	80
R-3 NORTH	80
NORTH AIR BLOWER	80
R-2 NORTH (NEW)	80
LIQ. DIST. MANIFOLD	80
T-13 AREA	80
P-56	79
LIQ. SECOND DECK	79
LIQ. THIRD DECK	79
R-5 NORTH	78
S-7/8 GRD LVL	77
S-19/20 GRD LVL	74
S-17/18 GRD LVL	74
S-13/14 GRD LVL	74
R-1 NORTH	70
FRONT OFFICE NORTH	55

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Figure 3

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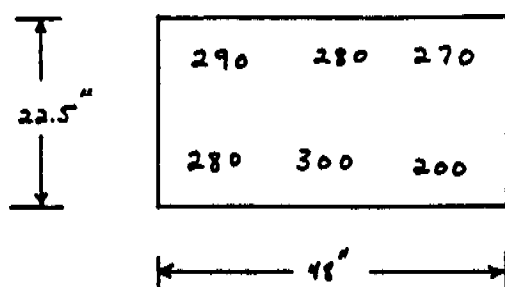
LOUISIANA DIVISION
INDUSTRIAL HYGIENE HOOD PERFORMANCE TESTING DATA

Facility I.D.: Chlorine Date of Test 2-7-90
Hood I.D.: Cell Crew Lab Hood
Tested by: W. E. Ledford

Static Pressure Readings (S.P.) No Static Pressure Indicator on Hood.

SASH Closed: S.P. = _____ inches of H₂O
SASH Open: S.P. = _____ inches of H₂O
SASH @ 18": S.P. = _____ inches of H₂O

Hood Face Velocity Readings at SASH Opening of 22.5 inches



(Indicate approximate measurement points and actual velocity readings)

Actual Face Velocities:

Mean ($\overline{FV}$): 270 FPM
Minimum (FV_m) 200 FPM

Hood Classification (based on above face velocity readings) -

Class A <u>X</u>	$\overline{FV} > 125$ FPM	$FV > 100$ FPM)
Class B _____	$\overline{FV} = 100 - 124$ FPM	$FV_m > 80$ FPM)
Class C _____	$\overline{FV} = 75 - 99$ FPM	$FV_m > 50$ FPM)
Class D (Inadequate) _____	$\overline{FV} < 74$ FPM	$FV_m < 50$ FPM)

Smoke Tube Observations (SASH at Work Opening of 22.5 inches)

X Good (Air capture by hood is strong and well defined with minimal internal turbulence, and no observable smoke swirling back to hood face when person stands at hood face.)

____ Moderate (Air capture by hood is positive but with some internal turbulence observed approaching the hood face. No smoke escaping the hood.)

____ Poor (Air capture by hood is weak and/or not well defined. Turbulence inside the hood and smoke observed escaping hood face.)

NOTE: Reevaluate if static pressure reading and anemometer reading differ $\pm 25\%$.

BH:cm
1/90
BH3

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Figure 4

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LOUISIANA DIVISION
INDUSTRIAL HYGIENE HOOD PERFORMANCE TESTING DATA

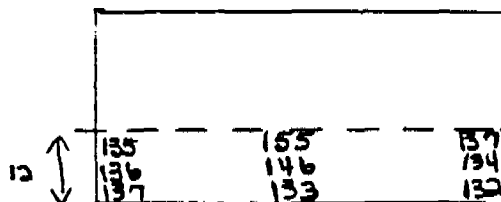
Facility I.D.: Chlorine
Hood I.D.: 2601-A Main Lab
Tested by: Darlene Creel

Date of Test October 3, 1990

Static Pressure Readings (S.P.) No static pressure gauge

SASH Closed: S.P. = _____ inches of H₂O
SASH Open: S.P. = _____ inches of H₂O
SASH @ 18": S.P. = _____ inches of H₂O

Hood Face Velocity Readings at SASH Opening of 12 inches ***



(Indicate approximate measurement points and actual velocity readings)

Actual Face Velocities:

Mean ($\overline{FV}$): 138 FPM
Minimum (FV_m) 132 FPM

Hood Classification (based on above face velocity readings) -

Class A	X	($\overline{FV}$ > 125 FPM	FV_m > 100 FPM)
Class B		($\overline{FV}$ = 100 - 124 FPM	FV_m > 80 FPM)
Class C		($\overline{FV}$ = 75 - 99 FPM	FV_m > 50 FPM)
Class D (Inadequate)		($\overline{FV}$ < 74 FPM	FV_m < 50 FPM)

Smoke Tube Observations (SASH at Work Opening of 12 inches)

X Good (Air capture by hood is strong and well defined with minimal internal turbulence, and no observable smoke swirling back to hood face when person stands at hood face.)

Moderate (Air capture by hood is positive but with some internal turbulence observed approaching the hood face. No smoke escaping the hood.)

Poor (Air capture by hood is weak and/or not well defined. Turbulence inside the hood and smoke observed escaping hood face.)

NOTE: Reevaluate if static pressure reading and anemometer reading differ $\pm$ 25%.

BH:cm
10/90
BH3

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Figure 5

LOUISIANA DIVISION
INDUSTRIAL HYGIENE HOOD PERFORMANCE TESTING DATA

DRAFT

Facility I.D.: Chlorine
Hood I.D.: Control Room Lab
Tested by: Darlene Creel

Date of Test October 4, 1990

Static Pressure Readings (S.P.) No static pressure gauge

SASH Closed: S.P. = _____ inches of H₂O
SASH Open: S.P. = _____ inches of H₂O
SASH @ 18": S.P. = _____ inches of H₂O

Hood Face Velocity Readings at SASH Opening of 12 inches ***

(Indicate approximate measurement points and actual velocity readings)

12" ↑ 126 118 109
133 115 111
↓ 141 113 143

Actual Face Velocities:

Mean ($\overline{FV}$): 125 FPM
Minimum (FV_m) 109 FPM

Hood Classification (based on above face velocity readings) -

Class A <u>X</u>	($\overline{FV}$ > 125 FPM	FV_m > 100 FPM)
Class B _____	($\overline{FV}$ = 100 - 124 FPM	FV_m > 80 FPM)
Class C _____	($\overline{FV}$ = 75 - 99 FPM	FV_m > 50 FPM)
Class D (Inadequate) _____	($\overline{FV}$ < 74 FPM	FV_m < 50 FPM)

Smoke Tube Observations (SASH at Work Opening of 12 inches)

** X Good (Air capture by hood is strong and well defined with minimal internal turbulence, and no observable smoke swirling back to hood face when person stands at hood face.)

____ Moderate (Air capture by hood is positive but with some internal turbulence observed approaching the hood face. No smoke escaping the hood.)

____ Poor (Air capture by hood is weak and/or not well defined. Turbulence inside the hood and smoke observed escaping hood face.)

NOTE: Reevaluate if static pressure reading and anemometer reading differ $\pm$ 25%.

* Slight turbulence by caustic PH analyzer.

10/90
BH3