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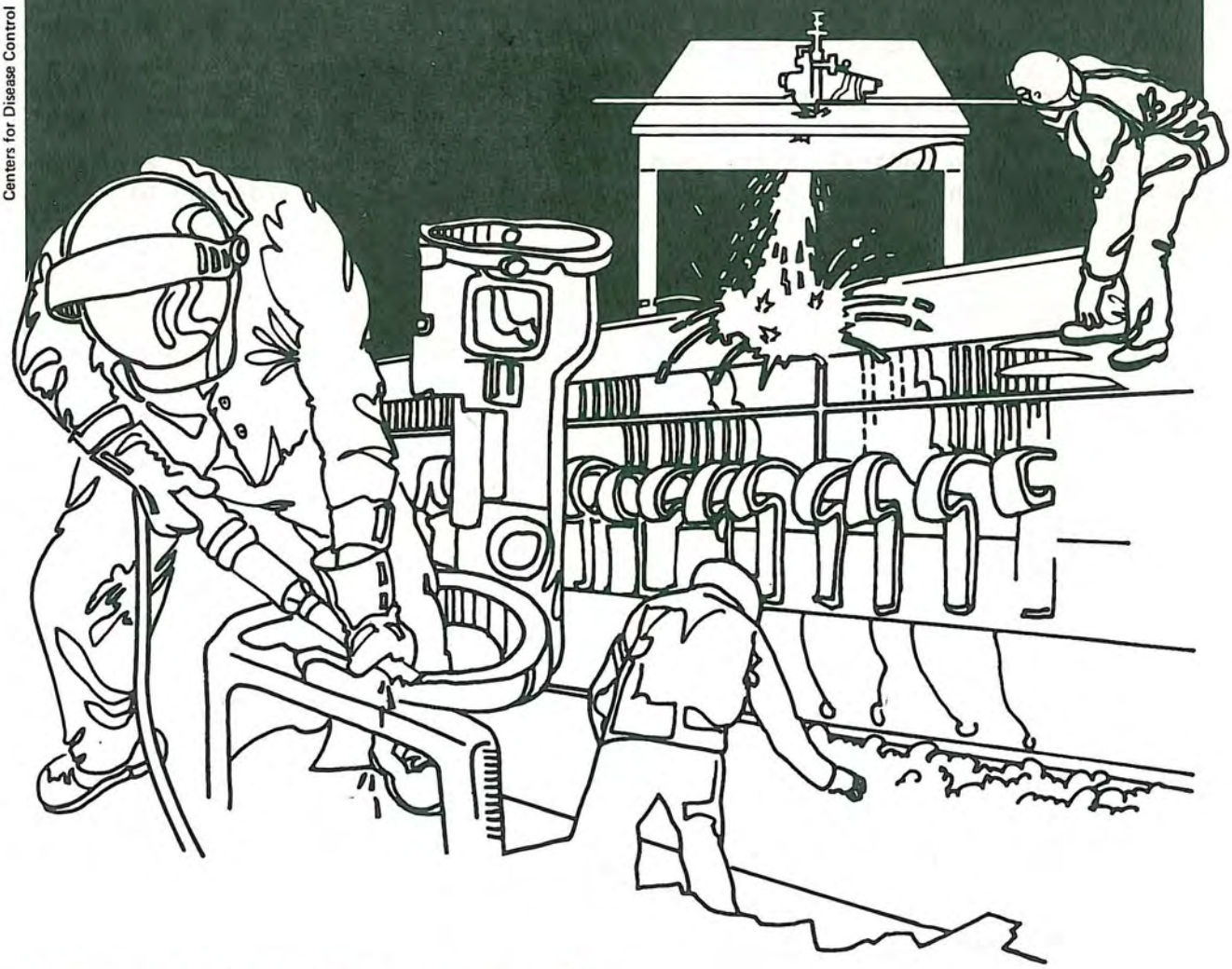

Health Hazard Evaluation Report

HHE 80-218-848
FORD MOTOR COMPANY
SAN JOSE, CALIFORNIA

PREFACE

The Hazard Evaluations and Technical Assistance Branch of NIOSH conducts field investigations of possible health hazards in the workplace. These investigations are conducted under the authority of Section 20(a)(6) of the Occupational Safety and Health Act of 1970, 29 U.S.C. 669(a)(6) which authorizes the Secretary of Health and Human Services, following a written request from any employer or authorized representative of employees, to determine whether any substance normally found in the place of employment has potentially toxic effects in such concentrations as used or found.

The Hazard Evaluations and Technical Assistance Branch also provides, upon request, medical, nursing, and industrial hygiene technical and consultative assistance (TA) to Federal, state, and local agencies; labor; industry and other groups or individuals to control occupational health hazards and to prevent related trauma and disease.

HE 80-218-848
APRIL 1981
FORD MOTOR COMPANY
SAN JOSE, CALIFORNIA

NIOSH INVESTIGATORS:
Paul Pryor, M.S., IH

I. SUMMARY

The National Institute for Occupational Safety and Health (NIOSH) received a request for a health hazard evaluation at Ford Motor Company, San Jose, California. The request originated from the employer's concern for potential health effects to approximately 50 employees who work in three departments at the Ford Motor plant. The request specified the following departments and potential toxic exposures found in those areas: Oil House (Paint Making) for diacetone alcohol, butylacetate, xylene, toluene, methyl ethyl ketone (MEK), acetone, and dichloromethane (methylene chloride); the Fine Wire Weld Booth for total welding fumes, manganese, chromium, and copper; and the Applicator line for arsenic and lead.

NIOSH conducted an industrial hygiene evaluation in June and July 1980 which included personal and area environmental sampling. Other concerns evaluated during this period were exhaust and make-up ventilation systems, and information was collected from personal interviews with the employees who work in these areas.

NIOSH's environmental sampling determined that there were no excessive airborne exposures during the survey period to those chemicals evaluated when compared to either OSHA standards or NIOSH's recommended criteria. However, in the Oil House there was evidence that a few workers have dermatological problems, i.e., skin redness or irritation on the arms and face of these workers. Therefore, although environmental exposure levels did not exceed the criteria established for this survey, individuals who work in the Oil House may suffer mild dermatologic effects from direct skin contact with those chemicals present.

Based on the data obtained in this investigation, NIOSH determined that a health hazard did not exist from the various airborne chemicals evaluated in either the Fine Wire Weld Booth or the Application Area. However, there does appear to be individuals in the Oil House who develop skin irritation from chemicals present in this environment. Recommendations to assist in resolving the concerns found in the Oil House are included in Section VII of this report.

KEYWORDS: SIC 3710 (Motor Vehicles and Motor Vehicle Equipment), passenger cars and commercial trucks, auto body paints, fine wire welding and lead application, diacetone alcohol, butylacetate, xylene, toluene, methyl ethyl ketone, acetone, dichloromethane, total welding fumes, manganese, chromium, copper, arsenic, lead, and dermatological sensitivity.

II. INTRODUCTION

On June 20, 1980, an authorized representative of Ford Motor Company in San Jose, California, submitted a health hazard evaluation request to evaluate exposures in the Oil House department, Fine Wire Weld Booth, and in the Application area. An environmental survey was conducted in June and July 1980 to evaluate the concerns stated in the request. After the evaluation of these departments, recommendations were given during the closing conference and these are included in this report.

III. BACKGROUND

Ford Motor Company, San Jose, California, is an assembly plant for compact automobiles and light trucks, and has been producing these vehicles since 1955 at this facility. During the NIOSH survey only one work shift was operating at the plant on both assembly lines; however, the work periods for these two groups were somewhat different, i.e. the truck line operated from 6:00 a.m. to 2:30 p.m. and the passenger assembly line ran from 6:30 a.m. to 3:00 p.m. The primary areas and/or jobs evaluated were those which occur midstream in the production of the vehicles, i.e., the fine wire welding and the lead application sections. The other process evaluated at Ford was the Oil House operation where all the primer and paints used on the vehicles are prepared. The actual number of workers in these departments varies with production rates. Normally, the truck assembly section would produce about 25 trucks per hour and the car assembly section would produce 56 cars per hour. A complicating factor during NIOSH's survey was the decline in vehicle sales during the year. This resulted in a reduced production rate--approximately 7-10 percent--and thus effected what could be considered normal working conditions or production flows during the survey.

The following is a brief description of the operations in question and the concerns and/or chemicals evaluated.

1. Fine Wire Weld Booth -- The fine wire weld operation had only one shift operating during our survey which ran from 6:30 a.m. to 3:00 p.m. The primary work performed here is the spot welding of various section of the car body, i.e. front roof/body posts, rear roof/body posts, interior engine compartment parts, interior passenger compartment parts, etc. This welding operation is performed in a long welding booth. There is a conveyor system which moves the vehicles through the booth, and the welders stand on each side of the vehicle while doing the welding. The only welding wire used here is a silicon and manganese dioxidize wire which is designed for general fabrication welding. The primary properties of the wire are 55 percent manganese, 30 percent silicon, 9 percent carbon, and minor trace compounds, e.g. chromium and copper. The booth has a general exhaust ventilation system.

2. Application Area -- Once the cars have been spot welded they then go into the lead application area. These employees work from 6:30 a.m. to 3:00 p.m. The applicators stand on each side of the vehicle as it is moving down the assembly line in order to do their work. Each operator uses a lead heating plate to melt the lead to approximately 550 degrees Fahrenheit. After the rods have melted

on the plate, the worker transfers the molten material via a spatula onto the front and rear roof posts of the automobiles. Once the operator has covered the weld areas with lead, he then smooths the hot material so that it blends into the roof top. The only exhaust system located here was over each of the hot plates. The flow rates obtained at the face of each of the four hoods was 55 feet per minute (fpm). This did not seem sufficient for properly exhausting the fumes from this source; however, the personal lead levels obtained for the employees do not indicate excessive airborne lead exposures.

3. Oil House/Paint Mixing -- The oil house operators are responsible for mixing all the paints and primers that are used on the passenger and commercial trucks at the San Jose plant. There are two men responsible for the paint mixing and two men who are responsible for dumping and transferring these materials. These employees work from 6:00 a.m. to 2:30 p.m. and from 5:30 a.m. to 2:00 p.m. respectively. The other employees who work in this department are the supervisor and the oil house assistant. The majority of paint used on the vehicles is acrylic. A urethane-type paint is used on the plastic parts on these vehicles. Besides these paints there are reducers, retarders, thinners, etc., that are used in this department. In general the majority of the process required the operators to mix the various paints with thinners in order to achieve the specific viscosity and then add reducers and/or retarders as needed in the spray painting processes.

   The employees in this department are supplied with non-skid shoes and coveralls which are given out and received back each day by the foreman. No respirators were supplied to the operators. There are no local exhaust ventilation systems. There was, however, seven general exhaust hoods (18" x 48") located throughout this department which stood about two feet off the floor. These exhaust hoods had flow rates that ranged from 500-600 fpm at the face.

IV. EVALUATION DESIGN AND METHODS

A variety of sampling techniques was used to evaluate the suspected contaminants in the various departments surveyed. Personal and area samples were taken on a portion of the population from each of the departments of concern. The following is a description of the techniques used:

1. Organic Compounds -- Personal and area samples for diacetone alcohol, butylacetate, xylene, tolune, MEK, acetone, and dichloromethane were collected in the Oil House/Paint Mixing department on charcoal tubes using low flow pumps. The pumps drew the air through the charcoal tubes at a flow rate of 50 and 200 cubic centimeters (cc) per minute. The charcoal samples were analyzed by gas chromatography.

2. Lead -- Personal and area samples for lead contaminants were collected on a pre-weighed AA 0.8 microgram pore density cellulose membrane filter at a flow rate of 1.5 liters per minute (lpm) with a high flow vacuum pump. The metal was analyzed by digesting the filter in a nitric acid solution and then aspirating the analyte into an atomic absorption spectrophotometer.

3. Welding -- Personal and area samples for total welding fume, manganese, arsenic, chromium, and copper were obtained by collecting the contaminant on a 37 millimeter (mm) diameter cellulose ester, 0.8 micrometer pore size filter. A high flow vacuum pump adjusted to pull a flow of 1.5 lpm was used. The filters were clipped to the inside of the subject's helmet, and thus, represented that amount of contaminant in the welder's helmet or breathing zone.

V. EVALUATION CRITERIA

In this study numerous sources of environmental exposure criteria and existing research data were used to assess the worker's exposure to the suspected chemicals evaluated in the workplace at Ford Motor Company, San Jose, California.

The exposure limits to toxic chemicals are derived from existing human and animal data and industrial experience to which it is believed that nearly all workers may be exposed for an 8-10 hour day, 40-hour work week, over a working lifetime with no adverse effects. However, due to variations in individual susceptibility, a small percentage of workers may experience effects at levels at or below the recommended exposure limit. A smaller percentage may be more seriously affected by aggravation of a pre-existing condition or by development of an occupational illness.

The environmental and medical evaluation criteria used for this investigation are presented in Table 1. Other recommended environmental limits and/or general information concerning each substance are also listed, i.e., the source of the recommended limits, the present OSHA standard, and a brief description of the primary health effects known to date.

VI. RESULTS AND DISCUSSION

Employee exposure to suspected airborne concentrations of diacetone alcohol, butylacetate, xylene, toluene, methyl ethyl ketone, acetone, dichloromethane (methylene chloride), lead, arsenic, total welding fume, manganese, chromium, and copper were evaluated. Also an evaluation was conducted of the general and local ventilation systems in the departments of concern. The following are the results and conclusions of this portion of the evaluation:

1. Organic Compounds -- Based on analytical results of those bulk samples received, the 16 air samples collected in the Oil House/Paint Mixing operations were analyzed for diacetone alcohol, butylacetate, xylene, tolune, methyl ethyl ketone, acetone, and dichloromethane. The environmental data is illustrated in Table 2. Each of the personal and area results were less than 5% of the criteria established for these chemicals. However, even at these levels the obvious rash found on the workers in this department strongly suggests that these chemicals may be causing dermatological problems and, therefore, a few individuals may react to any of the above chemicals at levels below the present criteria.

2. Welding -- Nine samples were evaluated in the fine wire weld booth for total welding fumes, manganese, chromium, and copper; these results are presented in Table 3. All the contaminants evaluated had results that were minimal, i.e., less than 1%, compared to the criteria established for the individual chemicals. Therefore, these results indicate that a health hazard did not exist during the days of our survey.

3. Lead and Arsenic -- Ten samples were evaluated in the application area for lead and arsenic, and these results are presented in Table 4. Again, the levels received on the samples were less than 2% of the criteria of 0.05 mg/M^3 and 0.2 mg/M^3 respectively. These results indicate that there was no excessive airborne exposure to these chemicals during our survey period.

4. Ventilation Results -- Based on the personal sampling results indicated above, i.e., no excessive airborne exposures to the various chemicals evaluated and the flow rates described earlier, it does appear that the exhaust ventilation systems in the Fine Wire Weld Booth, the Application Area, and the Oil House/Paint Mixing departments are adequate.

VII. CONCLUSIONS AND RECOMMENDATIONS

In view of the findings of NIOSH's environmental study, as well as personal communications with individuals at Ford Motor Company, San Jose, the only recommendations which can be made to provide a better work environment are for the employees who work in the Oil House/Paint Mixing department. The airborne concentrations found in this operation were well below the criteria; however, the dermatological problems described would indicate that a portion of the workforce in this department is at risk due to skin contact with the chemicals used in this department. Therefore, these workers should be provided impervious gloves with cotton liners to protect their hands and arms from exposure. Also, the use of barrier or protective creams should be considered to reduce and/or eliminate the skin irritation described by the employees.

VIII. REFERENCES

1. Industrial Hygiene and Toxicology, second edition, Frank Patty (editor), Interscience Publishers, 1967, Vol. II.

2. Industrial Toxicology, third edition, Hamilton and Hardy, Publishing Service Group, Inc., 1974.

3. "Threshold Limit Values for Chemical Substances in Workman Air", American Conference of Governmental Industrial Hygienists, (1980).

4. Encyclopedia of Occupational Health and Safety, International Labor Office, McGraw-Hill Book Company, New York.

5. U.S. Department of Health, Education, and Welfare. Occupational Diseases, A Guide to Their Recognition, Public Health Service Publication (NIOSH) No. 77-181.

IX. AUTHORSHIP AND ACKNOWLEDGMENTS

Report Prepared By:

Paul D. Pryor, M.S
Regional Industrial Hygienist
NIOSH, Region VIII
Denver, Colorado

Evaluation Assistance:

Pierre Belanger
Regional Industrial Hygienist
NIOSH, Region IX
San Francisco, California

Originating Office:

Hazard Evaluation and Technical Assistance Branch (HETAB)
Division of Surveillance, Hazard Evaluations, and Field Studies (DSHEFS)
NIOSH, Cincinnati, Ohio

Report Typed By:

Marilyn K. Schulenberg
NIOSH, Region VIII
Denver, Colorado

X. DISTRIBUTION AND AVAILABILITY

Copies of this report are currently available upon request from NIOSH, Division of Technical Services, Information Resources and Dissemination Section, 4676 Columbia Parkway, Cincinnati, Ohio 45226. After 90 days the report will be available through the National Technical Information Service (NTIS), Springfield, Virginia. Information regarding its availability through NTIS can be obtained from NIOSH, Publications Office, at the Cincinnati address.

Copies of this report have been sent to:

1. United Auto Workers, Local 460.
2. United Auto Workers International Union.
3. Ford Motor Company, Milipitas, California.
4. U.S. Department of Labor/OSHA - Region IX.
5. NIOSH - Region IX.
6. California Department of Health Services.
7. State Designated Agency.

For the purpose of informing affected employees, a copy of this report shall be posted in a prominent place accessible to the employees for a period of 30 calendar days.

To Union and Management:

NIOSH is thankful to the employees and management for their cooperation and assistace with this Health Hazard Evaluation. The information gathered from this study will not only assist in maintaining the health and safety of those persons working in this company, but also other auto industries that we investigate.

TABLE 1

ENVIRONMENTAL EVALUATION CRITERIA/TOXICOLOGY

Ford Motor Company
San Jose, California

Substance	Recommended Environmental Limit[1]	Reference Source	Primary Health Effects	OSHA Standard
Diacetone alcohol	240 mg/M^3	OSHA	Irritation of eyes, nose, throat; corneal tissue damage; narcosis; skin irritation.	240 mg/M^3
Butylacetate	950 mg/M^3	OSHA	Irritation of eyes; headaches; drowsiness; dry uppper respiratory; dry skin.	950 mg/M^3
Xylene	100 mg/M^3	NIOSH	Fatigue; weakness; confusion; euphoria.	435 mg/M^3
Toluene	100 mg/M^3	NIOSH	Dizziness; excitement; drowsiness.	375 mg/M^3
Methyl ethyl ketone	590 mg/M^3	OSHA	Irritation of eyes and nose; headaches, dizziness; vomiting	590 mg/M^3
Acetone	1780 mg/M^3	ACGIH	Irritation of eyes, nose and throat; headaches; dizziness; dermatitis	2400 mg/M^3
Dichloromethane (methylene chloride)	1800 mg/M^3 (C)	NIOSH	Fatigue; weakness; sleepy; headaches; nausea, irritation to eyes and skin.	1800 mg/M^3
Lead	0.05 mg/M^3	OSHA	Kidneys, peripheral and central nervous system, and hematopoietic system; weakness; tiredness, irritability.	0.05 mg/M^3
Total Welding Fume	5.0 mg/M^3	ACGIH[2]	Composition and quantity of alloy and material being welded determines toxicity.	----
Manganese	5.0 mg/M^3	OSHA	Central nervous system; metal fume fever; tight chest.	5.0 mg/M^3
Chromium	0.025 mg/M^3	NIOSH	Histologic fibrosis of lungs; perforation of nasal septum.	1.0 mg/M^3
Copper	0.1 mg/M^3	OSHA	Irritation of mucous membrane and pharynx;nasla ulceration; eye irritation; metal taste; dermatitis.	0.1 mg/M^3
Arsenic	0.2 mg/M^3	ACGIH[2]	Conjunctiva; skin, eyelid, ears, nose, ad mouth irritation; respirtory mucosa.	0.5 mg/M^3

[1] All air concentrations are expressed as time-weighted average (TWA) exposures for up to a 10 hour workday.
[2] ACGIH = American Conference of Governmental Industrial Hygienists
* mg/M^3 = Approximate milligrams of substance per cubic meter of air
(C) = Ceiling limit is not to be exceeded at any time over a 15-minute period.

TABLE 2

SUMMARY OF AIR SAMPLING FOR DIACETONE ALCOHOL, BUTYLACETATE, XYLENE, TOLUENE, METHYL ETHYL KETONE (MEK), ACETONE, AND DICHLOROMETHANE (mg/M^3)

Ford Motor Company
San Jose, California

June-July 1980

Job/Area Description	Sample Number	Sampling Time (minutes)	Diacetone Alcohol	Butylacetate	Xylene	Toluene	MEK	Acetone	Dichloromethane	Type Sample*
Mixing Room	1	70	1.0	.08	--	--	--	--	--	A
Mixing Room	2	70	--	--	.27	.06	.8	.64	1.3	A
Dumping Operator	3	70	.13	.04	--	--	--	--	--	P
Back Room	4	360	2.3	.10	--	--	--	--	--	A
Front Room	5	360	--	--	.07	.10	12.7	.02	2.4	A
Paint Maker	6	360	--	--	.11	.21	17.2	.65	.06	P
Oil House Operator	7	360	1.5	.10	--	--	--	--	--	A
Paint Maker	8	60	--	--	.11	.05	.8	.09	.46	A
Paint Maker	9	60	--	--	.11	.05	1.2	.18	.48	A
Oil House Operator	13	360	--	--	.03	.03	18.5	.06	.01	P
Oil House Operator	14	360	--	--	.06	.03	.8	.11	.34	P
Dumping Operator	15	360	--	--	.17	.02	.5	ND	.07	P
Paint Maker	16	360	--	--	.14	.04	.8	.07	.42	P
EVALUATION CRITERIA (mg/M^3)			240	950	435	375	590	1780	1800	
NIOSH LIMITS OF DETECTION (mg)			0.2	0.01	0.01	0.01	0.01	0.01	0.05	

* Type of Sample: A = Area; P = Personal
mg/M^3 = milligrams of substance per cubic meter of air
mg = milligram
ND = Nondetectable (i.e., below the levels of analytical detection)

TABLE 3

SUMMARY OF AIR SAMPLING FOR MANAGANESE, CHROMIUM, COPPER, AND TOTAL WELDING FUME (mg/M^3)

Ford Motor Company
San Jose, California

July 1980

Job/Area Description	Sample Number	Sampling Time (minutes)	Manganese	Chromium	Copper	Total Welding Fume	Type of Sample*
AAG Welder	282	540	0.09	ND	0.01	.02	P
AAG Welder	289	540	0.19	ND	0.004	.03	P
AAG Welder	284	540	0.06	ND	0.003	.01	P
Welder - 1	195	360	0.05	ND	0.002	.01	P
Welder - 2	203	360	0.11	ND	ND	.02	P
Welder - 3	193	360	0.05	ND	ND	.01	P
Welder - 1	184	270	0.13	ND	ND	.02	P
Welder - 2	183	270	0.05	ND	ND	.08	P
Fine Wire Weld	3373	250	ND	ND	ND	.08	A
EVALUATION CRITERIA (mg/M^3)			5.0	0.025	0.1	5.0	
NIOSH LIMITS OF DETECTION (ug)			2.0	3.0	2.0	0.01	

* Type of Sample: P = Personal; A = Area
mg/M^3 = milligrams of substance per cubic meter of air
ug = microgram
mg = milligram
ND = Nondetectable

TABLE 4

SUMMARY OF AIR SAMPLING FOR ARSENIC, LEAD, AND TOTAL PARTICULATE IN THE APPLICATION AREA (mg/M^3)

Ford Motor Company
San Jose, California

July 1980

Job/Area Description	Sample Number	Sampling Time (minutes)	Arsenic	Lead	Total Particulate	Type of Sample*
Applicator - 1	186	550	0.0003	0.01	0.004	P
Applicator - 2	295	540	0.0010	ND	0.001	P
Applicator - 3	294	540	0.0005	0.01	0.005	P
Applicator Area	3370	250	ND	ND	0.01	A
Applicator - 1	279	550	0.0010	ND	0.008	P
Applicator - 2	297	550	0.0010	0.0001	0.002	P
Application Area	1	540	---	0.0008	---	A
Application Area	2	540	---	0.0007	---	A
Application Area	3	540	---	0.0008	---	A
Application Area	4	540	---	0.0008	---	A
EVALUATION CRITERIA (mg/M^3)			0.2	0.05	10.0	
NIOSH LIMITS OF DETECTION			30.0 ng	4.0 ug	0.01 mg	

mg/M^3 = milligrams of substance per cubic meter of air
ug = microgram
ng = nanogram
mg = milligram
* Type of Sample: P = Personal; A = Area
ND = Nondetectable

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