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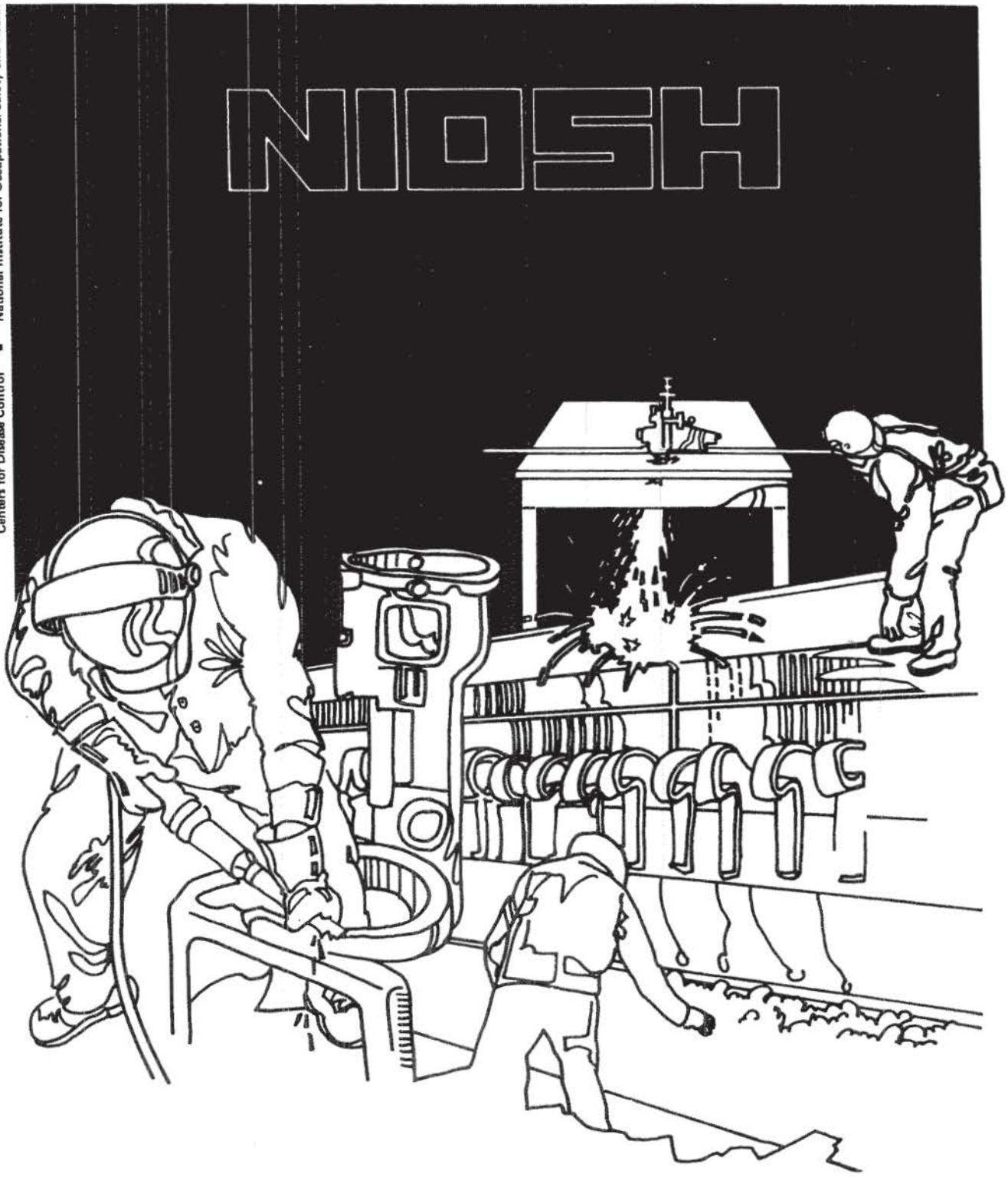

Health Hazard Evaluation Report

HETA 84-373-1509
THE INTERCHURCH CENTER
NEW YORK, NEW YORK

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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NIOSH INVESTIGATOR
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I. SUMMARY

In May, 1984, the Administration of the Interchurch Center and the Staff Association of the National Council of Churches (NCC), requested the National Institute for Occupational Safety and Health (NIOSH) to perform a health hazard evaluation at 475 Riverside Drive, New York, N.Y. 10115. The Interchurch Center is the building which houses many religious associations, including the National Council of Churches. The request was mainly concerned with potential exposures to carbon monoxide, which were believed to have been responsible for intermittent illness of several employees from December 1983 to March 1984. After touring the offices, a spot survey of carbon monoxide concentrations indicated exposure levels of about 5 parts of carbon monoxide per million parts of air. A decision was made to survey the ventilation system on the 5th, 6th and 7th floors, which house the offices of the NCC. While performing the ventilation survey, a black, viscous substance was observed on the frosted glass coverings of the fluorescent lighting fixtures. The substance was leaking from the ballasts of the fluorescent lights. Samples of the viscous substance were collected and analyzed, and found to contain polychlorinated biphenyls (PCBs).

The concentrations of carbon monoxide were determined to be approximately 5 parts per million parts of air (ppm), which is less than the OSHA standard of 50 ppm or the NIOSH recommended limit of 35 ppm. The ventilation survey indicated that the supply of air to the floors was not balanced. The substance on the glass coverings was determined to contain PCBs.

Although the NIOSH investigation was confined to the NCC floors of the building, it is supposed that similar conditions exist on other floors and the following recommendations should apply to the entire building.

The presence of PCBs in the light fixtures does not, in itself, constitute a health hazard to the office personnel, because of the inaccessability of the light fixtures. NIOSH recommends that the ballasts be replaced with "Class P" ballasts or ballasts which do not contain PCBs, and that the viscous tar containing PCBs be thoroughly cleaned from the light fixtures. In general, the ventilation system to the NCC floors should be balanced to deliver an adequate supply of air to all areas. To decrease the possibility of exposure to carbon monoxide, truck drivers should be prohibited from idling their truck engines while in the loading area near the air intakes on the South side of the building.

KEYWORDS; SIC 8661 (Religious Organizations), PCBs Polychlorinated Biphenyls, Carbon Monoxide, Ventilation, Closed Building Syndrome.

II. INTRODUCTION

In May 1984, the Region II Office of the National Institute for Occupational Safety and Health received a telephone request from the Administration of the Interchurch Center and from the Staff Association of the National Council of Churches (NCC) to perform a health hazard evaluation. The request was mainly concerned with potential exposures to carbon monoxide, which were believed to be associated with several episodes of illness (headache, dizziness) which occurred in offices of the NCC during the previous winter and spring. One of the intake grills for the building's ventilation systems is located next to the loading platform on the South side of the building. The idling engines of delivery trucks produce (among other compounds) carbon monoxide, which may be pulled into the intake grill and distributed to areas inside the building. On June 7, 1984, a representative of NIOSH visited the site, met with representatives of the building's administration and of the Staff Association of the National Council of Churches, which represents the employees of that organization. A walk through survey was performed on the 5th, 6th and 7th floors of the building and the loading platform, and carbon monoxide concentrations were determined to be within acceptable limits at that time. On June 11, 1984 the ventilation system was surveyed. Also, samples were collected of a black tar-like substance which was observed to have oozed from the ballasts of many of the fluorescent light fixtures. These samples were analyzed for polychlorinated biphenyls (PCBs) which is contained in ballast oil.

On July 1, 1984, a letter was sent to representatives of the building's administration and the employees union outlining the activities of NIOSH in response to the request for a health hazard evaluation. On July 11th, these representatives were notified that the samples were found to contain PCBs, and the pertinent recommendations that this report would contain about removal of PCBs and cleaning of the light fixtures.

III. BACKGROUND

The Interchurch Center is a 19 story building, first occupied in May, 1960. The tenants of the building are religious groups. About 2,200 employees work in the building. About 500 people work for the National Council of Churches on the 5th, 6th and 7th floors of the building. While interviewing employees of the NCC, they expressed complaints of general fatigue, eye irritation and headache that are common among some of the office workers. These complaints characterize what is known as "closed building syndrome, and usually are related to the quantity of air supplied to the offices. In addition to the usual office suites, there are several print shops in the building of which NCC has two offset printing shops. The main concern of personnel working in the print shops is about the temperature. The ventilation system of the building was designed to provide ventilation to general office areas and apparently cannot handle the heat load generated by the printing presses.

IV. EVALUATION DESIGN AND METHODS

The hazard evaluation consisted of three separate steps; 1) the determination of the concentration of airborne carbon monoxide and a judgment of the loading dock as a source of possible carbon monoxide generation, 2) an evaluation of the ventilation system on the floors occupied by the National Council of Churches and 3) collection and analysis for polychlorinated biphenyls of the material in the lighting fixtures.

A. CARBON MONOXIDE

The concentration of airborne carbon monoxide was determined using detector tubes as the sampling media. This sampling method provides an accurate determination of carbon monoxide concentrations within a few minutes and the lower limit of detection is a few parts of carbon monoxide per million parts of air (ppm). A visual inspection was made of the loading dock area on the South side of the building.

B. VENTILATION SURVEY

The quantity of air delivered into the offices on the 5th, 6th and 7th floors through a representational number of input grills was determined using a "Flow Hood" as the sampling instrument. This device measures the air input directly in cubic feet per minute (cfm). A complete survey of the ventilation system was not performed because it was soon made apparent that the system was unbalanced.

C. POLYCHLORINATED BIPHENYLS (PCBs)

The ceiling lighting fixtures in the building are covered with frosted glass. Many of these glasses (perhaps over 100) had black splotches on them. Upon examination, the inside of these glasses had deposits of a black, viscous, tar-like material. Although I was unable to open the fixtures to directly observe the source of the material, the position and appearance of the material led me to believe that it was oil that had oozed from the ballasts of the fluorescent lights. At the time that the building was constructed and the lighting fixtures were installed, all fluorescent light ballasts contained polychlorinated biphenyls. Using wooden spatulas, three samples of the tar-like material were scraped from the frosted glass and placed in glass sample bottles. These samples were analyzed for PCBs using a gas chromatographic analytical method. The limit of detection of the analytical method was 5 micrograms of PCBs per gram of material tested, or 5 ppm. Concentrations of airborne PCBs were not determined because past experience in similar situations indicates that detectable concentrations of airborne PCBs would not be expected. The vapor pressure of PCBs are very low and measurable concentrations of airborne PCBs are unlikely.

V. EVALUATION CRITERIA

A. CARBON MONOXIDE

Exposure to carbon monoxide may produce symptoms such as headache, dizziness, and nausea. The Permissible Exposure Limit (PEL) for carbon monoxide established by the Occupational Safety and Health Administration is 50 ppm for a time weighted, 8 hour average daily exposure. NIOSH recommends that exposure be limited to not more than 35 ppm as a time weighted, 10 hour average daily exposure, with a 200 ppm ceiling value never to be exceeded. Procedures for the determination of the carboxyhemoglobin levels in blood were requested and have been forwarded to the medical department at the Interchurch Center. If the illness episodes should recur, the procedures will be used to determine if the illnesses are related to carbon monoxide exposure.

B. VENTILATION

NIOSH is active in investigating possible causes of physical complaints among office workers. Typical symptoms encountered in "Closed Building Syndrome" (CBS) are lassitude, headache, eye irritation and tiredness. In general, exposure to chemical substances has not been identified with CBS, but inadequacies in the ventilation system have been found in many instances.

No Federal standard has been established regarding the quantity of air to be supplied to a work environment. The American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE) is a professional association which has recommended that 20 cfm of fresh outdoor air be supplied per person where cigarette smoking is permitted. The air supplied to office buildings is not 100% fresh outdoor air, but instead is a mixture of fresh air and air which has been circulated and tempered to room temperature. The air mix usually ranges from 25% fresh air (on days of mild temperatures) to 10% fresh air (on very hot or cold days). Therefore, the total amount of air which should be supplied, per person, in an office ranges from about 80 cfm to about 200 cfm.

C. POLYCHLORINATED BIPHENYLS (PCBs)

Exposure to PCBs has been related to a form of dermatitis called chloracne, liver function abnormalities and birth defects. PCBs are considered to be potential carcinogens in humans.

The type of PCB determined to be present in the samples contained 42% chlorine, This type of PCB is commonly known as "Aroclor 1242". The OSHA 8 hour time weighted daily PEL for airborne Aroclor 1242 is 1 milligram per cubic meter of air (mg/M^3). NIOSH recommends that exposure to Aroclor 1242 be limited to 0.001 mg/M^3 for a 10 hour time weighted daily exposure. Because the vapor pressure of PCBs is

very low, exposure to airborne vapors is of minimal concern. PCBs are capable of being absorbed by skin contact, and this method of exposure is of more concern, especially for the maintenance persons who replace burned-out fluorescent lights.

VI. RESULTS, DISCUSSION AND CONCLUSIONS

A. CARBON MONOXIDE

The concentrations of carbon monoxide measured on June 7th were approximately 5 ppm; less than either the OSHA PEL or the NIOSH recommendation. Similar concentrations have been measured by NIOSH personnel in other office buildings. Exposure to such low concentrations of carbon monoxide should produce no symptoms. The employees indicated that they believed the loading dock area to be the source of the carbon monoxide because strong odors of truck exhauts "fumes" were noticed in the office on the days of the illness incidents. The loading dock, located next to the ventilation system's intake grills on the South side of the building, was not heavily used on June 7th. Past experiences with similar situations indicates that carbon monoxide concentrations may build up in loading dock areas on days when the outdoor temperature is extreme and the drivers tend to leave the engines idling to maintain the temperature in the cab(s) of the truck(s). There is a large sign in the loading dock warning truck drivers not to keep their motors running. It is possible, under certain wind conditions, for the truck motor exhaust products to be entrained into the intake grills next to the loading dock. The occurrence of such conditions is unpredictable. Enforcement of the prohibition on idling truck engines at the loading dock would eliminate the possibility of entrainment of carbon monoxide into the building's ventilation system.

B. VENTILATION

The results of the ventilation survey are listed in Table I. Reference to the table will indicate that the ventilation system is not balanced and that the amount of air supplied to many areas is less than the quantities recommended by ASHRAE. Areas of the 6th floor and the 7th floor print shop were especially deficient in the quantity of air supplied. On the day of the survey, one of the two air conditioning systems which provide cool air to the 5th, 6th and 7th floors was not in operation because of low water pressure in the vicinity. The air movers were in operation and the quantity of air supplied was not affected, but the temperature in many of the offices was between 85° and 87°F. The heat build-up was most apparent in the printing shops. It must be emphasized that the

ventilation systems of the building were intended for commercial and not industrial applications. When the ventilation systems are balanced, special attention should be given to providing additional ventilation to the print shops to relieve the heat load in those areas.

C. POLYCHLORINATED BIPHENYLS (PCBs)

The results of analysis of three bulk samples for PCBs are listed in Table II. The PCB content of all samples were less than 300 micrograms per gram. The fact that Aroclor 1242 (42% chlorine) was determined to be present in the samples confirms the supposition that the samples are of ballast oil, as Aroclor 1242 is a type of PCB commonly used in fluorescent light ballasts. Although little hazard from exposure to airborne PCB vapors exists in the office, a potential hazard from contact and skin absorption among maintenance men who replace fluorescent lights does exist.

A more serious potential hazard may occur if a leaking ballast should burn or explode. The reason that PCBs are used in ballasts is that they have a large capacity to adsorb heat. If the PCBs leak from the ballasts, the ballasts then have diminished capacity to absorb heat. If a ballast overheats, it may smoke, burn or explode. As an individual ballast is small, a fire or explosion usually will produce little physical damage. However, the heat of a fire or explosion will cause some of the PCBs to undergo chemical reactions. Among the products of the chemical reactions are dibenzofurans, which are more potent carcinogens than are PCBs. Also, the heat of a fire or explosion vaporizes PCBs and dibenzofurans, increasing the hazard from inhalation of the vapors. Finally, the soot produced by a fire or explosion of a ballast may spread over a small area of the office or building. The soot may contain PCBs and/or di-benzo furans, increasing the possibility of contact and absorption and presenting a difficult cleaning operation.

VII. RECOMMENDATIONS

Although this health hazard evaluation was confined to the 5th, 6th and 7th floors of the building which headquarter the National Council of Churches, recommendations 3 through 6 should be applied to the other floors of the building.

1. Truck drivers should be prohibited from idling their trucks' engines when stationed at the loading platform on the South side of the building.

2. The fluorescent light fixtures on the other floors of the building should be inspected for ballast leakage to determine if there are problems with PCB contamination on the other floors.

3. The fluorescent light ballasts should be replaced with "Class P" ballasts, which use thermal protective cut-off switches, or with ballasts which do not contain PCBs.

4. The PCB containing tar-like residue should be cleaned from the fluorescent light fixtures. Personnel performing the cleaning operations must wear personal protective equipment appropriate to prevent skin contact with the residue.

5. The ventilation system should be balanced to provide at least 20 cfm per person of fresh outdoor air.

6. The ventilation in the print shops should be increased to remove the heat build-up in those areas.

VIII. REFERENCES

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American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Inc. ASHRAE handbook--fundamentals. Atlanta, GA: ASHRAE, 1981.

IX. ACKNOWLEDGEMENT AND AUTHORSHIP

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X. DISTRIBUTION AND AVAILABILITY OF REPORT

Copies of this report are currently available upon request from NIOSH, Division of Standards Development 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, VA 22161. 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. The Interchurch Center, N.Y., N.Y.
2. The Staff Association of the National Council of Churches, N.Y., N.Y.
3. OSHA, Region II, N.Y., N.Y.
4. NIOSH, Region II, N.Y., N.Y.
5. The New York State Department of Health, Albany, N.Y.

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NATIONAL COUNCIL OF CHURCHES

TABLE I

VENTILATION SURVEY

LOCATION	QUANTITY OF AIR (Cubic feet per minute)
Room 517 (Mailroom)	100 (front) 0 (rear)
Room 516	200
Hall outside Rm 513	300
Hall outside Rm 575	80
Hall outside Mens Room	50
Hall by Elevators	150 (input) 100 (return)
Fire Warden Station	0
Room 552 (Print Shop)	
ceiling	0
ceiling	120
window	100
window	0
ceiling	120
ceiling	200
ceiling	100
window	300 (return)

TABLE I

VENTILATION SURVEY

LOCATION	QUANTITY OF AIR (Cubic feet per minute)
Room 520	
Personnel Reception	160
kitchenette	0
Mr. "M" office	0
Mr. "F" office	0
Room 566	240
	60
	140
	260 (return)
Hall outside Rm 575	80
Hall outside Rm 566	0
Room 572	400
	0 (return)
	600
	600 (return)
Private office	0
Room 655	180
	100 (return
Room 656	0
Room 652	0
Room 658	0
Room 666	0
	0
Room 665	100
Room 612	130
	90
	110
	100
	300

TABLE I

VENTILATION SURVEY

LOCATION	QUANTITY OF AIR (Cubic feet per minute)
Room 616	0
	0
	200 (return)
Room 620	70
	0
	0
	110
Room 617	0
	70
Room 624	0
	100
	250
	170
Room 630	400
	200
	0
Hall outside Room 630	120
Elevator lobby	250
	200
Hallway	280
	100
	110
	110
Room 772	100
	0
	90
	50
	0
	150
	80
	130
	70
	70
	0
	50
	100

TABLE I

VENTILATION SURVEY

LOCATION	QUANTITY OF AIR (Cubic feet per minute)
7th floor Reception Area	0
Hallway	100
Hallway outside Rm 772	60
	0
Room 742 (Print Shop)	0
	0
	50
	0
	50
	60
	0
	0
	50
7th Floor Main Hall	0
	100
	400 (return)

Limit of Detection of Instrument = 50 cfm

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TABLE II

Polychlorinated Biphenyls in
Bulk Samples of
Ballast Oil

LOCATION	PCBs (Aroclor 1242) (micrograms per gram)
Room 516	290
Room 520	88
Room 566	190

Polychlorinated biphenyl identified as Aroclor 1242 (42% chlorine). Other Aroclors (1216, 1221, 1232, 1248, 1254 and 1260) were not identified in the samples submitted.