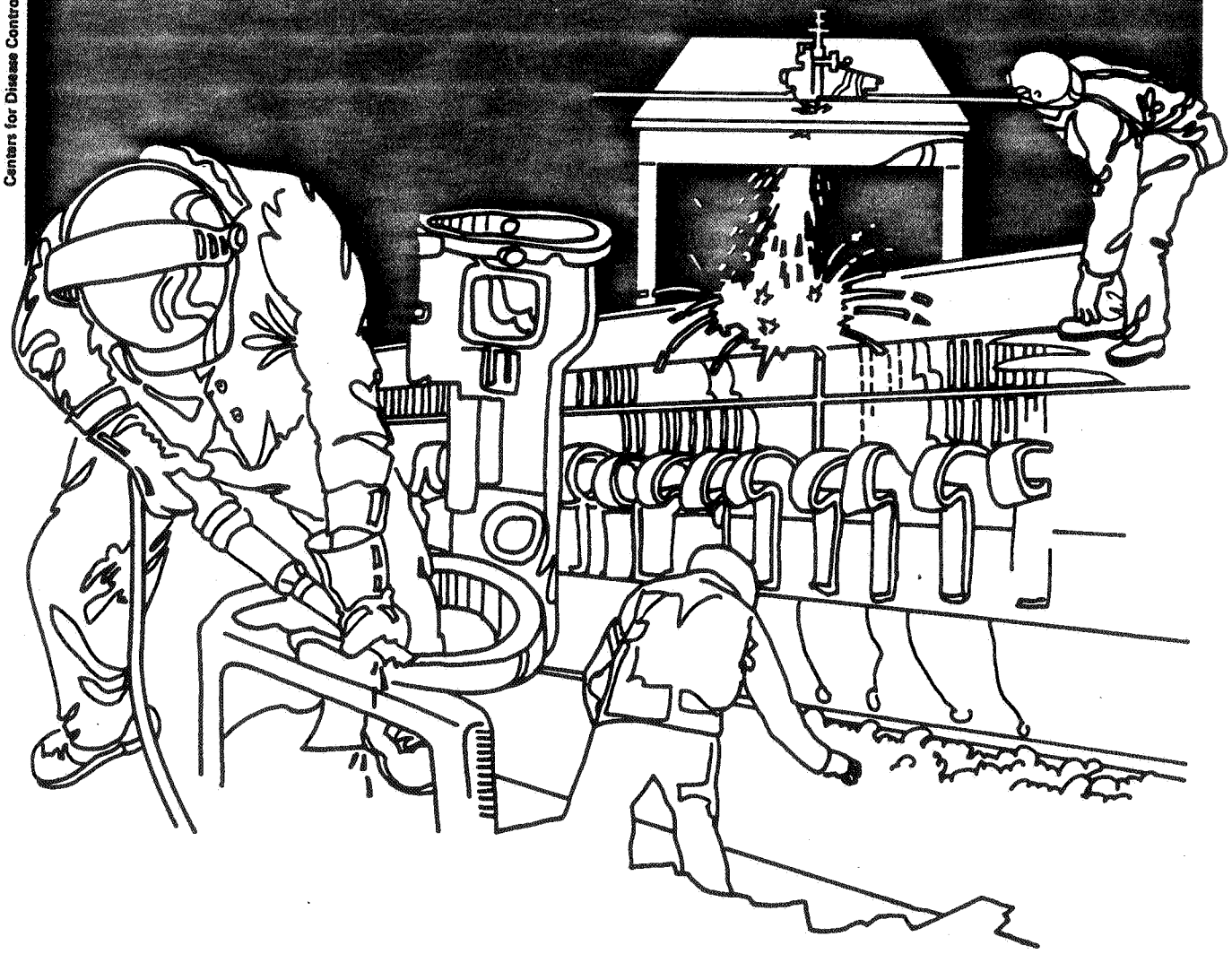
U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES ■ Public Health Service
Centers for Disease Control ■ National Institute for Occupational Safety and Health

NIOSH



Health Hazard Evaluation Report

HETA 84-196-1527
BASIC TOOL AND SUPPLY
OAKLAND, 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.

HETA 84-196-1527
November, 1984
BASIC TOOL AND SUPPLY
OAKLAND, CALIFORNIA

NIOSH INVESTIGATORS:
Pierre L. Belanger, IH
Molly Joel Coye, MD, MPH

I. SUMMARY

In February 1984, the National Institute for Occupational Safety and Health (NIOSH) received a request to evaluate solvent exposures to employees working in the degreasing and silk screening room at Basic Tool and Supply Company, Oakland, California.

On February 16, 23-24 and March 21, 1984, NIOSH investigators conducted environmental and medical surveys.

In the Degreasing and Lacquer Spraying Operations, methyl ethyl ketone air concentrations (14 samples) ranged from None detected to 64 ppm (NIOSH criteria - 200 ppm TWA); methyl isobutyl ketone air concentrations (14 samples) ranged from None detected to 4 ppm (NIOSH criteria - 50 ppm); glycol ethers were not detected (bulk air sample); excessive air concentrations were measured for only trichloroethylene (TCE) ranging from 0.1 to 426 ppm (33 samples during the February survey, and 25 to 27 ppm in March after degreasing operations were modified. NIOSH recommends that TCE exposures be reduced to the lowest feasible limit since it is a suspect carcinogen; the CAL-OSHA standard for TCE is 25 ppm. In Silk Screening Operations, no over exposures were measured for organic vapors (5 samples) noise measurements in the degreasing room (86-87 dBA) and in the spray booth (91 dBA) exceeded the NIOSH criteria of 85 dBA.

Questionnaires were administered, exposed skin areas were examined, and blood samples were drawn for analysis of liver function on the twelve employees working in the degreasing and silk screening room and two production supervisors.. All liver function tests were within normal limits. Symptoms reported by the 12 workers included sleepiness (9), dizziness (8), headache (7), nausea (6), decreased appetite (6), memory disturbances (5), visual disturbances (4), eye irritation (4), and difficulty concentrating (2); Of 10 workers reporting occasional beer or wine consumption, 5 reported exacerbation of the alcohol effect when consumed at the end of the workday. Skin rashes were reported by 9 employees, and in each case an irritant dermatitis was observed, with varying degrees of folliculitis superimposed.

On the basis of the data collected during the evaluation, NIOSH investigators concluded that a health hazard existed due to excessive trichloroethylene exposures and the reporting of neurologic and dermatologic symptoms. Recommendations to decrease the worker exposure to TCE and to other chemicals used in these processes are included in Section VIII of this report.

KEYWORDS: SIC 3479 (Metal degreasing, solvents, silk screening, lacquer, trichloroethylene, neurologic effects, dermatologic effects,solvents).

Silk Screening Operation

On February 23-24, 1984, five environmental air samples were collected and evaluated for six organic vapors: acetone, ethylbenzene, xylene (all), methyl chloroform, trichloroethylene, and perchloroethylene. No overexposures were measured.

On March 23, 1984, NIOSH did sound level measurements in the degreasing room and inside the lacquer spray booth. The sound levels in the degreasing room were 86 and 87 dBA. The measurement in the spray booth was 91 dBA. The NIOSH recommended criteria is 85 dBA.

The twelve employees working in the degreasing and silk screening room and two production supervisors working partially in these areas participated in a medical evaluation on February 23. Questionnaires were administered, exposed skin areas were examined, and blood samples were drawn for analysis of liver function. All liver function tests were within normal limits. Symptoms reported by the 12 workers included sleepiness (9), dizziness (8), headache (7), nausea (6), decreased appetite (6), memory disturbances (5), visual disturbances (4), eye irritation (4), and difficulty concentrating (2); skin rashes were reported by 9 employees, and in each case an irritant dermatitis was observed, with varying degrees of folliculitis superimposed. Of 10 workers reporting occasional beer or wine consumption, 5 reported exacerbation of the alcohol effect when consumed at the end of the workday.

On the basis of the environmental data collected during the evaluation, NIOSH investigators concluded that a health hazard existed due to trichloroethylene exposures and the reporting of neurologic and dermatologic symptoms. Recommendations to decrease the worker exposure to TCE and to other chemicals used in these processes are included in Section VIII of this report.

KEYWORDS: SIC 3479 (Metal degreasing, solvents, silk screening, lacquer, trichloroethylene, neurologic effects, dermatologic effects,solvents).

II. INTRODUCTION

In February, 1984, the National Institute for Occupational Safety and Health (NIOSH) received a request for a health hazard evaluation from a representative of the International Molders and Allied Workers Union #164, on behalf of the employees at Basic Tool and Supply Company, Oakland, California. NIOSH was requested to evaluate the degreasing and silk screening room for solvent exposures. One employee working in the degreasing room was reportedly overcome by solvent vapors and fainted. Additionally, NIOSH was requested, by management, to take sound level measurements of the degreasing room and the enclosed spray booth.

On February 16, 1984 NIOSH investigators conducted an initial environmental and medical survey of Basic Tool and Supply Company. A follow-up environmental survey was conducted on February 23-24 and March 21 and 23, 1984. A follow-up medical survey was conducted on February 23. The general findings of the investigation and recommendations were presented to the company and employee representatives at the end of the walk through survey. In March, the industrial hygienist telephoned management and labor representatives to report the environmental air sampling results. The medical results were sent by letter to the individual employees.

III. BACKGROUND

Basic Tool and Supply has been at this location since 1983. The plant occupies approximately 18,000 square feet of which office space accounts for about 4,000 square feet. The company employs 70 full-time employees of which 40-45 empoyees work in production and maintenance which consists of the following: polishing room; degreasing room; silk screening room; tool and die shop; and assembly, packaging, and shipping. Of these, approximately 20 of the workers are women. The majority of the employees work a five day week during the hours of about 8:00 AM to 5:00 PM.

Degreasing Room

The degreasing room consists of degreasing, lacquering, vinyl wash, and etching operations. Six to seven employees work in this area. The chemicals used in the degreasing room are lacquer, lacquer thinner, trichloroethylene, vinyl wash thinner (basically xylene), and an etching solution (ferric chloride). All raw parts e.g. buckles, coasters, cubes etc. are delivered to the finishing department where they are prepared by one or more of the following procedures: de-oxidized, de-burred, cut, polished, and buffed. Afterwards, the products are degreased and either lacquer sprayed, dried and packed, or they are silk screened, etched, vinyl washed, degreased, polished, degreased, lacquer sprayed, dried and packed.

The degreaser operator does most (95%) of the degreasing; however, there are several other employees who periodically use the degreaser to clean parts. All the workers who use the degreaser were reported to have received 15 minutes of job training from the supervisor.

There are two vapor degreasers, one 10 gallon open-top manually operated degreaser and one 90-gallon mechanized degreaser. Both of the degreasers have local exhaust ventilation. The manual degreaser basket is loaded with parts, and the basket is slowly set into the vapor degreaser for a prescribed amount of time or until the parts appear clean. Afterwards, the operator slowly lifts the basket out of the vapor zone and up to the cold zone where the solvent condenses and flows from the metal surface back into the tank. Once the parts appear dry, the basket is lifted out of the tank, and the parts are hand dried. Manufacturers recommend that parts be introduced into or removed from the tank at a rate of 11 feet per minute. The mechanized (automated) degreaser is used for special parts which can be attached to a rack. The rack is placed on the vertical conveyor that descends into the tank. A rheostat is used to control the conveyor speed at 11 feet per minute to prevent solvent drag out.

The manual degreaser is drained once a week. Due to the limited clearance (about 3-4 inches) between the drain valve and the floor, the manual unit is drained into a small container and transferred to a larger drum. The automated unit is drained once every 3000 cycles. The automatic unit has a drain hose at the bottom of the tank which is connected to a motor. The solvent is pumped directly to the storage container. Lacquer spraying is done at a partially enclosed booth (hot spray) and a fully enclosed booth (cold spray). The average air velocity at the hot and cold lacquer spray booth was measured to be 60 and 46 feet per minute, respectively.

Personal Protective Equipment.

Persons working in the degreasing room were wearing the following protective equipment depending on their job. The degreaser operator and the two lacquer sprayers wore half mask airline supplied respirators, safety goggles, and cotton gloves. The person hand drying the parts wore a half mask air purifying respirator and cotton gloves. The etching operator wears a full face airline supplied respirator with latex glove. The vinyl wash operator wears a half mask air purifying respirator, goggles and rubber gloves.

The incident in which an employee working in the degreasing operation lost consciousness was investigated. At the time of the incident, the employee was lifting the manual degreaser basket out of the vapor zone and placing it on a central table. It was

reported that the worker did not wear a respirator because none was available. According to the employee and to other co-workers present at the time, she set the basket down on the table and began to unload it, then lost consciousness and fell to the floor. She was taken to the hospital where her personal physician examined her. The physician reported that he found no alternative cause of the loss of consciousness, and believed it to be due to her exposure to trichloroethylene.

Silk Screening Room

The silk screening room is located next to the degreasing room. Four to five employees work in this area. Two workers do silk screening, one worker does part-time silk screening and etching, and one worker does pad printing and makes silk screens. The parts are silk screened with a vinyl resist, baked, taped and touched up, etched, vinyl washed off, degreased, polished degreased, wiped down, lacquered, and packaged. The chemicals used in this work area are acetone, 1,1,1 trichloroethane, perchloroethylene, and stoddard solvent. These chemicals are stored in spray cans or in small glass jar containers. A canopy exhaust hood which has slot exhaust ventilation is located in the corner of the room. The solvents are primarily used under the canopy hood to prevent solvent vapors from permeating the room.

IV. DESIGN AND METHODS

A. Environmental

Two bulk samples (lacquer and lacquer thinner) were collected and qualitatively analyzed for its components by gas chromatography/mass spectrophotometry. The detection limit for each component was 0.05 milligrams per gram of sample (mg/g).

One bulk air and 14 personal air samples were collected on silica gel tubes. The bulk air sample was qualitatively analzyed for glycol ethers by gas chromatography/mass spectrophotometry. The detection limit for each component was 0.05 mg/g.

One bulk air and 14 personal air samples were collected on Ambersorb tubes. The bulk air sample was qualitatively analyzed for ketones by gas chromatography/mass spectrophotometry. The detection limit for each component was 0.05 mg/g. The 14 personal air samples were analyzed for MEK and MIBK according to NIOSH method P&CAM 127 with modifications.

One bulk air and 42 personal and area air samples were collected on charcoal tubes. The bulk air samples was qualitatively analyzed for organic vapors by gass chromatography/mass spectrophotometry. The detection limit for each component was 0.05 mg/g. The 42 air samples were analyzed for isopropyl alcohol, acetone, heptane, toluene, ethylbenzene, xylenes(all), isobutyl acetate, 1,1,1-trichloroethane, trichloroethylene, and perchloroethylene, using NIOSH method P7CAM 127 with modifications. The detection limit for each component was 0.01 mg/g.

Eight personal air samples were collected on a charcoal tube during a follow-up investigation and analyzed for trichloroethylene by gas chromatography using NIOSH method S-336 with modifications. The detection limit was 0.01 mg/g.

Noise measurements were made using a Type 1565-B Sound Level Meter direct reading instrument.

B. Medical

All 12 employees in the degreasing and silk screening rooms and the two production supervisors working partially in these areas were invited to participate in a medical evaluation on February 23. Questionnaires were administered, exposed skin areas were examined, and blood samples were drawn for analysis of liver function.

V. EVALUATION CRITERIA

A. Environmental

As a guide to the evaluation of the hazards posed by workplace exposures. NIOSH field staff employ environmental evaluation criteria for assessment of a number of chemical and physical agents. These criteria are intended to suggest levels of exposure to which most workers may be exposed up to 10 hours per day, 40 hours per week for a working life time without experiencing adverse health effects. It is, however, important to note that not all workers will be protected from adverse health effects if their exposures are maintained below these levels. A small percentage may experience adverse health effects because of individual susceptibility, a pre-existing medical condition, and/or a hypersensitivity (allergy).

In addition, some hazardous substances may act in combination with other workplace exposures, the general environment, or with medications or personal habits of the worker to produce health

effects even if the occupational exposures are controlled at the level set by the evaluation criterion. These combined effects are often not considered in the evaluation criteria. Also, some substances are absorbed by direct contact with the skin and mucous membranes, and thus potentially increase the overall exposure. Finally, evaluation criteria may change over the years as new information on the toxic effects of an agent become available.

The primary sources of environmental evaluation criteria for the workplace are: 1) NIOSH Criteria Documents and recommendations, 2) the American Conference of Governmental Industrial Hygienists' (ACGIH) Threshold Limit Values (TLV's), and 3) the U.S. Department of Labor (OSHA) occupational health standards. Often, the NIOSH recommendations and ACGIH TLV's usually are based on more recent information than are the OSHA standards. The OSHA standards also may be required to take into where the agents are used; the NIOSH-recommended standards, by contrast, are based solely on concerns relating to the prevention of occupational disease. In evaluating the exposure levels and the recommendations for reducing these levels found in this report, it should be noted that industry is legally required to meet only those levels specified by an OSHA standard.

A time-weighted average (TWA) exposure refers to the average airborne concentration of a substance during a normal 8-10-hour workday. Some substances have recommended short-term exposure limits or ceiling values which are intended to supplement the TWA where there are recognized toxic effects from high short-term exposure.

TABLE A
ENVIRONMENTAL EXPOSURE LIMIT (ppm)[1]

SUBSTANCE	TIMEWEIGHTED AVERAGE	CEILING
Isopropyl Alcohol (NIOSH)	400	---
Isopropyl Alcohol (CAL-OSHA)	400	---
Acetone (CAL-OSHA)	750	---
Heptane (NIOSH)	85	---
Heptane (CAL-OSHA)	400	---
Toluene (NIOSH)	100	200(10 min)
Toluene (CAL-OSHA)	100	500
Ethylbenzene (CAL-OSHA)	100	---
Xylene (NIOSH)	100	200 (10 min)
Xylene (CAL-OSHA)	100	300
Isobutyl acetate (CAL-OSHA)	150	---
1,1,1 Trichloroethane (NIOSH)	---	350
1,1,1 Trichloroethane (CAL-OSHA)	350	800
Trichloroethylene (NIOSH)	LFL[2]	---
Trichloroethylene (CAL-OSHA)	25	75
Perchloroethylene (NIOSH)	LFL	---
Perchloroethylene (CAL-OSHA)	50	300
Methyl ethyl ketone (NIOSH)	200	---
Methyl ethyl ketone (CAL-OSHA)	200	---
Methyl isobutyl ketone (NIOSH)	50	---
Methyl isobutyl ketone (CAL-OSHA)	50	---
Noise (NIOSH)	85 dBA[3]	
Noise (CAL-OSHA)	90 dBA	

1. ppm-Parts of a vapor or gas per million parts of contaminated air by volume.
2. LFL- Lowest feasible limit (suspect or confirmed carcinogen), use best control technology.
3. dBA-decibels

B. Medical

The symptoms reported were evaluated in light of the toxicologic effects described below (Section V - C). The results of the liver function tests were compared with age-sex specific reference ranges provided by the laboratory doing the analyses.

C. Toxicological

Acetone, toluene, ethylbenzene, xylene, 1,1,1 trichloroethane, trichloroethylene (TCE), perchloroethylene ("perc"), heptane, methyl ethyl ketone (MEK) and methyl isobutyl ketone (MIBK) are all solvents. They are primarily absorbed by inhalation or through the skin in workplace exposures. Excessive exposure to solvents may result in neurologic effects and dermatologic effects, including:

Eye and upper respiratory irritation, sleepiness, fatigue, headache, memory disturbance, difficulty concentrating, nausea, vomiting, abdominal cramps, loss of appetite, weight loss, flushed skin, skin defatting and irritation, and folliculitis (inflammation of hair follicles). The intoxicating effects of alcohol are frequently increased when alcohol is consumed after exposure to solvents.

Extreme exposures may result in tremor, loss of coordination, mental confusion, loss of consciousness, coma and death. In addition, excessive and/or prolonged exposure to some of these solvents may result in chronic or delayed-onset effects including visual disturbances, loss of the sense of smell, impaired coordination and sense of touch, decreased nerve conduction velocity, neurobehavioral changes, and kidney and liver damage. Trichloroethylene and perchlorethylene are both suspect carcinogens based on production of excess tumors in experimental animals.(4,5,7)

Isopropyl alcohol and isobutyl acetate may also cause eye and upper respiratory irritation, skin defatting and irritation, folliculitis, and symptoms of nervous system depression including sleepiness, fatigue, headache, nausea, vomiting and weakness.

VI. RESULTS AND DISCUSSION

A. Environmental

In February 23-24, 1984, NIOSH collected bulk chemical and bulk air samples from the degreasing room to determine which chemicals workers are potentially exposed to during their work day. Personal breathing zone and area air samples were collected from the degreasing and silk screening room and analyzed for one or more of the following chemical groups: ketones, organic solvents and alcohols.

Degreasing Room

Fourteen environmental air samples were collected from the degreasing room and evaluated for MEK and MIBK (TABLE 1). MEK results ranged from non detectable to 63.7 ppm, and MIBK results ranged from non detectable to 4.0 ppm. Chemical exposures were far below the appropriate evaluation criteria. One bulk air and 15 environmental air samples were collected and evaluated for glycol ethers. None of the glycol ethers (2-methoxyethanol and 2-ethoxyethanol) were detected on the bulk air samples, thus, no further analysis was required. Thirty- three environmental air samples were collected and analyzed for the following solvents (TABLE II): xylenes (all), isobutyl acetate, methyl chloroform, trichloroethylene, perchloroethylene, isopropyl alcohol, acetone, heptane, toluene and ethylbenzene. Over exposures were measured for trichloroethylene (TCE). The time weighted average ranged from 0.1 to 426 ppm. Seventeen of 21 environmental air samples exceeded the NIOSH recommened criteria of lowest feasible limit based on the current available engineering controls and the Cal-OSHA permissible exposure limit(PEL). One ceiling exposure was measured to be 222 ppm which is well above the the CAL-OSHA PEL. No other chemical overexposures were measured. In fact, the other chemical exposures were well below the NIOSH evaluation criteria or CAL-OSHA standard listed in Table A.

Eight personal breathing zone air samples (both TWA and ceiling) were collected during a follow-up survey (Table III) to evaluate the effect of installing a hoist over the manual degreaser. The ceiling air samples did not exceed the CAL-OSHA PEL, but the TWA air sample concentrations (24.5 and 26.9 ppm) are marginal since the investigator felt that the work operation was slower that previously observed. It should be noted that the hoist was operated at a speed which exceeded the manufacturers recommended rate of 11 feet per minute thereby contributing to the marginal air concentrations mentioned above During a recent telephone conversation with an employer representative it was learned that lockout devices have been installed on both degreasers to prevent workers from changing the hoist speed and thus preventing solvent drag out.

Silk Screening Room

Five personal breathing zone air samples were collected (Table IV) and analyzed for actone, ethylbenzene, xylene (all), methyl chloroform, trichloroethylene, and perchloroethylene. Exposures to all of these chemicals mentioned above were well low.

Sound level measurements (Table V) were taken in the degreasing room at the request of the employer representative. Noise level measurements were 86 dBA infront of the degreasers, 87 dBA infront of the hot lacquer spray, and 91 dBA inside the spray booth. Noise levels outside of the degreasing room were 80 dBA. Based on the evaluation, all of the noise levels measured in the degreasing room were in excess of the NIOSH recommended criteria of 85 dBA. The CAL-OSHA standard is 90 dBA.

Based on discussions with several individuals, it is clear that there is no formal respirator program. Employees were not instructed how to properly wear their respirators or how to maintain them. Additionally, the airline respirator system was not being used in accordance with the NIOSH certification. Two air pumps were connected in parallel and air was pumped to five different stations which resulted in an inadequate air supply to the respirators. Also, the half-mask airline respirators were in poor condition due to cracking face pieces and over extended straps. The full face respirator used during the etching operation was missing a dust cap over the exhaust valve, and the half-mask air purifying respirator had no exhalation valve.

It should be noted that during peak operation periods, workers from the clean room assist in the degreasing and/or etching operations. It was reported that during these periods the additional workers did not have respirators available for them.

Draining of the manual degreaser produces considerable spillage of TCE on the floor due to inadequate clearance between the valve and the floor.

B. Medical

All employees in the degreasing and silk screening room and the two production supervisors working partially in these areas participated in a medical evaluation on February 23. Questionnaires were administered, exposed skin areas were examined, and blood samples were drawn for analysis of liver function. All liver function tests were within normal limits.

Symptoms reported by the 12 workers included sleepiness (9), dizziness (8), headache (7), nausea (6), decreased appetite (6), memory disturbances (5), visual disturbances (4), eye irritation (4), and difficulty concentrating (2). Skin rashes were reported by 9 employees, and in each case an irritant dermatitis was observed, with varying degrees of folliculitis superimposed; 2 workers reported frequent nosebleeds. Of 10 workers reporting occasional beer or wine consumption, 5 reported exacerbation of the alcohol effect when consumed at the end of the workday. (Table VI) Only 2 of the employees worked exclusively in the clean room; 2 others worked both in the clean room and in the degreasing room. There was no difference in the reporting of symptoms between work areas except in the chemicals associated with the symptoms; in the clean room, acetone was mentioned as provoking headaches and skin irritation.

Additional symptoms reported by the workers were: increased urination (1), eyestrain from working with small designs (1), difficulty hearing at the end of the workday (1, degreasing area), and eye injuries with degreasing liquid splashes (1).

Two workers assigned to the hot stamp machine used to impress a design into leather had several severe skin burns on their hands and lower forearms.
No training on the health effects of the chemical exposures and noise had been provided to the employees, and Material Safety Data Sheets were not made available to the employees. No periodic medical examinations are performed on the employees.

VII. CONCLUSIONS

Environmental air samples collected in the degreasing room indicate that the only chemical exposure above existing PELs was to trichloroethylene; exposure to both trichloroethylene and perchlorethylene are of concern because these compounds are suspect carcinogens. No excessive chemical exposures were measured in the silk screening room. Noise monitoring which was done in the degreasing room showed the levels to be in excess of the NIOSH criterion especially for the employee working in the enclosed spray booth.

Findings on medical evaluation of the workers indicated that health hazards did exist in the degreasing and silk screening room resulting in neurologic and dermatologic symptoms consistent with exposure to TCE and the other chemicals employed in these areas.

VIII. RECOMMENDATIONS

1. The company should institute a formal respirator program in accordance with the Occupational Safety and Health Act (OSHA) requirements outlined in 29 CFR Part 1910.134. The respirators program should include the following: proper respirator selection, training and education of the user, fit testing, maintenance of equipment, proper and adequate storage, periodic inspection, surveillance of work area condition, periodic inspection of program to determine continued effectiveness and medical determination of user.

2. Employees should receive training regarding the potential hazards of the chemicals used in their work area, including the symptoms of exposure, and instructed to report any symptoms immediately to the supervisor. Symptomatic employees should be removed from further exposure until the exposures can be controlled.

3. The manual degreaser should be drained using a hose connected to a motor to eliminate unnecessary spillage on the floor.

4. Both of the degreasers should have lock outs on the units to prevent workers from increasing the hoist or rack speed.

5. A full medical surveillance program, including pre-placement testing and periodic testing for liver function, hearing loss, dermatologic and neurologic problems should be provided.

6. All employees in the degreasing, cleaning, lacquer and etching areas should be provided with appropriate gloves and aprons to prevent dermal absorption and dermatitis.
7. The hot stamp machine should not require that operators hold the leather pieces in place for stamping.

8. Employees exposed to noise levels of 85 dbA or greater should receive audiometric examinations at pre-employment and yearly thereafter.

9. Periodic air monitoring should be done in the degreasing room to evaluate the TCE air concentrations.

10. Side shields should be installed on the manual degreaser to increase the capture capacity of the local exhaust fan.

IX. REFERENCES

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X. AUTHORSHIP AND ACKNOWLEDGEMENTS

Report Prepared By:

Pierre L. Belanger
Industrial Hygienist
NIOSH-Region IX
San Francisco, California

Molly J. Coye, M.D., M.P.H.
Medical Investigator
NIOSH-Region IX
San Francisco, California.

Originating Office:

Technical Assistance Branch
Division of Surveillance,
Hazard Evaluations and
Field Studies

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Laboratory Analysis:

Measurement Service Section
Measurement Support Branch
NIOSH
Cincinnati, Ohio

XI. DISTRIBUTION AND AVAILABILITY OF REPORT

Copies of this Determination Report are currently available upon request from NIOSH, Division of Standards Developement and Technology Transfer, 4676 Columbia Parkway, Cincinnati, Ohio 45226. After 90 days, the report will be available through the National Technical Information Service (NTIS), 5285 Port Royal Road, Springfield, Virginia, 22151. Information regarding its availability through NTIS can be obtained from the NIOSH Publications Office at the Cincinnati address.

Copies of this report have been sent to:

1. International Molders and Allied Workers Union #164.
2. Basic Tool and Supply Company.
3. U.S. Department of Labor, Region IX.
4. California-Occupational Safety and Health Administration.

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

TABLE I
SUMMARY OF AIR SAMPLES COLLECTED IN DEGREASING ROOM FOR KETONES

BASIC TOOL AND SUPPLY
Oakland, CA
HETA 84-196

Date	Sample Number	Type Sample	Location	Exposure Period (hrs)	Volume (liters)	TIME-WEIGHTED Concentration (ppm)[1] MEK[2]	MIBK[3]
2/23	A-1,6	P[4]	Lacquer Spray Booth	7.2	43.5	24.6	1.5
2/23	A-2,7	P	Hot Lacquer Spray	7.2	43.1	10.9	4.0
2/23	A-3,8	P	Degreaser	7.1	42.9	0.1	N.D.[6]
2/23	A-4,9	P	Wiping Parts Down	7	42.2	0.2	0.1
2/23	A-5,10	P	Etching	7.9	41.6	0.06	N.D.
2/24	A-11	P	Lacquer Spray Booth	3.8	22.9	63.7	3.5
2/24	A-12	P	Hot Lacquer Spray	3.8	22.8	0.3	0.5
2/24	A-13	P	Degreaser	3.7	22.3	N.D.	N.D.
2/24	A-14	A[5]	Wiping Parts Down	1	30	N.D.	N.D.

1. ppm - Parts of a vapor or gas per million parts of contaminated air by volume.
2. MEK - Methyl ethyl ketone.
3. MIBK - Methyl isobutyl ketone.
4. P - Personal air sample.
5. A - Area air sample.
6. N.D. - None detected.

EVALUATION CRITERIA
1. MEK - 200 ppm.
2. MIBK- 50 ppm.

TABLE II
SUMMARY OF AIR SAMPLES COLLECTED
IN DEGREASING ROOM

BASIC TOOL AND SUPPLY
Oakland, CA
HETA 84-196

Date	Sample Number	Type Sample	Location	Exposure Period (hrs)	Volume (liters)	TIME-WEIGHTED AVERAGE Concentration (ppm)[1] Isopropyl Alcohol	Acetone	Heptane	Toluene	Ethyl-Benzene
2/23	1,11	P[2]	Spray Booth	7.2	43.5	37.4	13.4	7.9	26.4	0.5
2/23	2,12	P	Spray Booth	7.2	43.5	32.7	17.3	6.3	21.9	0.4
2/23	3,13	P	Hot Lacquer Spray	7.2	43.1	3.2	6.7	0.3	22.1	1.2
2/23	4,14	P	Hot Lacquer Spray	7.2	43.1	20.7	5.3	0.2	14.1	0.8
2/23	5,15	P	Degreaser	7.2	42.4	0.3	1.8	N.D.[3]	0.5	0.1
2/23	6,16	P	Degreaser	7.2	42.4	0.3	8.6	N.D.	0.5	0.1
2/23	7,17	P	Wiping TCE from Parts	7.0	42.2	0.4	1.3	N.D.	0.5	0.1
2/23	8,18	P	Wiping TCE from Parts	7.0	42.2	0.4	1.3	N.D.	0.5	0.1
2/23	9,19	P	Etching	6.9	41.6	N.D.	18.6	N.D.	2.1	0.5
2/23	10,20	P	Etching	6.9	41.6	N.D.	18.0	N.D.	2.1	0.4
2/23	21	P	Draining of Degreasing and refilling.	1.5	4.7	N.D.	0.2	N.D.	N.D.	N.D.

1. ppm - Parts of a vapor or gas per million parts of contaminated air by volume.
2. P - Personal air samples.
3. N.D. - None detected.
4. A - Area air sample.

TABLE II (continued-p.2)
SUMMARY OF AIR SAMPLES COLLECTED
IN DEGREASING ROOM

BASIC TOOL AND SUPPLY
Oakland, CA
HETA 84-196

Date	Sample Number	Type Sample	Location	Exposure Period (hrs)	Volume (liters)	TIME-WEIGHTED AVERAGE Solvent Concentration (ppm) Isopropyl Alcohol	Acetone	Heptane	Toluene	Ethyl-Benzene
2/23	1c (ceiling)		Degreaser	.25	3.1	--	--	--	--	--
2/23	3c " "	P	Spray Booth	.16	0.7	--	--	--	455	--
2/24	31	P	Spray Booth	3.8	22.9	51.6	34.9	9.8	34.7	0.9
2/24	32	P	Spray Booth	3.8	22.9	30.2	16.5	4.3	19.7	0.8
2/24	33	P	Hot Lacquer Spray	3.8	22.8	0.5	4.1	N.D.	2.6	0.5
2/24	34	P	Hot Lacquer Spray	3.8	22.8	1.6	37	0.2	3	0.5
2/24	35	P	Degreaser	3.7	22.3	N.D.	2.6	N.D.	0.3	0.4
2/24	36	P	Degreaser	3.7	22.3	0.2	75.5	N.D.	0.3	0.4
2/24	37	P	Wiping TCE from parts	3.7	11.2	N.D.	3	N.D.	0.2	0.8
2/24	38	P	Etching	3.8	12.8	N.D.	10.5	N.D.	1.2	9.3
2/24	39	A[4]	Packaging Desk	4.3	12.3	N.D.	N.D.	N.D.	N.D.	N.D.
2/24	40	A	On table where degreased parts are wiped down	1	30	0.3	5	N.D.	0.6	2.5

TABLE II (continued-p.3)
SUMMARY OF AIR SAMPLES COLLECTED
IN DEGREASING ROOM

BASIC TOOL AND SUPPLY
Oakland, CA
HETA 84-196

Date	Sample Number	Type Sample	Location	Exposure Period (hrs)	Volume (liters)	TIME-WEIGHTED AVERAGE Solvent Concentration (ppm) Xylenes	Isobutyl Acetate	Methyl Chloroform	Trichloro-Ethylene	Perchloro-Ethylene
2/23	1,11	P	Spray Booth	7.2	43.5	1.9	14.3	0.4	29.3	N.D.
2/23	2,12	P	Spray Booth	7.2	43.5	1.2	10.6	0.6	25.3	N.D.
2/23	3,13	P	Hot Lacquer Spray	7.2	43.1	4.1	4.4	2.3	147	0.7
2/23	4,14	P	Hot Lacquer Spray	7.2	43.1	2.8	3.2	1.6	121	0.7
2/23	5,15	P	Degreaser	7.2	42.4	.4	0.4	1.5	225	0.2
2/23	6,16	P	Degreaser	7.2	42.4	.4	0.4	0.5	274	0.4
2/23	7,17	P	Wiping TCE from Parts	7.0	42.2	.5	0.4	0.8	61.8	N.D.
2/23	8,18	P	Wiping TCE from Parts	7.0	42.2	.5	0.4	0.1	62.7	N.D.
2/23	9,19	P	Etching	6.9	41.6	2.2	1	N.D.	38.1	N.D.
2/23	10,20	P	Etching	6.9	41.6	2.3	0.1	N.D.	37.2	N.D.
2/23	21	P	Draining of Degreaser and Refilling	1.5	4.7	N.D.	N.D.	0.8	397	N.D.

TABLE II (continued-p.4)
SUMMARY OF AIR SAMPLES COLLECTED
IN DEGREASING ROOM

BASIC TOOL AND SUPPLY
Oakland, CA
HETA 84-196

Date	Sample Number	Type Sample	Location	Exposure Period (hrs)	Volume (liters)	TIME-WEIGHTED AVERAGE Solvent Concentration (ppm) Xylenes	Isobutyl Acetate	Methyl Chloroform	Trichloro-Ethylene	Perchloro-Ethylene
2/23	1C(Ceiling)	P	Degreaser	0.2	3.1	N.D.	N.D.	N.D.	222	0.5
2/23	3C(Ceiling)	P	Spray Booth	0.2	0.7	49.4	--	--	--	--
2/23	31	P	Spray Booth	3.8	22.9	3.4	15.6	1	7.3	N.D.
2/24	32	P	Spray Booth	3.8	22.9	2.9	7.3	1	7.6	N.D.
2/24	33	P	Hot Lacquer Spray	3.8	22.8	1.9	2.3	1	426	2.3
2/24	34	P	Hot Lacquer Spray	3.8	22.8	2.3	2.5	0.8	43	1
2/24	35	P	Degreaser	3.7	22.3	1.5	0.3	0.2	352	N.D.
2/24	36	P	Degreaser	3.7	22.3	1.7	0.4	0.2	92	N.D.
2/24	37	P	Wiping TCE from Parts	3.7	11.2	3.3	0.2	N.D.	41.7	0.1
2/24	38	P	Etching	3.8	12.8	37.0	N.D.	0.5	11.3	N.D.
2/24	39	A	Packaging Desk	4.3	12.3	N.D.	N.D.	0.3	0.1	N.D.
2/24	40	A	On Table where degreased parts are wiped down	1.0	30	9.9	0.3	0.1	68.4	N.D.

T A B L E III
SUMMARY OF PERSONAL AIR SAMPLES COLLECTED
IN SILK SCREENING ROOM FOR SOLVENTS

BASIC TOOL AND SUPPLY
Oakland, CA
HETA 84-196

Date	Sample Number	Location	Exposure Period (hrs)	Volume (liters)	Solvent Concentration (ppm)[1] Acetone	Ethyl-Benzene	Xylene	Methyl-Chloroform	Trichloro-ethylene	Perchloro-ethylene
2/23	2	Pad Printing	61	20.1	1.46	N.D.	N.D.	N.D.	2.2	N.D.
2/23	23	Silk Screening	5	14.5	12.7	N.D.	N.D.	N.D.	1	N.D.
2/23	24*	Silk Screening	6.5	18.5	34.1	0.2	1.1	N.D.	15.1	N.D.
2/24	41	Pad Printing	3.9	11.4	N.D.	N.D.	N.D.	N.D.	0.3	0.1
2/24	42	Silk Screening	3.9	6.8	68.1	N.D.	N.D.	N.D.	3.3	0.2

1. ppm - Parts of a vapor or gas per million parts of air by volume.

* B-section of tube not analyzed.

EVALUATION CRITERIA

1. Acetone - 750 ppm.
2. Ethylbenzene - 100 ppm.
3. Xylene - 100 ppm.
4. Methyl Chloroform - 350 ppm.
5. Trichlorethylene - Lowest feasible limit.
6. Perchloroethylene - Lowest feasible limit .

T A B L E IV

SUMMARY OF PERSONAL AIR SAMPLES
COLLECTED IN DEGREASING ROOM
FOR TRICHLOROETHYLENE
BASIC TOOL AND SUPPLY

Oakland, CA
HETA 84-196
March 21, 1984

Sample Number	Description	Exposure Period (hrs)	Volume liters	Concentration (ppm[1])	Time Weighted Average Conc. (ppm)
C[2]	Degreaser	0.25	3	35	
2C	Parts wipe down.	0.25	3	33	
3	Degreaser	3.8	31.5	31	
5	Degreaser	1.9	16.1	9.6	24.5
10	Degreaser	2	15.4	25	
4	Parts wipe down.	3.8	39.7	17.8	
6	Parts wipe down.	2	20.1	46.2	26.9
9	Parts wipe down.	2	21	25	

1)ppm - Parts of a vapor or gas per million parts of contaminated air by volume.
2) C - Ceiling sample collected during 15 minute period.

EVALUATION CRITERIA (Time Weighted Average)
1) 5 ppm (NIOSH)

TABLE V

SOUND LEVEL MEASUREMENTS IN DEGREASING ROOM

BASIC TOOL AND SUPPLY
Oakland, CA
HETA 84-196
March 23, 1984

LOCATION	dBA[1]
In front of manual degreaser.	86
In front of hot lacquer spray booth.	87
Inside cold lacquer spray booth.	91
Outside double door (packing area).	80

1) Sound level measurements were determined on dBA scale slow response.

T A B L E VI

BASIC TOOL AND SUPPLY
Oakland, CA
HETA 84-196
February 16, 1984

SYMPTOMS REPORTED WORKERS AT BASIC TOOLS, INC.

Symptoms Reported	Frequency
Dizziness	8
Headache	7
Sleepiness/fatigue	9
Memory disturbances	5
Difficulty concentrating	2
Nausea	6
Vomiting	1
Decreased appetite	6
Weight loss	3
Visual disturbances	4
Eye irritation	4
Skin rash:	9
face/neck	2
hand/arms	7
legs/feet	2
chest/back	2
Nosebleeds	2
Alcohol consumption:	
at end of work day	10
enhanced effect	5

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