U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
CENTER FOR DISEASE CONTROL
NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH
CINCINNATI, OHIO 45202

HEALTH HAZARD EVALUATION DETERMINATION
REPORT NO. 74-135-226

GAF CORPORATION
EQUIPMENT MANUFACTURING PLANT
VESTAL, NEW YORK

OCTOBER 1975

I. TOXICITY DETERMINATION

Based upon environmental air samples collected on February 6 and April 23-24, 1975, confidential employee interviews, evaluations of work procedures, evaluation of ventilation systems and available toxicity information the following determinations have been made:

(1) The cleaning tank worker (on the cold strips) is exposed to toxic concentrations of methylene chloride.

(2) The parts cleaning operation conducted (with methyl ethyl ketone) in the spray paint room poses a potential health hazard.

(3) The automatic production cleaning does not constitute a health hazard.

(4) The blue line manual cleaning does not constitute a health hazard.

(5) The spray paint operation as conducted in both the batch booth and four spray paint booths contained within the spray paint room do not constitute a health hazard.

(6) At least one welder is exposed to potentially toxic welding fumes concentration and a second to potentially toxic fluoride concentrations.

(7) Grinders exposure to nuisance dust did not pose a health hazard at the concentrations measured during this evaluation.

Recommendations to ameloriate those situations which were considered a potential health hazard are incorporated within the body of this report.

II. DISTRIBUTION AND AVAILABILITY OF DETERMINATION REPORT

Copies of this Determination Report are available upon request from the Hazard Evaluation Services Branch, NIOSH, U.S. Post Office Building, Room 508, Fifth and Walnut Streets, Cincinnati, Ohio. Copies have been sent to:

a) GAF Corporation, Equipment Manufacturing Plant, Vestal, New York
b) Authorized Representative of Employees
c) U.S. Department of Labor - Region II
d) NIOSH - Region II

For the purposes of informing the approximately 23 "affected employees" the employer will promptly "post" the Determination Report in a prominent place(s) near where exposed employees work for a period of 30 calendar days.

III. INTRODUCTION

Section 20(a)(6) of the Occupational Safety and Health Act of 1970, 29 U.S.C. 669 (a)(6), authorizes the Secretary of Health, Education, and Welfare, following a written request by 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 National Institute for Occupational Safety and Health received such a request from an authorized representative of employees regarding employees exposure to paint and paint solvents, chlorinated hydrocarbons, welding fumes, dust and "sickening odors."

IV. HEALTH HAZARD EVALUATION

A. Plant Process - Conditions of Use

The GAF Equipment Manufacturing Plant in Vestal, New York is engaged in the fabrication of twenty-one different models of duplicating equipment. As part of the overall production process the following operations (where the alleged hazards were present) are conducted in respectively designated areas: cleaning; spray painting; welding and soldering; and grinding.

1. Cleaning

Four different parts cleaning operations were present in the areas of concern.

Of these four, one was eliminated from further investigation after observing the operation. This cleaning operation is identified as the "conveyorized dip and agitate production cleaning" and is essentially completely automated. Parts are manually loaded into a large basket which is hoisted to the the conveyor. The entire process is conducted without any one in the area of the dip tanks. For this reason this cleaning operation was not investigated any further.

A second cleaning operation, identified as the "blue line", was also eliminated from further investigation after observing the operation and measuring slot velocities. Parts, contained in baskets, are dipped into a series of tanks containing cleaning solutions and rinses. These baskets are lowered and raised with the use of a motorized winch by one employee who walks on a metal platform adjacent to the tanks. Some of these tanks are equipped with lids and all tanks had a push-pull exhaust system. In addition the cleaning tank worker was equipped with protective equipment for accidental splashes.

The "cold strip operation", the third cleaning operation, is conducted by one employee for a period of 2 to 4 hours per day. Parts are submerged in a cleaning solution containing methylene chloride, formic acid, detergent, and phenol. These parts are permitted to remain there overnight. The cold strip tank is actually a two compartment tank; one for dipping and one for washing down parts, scrubbing them, and permitting them to drip dry. The compartment used for dipping is provided with a lid, a water layer above the cleaning solution, and slot ventilation along the edge on the back and right-hand side. The second compartment is flanged on the left-hand side and provided with slot ventilation along the edge on the back side.

Parts removed from the dipping compartment and placed in the second compartment are then scrubbed by hand with a brush if they are not sufficiently clean at this point; this is generally the case. The cleaning tank worker scrubs the parts while standing on a metal platform in front of the tank and leaning over the edge.

The fourth parts cleaning operation consisted of scrubbing parts (with a brush) while they were partially submerged in a rectangular tank which contained methyl ethyl ketone. The operation was conducted in the spray paint room. The cleaning tank operator stands between the wall and the tank (approximately 5' long, 1-1/2' wide and 1' deep), which had been elevated about waist height. The tank was positioned opposite the NE spray paint booth (one of four housed in the spray paint room) but not in the line of air movement.

At both of these parts cleaning operations, third and fourth processes, the worker was equipped with an apron, gloves and glasses. Respirators were not worn at either location.

2. Spray Painting

The spray painting was conducted under favorable conditions; all booths were equipped with an exhaust system. There were five different spray paint booths; four of these were contained in the spray paint room and were of the water curtain type. The fifth booth, identified as the "batch booth", was equipped with a reusable filter and was physically separated from the spray paint room.

Painters were provided with respirators, but not used in all cases.

There was some rebound noted when painting the interior of some of the metal housings; however, this appeared to be dependent on the individual painter.

3. Welders

There were six designated arc and oxyacetylene welding stations, only three of which were in use during the second visit. The stations are physically separated from each other through the use of portable screens. None of the welding stations are equipped with a local exhaust system. An exhaust fan with one flexible duct was available. However, the exhaust side of the fan was not connected to any duct work and welding fumes removed from the source would be exhausted into the room air. This system was not used during either visit.

Materials used in the welding include wire for wire welding, a variety of welding electrodes, a fluoride-containing flux, and materials welded (aluminum, cold rolled steel and stainless steel).

The amount of actual welding varied considerably. Two of the welders did more tack welding, whereas the third did a more continuous type of welding. This third welder was welding on a heavier gaged steel and each weld required more time.

In addition to this, there were three spot welders in the same general area. Only one of the machines was equipped with a local exhaust system. A large copper electrode was used to spot weld on mostly mild steel.

One area was designated as the soldering station. Soldering was conducted in a ventilated hood. The filler material consisted of 50% lead and 50% tin. On one of the days of the investigation the solderer did grinding outside of the hood instead of soldering.

All personnel in this area are equipped with safety glasses. Protective aprons and gloves were available where needed.

4. Grinding

Adjacent to this room is the burr room (grinding room). Contained in this room are two semi-automatic pieces of equipment used to sand, grind, and buff the various metal sheets used. One of these, "the time-saver", is equipped with its own collection system; this includes a cyclone and bags, all of which are housed in the burr room. A second machine, identified as a belt sander and buffer, was connected to a separate exhaust system.

In addition to this, one of the employees in this area did grinding and sanding with hand held equipment. No local exhaust system was provided for this particular operation. Three portable air circulation fans were used in the general area.

B. Evaluation Progress

An initial survey was conducted on February 5-6, 1975. This survey included obtaining background information, conducting a walk-through survey in those areas where the alleged hazards were present, conducting confidential employee medical interviews, and collecting both area and breathing zone samples.

A follow-up survey was conducted on April 23-24, 1975. This included collecting approximately seventy breathing zone samples to determine the following groups' exposure to air contaminants: welders, painters, cleaning tank workers and grinders. In addition to this employees were informally questioned in regard to symptoms commonly associated with each work environment.

C. Environmental Evaluation Methods

Two of the parts cleaning operations were eliminated from further investigation after the initial survey. The "dip and agitate production cleaning" process was not investigated further since there was no one exposed during the cleaning process. The second cleaning operation, "the blue line", was eliminated after observation and measuring slot velocities at the perimeter of each tank.

During the initial survey the cold strip operation was evaluated by collecting breathing-zone samples on charcoal tubes at 1 liter per minute with an MSA pump. During the follow-up survey both area and breathing zone samples were collected on charcoal tubes at a flow rate that resulted in a volume of approximately 10 liters. During this second survey five liter samples were collected over a five minute period to determine peak exposures. These samples were analyzed for methylene chloride by gas chromatography.

Breathing zone samples for formic acid were collected in impingers during the follow-up survey. These samples were analyzed by gas chromatography. Also, ventilation measurements were recorded and work practices observed.

The parts cleaning operation conducted (with methyl ethyl ketone) in the spray paint room was evaluated by collecting breathing zone samples on charcoal tubes. This type of samples were collected during both surveys.

The spray paint operation was evaluated by first collecting two short term samples in two of the spray painters' breathing zones and also bulk air samples in the paint storage room. The samples were collected on charcoal tubes and analyzed by gas chromatography for those substances listed in Table II.

During the follow-up survey painters'(4) exposure to vapors from the spray painting was determined by collecting breathing zone samples on charcoal tubes. Each of the samples was collected for a four hour period; two samples for each painter. This sampling protocol was conducted on two consecutive days. These samples were also analyzed by gas chromatography. In addition to this ventilation measurements were taken at each of the five spray paint booths with an Alnor Velometer Jr.

Welders' exposure to welding fumes was determined by collecting breathing zone samples on AA filters at 2 liters per minute. This type of sampling was conducted during both surveys and was essentially for eight hours. Filters were tared to determine total welding fumes and then analyzed for those metals listed in Table III by Atomic Absorption. In addition to this four filters were checked for molybdenum and two for cadmium.

Also two of the welders' exposure to these air contaminants was monitored by collecting samples on cellulose membrane filters at 2 liters per minute inside the welding helmet. This was accomplished during the follow-up survey by utilizing modified welder helmets.

In addition to this one of the welder's exposure to fluoride (from a fluoride containing flux) was evaluated by collecting samples in an impinger containing sodium acetate. These samples were than analyzed by utilizing a specific ion electrode.

Spot welders' exposure to air contaminants from the metals welded on was determined by utilizing tared filters and then analyzing them for specific metals. This sampling was done during the follow-up survey only and analysis was by Atomic Absorption.

The solderers' exposure to lead and tin was determined by the method described above. Also, his exposure to nuisance particulate on the second day of the follow-up survey was determined by utilizing pre-weighed filters.

The grinders' exposure to nuisance particulate (Al_2O_3) in the burr room was determined by collecting a respirable and total dust area sample during the initial survey. During the follow-up survey breathing zone samples for total nuisance particulate were collected. All of these samples were collected on pre-weighed filters.

In addition to the environmental evaluation, employees in the work area of concern were interviewed in regard to their work history, medical history and symptomatology associated with such work environments. Such interviews were conducted in private during the initial survey. During the follow-up survey questioning was limited to more directed questions, at the work site, in regard to symptomatology.

D. Environmental Criteria

a. Environmental Standard

The three primary sources of environmental evaluation criteria considered in this report are: (1) NIOSH criteria documents recommending occupational health standards, (2) American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values for Chemical Substances with Intended Changes for 1974, and (3) Occupational Health Standards promulgated by the U.S. Department of Labor (Federal Register, June 27, 1975, Vol. 39, No. 125; Title 29, Chapter XVIII, Part 1910, Subpart G, Tables G1 and G2). Since the criteria were used only as a guide and listing the NIOSH recommended standards and/or the Federal standards would not change any of the determinations made as a result of this evaluation, only the ACGIH Threshold Limit Values applicable to the substances of concern are listed below.

	8-hour time-weighted average (TWA) in parts per million (PPM)	
Methyl ethyl ketone	200	
Methylene chloride	200	intended change
Formic acid	5	
Ethyl acetate	400	
Toluene - skin	100	
Butyl acetate	150	
Ethyl benzene	100	
Xylene - skin	100	
Methyl cellosolve - skin	25	
Butyl cellosolve - skin	50	

The following are also TLVs expressed in milligrams per cubic meter (mg/M^3).

		8-hour TWA in mg/M^3	
	Iron oxide fume	5	
	Copper fume	0.2	
C	Manganese & compounds, as Mn	5	
	Nickel, metal & insoluble compounds, as (Ni)	1	
	Chromium metal & insoluble salts	1*	
	Zinc oxide fume	5	
	Silver, metal & soluble compounds	0.01	
	Welding fume **	5	intended change
	Molybdenium (insoluble compounds)	10	
C	Cadmium oxide fume (as Cd)	0.05	
	Nuisance dust	10	
	Fluoride (asF)	2.5	
	Lead fume	0.15	
	Tin oxide	10***	

C - Ceiling value
* - Federal Standard (not a TLV)
**- Not otherwise classified; total Particulate
*** - Considered a nuisance dust

b. Physiological Effects

The following is a summary of the adverse effects resulting from excessive exposure to each of the substances of concern:

Methylene Chloride - The toxic effect is predominantly narcosis. Symptoms of excessive exposure may be vertigo, ataxia, weakness, headache, difficulty in speech, and possibly blurred vision. Methylene chloride is only mildly irritating to the skin; the problem may be accentuated by its being sealed to the skin by shoes or tight clothing.

Formic Acid - The primary characteristic of formic acid is its irritating properties.

Methyl Cellosolve - This compound which has a mild etheral odor and a bitter taste may give rise to acute irritating effects on the skin, eyes, and mucous membranes if concentrations are sufficiently high. Prolonged exposure to lower concentrations which may be systemically toxic have negligible warning properties. Symptoms and signs which have been associated with long-term exposure to excessive concentrations of methyl cellosolve include weakness, headache, sleepiness, gastrointestinal upset, weight loss, neurological abnormalities, and anemia.

Methyl Ethyl Ketone (MEK) - Prolonged exposure to MEK may result in mucous membrane irritation, nausea, vomiting, dermatitis, headache and paresthesias.

Butyl Acetate - N-butyl acetate is primarily an irritant but also possesses some narcotic effect. Symptoms of intoxication include irritation of mucous membranes followed by incoordination, fatigue, weight loss and narcosis.

Ethyl Acetate - Prolonged and excessive exposure to this agent may result in dermatitis, mucous membrane irritation and respiratory tract irritation and narcosis.

Toluene - Prolonged excessive exposure to this agent may acutely cause headache, weakness, fatigue, unconsciousness, loss of coordination, nausea, vomiting, anorexia, acute dermatitis and irritation of skin and mucous membranes.

Xylene - Excessive exposure to xylene may cause dermatitis, irritation of mucous membranes, nausea, vomiting, anorexia and heart burn. Dizziness, incoordination and a staggering gait may also occur.

Ethyl Benzene - Ethyl benzene is a primary skin irritant and less markedly a narcotic. Prolonged exposure may produce severe irritation of mucous membranes and dermatitis.

Welding Fumes - Inhalation of excessive amounts of welding fumes may result in metal fume fever. However, this is highly dependent upon the various metal fumes. Iron, tin oxide, and molybdenum are considered relatively inert; copper, manganese and zinc are capable of producing metal fume fever; others may be more toxic. Some of the symptoms of metal fume fever include chills and fever, which rarely exceeds 102°F, upset stomach and vomiting, dryness of the throat, cough, weakness, and aching of the head and body. Such symptoms often occur some hours later and usually last only a day.

Fluorides - The inhalation of fluoride fumes and gases may produce eye and respiratory tract irritation. Nose bleeds may also occur at higher concentrations. If fluoride intake exceeds fluoride excretion rate for a sufficiently long period of time, chronic bone damage may occur.

Lead - Inhalation of lead fumes may result in lead poisoning. Signs and symptoms may include abdominal pain with tenderness, constipation, headache, weakness, muscular aches and cramps, loss of appetite, nausea, vomiting, weight loss, anemia with pallor and lead lines.

Nuisance Dust - Inhalation of excessive amounts cause no adverse effects in the lung; elevated concentrations reduce visibility and may result in unpleasant deposits in the eyes and nose, plus injury to the mucous membranes through mechanical action.

E. Evaluation Results and Discussion

1. Cleaning

The cold strip cleaning operation as conducted now is considered to have been poorly designed and is conducted with inadequate engineering controls. The cleaning tank worker at this location is required to lean over the edge of the tank and scrub those parts that are not clean. This procedure may result in exposure to extremely elevated concentrations of methylene chloride as can be seen from Table I. Breathing zone sample number 10 was collected while the operation was conducted as described above. The concentration measured during that sampling period was greater than 5000 parts per million. The concentrations measured during similar sampling periods were much lower since the actual scrubbing of parts was conducted for only part of the sampling periods. Formic acid was not detectable in the breathing zone samples collected for the duration of the cleaning tank workers' exposure on April 23 and 24, 1975.

Exhaust ventilation measurements recorded during the initial visit were not only inadequate (zero, ft/min. 1-1/2 ft. from the slot) but are being exhausted from the wrong point. The exhaust point is located in such a manner that any vapors exhausted, while the cleaning tank worker is scrubbing parts, are exhausted only after being drawn past his breathing zone. Although the odors were very noticeable and objectionable to the NIOSH investigator, cleaning tank workers did not emphasize their objection to the odor, but only casually mentioned it.

One worker presently in this area reported having experienced a light headed sensation in the past and one worker had been rotated out of this area because he had developed dermitatis.

Redness and swelling of the eyes was one of alleged symptoms experienced as a result of exposure to vapors eminating from this operation. During the follow-up survey the cleaning tank worker's eyes were red, but directed questions did not reveal that he was experiencing an irritation of the eyes. He did say he was tired but did not relate it to his work environment.

Irritation of the eyes and nose was reported by at least one worker as a result of cleaning parts with MEK in the spray paint room.

For some unexplained reason MEK concentrations in the cleaning tank worker's breathing zone were considerably different during the 1st and 2nd visit (see Table I).

Ventilation measurements in the worker's normal breathing zone revealed that there was essentially no air movement past this point. The operation is conducted in the spray paint room but is not in the air stream.

2. Spray Painting

The spray paint operation is considered to be adequately controlled through engineering controls and personal protective equipment. As can be seen from Table II organic vapor concentrations were very low; there was some problem with paint rebound but was considered to be directly related to the painter's skill as a painter.

Face velocities at each booth were greater than 150 feet per minute.

One painter stated he had experienced some minor irritation in the past but that it was due to the MEK used to clean parts with and not from the paint. Also, this same painter reported experiencing dryness of the hands due to his personal work practice of removing paint from his hands with thinner. The biggest objection the painters had was the odor, just outside of the spray paint room, from the cold strip operations.

Also, painters are required to do some paint mixing (for about 10 min./day) in the paint storage room; one painter reported that he had experienced slight intoxication in the past as a result of this. Presently, there is a push-pull system moving air across the room at 50-60 feet per minute. This system was reportedly repaired just prior to our initial visit and the painter did not experience such symptoms during the visits.

3. Welding

Welders objected to having to weld on oily or dirty metal because this practice results in irritation of eyes, nose and throat.

Welding fume concentrations varied considerably from welder to welder and differed from inside of the welding helmet to the outside (see Table III). Breathing zone concentrations (outside of the helmet) were in excess of the recommended TLV (5 mg/M^3) for one of the welders on three different days. However, welding fume concentrations were measured inside of the helmet on two of the days and they were below the TLV. Based on the fact that several metals were present in the samples and could possibly act synertistically, plus the fact that the welder (Welder A) was experiencing upper respiratory irritation and often a bad taste, it was determined that a potential health hazard was present.

In addition to this the fluoride concentration for a second welder (Welder B approached the recommended TLV of 2.5 mg/M3. The concentration measured on April 24 was 2.2 mg/M^3. Also a third welder reported having experienced severe eye irritation in addition to upper respiratory irritation when using the fluoride containing flux.

Spot welders did not report experiencing such eye and upper respiratory irritation, although all welders, spot welders included, did feel that welding fumes did accumulate in the area periodically and that the present ventilation was inadequate during such peak periods.

The solderer in the welding area did soldering inside of a hood using solder composed of 50% lead and 50% tin. Both of these metals were present in very low concentrations; 0.036 mg/M^3 and 0.024 mg/M^3 respectively. In addition to this he did not report any adverse symptomology

4. Grinding

Grinders' exposure to nuisance dust was well below the recommended TLV TLV (see Table IV). Grinders report experiencing typical annoyances associated with exposure to elevated nuisance dust concentration (e.g., particle deposition in eyes and nose). Such conditions were not present during the evaluation but were reported to be present when a large amount of hand grinding on aluminum was done. Also, the person doing the hand grinding had been provided with a dust respirator.

V. RECOMMENDATIONS

1. Reduce the cleaning tank worker's exposure to vapors from the cold strip operation by:

a) Alter the process such that the worker will no longer be required to lean over the edge of the tank to scrub parts and

b) provide local exhaust in such a manner that it will remove vapor at the source and not draw them past the worker's breathing zone.

2. Conduct the parts cleaning operations, presently conducted adjacent to a wall in the spray paint room with methyl ethyl ketone, at a location where a local exhaust system will remove vapors away from the worker's breathing zone. Also, a less toxic solvent should be considered as a substitute.

3. Remove gas and welding fumes at the source through engineering controls, such as local exhaust ventilation. Gases and fumes removed at the source should not be exhausted into room air.

VI. REFERENCES

1. Patty, F.A., Editor, Industrial Hygiene and Toxicology, Vol. II, Interscience Publisher, 1963.

2. American Conference of Governmental Industrial Hygienist; TLVs Threshold Limit Values for Chemical Substances in Workroom Air Adopted by ACGIH for 1974 and Supporting Documentation.

3. NIOSH Criteria Documents.

4. American Welding Society, the Welding Environment, 1973.

5. Browning, Ethel, Toxicity and Metabolism of Industrial Solvents. New York: Elserier Publishing Company (1965).

6. Ratney, Ronald S., In Vivo Conversion of Methylene Chloride to Carbon Monoxide; Archives of Environmental Health, Vol. 28, April 1974.

7. Dept. of Labor; Occupational Safety and Health Standards, Vol. 39, No. 125; Title 29, Chapter XVIII, Part 1910.

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TABLE I

ORGANIC VAPOR CONCENTRATIONS ASSOCIATED WITH PARTS CLEANING

Feb. 6, April 23-24, 1975

Sample #	Location or Job Classification	Date	Time	Concentration in ppm * Methyl Ethyl Ketone	Methylene Chloride
1	Cleaning Tank Worker (Cleaning in paint booth)	02/06/75	0720 - 0756	140**	-
4	" " "	02/06/75	0756 - 0849	128**	-
7	" " "	02/06/75	0849 - 0950	113**	-
2	Cleaning Tank Worker (Cold strip)	02/06/75	0716 - 0755	-	147
3	" " "	02/06/75	0755 - 0845	-	49.7
5	" " "	02/06/75	0845 - 0921	-	24.2
13	Cleaning Tank Worker (Cleaning in paint booth)	04/23/75	1049 - 0316	20.6	-
14 & 19	" " "	04/23/75	1049 - 0316	14.7	-
30	" " "	04/24/75	0850 - 1115 1215 - 1500	25.5	-
31 & 35	" " "	04/24/75	0850 - 1115 1215 - 1500	25.8	-
1	Cleaning Tank Worker (Cold strip)	04/23/75	0737 - 1032	-	129
9	" " "	04/23/75	0907 - 0912	-	5156
10	Area - Cleaning Tank Platform	04/23/75	0917 - 0922	-	82
11	Cleaning Tank Worker (Cold strip)	04/23/75	1003 - 1008	-	196
12	Area - Cleaning Tank Platform	04/23/75	1014 - 1019	-	25
22	Cleaning Tank Worker (Cold strip)	04/24/75	0705 - 0850	-	131
28	" " "	04/24/75	0810 - 0815	-	364
29	Area Cleaning Tank Platform	04/24/75	0826 - 0831	-	21

* Parts per million

** Minimum concentration. It is assumed that the saturation limit of the charcoal tube was exceeded since a significant amount was found on the reference portion.

\- No analysis

TABLE II

ORGANIC VAPOR CONCENTRATIONS ASSOCIATED WITH SPRAY PAINTING

Feb. 6, April 23-24, 1975

Sample #	Job Classification	Date	Time	TIME WEIGHTED AVERAGE CONCENTRATION IN PPM* Ethyl Acetate	Methyl Ethyl Ketone	Toluene	Butyl Acetate	Ethyl Benzene	Xylene	Methyl Cellosolve	Butyl Celloso
6 & 18	Spray Painter (A)	04/23/75	0715 - 1204 1205 - 1515	N.D.**	0.4	7.0	N.D.	1.9	6.6	6.0	0.4
4 & 16	Spray Painter (B)	04/23/75	0758 - 1210 1210 - 1517	N.D.	N.D.	1.6	N.D.	0.2	1.6	1.5	N.D.
5 & 17	Spray Painter (C)	04/23/75	0800 - 1206 1206 - 1517	N.D.	N.D.	2.8	N.D.	0.4	1.5	1.6	N.D.
26 & 37	Spray Painter (A)	04/24/75	0717 - 1119 1214 - 1500	N.D.	11.9	2.6	0.6	0.2	N.D.	N.D.	0.2
24 & 33	Spray Painter (B)	04/24/75	0720 - 1117 1212 - 1450	N.D.	0.5	0.8	N.D.	0.2	1.0	1.0	N.D.
25 & 34	Spray Painter (C)	04/24/75	0720 - 1119 1213 - 1452	N.D.	1.3	1.1	N.D.	0.4	1.0	1.5	N.D.
3 & 15	Spray Painter (D) (Batch Booth)	04/23/75	0745 - 1216 1216 - 1518	N.D.	0.5	1.9	N.D.	1.2	3.7	3.3	0.2
23 & 32	Spray Painter (D) (Batch Booth)	04/24/75	0722 - 1120 1210 - 1454	1.1	1.0	14.0	N.D.	0.9	3.4	2.6	N.D.
CT8	Spray Painter (F)	02/06/75	1005 - 1118	N.D.	N.D.	0.6	0.1	N.D.	N.D.	-	-
CT9	Spray Painter (G)	02/06/76	1026 - 1118	N.D.	N.D.	0.4	N.D.	N.D.	N.D.	-	-
6 & 15	Paint Storage Area	02/06/75	0723 - 0947	7.0	N.D.	10.1	1.2	14.8	38.5	-	-

* Parts per million
** None detected (Detection limit is 0.01 mg/charcoal tube)
\- No analysis

TABLE III

WELDING FUME CONCENTRATIONS

Feb. 6, April 23-24, 1975

TIME WEIGHTED AVERAGE CONCENTRATION IN MG/M3*.

Sample Number	Job Classification	Date	Time	Welding Fumes	Fe_2O_3	Cu	Mn	Ni	Cr	Zn	Ag	Comments
260 & 286	Welder (A) (Wire weld)	04/23/75	0726 - 1125 1208 - 1509	5.8	5.05	0.036	0.468	N.D.	N.D.	0.005	-	Outside of welding helmet
63 & 40	" " (A)	04/24/75	0737 - 1114 1218 - 1502	5.4	2.86	0.023	0.277	N.D.	N.D.	0.005	-	Outside of welding helmet
49 & 259	" " (A)	04/23/75	0726 - 1125 1208 - 1509	3.6	1.61**	0.015**	0.165**	N.D.**	N.D.**	0.004**	-	Inside of welding helmet
250 & 57	" " (A)	04/24/75	0737 - 1114 1218 - 1502	3.2	1.82	0.017	0.184	N.D.	N.D.	0.004	-	Inside of welding helmet
45 & 280	Welder (B) (Does soldering and brazing)	04/23/75	0751 - 1125 1202 - 1511	1.28	0.32	0.007	0.027	N.D.	N.D.	0.022	Trace	Outside of welding helmet
64 & 61	" " (B)	04/24/75	0711 - 1120 1202 - 1457	1.11	0.19	0.002	0.014	Trace	Trace	0.013	Trace	Outside of welding helmet
263 & 58	" " (B)	04/24/75	0711 - 1120 1202 - 1457	0.64	0.13	0.004	0.011	N.D.	Trace	0.064	Trace	Inside of welding helmet
39 & 288	" " (B)	04/23/75	0902 - 1125 1202 - 1511	0.81	0.33	0.007	0.032	N.D.	N.D.	0.051	Trace	Inside of welding helmet
291 & 26	Welder (C) (Used rods)	04/23/75	0746 - 1123 1205 - 1512	1.70	0.11	0.006	0.011	N.D.	N.D.	N.D.	-	Outside of welding helmet
75 & 60	Welder (C) (Used rods)	04/24/75	0727 - 1117 1203 - 1457	1.11	0.06	0.004	0.006	N.D.	N.D.	N.D.	-	Outside of welding helmet
290	Spot Welder (D)	04/23/75	0816 - 1519	0.78	0.12	0.002	-	-	-	-	-	Outside of welding helmet
252	" " (E)	04/23/75	0824 - 1516	0.67	0.05	0.002	-	-	-	-	-	Outside of welding helmet
66	" " (E)	04/24/75	0729 - 1455	1.0	0.06	0.001	-	-	-	-	-	Outside of welding helmet
295	" " (F)	04/23/75	0841 - 1514	0.28	0.076	0.003	-	-	-	-	-	Outside of welding helmet
74	" " (F)	04/24/75	0723 - 1455	0.86	0.077	0.001	-	-	-	-	-	Outside of welding helmet
63 & 73	Welder (A) (Wire weld)	02/06/75	0752 - 1427	7.55	4.96	0.025	-	-	-	-	-	Outside of welding helmet
59 & 69	Welder (G) (Oxyacetylene)	02/06/75	0735 - 1417	0.57	0.06	0.001	-	N.D.	-	0.026	N.D.	Outside of welding helmet
66 & 67	Welder (B) (Wire feed)	02/06/75	0742 - 1416	0.63	0.21	0.001	-	N.D.	N.D.	-	-	Outside of welding helmet

* Milligrams per cubic meter

** These results are for Filter 49 Only

\- No analysis

TABLE IV

NUISANCE DUST CONCENTRATIONS

Feb. 6, April 23-24, 1975

Sample #	Location or Job Classification	Date	Time	Concentration in mg/m^3 Particulate
293	Grinder - Burr room	04/23/75	0828 - 1516	1.72
271	Grinder - Burr room	04/23/75	0831 - 1517	0.07
56	Grinder - Burr room	04/24/75	0733 - 1457	0.77
65	Solderer (doing grinding)	04/24/75	0724 - 1500	1.81
72	Grinder - Burr room	04/24/75	0734 - 1457	4.93
55	Area - Burr room	02/06/75	0749 - 1415	0.27
57	Area - Burr room	02/06/75	0749 - 1415	0.17*

* respirable fraction