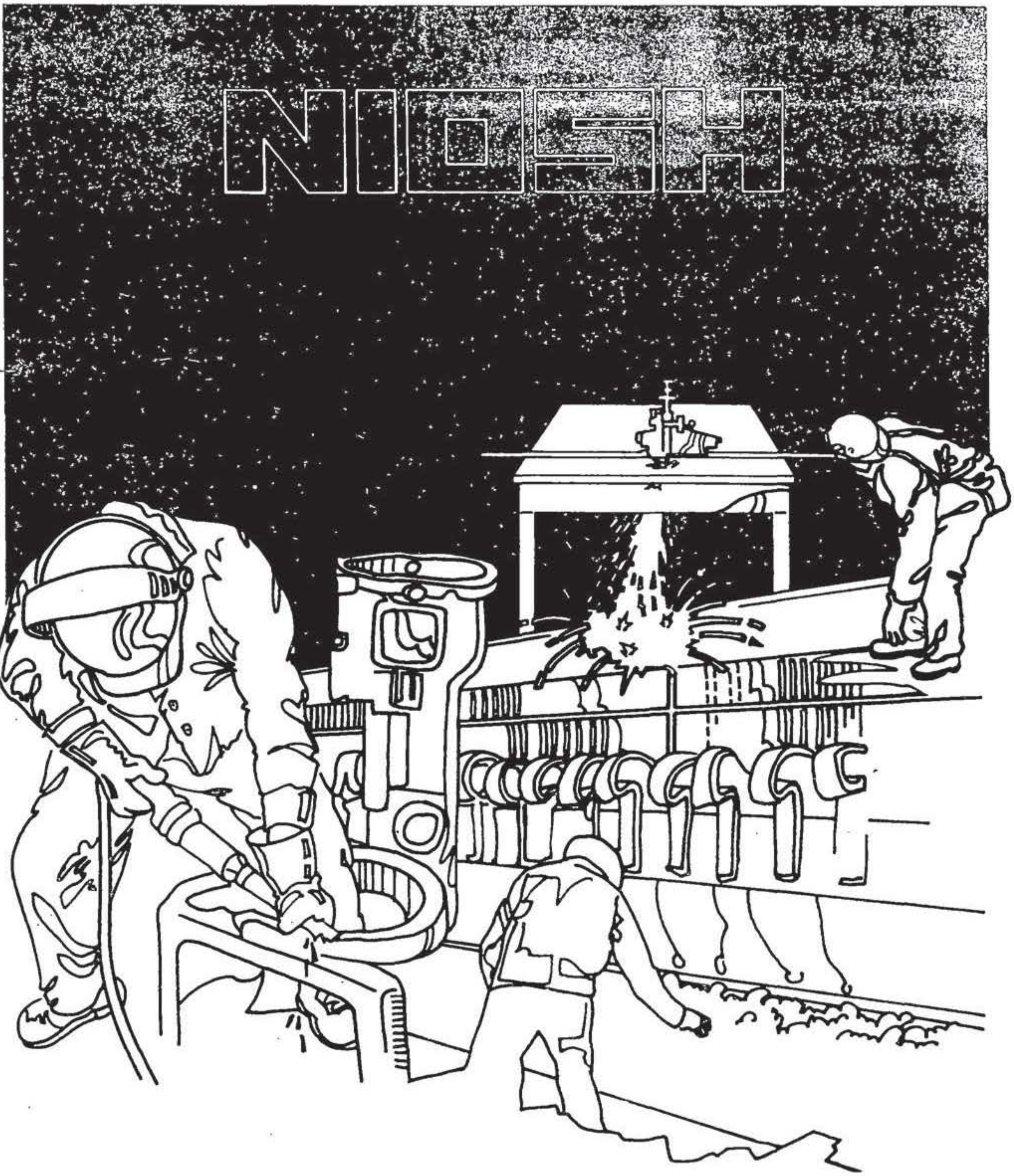
U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES ■ Public Health Service
Centers for Disease Control ■ National Institute for Occupational Safety and Health



Health Hazard Evaluation Report

HETA 82-090-1274
EAST LEYDEN HIGH SCHOOL
FRANKLIN PARK, ILLINOIS

HETA 82-090-1274
MARCH 1983
EAST LEYDEN HIGH SCHOOL
FRANKLIN PARK, ILLINOIS

NIOSH INVESTIGATOR:
William Daniels, IH

I. SUMMARY

On December 28, 1981, the National Institute for Occupational Safety and Health (NIOSH) received a request from the East Leyden High School, Franklin Park, Illinois to evaluate possible health hazards resulting from exposures during ceramics, metal casting, and other activities conducted in the school's art department.

In February 1982, NIOSH investigators conducted an initial survey of the facility, and in May 1982, two environmental surveys were conducted. Personal and area air samples, and bulk material samples were collected during clay mixing, kiln operation, and metal casting activities.

The 8-hour time weighted average (TWA) concentration of respirable crystalline silica (as quartz) was 42 micrograms per cubic meter of air (ug/M^3) in the personal breathing zone air sample and 69 ug/M^3 in an area air sample collected during clay mixing. The concentration in the personal sample was below the NIOSH recommended standard of 50 ug/M^3, and the OSHA standard of 480 ug/M^3. The quartz content in the personal air sample and in a bulk sample of the clay was determined to be 19%.

Area air samples collected in the kiln room during bisque and glaze firing revealed no significant concentrations of carbon monoxide, sulfur dioxide, nitrogen dioxide, hydrochloric acid, trace metals, or total airborne particulate. In addition, no detectable levels of nickel were detected during metal casting, and no asbestos was detected in the sample of material taken from the lining of an electric kiln. Analysis of a bulk sample of a glaze ingredient revealed the composition to be 0.034% hexavalent chromium.

On the basis of the data obtained in this investigation, NIOSH has determined that no health hazard existed at the East Leyden High School during the time of this survey. However, due to the high crystalline silica content of the clay, a potential for a health hazard may exist if exposures are not properly controlled. Recommendations related to this evaluation are included in the full body of the report.

KEY WORDS: SIC 8211, Ceramics, Metal Casting, Kiln, Crystalline Silica, Art Hazards

II. INTRODUCTION

On December 28, 1981, a representative of East Leyden High School, Franklin Park, Illinois, requested a NIOSH health hazard evaluation of the school's art department. The requestor was concerned with possible health hazards resulting from the use of various substances during ceramics, metal casting, and other activities conducted within the art department.

On February 11, 1982, NIOSH investigators conducted an initial survey of the facility. This included an opening conference with the school principal, a walk-through inspection of the art department, and discussions with members of the art department teaching staff. On May 6, 1982, an environmental survey was conducted during which personal and area air samples were collected, followed by additional environmental sampling on May 12, 1982.

III. BACKGROUND

The art department of the East Leyden High School provides a variety of activities for students to become familiar with the different forms of art. Located in the basement level of the school, the department is divided into the following; two craft classrooms, a ceramics room with an attached mixing room, a wood shop, a photographic lab, and a kiln room. All rooms are supplied with general ventilation through the school's central heating and air conditioning system. In addition, local exhaust ventilation is present at individual machines in the wood shop, at the mixer in the ceramics mixing room, and in the kiln room. A laboratory type hood equipped with local exhaust ventilation is located in the rear of the department, but was not operable at the time of the survey.

Ceramics is a major activity in the art department. In this process, clay and other materials are shaped and transformed by heat into functional and aesthetic objects. The clay used in this process is prepared each morning by the ceramics instructor in a small room attached to the ceramics classroom. The entire mixing process usually takes less than one-half hour, depending on the amount of clay needed. After mixing, the moist clay is utilized throughout the day by students who shape it into various objects. The formed objects are placed in the kiln for bisque firing, which hardens the clay. After cooling, glazes are applied to the objects and they are refired in the kiln to bond the glaze to the hardened clay material. Firing occurs in a gas fired kiln located in a room across the hall from the ceramics area. A canopy hood above the kiln exhausts contaminants to the building's roof. A locked door restricts access to the room during firing. A small electric kiln is also present in the classroom area, but is not routinely used.

Another art process identified as posing a potential for hazardous exposures was metal casting; however, this activity was not conducted regularly due to the lack of a ventilated work area. To begin this process, a mold is first prepared from wax or other suitable materials.

Next, small pieces of metal scrap are melted with a torch and poured into a crucible for casting in a centrifugal casting machine. The mold is then placed in a water bath for cooling. Lastly, any remaining mold materials are removed from the finished metal object. This entire process is conducted in an open classroom area with no local exhaust ventilation.

Photography is another process which is regularly conducted in the art department. The major chemicals used in this process include a Kodak® fixer (which is prepared once a week) and acetic acid used in the stopbath. This process is conducted in a room separated from the other classroom areas.

In addition to those activities previously listed, a variety of other arts and crafts are instructed. The wood shop, which contains cutting and grinding machinery equipped with local exhaust ventilation, is used to support these activities as necessary.

IV. MATERIALS AND METHODS

Environmental surveys were conducted by NIOSH on May 6, and May 12, 1982. Processes were selected for environmental sampling based on their potential hazards and occurrence during the survey dates.

A. Clay Mixing

One area sample located near the clay mixer and one personal sample located near the breathing zone of the mixer operator were collected using battery-powered air sampling pumps. A flow rate of 2.0 liters per minute (Lpm) was utilized during sampling to ensure collection of a quantifiable level of contaminant. The pumps were attached via tygon tubing to a sampling media consisting of a two-stage respirable dust sampler (a 10 millimeter nylon cyclone followed by a pre-weighed membrane filter). Samples were collected for the duration of the mixing process, approximately 38 minutes (this mixing time was reported to be longer than usual). The samples were analyzed for respirable particulate by gravimetric weighing, and respirable crystaline silica by NIOSH method P&CAM 259[1].

B. Kiln Firing

Samples were collected during the two types of kiln firing; Bisque (1100 - 1570 °F) and glaze firing (1700°F). Area samples in the kiln room were collected in the manner previously described utilizing a sampling media of mixed celluloxe ester (MCE) and pre-weighed membrane filters. The duration of sample collection was 200 minutes for bisque firing and 395 minutes for glaze firing. The pre-weighed filters were analyzed by gravimetric weight for total particulate, and the MCE filters were analyzed by Inductively Coupled Plasma - Atomic Emission Spectroscopy for trace metal content. In addition, long-term, direct reading detector tubes were utilized to detect levels of carbon monoxide (Draeger®, CO 50/a-L), and periodic measurements were made with short term direct reading detector tubes for sulfur dioxide, nitrogen dioxide, and hydrochloric acid (Draeger®, SO_2 1/a, HCl 1/a, and NO_2 2/c).

C. Metal Casting

Two personal samples were collected near the breathing zone of a faculty member during metal heating, casting, and cooling. Samples were collected by the manner previously described using a collection media consisting of one MCE and one pre-weighed filter. Samples were collected for the duration of the process, approximately 5 minutes. Since a nickel/silver metal was utilized in the metal casting, the MCE filter was analyzed for nickel by NIOSH method No. S-206[2]. The pre-weighed filter was analyzed by gravimetric weighing for total particulate.

D. Bulk Samples

Two bulk samples of materials were also collected for analysis. This included a sample of a chromium glaze ingredient which was analyzed by NIOSH method P&CAM 152[3] for chromium and hexavalent chromium content, and a sample of a friable material lining an electric kiln which was analyzed by polarized microscopy for asbestos content.

V. EVALUATION CRITERIA

A number of sources recommend airborne levels of substances below which it is believed that nearly all workers may be repeatedly exposed 8-10 hours per day, 40-hours per week, over a working lifetime, without suffering adverse health effects. Such airborne levels are referred to as exposure limits or threshold limit values (TLV's®). However, due to variations in individual susceptibility, a small percentage of workers may experience effects at levels at or below the criteria; a smaller percentage may be more seriously affected by aggravation of a pre-existing condition or by a hypersensitivity reaction.[4]

The environmental criteria used in this evaluation are given in Table 1. Listed for each substance are three primary sources of exposure criteria: (1) NIOSH recommended standards for occupational exposure to substances (Criteria Documents)[5]; (2) recommended TLV's and their supporting documentation as set forth by the American Conference of Governmental Industrial Hygienists (ACGIH) (1981);[4] and (3) occupational health standards as promulgated by the U.S. Department of Labor (29 CFR 1910.1000).[6]

Following is a brief discussion of the processes encountered during this survey, their primary hazards, and a listing of the major health effects associated with overexposure to a number of substances commonly encountered.

A. Clays

Clays are the primary materials used in ceramics and are composed of naturally occurring hydrated aluminum silicates, most of which are considered nuisance dust. However, the primary hazard from clays is due to the presence of varying amounts of the impurity, crystalline silica. In addition, another substance frequently used when mixing clays is talc. Talc is composed of hydrated magnesium silicates which are often contaminated with asbestos fibers. A discussion of the toxicity of these substances follows:

Nuisance dusts - Have little adverse effect on the lungs and do not produce significant organic disease when exposures are kept under reasonable control. Excessive concentrations in the workroom air may reduce visibility, cause unpleasant deposits in the eyes, ears and nasal passages, or cause injury to the skin or mucous membranes by chemical or mechanical action.[11]

Crystalline silica - Long-term exposure may result in silicosis; a disease characterized by the development of scar tissue of the lungs with shortness of breath and cough.

Asbestos - Long term exposure may cause asbestosis - a disease which may cause lung damage and shortness of breath. In addition, asbestos exposure has been shown to cause lung cancer, mesothelioma (a cancer of the lining of the chest and abdomen), and other forms of cancer.[7] Extreme caution should be taken to avoid inhalation of any materials containing asbestos.

B. Glazes

Glazes are used to add color and a protective coating to the ceramic ware and are usually composed of metallic oxides. Hazards can arise during the handling and mixing of the powdered materials, which are required to be very finely ground, thereby increasing the potential for inhalation. Hazards from skin contact and accidental ingestion can also occur during the application of the glaze. During the subsequent kiln firing, the metal components of the glaze may be given off as a fume presenting a further inhalation hazard. Since many of these materials can irritate the skin, skin contact as well as inhalation of these materials should be avoided. Following is a brief discussion of the toxicity of some of the more commonly used glaze materials.

Bone ash - Inhalation and skin contact with the dust may cause slight irritation to the skin and mucous membranes.[8]

Chromium and its compounds - In some workers, chromium compounds act as allergens, causing dermatitis and pulmonary sensitization. In the hexavalent state (VI), these compounds are irritant and corrosive to the skin and mucous membranes. Certain forms of hexavalent chromium have been found to cause respiratory cancer.[5,9]

Cobalt and its compounds - Repeated skin contact may cause irritation and allergic type dermatitis, primarily at the elbow, knee, ankles and neck. Inhalation may cause an asthma-like disease with cough and shortness of breath. Some cobalt compounds have been shown to cause fibrosis in lung tissue and heart problems. Care should be taken to avoid skin contact or inhalation of the dust.[10]

Dolomite - Although dolomite in itself presents no specific hazards, it can be contaminated with crystalline silica, so care should be taken to avoid inhalation of the dust.[8]

Flint - May contain relatively high amounts of crystalline silica, care should be taken so the dust is not inhaled.[8]

Inorganic Lead - Ingestion or inhalation may cause damage to the kidneys, nervous system, and bone marrow. Long-term exposure is associated with infertility and with fetal damage in pregnant women. Use of this substance as a glaze component should be avoided. Lead glazes were not used or encountered during this evaluation.

Iron oxide - The inhalation of iron oxide fumes or dust may cause a benign pneumoconiosis known as siderosis. It is probable that the inhalation of pure iron oxide does not cause fibrotic pulmonary changes, whereas the inhalation of iron oxide plus certain other substances may cause injury.[9]

Rutile (titanium oxide) - Titanium and titanium compounds are, for the most part, inert and not highly toxic to man.[9]

Whiting (calcium carbonate) - No specific hazards are presented by this material.

Zinc oxide - Poor hygiene practices when using this substance may lead to the development of dermatitis. Inhalation of the fumes or dust particles of small size may cause metal fume fever; a syndrome usually lasting 24-48 hours which causes a feeling of general malaise, weakness, fever, and chills.[9]

C. Kiln Operation

In addition to the more obvious hazards associated with the high temperatures of the kiln, e.g., heat stress and burns, there are many more subtle but serious hazards which may arise from kiln firing. Ultraviolet radiation can result in eye injury and cataracts if proper eye protection or shielding is not used when looking into the kiln. Carbon monoxide is a colorless and odorless gas which can result from the combustion process in fuel fired kilns, as well as through the oxidation of organic matter in clays. Metals present in clay or glaze material may be liberated as metal fumes by the high heat of the kiln and can be highly toxic if inhaled. In addition, other gases such as hydrogen chloride, chlorine, fluorine, sulfur dioxide, nitrogen dioxide and ozone, all of which can be highly irritant and cause other toxic effects in sufficient concentrations, may be given off due to the thermal decomposition of clay and glaze materials. Due to the potential for a buildup of hazardous concentrations of fumes and gases, good ventilation of kilns is essential.

D. Metal Casting

Metal casting is another process which can present a variety of hazards. Skin contact with the hot metal and hot surfaces encountered during metal heating and casting is probably the most apparent hazard. In addition to this, an inhalation hazard exists from the various metal fumes which can be given off as a result of the liquefication of the metal. Lead fumes can be generated from melting lead metal, pewter, and bronzes. Zinc fumes can be generated from melting bronze and brass. Metals containing nickel can give off nickel fumes and nickel carbonyl. Nickel fumes can cause a skin rash and irritation of the eyes and upper respiratory tract. Both nickel and nickel carbonyl are suspect of causing cancer of the lung and nasal passages.[9] Inhalation of all metal fumes should be avoided.

E. Photography

Due to the large number of chemicals which may be used in both black and white and color photography, no specific evaluation criteria or toxicity discussion was presented for these substances. However, in general, many of these compounds can cause irritation to the skin and mucous membranes, and in some cases cause sensitization from skin contact and inhalation. Many are also moderately to highly toxic through ingestion. Manufacturer's information should be consulted to determine the composition, hazards, and appropriate safe handling procedures for each of these substances. If this information is not available, the Photo Lab Index lists the chemical composition of many of these products.

VI. RESULTS

A. Mixing

The results of the environmental samples are provided in Table 2. The 8-hour TWA concentration of respirable crystalline silica (as quartz) was 42 micrograms per cubic meter of air (ug/M^3) in the personal breathing zone air sample and 69 ug/M^3 in the area air sample. The concentration in the personal sample was below the NIOSH recommended standard of 50 ug/M^3, and the OSHA standard of 480 ug/M^3. The 8-hour TWA concentration of respirable particulate was 2.8 milligrams (mg)/M^3 in the personal breathing zone air sample and 2.4 mg/M^3 in the area air sample. The quartz content of a bulk sample of the clay was determined to be 19%, equal to the percentage of quartz in the personal sample.

B. Kiln Firing

Area air samples collected in the kiln room during the bisque firing revealed the concentration of total particulate to be 0.1 mg/M^3 as a TWA for the duration of sample collection. Analysis of the trace metals in this dust showed the primary components to be zinc and sodium, with barely detectable amounts of aluminum, chromium, iron, phosphorous and selenium. Area samples collected during the glaze firing revealed the total particulate concentration to be 0.03 mg/M^3 as a TWA for the duration of sample collection. Trace metal analysis showed the primary component of the dust to be sodium, with a barely detectable amount of selenium. The limit of detection for each of the trace metals in these samples was 1.0 microgram (ug) per filter. No carbon monoxide, sulfur dioxide, nitrogen dioxide, or hydrochloric acid was measured using the detector tubes. The concentrations of all substances detected during kiln firing were well below the corresponding environmental criteria.

C. Metal Casting

Of the personal breathing zone air samples collected during the metal casting process, no detectable levels of nickel or total particulate were found. This is not surprising in view of the relatively short length of the process. The limit of detection for nickel was 3 ug per sample. The weight of total particulate in the personal sample was less than the weight of an identical blank filter.

D. Bulk Samples

No asbestos was detected in the sample of material taken from the lining of the electric kiln. Analysis of the bulk sample of the chromium glaze ingredient revealed the composition to be 64% chromium by weight, and 0.034% chromium VI.

VII. DISCUSSION AND CONCLUSIONS

The results of the environmental survey indicated that the clay mixer's exposure was below the NIOSH recommended standard, but still substantial. However, since the operation sampled was of a longer duration than usual, the crystalline silica exposure during normal clay mixing would be expected to be lower. The lower limit of quantification for quartz in the samples collected was 0.03 mg per sample, while the level detected in the personal sample was only 0.04 mg. Although the air monitoring during a normal mixing operation might not reveal quantifiable levels of respirable crystalline silica, the actual exposure may still be substantial. Based on a lower limit of quantification of 0.03 mg/sample, a sample collected for a shorter period of time and found to be below the limit of quantification could still reflect a concentration greater than 1/2 the NIOSH recommended standard.

One should also be aware of a number of other variables which could increase the exposure above the NIOSH recommended standard. Mixing for longer periods of time than normal, loss of efficiency of the local exhaust ventilation, or careless work practices could all lead to an increased exposure. Also, since it is common for ceramics teachers to practice the craft in their homes, this could also increase the daily exposure. Therefore, it is important to reduce exposure to the clay dust to the extent possible.

No significant concentrations of any substance were identified in the kiln room which would constitute a health hazard, nor would it be expected to in the future, providing the ventilation system continues to operate effectively.

Although the results indicate no detectable levels of any contaminant during metal casting, the extremely short duration of the operation sampled must be considered. If this activity were to be conducted on a larger scale, it could produce substantial exposures. Due to the relatively high toxicity of the fumes of many of the metals frequently utilized, metal casting should only be conducted in a well ventilated area using the proper personal protective equipment.

The use of glaze components was reported to be relatively infrequent and all mixing was to be conducted only by the instructor. Since many of the glaze ingredients can be highly toxic, (i.e. hexavalent chromium) care should be taken in limiting exposure to these substances as much as possible.

No asbestos was detected on the lining of the electric kiln, and use of this machine should not create a health hazard, providing that it is operated in a properly ventilated area in order to exhaust any gases or fumes given off as a result of its use.

VIII. RECOMMENDATIONS

In order to alleviate any potential health hazards from the art processes encountered in this survey, the following recommendations are made:

1. All local exhaust ventilation systems should be periodically inspected to insure their proper operation. This is especially critical for the kiln room and clay mixing room, where failure of the system could result in a buildup of high concentrations of contaminants.

2. Students should not be allowed to enter the mixing room or kiln room unless supervised by an instructor.

3. Glaze mixing, metal casting, and the use of the electric kiln should be conducted in a properly ventilated area. If made operational, the laboratory-type hood located in the rear of the art department would provide an ideal location for these activities.

4. Protective gloves should be used when handling glaze components to avoid skin contact with these substances.

5. The mixing room and classroom area should be wet mopped on a daily basis. Shelves and ledges should be regularly cleaned with a damp cloth. Good housekeeping is a necessity in order to prevent the accumulation and dispersion of potentially toxic dusts in the ceramics area.

6. A medical examination, including pulmonary function testing, should be made available initially and periodically (at least once every three years) to the mixer operator.

7. As a minimum, a properly fitted NIOSH/MSHA approved single use dust respirator should be used during mixing operations conducted for greater than 1/2 hour or in other instances which might result in higher exposures than normal. This type of respirator should provide

adequate protection in concentrations up to 5 times the NIOSH recommended standard. The use of a respirator on a regular basis would substantially reduce exposure to the dust.

8. Information should be obtained from the manufacturer regarding the composition and appropriate precautions to be taken in working with any art materials to be used in the department.

IX. REFERENCES

1. NIOSH Manual of Analytical Methods, Volume 5, National Institute for Occupational Safety and Health, DHEW (NIOSH) Publication No. 79-141.
2. NIOSH Manual of Analytical Methods, Volume 3, National Institute for Occupational Safety and Health, DHEW (NIOSH) Publication No. 77-157-C.
3. NIOSH Manual of Analytical Methods, Volume 1, National Institute for Occupational Safety and Health, DHEW (NIOSH) Publication No. 77-157-A.
4. American Conference of Governmental Industrial Hygienists, Threshold Limit Values for Chemical Substances and Physical Agents in the Workroom Environment with Intended Changes for 1982, Cincinnati, Ohio, 1981.
5. NIOSH/OSHA Pocket Guide to Chemical Hazards, National Institute for Occupational Safety and Health/Occupational Safety and Health Administration, DHEW (NIOSH) Publication No. 78-210.
6. Code of Federal Regulations, 29:1900-1910, U.S. Department of Labor, Occupational Safety and Health Administration, 1980.
7. Asbestos Exposure - What it means - What to do, National Cancer Institute, DHEW Publication No. (NIH) 78-1594.
8. McCann, M., Artist Beware, Watson-Guptill Publications, New York, 1979.
9. Occupational Diseases - A Guide to Their Recognition, National Institute for Occupational Safety and Health, DHEW (NIOSH) Publication No. 77-181.
10. Criteria for a Recommended Standard...Occupational Exposure to Cobalt, National Institute for Occupational Safety and Health, DHEW (NIOSH) Publication No. 82-107.
11. Documentation of the Threshold Limit Values, American Conference of Governmental Industrial Hygienists, Fourth Edition, 1980.
12. NIOSH Technical Report - Occupational Exposure to Talc Containing Asbestos, National Institute for Occupational Safety and Health, DHEW (NIOSH) Publication No. 80-115.

X. AUTHORSHIP AND ACKNOWLEDGEMENTS

Report Prepared By:	William J. Daniels Industrial Hygienist NIOSH - Region V Chicago, Illinois
Originating Office:	Division of Surveillance, Hazard Evaluations, & Field Studies, Hazard Evaluation and Techinical Assistance Branch Cincinnati, Ohio
Laboratory Support:	Utah Biomedical Test Laboratory Salt Lake City, Utah
	Measurement Support Branch NIOSH Cincinnati, OHIO

XI. DISTRIBUTION AND AVAILABILITY OF DETERMINATION REPORT

Copies of this Determination Report are currently available upon request from NIOSH, Division of Standards Development and Technology Transfer, Information Resources and Dissemination Section, 4676 Columbia Parkway, Cincinnati, Ohio 45226. After 90 days the report will be available through the National Technical Information Services (NTIS), Springfield, Virginia. Information regarding its availability through NTIS can be obtained from NIOSH publications office at the Cincinnati address. Copies of this report have been sent to the following:

1. East Leyden High School
2. U.S. Department of Labor, OSHA - Region V
3. NIOSH Regional Offices/Divisions

For the purposes of informing the affected employees, copies of the report should be posted in a prominent place accessible to the employees, for a period of 30 calendar days.

TABLE 1

Summary of Environmental Criteria for Materials Commonly Used in Art Processes

Substance	OSHA Standard	NIOSH Recommended Standard	ACGIH Recommended TLV
Asbestos	2,000,000 fibers/M^3* 10,000,000 fibers/M^3†	100,000 fibers>5u/M^3 500,000 fibers>5u/M^3†	Varies with fiber type
Carbon Monoxide	50 ppm*	35 ppm 200 ppm†	50 ppm 400 ppm†
Chromium (VI)	1 mg/M^3† (for the metal & insoluble salts)	1 ug/M^3(carcinogenic) 25 ug/M^3(others) 50 ug/M^3†	0.05 mg/M^3
Crystalline Silica	$\frac{10 \text{ mg/M3}}{\%SiO_2+2}$(respirable)	50 ug/M^3* (respirable)	$\frac{10 \text{ mg/M3}}{\%\text{quartz}+2}$ (resp)
Cobalt (metal)	0.1 mg/M^3	NA*	0.05 mg/M^3 0.1 mg/M^3†
Inorganic Lead	50 ug/M^3	< 100 ug/M^3	0.15 mg/M^3 0.45 mg/M^3†
Nickel (metal)	1 mg/M^3	15 ug/M^3	1 mg/M^3
Nickel Carbonyl	7 ug/M^3	7 ug/M^3	0.35 mg/M^3
Nuisance Dust	15 mg/M^3	NA	10 mg/M^3
Zinc Oxide (fume)	5 mg/M^3	5 mg/M^3 15 mg/M^3†	10 mg/M^3

*Abbreviations: mg/M^3 - milligrams of contaminant per cubic meter of air
ug/M^3 - micrograms of contaminant per cubic meter of air
ppm - parts of contaminant per million parts of air
NA - No applicable recommended standard

† - All concentrations are expressed as 8 or 10-hour TWA's unless marked with a †, which indicates a short term or ceiling limit. The concentrations given should not be exceeded for any 15 minute period.

TABLE 2

RESULTS OF THE ENVIRONMENTAL SAMPLES COLLECTED
AT THE EAST LEYDEN HIGH SCHOOL ART DEPARTMENT
(May 6 and May 12, 1982)

Sample Type	Process Sampled	Minutes Sampled	Liters Sampled	Contaminant(s)/ TWA Concentration
Personal	Clay Mixing	38	76	Crystalline Silica/42 ug/M^3
Area	Clay Mixing	36	72	Crystalline Silica/69 ug/M^3
Personal	Metal Casting	4	8	Nickel/< 3 ug per sample Total Particulate/< blank
Area	Kiln Firing (Bisque)	200	400	Metals/Trace Total Particulate/0.1 mg/M^3
Area	Metal Casting (Glaze)	395	592	Metals/Trace Total Particulate/0.03 mg/M^3

Abbreviations: mg/M^3 - milligrams of contaminant per cubic meter of air
ug/M^3 - micrograms of contaminant per cubic meter of air
TWA - Time weighted average