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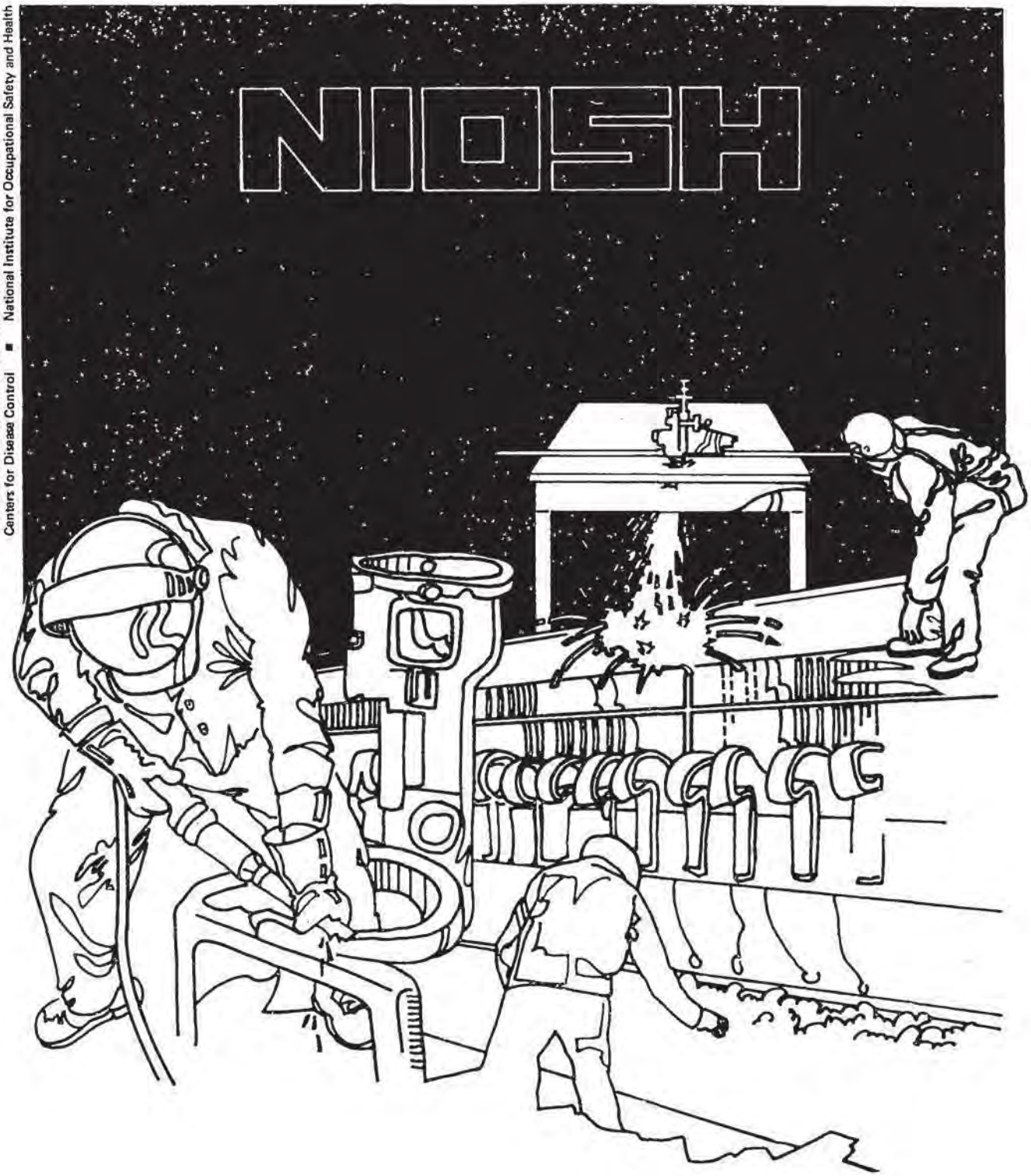

Health Hazard Evaluation Report

HETA 82-063-1095
HAMILTON COUNTY HEALTH DEPARTMENT
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.

HETA 82-063-1095
APRIL 1982
HAMILTON COUNTY HEALTH DEPARTMENT
CINCINNATI, OHIO

NIOSH INVESTIGATOR:
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I. SUMMARY

On December 3, 1981, the National Institute for Occupational Safety and Health (NIOSH) was requested by the Hamilton County Health Commissioner to determine possible polychlorinated biphenyl (PCB) contamination at the Hamilton County Health Department subsequent to the burn-out of a General Electric Fluorescent Lamp Ballast (Catalog No. 58G983). Air and surface wipe samples were obtained to determine the presence of PCBs on the same day that the burn-out occurred.

An air sample obtained approximately four hours after the incident showed no detectable concentration of PCBs. (The lower limit of detection for this sample was 0.4 ug/m^3; NIOSH recommended exposure limit is 1.0 ug/m^3). A sample of the thermal-dielectric compound that had leaked from the ballast casing contained 260 micrograms of PCBs (reported as Aroclor 1254). Wipe samples obtained on the top and bottom surfaces of the ballast casing contained 0.5 and 0.6 ug PCBs (as Aroclor 1254) per 100 cm^2 surface area, respectively. Wipe samples obtained from other horizontal surfaces (desks, tables, etc.) did not contain detectable amounts of PCBs (<0.5 ug per sample) indicating that there was no significant distribution of PCBs into the office areas.

The white powder released when the fluorescent lamps burst consisted of phosphor and titanium dioxide. Both chemicals are basically considered to be nuisance particulates.

On the basis of the air and wipe samples obtained, NIOSH concluded that burn-out of the fluorescent lamp ballast did not present a health hazard to the persons working in this office. However, based upon the potential carcinogenic effects of PCBs and studies demonstrating that significant quantities of PCBs can be released during ballast burn-out, NIOSH recommends replacement of thermally unprotected ballasts with thermally protected units of Class P classification before burn-outs occur. Part V of the report offers guidelines for identifying such unprotected ballasts.

KEYWORDS: SIC 9310 (Local Government), PCB, polychlorinated biphenyl, ballast, capacitor, burn-out, surface wipe and air concentrations.

II. INTRODUCTION

On December 3, 1981, the National Institute for Occupational Safety and Health (NIOSH) received a request for a health hazard evaluation at the Hamilton County Health Department, Cincinnati, Ohio. The Health Commissioner of Hamilton County submitted the request subsequent to the burn-out of a fluorescent lamp ballast on December 3, 1981. The Health Commissioner asked NIOSH to determine the surface and air concentrations of polychlorinated biphenyls (PCBs) and the relative health risk to the persons working in this office area.

NIOSH distributed Interim Report No. 1 for this investigation on December 14, 1981. The report presented the results of the wipe and air samples obtained during the December 3, 1981 visit.

III. BACKGROUND

On December 3, 1981, at about 8:30am a 40-watt General Electric non-thermally protected Tulamp ballast (Catalog No. 58G983) burned-out in the central corridor of the office area of the Hamilton County Health Department, Cincinnati, Ohio. The burn-out presumably resulted from a short-circuit in the windings or power capacitor generating an excessive internal ballast casing temperature. The burn-out resulted in rupture of the ballast casing and release of smoke into the approximately 12' high by 8' wide by 30' long corridor. The two 40-watt fluorescent lamps burst during the burn-out.

IV. METHODS

Environmental sampling was conducted to determine the possible air and surface concentrations of PCBs in the office area. Airborne PCBs were collected on Florisil packed in approximately 7 cm long, 4 mm I.D. glass tubes. The Florisil was packed in two sections separated by a polyurethane plug: the front section contained 100 mg and the backup section (used as the blank) contained 50 mg of Florisil. The sample was collected using a calibrated constant flow vacuum pump operating at 1.0 liters per minute. The PCBs were desorbed from the Florisil with toluene and analyzed using a gas chromatograph equipped with an electron capture detector according to NIOSH P & CAM Method 244.[1] Air concentration is reported as micrograms of PCBs per cubic meter of air sampled (ug/m^3).

Wipe samples from various surfaces were collected to determine the presence of PCBs. Except for one bulk solid sample, the samples were obtained by wiping an area of approximately 100 square centimeters using a Whatman smear tab moistened with pesticide quality cyclohexane. Vinyl gloves were worn by the industrial hygienist during surface sampling and changed after each sample was obtained. The wipe sample was immediately placed into a glass vial with a teflon lined cap for shipment to the laboratory for analysis. The samples were

extracted using toluene and analyzed using the procedure described above.[1] The presence of PCBs is reported as micrograms of PCBs per sample for the bulk solid sample, and as micrograms of PCBs per 100 square centimeters surface area for all other samples.

V. RESULTS

Table I presents the analyses for nine wipe samples. Aroclor 1254 was the only type of Aroclor identified in the samples. Thus, the PCBs are reported as Aroclor 1254. A sample (W-01) of the thermal-dielectric compound that had leaked from the ballast casing and deposited on its surface contained 260 micrograms of PCBs. Wipe samples (W-02 and W-03) obtained on the top and bottom surfaces of the ballast contained 0.5 and 0.6 micrograms of PCB per 100 cm^2, respectively. The remaining six wipe samples did not contain detectable amounts of PCBs. The lower limit of analytical detection is less than 0.5 micrograms per sample for each of the six aroclors analyzed.

A general area air sample was obtained in the veterinarian's office, which had an office entrance nearest (within 2 meters) to the fluorescent lamp luminaire. PCBs were not detected at the lowest level measurable by the analytical method (less than 0.05 micrograms per sample).

The white powder released when the fluorescent lamps burst consisted of a mixture of phosphor and titanium dioxide. Both chemical compounds are basically considered to be nuisance particulates.

VI. DISCUSSION AND CONCLUSION

The air and wipe samples obtained by NIOSH indicate that there was no detectable release of PCBs into the office area working environment. Studies, however, have shown that significant quantities are released during burn-out by certain types of fluorescent lamp ballast.[2,3,4] In one study[2], measurements made in a room immediately after a ballast burned-out showed air concentrations of 118 to 166 micrograms per cubic meter (ug/m^3) at one meter from the ballast; 31 to 46 ug/m^3 at two meters; 18 ug/m^3 at three meters; 12 ug/m^3 at four and one-half meters; and 14 ug/m^3 at six meters. By comparison, the NIOSH recommended permissible exposure limit is 1 ug/m^3.[5] The recommendation is based on the potential carcinogenic effects of PCBs.

The absence of detectable air concentrations of PCB is most likely attributable to the available air circulation in the office area. The air circulation apparently dissipated and diluted the contaminant levels below the detectable concentrations. The six wipe samples that showed no detectable levels of PCBs further confirms the rapid dissipation without detectable surface deposition of the contaminant from the office area.

NIOSH concludes that burn-out of the fluorescent lamp ballast did not present a health hazard to the persons working in the office area.

VII. RECOMMENDATIONS

Since 1969, ballasts manufacturers have incorporated thermal protective cut-off switches into the units to prevent overheating and burn-out. Thus, units now used as replacements should not overheat, rupture and emit PCBs. However, because of the long life of ballasts (estimated at 12 years average by the Illuminating Engineers Society[6]) many of the older, thermally unprotected units are still in use at the present time. The aforementioned General Electric Ballast (Catalog No. 58G983) that burned-out did not have a thermal protective cut-off switch. Therefore, based upon the potential health effects associated with PCBs and the referenced studies demonstrating that significant quantities of PCBs are emitted during burn-out, NIOSH recommends replacement of such unprotected units with thermally protected units of Class P ballast classification [according to National Electrical Code Section 410-73 (e)] before burn-outs occur, thus, eliminating the risk of exposure to office personnel.

An inventory of the ballast currently in use should be conducted to determine the number of non-Class P ballast for replacement. Class P ballast are identified by the catalog number (CAT. No.) located on the top surface of the ballast casing. The four manufacturers of ballasts and the respective Class P identification information is presented in Table II.

Ballast replacement should be prioritized to first include those that display visible compound leakage. Compound leakage may be considered as a good end-of-life indicator.

VIII. REFERENCES

1. National Institute for Occupational Safety and Health. NIOSH manual of analytical methods. Vol 1, 2nd ed. Cincinnati, OH: National Institute for Occupational Safety and Health, 1977. P & CAM No. 244.

2. Staiff, D.C., G.E. Quinby, D.L. Spencer and H.C. Starr: Polychlorinated Biphenyl Emission from Fluorescent Lamp Ballasts. Bull. Environ. Contam. Toxicol. 12: 455-463 (1974).

3. Sources of Emissions of Polychlorinated Biphenyls into the Ambient Atmosphere and Indoor Air. U.S. Environmental Protection Agency Publication No. 600/4-79-022 (1979).

4. Williams, D.T., G.L. LeBel and T. Furmanczyk: Polychlorinated Biphenol Contamination of Laboratory Air. Chemosphere 9 (1): 44-50 (1980).

5. National Institute for Occupational Safety and Health. Criteria for a recommended standard: occupational exposure to polychlorinated biphenyls. Cincinnati, Ohio: National Institute for Occupational Safety and Health, 1977. (DHEW publication no. (NIOSH) 77-225).

6. IES Lighting Handbook, 4th edition, Illuminating Engineering Society, New York, N.Y. (1966).

7. Final Ban Rule for Polychlorenated Biphenyle (PCBs) Manufacturing, Processing, Distribution in Commerce and Use Prohibitions. Federal Register (44 CFR 31514). (May 31, 1979).

IX. AUTHORSHIP AND ACKNOWLEDGEMENTS

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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, Springfield, Virginia 22161. 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:

1. Health Commissioner, Hamilton County Health Department, Cincinnati, Ohio 45202
2. NIOSH, Region V
3. OSHA, Region V

For the purpose of informing approximately 12 directly 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

ANALYSES OF POLYCHLORINATED BIPHENYL'S (PCBs)* IN WIPE SAMPLES

Hamilton County Health Department
Cincinnati, Ohio
HE 82-063

December 3, 1981

SAMPLE NUMBER	SAMPLE DESCRIPTION	MICROGRAMS OF PCB
W-01	Thermal-dielectric material surface of ballast	260 (Bulk solid)
W-02	Top surface of ballast	0.5 (per 100 square centimeters surface area)
W-03	Bottom surface of ballast	0.6 " " "
W-04	Inside surface of fluorescent lamp luminaire	<0.5** " " "
W-05	Veterinarian's office: top surface of desk	<0.5 " " "
W-06	Administration office: top surface of desk	<0.5 " " "
W-07	Environmental health office: top surface of desk	<0.5 " " "
W-08	Director of nursing office: top surface of desk	<0.5 " " "
W-09	Nurse staff room: top surface of desk	<0.5 " " "

* Reported as Aroclor 1254
** A less than (<) value means that PCBs were not detected at the lowest level capable of being measured by the analytical method.

TABLE II

BALLAST MANUFACTURERS AND CLASS P IDENTIFICATION DATA

Hamilton County Health Department
Cincinnati, Ohio
HE 82-063

December 3, 1981

MANUFACTURER*	CLASS P IDENTIFICATION CODE	EXAMPLE OF CATALOG NO.
Universal Manufacturing Corp. Paramus, New Jersey 07652 (201) 967-7600	CAT. NO. suffix-TC-P	446-LR-TC-P
General Electric Corp. Cleveland, Ohio 44112 (216) 266-4256	CAT. NO. prefex 8G	8G3742W
Advance Transformer Co. Chicago, Illinois 60618 (312) 267-8100	CAT. NO. suffix TP	HM-1P30-TP
Jefferson Electric Co. Chicago, Illinois 60104 (312) 626-7700	CAT. NO. suffix 800 series	254-4701-800

* - On May 31, 1979, U.S. Environmental Protection Agency issued a Final PCB Ban Rule which includes a prohibition rule to terminate the manufacture of any new PCB capacitors.[7] Ballasts containing non-PCB capacitors is so stated on the face of the ballast casing.