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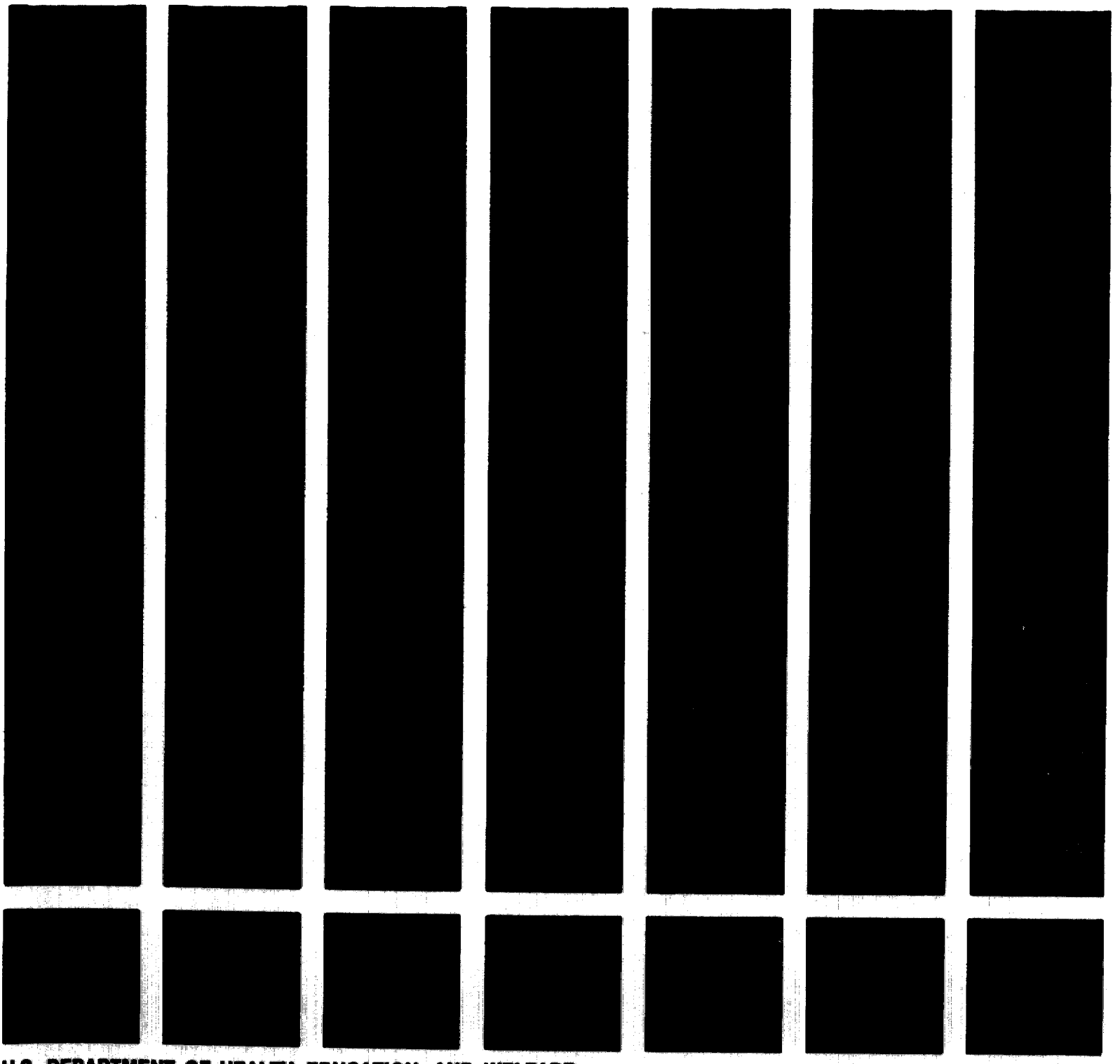
## criteria for a recommended standard . . . . occupational exposure to

# POLYCHLORINATED BIPHENYLS (PCBs)



U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Public Health Service Center for Disease Control
National Institute for Occupational Safety and Health

# criteria for a recommended standard....

# OCCUPATIONAL EXPOSURE TO POLYCHLORINATED BIPHENYLS (PCBs)

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Public Health Service
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# PREFACE

The Occupational Safety and Health Act of 1970 emphasizes the need for standards to protect the health and safety of workers exposed to an ever-increasing number of potential hazards at their workplace. The National Institute for Occupational Safety and Health has projected a formal system of research, with priorities determined on the basis of specified indices, to provide relevant data from which valid criteria for effective standards can be derived. Recommended standards for occupational exposure, which are the result of this work, are based on the health effects of exposure. The Secretary of Labor will weigh these recommendations along with other considerations such as feasibility and means of implementation in developing regulatory standards.

It is intended to present successive reports as research and epidemiologic studies are completed and as sampling and analytical methods are developed. Criteria and standards will be reviewed periodically to ensure continuing protection of the worker.

I am pleased to acknowledge the contributions to this report on polychlorinated biphenyls by members of the NIOSH staff and the valuable, constructive comments by the Review Consultants on polychlorinated biphenyls, by the ad hoc committees of the Society for Occupational and Environmental Health and the American Occupational Medical Association, and

by Robert B. O'Connor, M.D., NIOSH consultant in occupational medicine. The NIOSH recommendations for standards are not necessarily a consensus of all the consultants and professional societies that reviewed this criteria document on polychlorinated biphenyls. A list of Review Consultants appears on page vi.

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The Division of Criteria Documentation and Standards Development (DCDSD), National Institute for Occupational Safety and Health, had primary responsibility for the development of the criteria and recommended standard for polychlorinated biphenyls. From DCDSD, John M. Fajen served as criteria manager and developed the basic information with the assistance of John A. Wass, Ph.D. Personnel from other NIOSH Divisions that assisted in the development of this document were Robert H. Hill Jr., Ph.D., Alan K. Gudeman, and Dennis M. O'Brien (Division of Physical Sciences and Engineering); Mark W. Jones (Division of Surveillance, Hazard Evaluations and Field Studies); and Trent R. Lewis, Ph.D. (Division of Biomedical and Behavioral Science).

The DCDSD review of this document was provided by Richard A. Rhoden, Ph.D., Chairman; J. Henry Wills, Ph.D.; and Howard L. McMartin, M.D., with A. Blair Smith, M.D. (Division of Surveillance, Hazard Evaluations and Field Studies), and James H. Sterner, M.D.

The views expressed in this document, the conclusions reached, and the recommendations for a standard are those of NIOSH after review of the evidence and consideration of the comments of reviewers. These views and conclusions are not necessarily those of the consultants, other federal agencies, and professional societies that reviewed the document.

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CRITERIA DOCUMENT: RECOMMENDATIONS FOR AN OCCUPATIONAL EXPOSURE STANDARD FOR POLYCHLORINATED BIPHENYLS

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# I. RECOMMENDATIONS FOR A POLYCHLORINATED BIPHENYLS (PCBs) STANDARD

The National Institute for Occupational Safety and Health (NIOSH) recommends that employee exposure to polychlorinated biphenyls (PCBs) in the workplace be controlled by adherence to the following sections. The standard is designed to protect the health and provide for the safety of employees for up to a 10-hour workday, 40-hour workweek, over a normal working lifetime. The standard is measurable by techniques that are valid, reproducible, and available to industry and governmental agencies. Compliance with the standard should substantially reduce any risk of reproductive or tumorigenic effects of PCBs and prevent other adverse effects of exposure in the workplace. Employees should regard the recommended workplace environmental limit as the upper boundary for exposure and make every effort to keep exposure as low as possible.

Evidence indicates adverse reproductive and tumorigenic effects in experimental animals exposed to certain commercial PCB preparations. Currently available information is not adequate to demonstrate that other commercial PCB preparations do not have these effects. Should sufficient information become available to indicate that the standard offers greater or lesser protection from some chlorobiphenyl isomers or commercial preparations than is needed, it will be considered for revision.

The Toxic Substances Control Act of 1976 (Public Law 94-469) required the US Environmental Protection Agency (EPA) to prescribe marking and disposal regulations for PCBs by July 1, 1977 (Federal Register 42:26563-77, May 24, 1977). By this Act, the manufacture, processing, distribution

in commerce, or use of PCBs in any but totally enclosed systems is to be banned, effective 1 year after the date of its enactment, October 11, 1976. Two years after the enactment date PCB manufacture is to be banned, and processing and distribution in commerce are to be banned 2.5 years from that date. However, the Act allows the Administrator of EPA to rule otherwise if he finds that manufacture, processing, distribution in commerce, or use in other than totally enclosed systems will not present an unreasonable risk of injury to health or to the environment. The Act does not affect use of equipment already containing PCBs in totally enclosed systems, so that a potential for occupational exposure to PCBs will continue to exist for many years as a consequence of their transportation, installation, use, and disposal. The part of the Act specific for PCBs is presented in Figure I-1.

"PCBs" are defined for this recommended standard as commercial preparations of chlorinated biphenyl compounds, including those preparations which may be described as single isomers or classes of isomers, such as Decachlorodiphenyl. Biphenyl and its monochlorinated derivatives occurring in commercial preparations of PCBs shall be measured along with the polychlorinated derivatives, and shall be treated in this standard as the polychlorinated components of the preparations. "Occupational exposure to PCBs," is defined as working with PCBs or with equipment containing PCBs that can become airborne or that can spill or splash on the skin or into the eyes, or the handling of any solid products that may result in exposure to PCBs by skin contact or by inhalation. The term "PCB work area" is defined as an area where there is occupational exposure to PCBs. In areas where no occupational exposure to PCBs occurs,

but where PCBs are present in equipment in the workplace, adherence is required only to Section 8(a).

Section 1 - Environmental (Workplace Air)

(a) Concentration

Occupational exposure to polychlorinated biphenyls (PCBs) shall be controlled so that no worker is exposed to PCBs at a concentration greater than 1.0 microgram total PCBs per cubic meter of air (1.0 μg/cu m), determined as a time-weighted average (TWA) concentration, for up to a 10-hour workday, 40-hour workweek.

(b) Sampling and Analysis

The recommended TWA occupational exposure limit for PCBs has been determined to be the lowest reliably detectable limit by the sampling and analytical methods recommended in this document. Environmental samples shall be collected and analyzed as described in Appendices I and II, or by any methods shown to be at least equivalent in accuracy, precision, and sensitivity to the methods specified.

Section 2 - Medical

Medical surveillance shall be made available to all employees subject to occupational exposure to PCBs.

(a) Preplacement or initial medical examinations for workers shall include:

(1) Comprehensive medical and work histories with special emphasis on hepatic function, skin condition, and reproductive history.

(2) Comprehensive physical examination with particular attention to the skin and to hepatic function including determinations of serum glutamic-oxaloacetic transaminase (SGOT) and serum glutamic-pyruvic transaminase (SGPT) activities. The responsible physician may also wish to obtain measurements of serum triglyceride concentrations or of other indices of fat metabolism.

(3) A judgment of the employee's ability to use positive pressure respirators.

(b) During examinations, applicants or employees having medical conditions that could be directly or indirectly aggravated by exposure to polychlorinated biphenyls or formulations containing polychlorinated biphenyls shall be counseled on the increased risk of impairment of their health that might result from working with these substances.

(c) Women in the work force who are of child-bearing age shall be advised of the potential adverse effects of PCBs on the unborn child. Those who bear children while working with PCBs shall be counseled concerning the advisability of nursing their babies.

(d) Initial medical examinations shall be made available to all workers as soon as practicable after promulgation of a standard based on these recommendations.

(e) Periodic examinations shall be made available at least annually and include: (1) interim medical and work histories, and (2) physical examinations as outlined in paragraphs (a)(1) and (a)(2) of this section.

(f) If evidence of adverse effects of exposure to PCBs is suspected or confirmed, appropriate medical care shall be made available to the affected worker(s).

(g) Pertinent medical records shall be maintained for all employees exposed to PCBs in the workplace. Such medical records shall be maintained for the period of employment plus 30 years. These records shall be made available to the designated medical representatives of the Secretary of Health, Education, and Welfare, of the Secretary of Labor, of the employer, and of the employee or former employee.

Section 3 - Labeling and Posting

All labels and warning signs shall be printed both in English and in the predominant language of non-English-reading workers. Illiterate workers and workers reading languages other than those used on labels and posted signs shall be otherwise informed regarding hazardous areas and shall be informed of the instructions printed on labels and signs.

(a) Labeling

The following warning label shall be affixed in a readily visible location on PCB-processing or other equipment, and on PCB-storage tanks or containers:

POLYCHLORINATED BIPHENYLS
(PCBs)

DANGER! CONTAINS POLYCHLORINATED BIPHENYLS
CANCER SUSPECT AGENT

Use only with adequate ventilation.
Do not get in eyes, or on skin or clothing.

First Aid: In case of skin or eye contact, flush with running water.

(b) Posting

Warning placards shall be affixed in readily visible locations in or near PCB work areas. The information contained thereon shall be arranged as in the following example.

POLYCHLORINATED BIPHENYLS
(PCBs)

DANGER!

CANCER SUSPECT AGENT

AUTHORIZED PERSONNEL ONLY

Do not enter unless area is adequately ventilated.
Do not get in eyes, or on skin or clothing.

First Aid: In case of skin or eye contact, flush with running water.

Section 4 - Personal Protective Equipment and Clothing

(a) Protective Clothing

In any operation where workers may come into direct contact with PCBs, protective clothing impervious to PCBs shall be worn. Gloves, boots, overshoes, and bib-type aprons that cover boot tops shall be provided when necessary. Protective apparel shall be made of materials which most effectively prevent skin contact with PCBs where it is most likely to occur. Employers shall ensure that all personal protective clothing is inspected regularly for defects and that it is in a clean and satisfactory condition.

(b) Eye Protection

Chemical safety goggles, face shields (8-inch minimum) with goggles, or safety glasses with side shields shall be provided by employers and shall be worn during any operation in which PCBs are present. If liquid or

solid PCBs contact the eyes, the eyes shall be irrigated immediately with large quantities of water and then examined by a physician or other responsible medical personnel. (A drop of vegetable oil on the eye has been found to reduce the resultant irritation.) Eye protection shall be in accordance with 29 CFR 1910.133 and ANSI Z 87.1-1968.

(c) Respiratory Protection

(1) Engineering controls shall be used when needed to keep concentrations of airborne PCBs at or below the recommended TWA occupational exposure limit. The only conditions under which compliance with the permissible exposure limit may be achieved by the use of respirators are:

(A) During the time necessary to install or test the required engineering controls.

(B) For nonroutine maintenance or repair activities.

(C) During emergencies when concentrations of airborne PCBs may exceed the permissible limit.

(2) When the use of respirators is permitted by paragraph c(1) of this section, respirators shall be selected and used in accordance with the following requirements:

(A) The employer shall establish and enforce a respiratory protection program meeting the requirements of 29 CFR 1910.134.

(B) The employer shall provide respirators in accordance with Table I-1 and shall ensure that employees properly use the respirators provided. The respirators shall be those approved by NIOSH or the Mining Enforcement and Safety Administration. The standard for approval is specified in 30 CFR 11. The employer shall ensure that

respirators are properly cleaned, maintained, and stored when not in use.

TABLE I-1

RESPIRATOR SELECTION GUIDE

| Concentration of PCBs | Respirator Type Approved under Provisions of 30 CFR 11 |
|---|---|
| Greater than 1.0 µg/cu m or Emergency (entry into area of unknown concentration) | (1) Self-contained breathing apparatus with full facepiece operated in pressure-demand or other positive pressure mode.<br>(2) Combination Type C supplied-air respirator with full facepiece operated in pressure-demand or other positive pressure mode and an auxiliary self-contained breathing apparatus operated in pressure demand or other positive pressure mode. |

Section 5 - Informing Employees of Hazards from PCBs

(a) All new and present employees in any area in which PCBs are used shall be informed of the hazards, relevant symptoms, and effects of overexposure to PCBs, and the precautions to be observed for safe use and handling of these materials.

(b) All employees involved with the manufacture, use, transport, or storage of PCBs shall be informed that PCBs have been found to induce tumors in experimental animals after repeated oral ingestion and that because of these findings it is concluded that PCBs are potential human carcinogens; employees shall also be informed that adverse reproductive

effects may result from occupational exposure to PCBs.

(c) The employer shall institute a continuing education program, conducted by instructors qualified by experience or training, to ensure that all employees occupationally exposed to PCBs have current knowledge of job hazards, proper maintenance and cleanup methods, and proper use of protective clothing and equipment, including respirators. The instructions shall include a general description of the medical surveillance program and of the advantages to the employee of participation. Special attention shall be given to women in the workplace. They shall be made aware of the potential adverse effects of PCBs on the unborn child, and of the known transport of PCBs to breast milk. Elements of the program shall also include:

Emergency procedures and drills;
Instruction in handling spills and leaks;
Decontamination procedures;
Firefighting equipment location and use;
First-aid procedures, equipment location, and use;
Rescue procedures;
Confined space entry procedures;
Low warning (odor) properties of PCBs.

(d) The information explaining the hazards of working with PCBs shall be kept on file and be readily accessible to workers at all places of employment where PCBs are manufactured, used, stored, or transported. Required information shall be recorded on the "Material Safety Data Sheet" shown in Appendix III, or similar form approved by the Occupational Safety and Health Administration, US Department of Labor.

Section 6 - Work Practices and Engineering Controls

(a) Regulated Areas

Access to PCB work areas shall be regulated and limited to authorized persons. A daily roster shall be kept of persons entering such areas.

(b) Handling of PCBs and General Work Practices

(1) Operating instructions shall be formulated and posted where PCBs are handled or used.

(2) Transportation and use of PCBs shall comply with all applicable local, state, and federal regulations.

(3) PCBs shall be stored in tightly closed containers in well-ventilated areas.

(4) When PCB storage containers are being moved, or when they are not in use and are disconnected, valve protection covers shall be in place. Containers shall be moved only with the proper equipment and shall be secured to prevent dropping or loss of control during transport.

(5) Storage facilities shall be designed to contain spills completely within surrounding dikes and to prevent contamination of workroom air.

(6) Ventilation switches and emergency respiratory equipment shall be located outside storage areas in readily accessible locations which will remain minimally contaminated with PCBs in an emergency.

(7) Process valves and pumps shall be readily accessible and shall not be located in pits or congested areas.

(8) Containers and systems shall be handled and opened with care. Approved protective clothing as specified in Section 4 shall be worn

by employees engaged in opening, connecting, and disconnecting PCB containers and systems. Adequate ventilation shall be provided to minimize exposures of such employees to airborne PCBs.

(9) PCB-operating and storage equipment and systems shall be inspected daily for signs of leaks. All equipment, including valves, fittings, and connections shall be checked for leaks immediately after PCBs are introduced therein.

(10) When a leak is found, it shall be repaired or otherwise corrected immediately. Work shall resume normally only after necessary repair or replacement has been completed, the area has been ventilated, and the concentration of PCBs has been determined by monitoring to be at or below the recommended TWA concentration limit.

(c) Control of Airborne PCBs

(1) Suitable engineering controls, designed to maintain exposure to airborne PCBs at or below the limit prescribed in Section 1(a), shall be used. Complete enclosure of processes is the recommended method for control of PCB exposure. Local exhaust ventilation may also be effective, used alone or in combination with process enclosure. When a local exhaust ventilation system is used, it shall be so designed and operated as to prevent accumulation or recirculation of airborne PCBs in the workplace environment and to effectively remove PCBs from the breathing zones of employees. Exhaust ventilation systems discharging to outside air must conform to applicable local, state, and federal regulations and must not constitute a hazard to employees or to the general population. Before maintenance work on control equipment begins, the generation of airborne PCBs shall be eliminated to the extent feasible.

Enclosures, exhaust hoods, and ductwork shall be kept in good repair so that designed airflows are maintained. Airflow at each hood shall be measured at least semiannually and preferably monthly. Continuous airflow indicators are recommended, such as water or oil manometers properly mounted at the juncture of fume hood and duct throat (marked to indicate acceptable airflow). A log shall be kept showing design airflow and the results of semiannual airflow measurements.

(2) Forced-draft ventilation systems shall be equipped with remote manual controls and shall be designed to shut off automatically in the event of a fire in the PCB work area.

(d) Special Work Areas

(1) PCB Hazard Areas

A hazard area shall be considered as any space having physical characteristics and containing sources of PCBs, such as transformers, that could result in PCB concentrations in excess of the recommended airborne PCB exposure limit. Exits shall be plainly marked, conveniently located, and open outwardly into areas which will remain minimally contaminated in an emergency.

(2) Confined or Enclosed Spaces

Entry into confined or enclosed spaces, such as tanks, pits, process vessels, and tank cars where there is limited egress, shall be controlled by a permit system. Permits shall be signed by an authorized representative of the employer and shall certify that appropriate measures have been taken to prevent adverse effects on the worker's health as a result of his or her entry into such space.

Confined or enclosed spaces which have contained PCBs shall be thoroughly ventilated to assure an adequate supply of oxygen, tested for PCBs and other contaminants, and inspected for compliance with these requirements prior to each entry. Adequate ventilation shall be maintained while workers are in such spaces. Leakage of PCBs into such confined or enclosed spaces while work is in progress shall be prevented by disconnecting and blanking the PCB supply lines. Each individual entering such confined or enclosed space shall be furnished with appropriate personal protective equipment and clothing and be connected by a lifeline harness to a standby worker stationed outside of the space. The standby worker shall also be equipped for entry with approved personal protective equipment and clothing and have contact with a third person. The standby person shall maintain communication (visual, voice, signal line, telephone, radio, or other suitable means) with the employee inside the confined or enclosed space.

(e) Emergency Procedures

For all PCB work areas where there is a potential for the occurrence of emergencies, employers shall take all necessary steps to ensure that employees are instructed in, and follow, the procedures specified below as well as any others appropriate to the specific operation or process.

(1) If PCBs leak or are spilled, the following steps shall be taken:

(A) All nonessential personnel shall be evacuated from the leak or spill area.

(B) The area of the leak of spill shall be adequately ventilated to prevent the accumulation of vapors.

(C) If the PCBs are in liquid form, they shall be collected for reclamation or sorbed in vermiculite, dry sand, earth, or similar nonreactive material.

(2) Personnel entering the spill or leak area shall be furnished with appropriate personal protective equipment and clothing. All other personnel shall be prohibited from entering the area.

(3) Only personnel trained in the emergency procedures and protected against the attendant hazards shall shut off sources of PCBs, clean up spills, control and repair leaks, and fight fires, in areas where PCBs are used.

(4) All wastes and residues containing PCBs shall be collected in PCB-resistant containers and appropriately disposed of (Federal Register 42:26563-77, May 24, 1977).

(5) Safety showers, eyewash fountains, and washroom facilities shall be provided, maintained in working condition, and located so as to be readily accessible to workers in all areas where the occurrence of skin or eye contact with PCBs is likely. If liquid or solid PCBs are splashed or spilled on an employee, contaminated clothing shall be removed promptly and the skin washed thoroughly with soap and water for at least 15 minutes. Eyes shall be irrigated immediately with copious quantities of running water for at least 15 minutes if liquid or solid PCBs get into them. A drop of vegetable oil may be applied to the eye to relieve the irritating effect of PCBs.

Section 7 - Sanitation Practices

(a) Employees occupationally exposed to PCBs shall be provided

with separate lockers or other storage facilities for street clothes and for work clothes.

(b) Employees occupationally exposed to PCBs shall not wear work clothing away from their place of employment.

(c) Employees occupationally exposed to PCBs shall be provided clean work clothing daily, and cleaning establishments shall be informed as to the hazards of handling PCBs and proper disposal procedures for PCB-contaminated waste water.

(d) Facilities for shower baths shall be provided for employees occupationally exposed to PCBs. Workers should shower before changing into street clothes.

(e) Employees exposed to PCBs shall be advised to wash their hands and exposed skin before eating, drinking, smoking or using toilet facilities during the work shift.

(f) Food, drink, or smoking materials shall not be permitted in areas where PCBs are handled, processed, or stored.

Section 8 - Monitoring and Recordkeeping Requirements

(a) Monitoring

(1) As soon as practicable after the promulgation of a standard based on these recommendations, each employer who manufactures, processes, handles, stores or otherwise uses PCBs shall determine by an industrial hygiene survey whether occupational exposure to PCBs may occur. Surveys shall be repeated at least once every year and within 30 days of any process change likely to result in occupational exposure to PCBs. Records of these surveys, including the basis for any conclusion that there

may be no occupational exposure to PCBs, shall be retained until the next survey has been completed.

(2) If occupational exposure to PCBs is determined to be possible, a program of personal monitoring shall be instituted to measure or permit calculation of the exposures of all employees.

(A) In all personal monitoring, samples representative of the employees' breathing zones shall be collected.

(B) For each TWA concentration determination, a sufficient number of samples shall be taken to characterize each employee's exposure during each work shift. Variations in work and production schedules and in employees' locations and job functions shall be considered in choosing sampling times, locations, and frequencies.

(C) Each operation in each work area shall be sampled at least once every 3 months.

(3) If an employee is found to be exposed to PCBs in excess of the recommended TWA concentration limit, control measures shall be initiated, the employee shall be notified of the exposure and of the control measures being implemented to correct the situation, and the employee shall be monitored every 30 days. Such monitoring shall continue until two such consecutive determinations indicate that the employee's exposure no longer exceeds the recommended TWA concentration limit. Routine monitoring may then be resumed.

(b) Recordkeeping

Environmental monitoring records shall be maintained for at least 30 years after the employee's last occupational exposure to PCBs. These records shall include the dates and times of measurements, job function and

location of employees within the worksite, methods of sampling and analysis used, types of respiratory protection in use at the time of sampling, TWA concentrations found, and identification of exposed employees. Each employee shall be able to obtain information on his or her own environmental exposures. Daily rosters of authorized persons who enter regulated areas shall be retained for 30 years. Environmental monitoring records and entry rosters shall be made available to designated representatives of the Secretary of Labor and of the Secretary of Health, Education, and Welfare.

Pertinent medical records for each employee shall be retained for 30 years after the employee's last occupational exposure to PCBs. Records of environmental exposures applicable to an employee should be included in that employee's medical records. These medical records shall be made available to the designated medical representatives of the Secretary of Labor, of the Secretary of Health, Education, and Welfare, of the employer, and of the employee or former employee.

(e) POLYCHLORINATED BIPHENYLS.—(1) Within six months after the effective date of this Act the Administrator shall promulgate rules to— Rules.

(A) prescribe methods for the disposal of polychlorinated biphenyls, and

(B) require polychlorinated biphenyls to be marked with clear and adequate warnings, and instructions with respect to their processing, distribution in commerce, use, or disposal or with respect to any combination of such activities.

Requirements prescribed by rules under this paragraph shall be consistent with the requirements of paragraphs (2) and (3).

(2)(A) Except as provided under subparagraph (B), effective one year after the effective date of this Act no person may manufacture, process, or distribute in commerce or use any polychlorinated biphenyl in any manner other than in a totally enclosed manner.

(B) The Administrator may by rule authorize the manufacture, processing, distribution in commerce or use (or any combination of such activities) of any polychlorinated biphenyl in a manner other than in a totally enclosed manner if the Administrator finds that such manufacture, processing, distribution in commerce, or use (or combination of such activities) will not present an unreasonable risk of injury to health or the environment.

(C) For the purposes of this paragraph, the term "totally enclosed manner" means any manner which will ensure that any exposure of human beings or the environment to a polychlorinated biphenyl will be insignificant as determined by the Administrator by rule. "Totally enclosed manner."

(3)(A) Except as provided in subparagraphs (B) and (C)—

(i) no person may manufacture any polychlorinated biphenyl after two years after the effective date of this Act, and

(ii) no person may process or distribute in commerce any polychlorinated biphenyl after two and one-half years after such date.

(B) Any person may petition the Administrator for an exemption from the requirements of subparagraph (A), and the Administrator may grant by rule such an exemption if the Administrator finds that— Petition for exemption.

(i) an unreasonable risk of injury to health or environment would not result, and

(ii) good faith efforts have been made to develop a chemical substance which does not present an unreasonable risk of injury to health or the environment and which may be substituted for such polychlorinated biphenyl.

An exemption granted under this subparagraph shall be subject to such terms and conditions as the Administrator may prescribe and shall be in effect for such period (but not more than one year from the date it is granted) as the Administrator may prescribe. Terms and conditions.

(C) Subparagraph (A) shall not apply to the distribution in commerce of any polychlorinated biphenyl if such polychlorinated biphenyl was sold for purposes other than resale before two and one half years after the date of enactment of this Act.

(4) Any rule under paragraph (1), (2)(B), or (3)(B) shall be promulgated in accordance with paragraphs (2), (3), and (4) of subsection (c).

(5) This subsection does not limit the authority of the Administrator, under any other provision of this Act or any other Federal law, to take action respecting any polychlorinated biphenyl.

FIGURE I-1. SECTION 6(e) OF THE TOXIC SUBSTANCES CONTROL ACT

# II. INTRODUCTION

This report presents the criteria and the recommended standard based thereon which were prepared to meet the need for preventing occupational disease and injury arising from workplace exposure to PCBs. The criteria document fulfills the responsibility of the Secretary of Health, Education, and Welfare, under Section 20(a)(3) of the Occupational Safety and Health Act of 1970, to "...develop criteria dealing with toxic materials and harmful physical agents and substances which will describe...exposure levels at which no employee will suffer impaired health or functional capacities or diminished life expectancy as a result of his work experience."

The National Institute for Occupational Safety and Health (NIOSH), after a review of data and consultations with others, formalized a system for the development of criteria upon which standards can be established to protect the health and to provide for the safety of employees exposed to hazardous chemical and physical agents. Criteria and recommended standards should enable management and labor to develop better engineering controls resulting in more healthful work environments. Mere compliance with the recommended standard should not be used as a final goal.

These criteria for a standard for PCBs are part of a continuing series of criteria developed by NIOSH. The recommended standard applies to the processing, manufacture, and handling of PCBs as applicable under the Occupational Safety and Health Act of 1970. The standard was not designed for the population-at-large, and any application to situations other than occupational exposures is not warranted. It is intended to (1) protect

against acute and chronic PCB poisoning, (2) be measurable by techniques that are available to industry and official agencies, and (3) be attainable with existing technology.

The standard is designed to substantially reduce the risk of development of carcinogenic, adverse reproductive, hepatotoxic, and dermatologic effects. Since 1970, PCBs have been one of the more thoroughly investigated environmental and occupational hazards. Nevertheless, there are important gaps in the knowledge of chronic exposure effects in man at low concentrations of PCBs. Important research needs include studies on the reproductive histories of women who have been exposed to PCBs, and quantitation of the dermal and respiratory absorption of different mixtures of PCBs. A better understanding is needed of the contaminants in commercial PCB preparations, particularly studies to determine the extent to which any chlorinated dibenzofurans in tissues of PCB-exposed American workers result from direct absorption or are derived from PCBs in the body. Another need is for an assessment of the hazards associated with the mobilization, during fasting or in other abnormal physiologic states, of PCBs stored in the body.