U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES • Public Health Service
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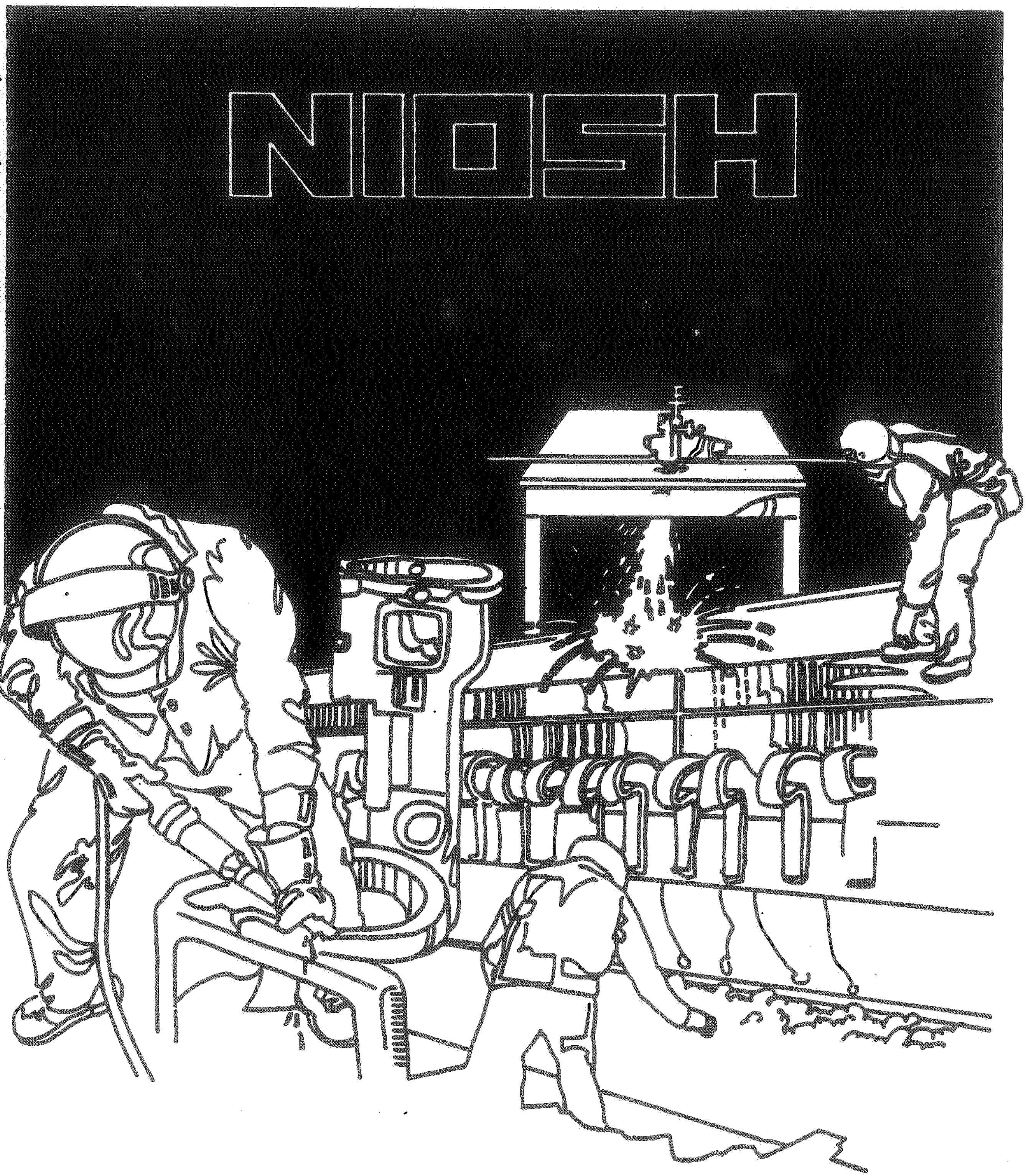

Health Hazard Evaluation Report

HETA 82-059-1752
ART ACADEMY OF CINCINNATI
CINCINNATI, OHIO

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.

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ART ACADEMY OF CINCINNATI
CINCINNATI, OHIO

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I. SUMMARY

In November 1981 the National Institute for Occupational Safety and Health (NIOSH) received a request from the Art Academy of Cincinnati to perform a health hazard evaluation of their classes. From December 1981 to March 1983, an extensive industrial hygiene evaluation was conducted in several classrooms: silk-screen (oil-base paints - 1982, water-base paints - 1983), lithography, etching, sculpture, studio painting, woodworking and photography.

In general, the air concentrations of contaminants for each class were below their respective exposure limits. Exceptions to this were the high levels of total particulate measured in the sculpture and woodworking classrooms and the perchloroethylene levels measured in lithography. Excessive noise exposures were also documented in the sculpture class.

However, exposure to hazardous art materials can occur not only by inhalation but by dermal absorption and by ingestion. Therefore, this report notes several areas where engineering controls such as ventilation, personal protective equipment such as respirators, and substitution of a less toxic material such as water-base for oil-base paints, would dramatically reduce potential exposure.

Based on the results of this study, students and faculty were generally not found to be exposed to high airborne levels of gases and vapors. However, some excessive exposures to airborne particles were found in the sculpture and woodworking classes and exposure to perchloroethylene was documented in lithography. Recommendations for improving work practices, personal protective equipment and engineering controls are made in Section VII of this report.

KEYWORDS: SIC 8221 (Colleges, universities, and professional schools) art hazards

II. INTRODUCTION

In November 1981, NIOSH received a request from the Art Academy of Cincinnati to conduct a health hazard evaluation of their classes. In December 1981, several classes were identified for follow-up environmental sampling, including the silk-screen, lithography, etching, sculpture, studio painting, woodworking, and photography classes. During the follow-up studies in March 1982 and 1983, these classes were evaluated for airborne levels of contaminants, and the sculpture and silk-screen classes were evaluated for noise levels.

III. BACKGROUND

The Art Academy of Cincinnati is a private, undergraduate college offering the Bachelor of Fine Arts degree with specialties in several areas of art. The college has a student enrollment of 250 and a full-time staff of 45, including 30 faculty members.

The classes selected for environmental evaluation were silk-screen, lithography, etching, sculpture, studio painting, woodworking, and photography. The silk-screen process involves the application of oil or water-based pigments through screens onto canvas or cloth. While applying oil-based pigments, there is considerable potential for exposure to organic compounds by inhalation and skin absorption. During the 1981-82 school-year, oil-based pigments were used in the silk-screen classes. Water-based pigments were substituted during the 1982-83 academic year.

The lithography process involves drawing with an oil crayon or oil solution onto a limestone or other absorbent surface. Airborne levels of kerosene and toluene vapors evolved from the ink and solvents used for clean-up. The etching process involves making lines and images, either manually or with acids, onto zinc or copper plates, covering these plates with ink, and then transferring the image from the plate on to paper. Airborne levels of kerosene, toluene, and nitric acid were generated in the etching class.

The sculpturing process involved the shaping of limestone or marble stone either manually or with pneumatic chipping devices. Considerable noise, as well as airborne particulate, were generated in the sculpture class.

For this study, all pigments used in the studio painting class were oil-based and the brushes from this class were cleaned in open containers of turpentine. Airborne levels of turpentine, perchloroethylene, and other aliphatic hydrocarbons vapors evolved from these open containers and from the students' supply of pigments located at their easels.

The woodworking process involved the cutting, sanding, and shaping of wood, either manually or with powered tools. The woodworking process produced airborne levels of wood particulates.

Finally, in the photography class airborne levels of acetic acid, other organic compounds, and sodium thiosulfate were generated in the black and white print developing process.

IV. EVALUATION DESIGN AND METHODS

Environmental sampling was conducted at the Art Academy of Cincinnati during March 1982 except for 10 air samples collected during March 1983 as part of a follow-up study in the silk-screen classroom where water-based pigments were used. In the silk-screen classroom, a total of 24 (14 in 1982, 10 in 1983) personal and area air samples for turpentine, perchloroethylene, and other organic (aliphatic) hydrocarbons were collected for approximately 2 1/2 hours on charcoal tubes at a flowrate of 200 cubic centimeters per minute (cc/min). These samples were analyzed according to NIOSH Method P&CAM No. 127. In the lithography, a total of 4 personal air samples for perchloroethylene and other organics were collected for approximately 2 1/2 hours on charcoal tubes at a flowrate of 200 cc/min. These samples were analyzed according to NIOSH Method P&CAM No. 127.

In the etching class, a total of 7 (3 area, 4 personal) air samples for nitric acid were collected for approximately 3 hours on silica gel tubes at a flowrate of 200 cc/min. These samples were analyzed according to NIOSH Method P&CAM No. 339. Also, in the etching class, a total of 3 (1 area, 2 personal) air samples for kerosene and toluene were collected for approximately 2 1/2 hours on charcoal tubes at a flowrate of 200 cc/min. These samples were analyzed according to NIOSH Method P&CAM No. 127.

In the sculpture class, a total of 18 (4 area, 14 personal) air samples for total particulate and silica were collected on pre-weighed polyvinyl chloride (PVC) particulate filters for approximately 2 hours at a flowrate of 1.5 liters per minute (lpm). In the studio painting class, a total of 15 (4 area, 11 personal) air samples for turpentine, perchloroethylene, and other aliphatic hydrocarbons were collected for approximately 2 1/2 hours on charcoal tubes at a flowrate of 200 cc/min. These samples were analyzed according to NIOSH Method P&CAM No. 127.

In the woodworking class, a total of 5 (1 area, 4 personal) air samples for total particulate were collected on pre-weighed PVC particulate filters for approximately 2 1/2 hours at a flowrate of 1.5 lpm. In the photography class, a total of 14 (7 area, 7 personal) air samples for acetic acid were collected on charcoal tubes for approximately 2 hours at a flowrate of 200 cc/min. These samples were analyzed according to NIOSH Method P&CAM No. 127. Also, in the photography class 4 personal air samples for total particulate and sodium thiosulfate were collected for approximately 10 minutes during a mixing operation on pre-weighed PVC particulate filters. These samples were analyzed according to a specially developed NIOSH analytical method for sodium thiosulfate.

Ten area sound level measurements were collected for approximately 5 minutes in the sculpture class using the Metrosonics® sound level dosimeter.

V. EVALUATION CRITERIA

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 lifetime 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 (TLVs), and 3) the U.S. Department of Labor (OSHA) occupational health standards. Often, the NIOSH recommendations and ACGIH TLVs are lower than the corresponding OSHA standards. Both NIOSH recommendations and ACGIH TLVs usually are based on more recent information than are the OSHA standards. The OSHA standards also may be required to take into account the feasibility of controlling exposures in various industries where the agents are used; the NIOSH-recommended exposure limits, by contrast, are based primarily 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 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- to 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 exposures.

For this study, the pertinent environmental criteria are listed below.

Substance	Evaluation Criteria Source	OSHA Standard
Perchloroethylene	Lowest Feasible Level (NIOSH)	678 mg/M^3
Toluene	375 mg/m^3 (NIOSH)	750 mg/m^3
Nitric Acid	5 mg/m^3 (NIOSH)	5 mg/m^3
Total Nuisance Dust	10 mg/m^3 (ACGIH)	15 mg/m^3
Crystalline Silica	30 mg/m^3 / % Silica +2 (OSHA)	30 mg/m^3 / % Silica +2
Sodium Thiosulfate	-	-
Noise	85 dBA TWA; 115 dBA ceiling (NIOSH)	90 dBA (8-hr TWA)

KEY: milligrams per cubic meter (mg/m^3)
decibels-A weighting (DBA)

VI. RESULTS AND DISCUSSION

A. Silk-Screen Classroom

The silk-screen classroom environmental results have been separated from the other classroom results because of the uniqueness of the before and after substitution study in this area and the great potential for reducing solvent exposure by substituting water-based for solvent-based pigments.

The "before" classroom environment involved the use of oil or solvent-based pigments while the "after" environment involved water-based pigments. A total of 14 air samples, including 9 personal and 5 area, were collected in the "before" environment and analyzed for "total organic vapors". A total of 10 air samples, including 6 personal and 4 area were collected in the "after" environment and analyzed for "total organic vapors". For both the "before" and "after" portion of this study, "total organic vapors" consisted of all airborne organic compounds (total hydrocarbons) collected on charcoal tubes and analyzed according to NIOSH Method P&CAM No. 127.

For the 9 "before" personal air samples, the mean concentration of "total organic vapors" was 31.7 milligrams per cubic meter (mg/m^3) (standard deviation - 8.2 mg/m^3). For the 6 "after" personal air samples, the mean concentration of "total organic vapors" was 3.4 mg/m^3 (standard deviation - 1.3 mg/m^3). The mean "before" concentration for the personal samples was 9.3 times greater than the mean "after" concentration. For both the "before" and "after" portion of this study, "total organic vapors" consisted of all airborne organic compounds (total hydrocarbons) collected on charcoal tube samples and analyzed by gas chromatography using NIOSH Method P&CAM No. 127.

For all 14 "before" air samples (including 5 area air samples), the mean concentration of total organic vapors was 26.1 mg/m^3 (standard deviation - 10.4 mg/m^3). For all 10 "after" air samples (including 4 area air samples), the mean concentration of total organic vapors was 3.7 mg/m^3 (standard deviation - 1.3 mg/m^3). The mean "before" concentration for all samples was 7.1 times greater than the mean "after" concentration.

That any organic vapors were found in the "after" environment was probably due to the use of solvent-based pigments in other classes which shared the same room at different times. Also, organic vapors were undoubtedly emanating from the storage cabinet, located in the corner of the silk-screen classrooms, which contained organic solvents and solvent-based pigments. This latter hypothesis is substantiated by the air concentration results of the 4 area air samples taken from the "after" classroom environment. The area sample closest to the storage cabinet had the highest organic vapor concentration (5.41 mg/m^3). The 2 area samples located an intermediate distance from the storage cabinet had the next highest concentration (5.36, 2.86 mg/m^3), while the area sample furthest from the storage cabinet had the lowest organic vapor concentration (2.80 mg/m^3). Although these 4 area concentrations are not different statistically, there is an apparent trend from high to low concentration away from the storage cabinet.

A two-sample t-test adjusted for unequal population variances was used to compare statistically the "before" and "after" environments. This statistical analysis substantiated the obvious, that the "before" organic vapor concentration for the personal samples was significantly ($t=10.2$, $df=9$, $p<.001$) greater than the "after" concentration. For all samples (both personal and area), the "before" concentration was also significantly ($t=8.0$, $df=14$, $p<.001$) greater than the "after" concentration.

B. All Other Art Classrooms

1. Lithography

The 4 personal air concentrations (Table III) for perchloroethylene ranged from 2.0 to 2.4 milligrams per cubic meter (mg/m^3). NIOSH recommends that it is prudent to handle perchloroethylene as if it were a human carcinogen and that exposure be minimized. The total organic vapor (TOV) concentrations ranged from 7.1 to 20.2 mg/m^3. Although no environmental criteria exist for TOVs, the TOV concentrations excluding perchloroethylene, are well below the individual environmental criteria of the constituent chemicals.

2. Etching

For the nitric acid samples (Table IV), the 3 area sample concentrations ranged from 164 to 192 micrograms per cubic meter (ug/m^3) and the 4 personal samples ranged from 205 to 396 ug/m^3 (EC-5000 ug/m^3). For the 2 personal organic vapor samples, the kerosene concentrations were 6.7 and 23.3 mg/m^3 (EC-none available) and the toluene concentrations were 0.3 and 6.7 mg/m^3 (EC-375 mg/m^3).

3. Sculpture

For the particulate samples (Table V), the 4 area sample concentrations ranged from 0.3 mg/m^3 to 1.6 mg/m^3 and the 13 personal concentrations ranged from 0.5 to 13.0 mg/m^3 (EC-10 mg/m^3). All but 2 of the area samples were analyzed for total quartz and cristobalite. The cristobalite analyses were all non-detectable. Two area samples (0.07, 0.10 mg/m^3) and one personal sample (1.9 mg/m^3) showed detectable levels for quartz (EC-0.6 mg/m^3).

This latter personal sample was taken on a student working with sandstone. The other personal samples which showed non-detectable levels of quartz were taken on students working with limestone or marble. Although 6 of the 13 individuals who were sampled wore respirators, the student who worked with the quartz containing sandstone did not wear a respirator. Only 2 of the 13 individuals wore goggles.

The 10 area time-weighted average noise samples ranged from 84-102 dBA (EC-115 dBA ceiling).

4. Studio Painting

For 2 classes, 12 personal and 3 area charcoal-tube samples (Table VI) were collected for organic vapor including perchloroethylene, turpentine (carene) and total aliphatic hydrocarbons.

For all samples, perchloroethylene results were not significantly different from blank values. For turpentine, the personal samples ranged from 2.5 to 18.6 mg/m^3 and the 3 area samples ranged from 5.0 to 9.8 mg/m^3 (EC-560 mg/m^3). For total aliphatic hydrocarbons, the personal samples ranged from 6.1 to 26.9 mg/m^3 (EC-none available).

5. Woodworking

For 1 class, 4 personal and 1 area samples (Table VII) were collected for total particulate during a class where plywood, oak and pine were being cut and worked. The area sample concentration was 9.4 mg/m^3 and the personal samples ranged from 1.9 to 53.6 mg/m^3 (EC-10 mg/m^3).

6. Photography

During 2 classes, a total of 7 personal and 6 area charcoal tube samples were collected for perchloroethylene (no acetic acid and only small amounts of other hydrocarbons including toluene, xylene, isopropanol, etc. were detected). The perchloroethylene concentrations ranged from 1.3 to 2.6 mg/m^3 for the personal samples and from 0.5 to 1.8 mg/m^3 for the area samples (EC-Lowest Feasible Level).

During one class, a total of 2 personal samples for particulate sodium thiosulfate were collected during the fixer mixing operation. For this ten minute mixing operation, one sample was non-detectable and the other concentration was 170 ug/m^3.

VII. RECOMMENDATIONS

This study has identified several areas where significant improvements can be made to reduce health and safety hazards. First, where technically and aesthetically feasible, water-based paints and inks should be substituted for solvent-based systems. This simple substitution would dramatically reduce both respiratory and dermal exposure to harmful organic solvents. In classes where this substitution is not possible, every effort should be made to isolate and ventilate significant sources of solvent exposure, such as open containers of solvent, etc. Also, gloves, which are chemically resistant* to solvent(s) in use, should be worn during cleaning operations and under no circumstances should solvents be used to clean skin areas.

In classes where exposure to airborne particulates is high (such as woodworking and sculpturing), NIOSH certified half-mask respirators should be worn with dust and mist particulate filters.

Persons working with sandstone or other crystalline silica containing materials should be particularly concerned about wearing respiratory protection because permanent lung damage (silicosis) may result from airborne exposure to this material. Also, where feasible, local exhaust ventilation should be used to control dust exposure, such as near grinders and electric saws.

During certain operations (grinding and cutting) students and instructors are exposed to high levels of noise. Ear inserts or ear muffs should be worn to minimize hazardous exposure to noise.

Finally, dissemination of safety and health information is probably the most important recommendation for preventing hazardous exposure in the art industry. It is particularly important that safety and health information be made an integral part of curriculum either as a separate, for-credit course or as a subpart of the beginning course in each curriculum area. Fundamental information should be presented such as major health and safety hazards, health and safety effects resulting from exposure to hazards, and the primary intervention techniques for preventing exposure. Several course references are available for teaching this material.[5,6,7]

*Major glove manufacturers such as Edmont list appropriate glove materials for given organic solvents.

VIII. REFERENCES

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5. "Art Hazard News" published by the Center for Occupational Hazards, New York, New York.

6. "Safe Practices in the Arts & Crafts - A Studio Guide", Gail Coningsby Barazani, published by The College Art Association of America.

7. Series of Paperback Books on Art Hazards by the Art Institute of Chicago.

IX. AUTHORSHIP AND ACKNOWLEDGEMENTS

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X. DISTRIBUTION AND AVAILABILITY OF REPORT

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1. Art Academy of Cincinnati, Cincinnati, Ohio
2. OSHA, Region V

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

Table I

Silk Screen Classroom
Oil-Base Paints ("Before")
Cincinnati Art Academy
Cincinnati, Ohio

HETA 86-059
February 23, March 2 and 16, 1982

Area

Location	Date	Sample Volume (liters)	Total Organic Vapor Concentration (mg/m^3)
#1	2/23/82	29.7	14.1
#2	"	30.2	14.9
#3	"	29.3	19.1
#4	"	29.4	22.4

Personal

Title	Date	Sample Volume (liters)	Total Organic Vapor Concentration (mg/m^3)
Student #1	3/2/82	27.4	31.4
Student #2	"	27.7	35.0
Student #3	"	26.2	28.6
Instructor	"	30.4	35.5
Student #1	3/16/82	26.2	21.4
Student #4	"	20.9	46.9
Student #5	"	24.5	37.6
Instructor	"	25.8	20.9
Student #6	"	20.2	27.7

Table II

Silk Screen Classroom
Water-Base Paints ("After")
Cincinnati Art Academy
Cincinnati, Ohio

HETA 86-059
March 22, 1983

Area

Location	Sample Volume (liters)	Total Organic Vapor Concentration (mg/m^3)
#1	34.8	2.9
#2	37.0	5.4
#3	37.3	5.4
#4	35.7	2.8

Personal

Title	Sample Volume (liters)	Total Organic Vapor Concentration (mg/m^3)
Student #1	34.1	2.9
Student #2	35.5	2.8
Student #3	33.1	3.0
Student #4	37.4	2.7
Student #5	33.6	3.0
Instructor	33.1	6.0

Table III

Lithography Classroom
Cincinnati Art Academy
Cincinnati, Ohio

HETA 86-059
March 2, 1983

Area Title	Sample Volume (liters)	Concentration (mg/m^3) Perchloroethylene	Total Organic Vapor
Student #1	30.6	2.3	6.9
Student #2	29.7	2.0	4.0
Instructor	29.4	2.4	7.1
Student #3	30.2	2.3	20.2

Table IV

Etching Classroom
Cincinnati Art Academy
Cincinnati, Ohio

HETA 86-059
March 2, 1983

Area Location	Sample Volume (liters)	Concentration Nitric Acid (ug/m^3)	Kerosene (mg/m^3)	Toluene (mg/m^3)
#1	34.8	172.4	-	-
#2	36.4	192.3	-	-
#3	30.5	163.9	-	-
Title				
Student #1	33.4	209.6	-	-
Student #2	30.0	395.7	-	-
Student #3	28.1	213.5	-	-
Student #4	19.5	205.1	-	-
Student #2	30.0	-	23.3	6.7
Instructor	29.7	-	6.7	0.3

Table V

Sculpture Classroom
Cincinnati Art Academy
Cincinnati, Ohio

HETA 86-059
March 2, 18, and 25, 1982

Area

Location	Date	Sample Volume (liters)	Concentration (mg/m^3)		
			Quartz	Cristobalite	Total Weight
#1	3/2/82	708	*	ND	1.61
#2	3/2/82	775	0.07	ND	0.98
#1	3/18/82	552	*	*	0.31
#2	3/18/82	676	0.10	ND	1.52

Personal

Title	Material	Date	Protection Equipment	Sample Volume (liters)	Concentration (mg/m^3)		
					Quartz	Cristobalite	Total Weight
Student #1 (filing)	1	3/2/82	-	180	ND	ND	3.39
Student #2 (chipping)	1	3/2/82	-	177	ND	ND	7.18
Student #3 (chipping)	1	3/2/82	R	171	ND	ND	3.68
Student #4 (chipping)	1	3/2/82	-	164	ND	ND	2.01
Student #5 (filing)	2	3/2/82	-	158	ND	ND	9.30
Student #6 (chipping)	1	3/2/82	R,G	162	ND	ND	4.14

(Continued)

Table V

(Continued)

Personal

Title	Material	Date	Protection Equipment	Sample Volume (liters)	Concentration (mg/m3) Quartz	Cristobalite	Total Weight
Student #7 (chipping)	1	3/2/82	R,G	158	ND	ND	2.47
Instructor	-	3/18/82	-	200	ND	ND	0.50
Student #8 (chipping)	1	3/18/82	R	189	ND	ND	1.53
Student #9 (chipping)	1	3/18/82	R	176	ND	ND	9.32
Student #10 (chipping)	1	3/18/82	R	177	ND	ND	13.00
Student #11 (chipping)	1	3/18/82	-	176	ND	ND	5.51
Student #12 (chipping)	3	3/18/82	-	162	1.85	ND	4.01

* = Analytical Interference, Sample Lost

1 = Limestone
2 = Marble
3 = Sandstone

R = Respirator
G = Goggles

Table VI

Studio Painting Classroom
Cincinnati Art Academy
Cincinnati, Ohio

HETA 86-059
March 3 and 17, 1982

Area

Location	Date	Sample Volume (liters)	Concentration (mg/m3)		
			Perchloroethylene	Turpentine	Aliphatic Hydrocarbons
#1	3/3/82	62.2	ND	8.6	6.5
#2	3/3/82	61.7	ND	5.0	10.7
#1	3/17/82	42.0	ND	9.8	17.4

Personal

Title	Date	Sample Volume (liters)	Concentration (mg/m3)		
			Perchloroethylene	Turpentine	Aliphatic Hydrocarbons
Student #1	3/3/82	26.7	ND	6.0	15.0
Instructor	3/3/82	60.5	ND	2.5	6.1
Student #2	3/3/82	26.8	ND	14.5	26.5
Student #3	3/3/82	26.9	ND	1.9	6.3
Student #4	3/17/82	28.3	ND	11.0	25.8
Student #5	3/17/82	24.1	ND	11.2	16.2
Student #6	3/17/82	24.3	ND	11.1	20.2
Student #1	3/17/82	30.2	ND	9.9	16.9
Student #7	3/17/82	30.2	ND	8.6	15.9
Student #8	3/17/82	26.4	ND	18.6	26.9
Student #9	3/17/82	26.3	ND	16.3	24.7
Instructor	3/17/82	32.2	ND	13.4	23.3

Table VII

Wood Working Classroom
Cincinnati Art Academy
Cincinnati, Ohio

HETA 86-059
March 3, 1982

Location	Sample Volume (liters)	Total Particulate Concentration (mg/m^3)
Area		
#1	249	9.4
Personal		
Technician	254	4.1
Student #1	198	53.6
Instructor	278	1.9
Student #2	99	2.3

Table VIII

Photography Classroom
Cincinnati Art Academy
Cincinnati, Ohio

HETA 86-059
March 1 and 24, 1982

Location	Date	Sample Volume (liters)	Concentration* Perchloroethylene (mg/M^3)	Sodium Thiosulfide (ug/M^3)
Area				
#1	3/24/82	60.3	0.7	-
#2	3/24/82	62.4	0.5	-
#3	3/24/82	59.1	1.8	-
#4	3/24/82	58.8	0.7	-
#5	3/24/82	58.5	0.7	-
#6	3/24/82	41.7	0.7	-
Personal				
Student #1	3/1/82	50.0	-	170
Student #1	3/1/82	30.0	-	N.D.
Student #2	3/1/82	26.1	1.5	-
Student #3	3/1/82	15.2	2.6	-
Student #4	3/1/82	27.3	1.5	-
Instructor	3/1/82	30.8	1.3	-
Student #1	3/1/82	31.4	1.6	-
Student #5	3/24/82	16.9	1.8	-
Student #6	3/24/82	17.0	1.8	-

*Acetic acid and other hydrocarbons not detected.