Los Angeles City Fire Department

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POLYCHLORINATED BIPHENYLS (PCB's)

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PURPOSE

This Bulletin has been written to familiarize Department personnel with the hazards of PCB's and safety procedures in an emergency involving PCB's.

REFERENCE

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PCB's: A Closer Look, Fire Service Today, June, 1983 EPA Part IV, Federal Register, December 8, 1983
Fire Illustrates Toxic Danger, L. A. Times, January 23, 1984 Comments an Studies on the Use of PCB's, Drill, Friess, Hays, Loumis an Shaffer, Inc., February 12, 1982

INTRODUCTION

Over recent years, wide publicity has accompanied the condemnation of polychlorinated biphenyls - commonly called PCB’s. As a result, the EPA has forbidden manufacturing of PCB s since 1979, except in isolated cases.

Comprehensive studies in 1982 requested by the EPA indicated that only dermatological effects have occurred from occupational exposure to PCB's. These statistics were derived from exposures during normal conditions in the work place and are not indicative of situations encountered in an emergency. PCB's are often subjected to conditions extremely different from those associated with "Occupational Exposure", namely fire incidents and accidental spills.

Emergency incidents involving PCB's are commonplace. The following two incidents graphically illustrate the seriousness of PCB's. In 1981, a fire in an eighteen story State Office Building in Binghamton, New York closed the structure for three years. Authorities are still unsure if the building will ever reopen. Lawsuits asking more than $1 billion have been filed over the incident.

The second incident occurred on May 15, 1983, in an underground vault outside a 28-story San Francisco building. Although the fire occurred outside the building, smoke entered the intake for the ventilation system, thereby spreading contaminated smoke throughout the first six floors and the elevator shafts. Stairwells in the top twenty-one floors were also filled. This prompted health officials to seal off the entire building. Decontamination of the building cost more than $20 million, closing the first six floors for more

than eight months. Lawsuits for hundreds of millions of dollars have been filed. The largest is an $80 million suit filed by firefighters concerned over the health damage they may have suffered.

HISTORY

PCB's were first discovered in 1881, but it wasn't until 1929 that they were commercially manufactured. Only 100 out of 209 compounds referred to as "Poly-chlorinated Biphenyls" are used commercially.

The dangers of PCB's were first recognized in 1968 in Yusho, Japan, when more than 1000 people were contaminated after using rice oil which was contaminated with PCB's from a leaking heat exchanger. Many of the victims suffered adverse affects, which prompted the Japanese Government to ban the production, import and export of PCB's in 1972.

The "Yusho Case" and other PCB's incidents along with studies conducted by many people prompted the EPA to ban the manufacture and processing of PCB's after July 2, 1979. There are still an estimated 750-million pounds of these chemicals in use throughout the United States. Although the hazard exists, economic consideration prompted the EPA to allow alder industrial equipment containing PCB's to continue in operation.

DESCRIPTION

PCB's are used primarily as insulating oils because of their stability and ability to transfer heat. The fluid is clear to amber in color and has the consistency o£ oil. These chemicals consist of a double benzene ring, chlorinated by replacing any or all of the hydrogen atoms with chlorine. There are many PCB isomers (sane chemical composition but different structural arrangements and properties).

Some general physical and chemical properties include:

1. High flash point 383° F
2. High boiling point (612° F +)
3. Low solubility
4. Heavier than water (1.44 specific gravity) .
5. Low vapor pressure
6. High thermal stability
7. General inertness

8. Highly resistant to corrosives

9. High dielectric constant

Natural Gas Pipelines and Gas Pumping Facilities

PCB's have recently been detected in natural gas supply systems, in Southern California. This was caused by a major, out of State, gas supplier who used PCB fluid in gas compressors for many years. As a result of these findings, Southern California Gas Company conducted a major testing program. These tests substantiated the fact that PCBs are present in many pipeline liquids. The concentrations found ranged from less than one part per million to 1600 parts per million.

As a precautionary measure, any oily mist or liquid encountered in any natural gas pipeline system should be presumed to contain PCBs. Places where these liquids may be encountered include portions of the pipelines where any liquid would tend to accumulate (e.g., low points, drips, orifice, meters, scrubbers, and regulators).

SOURCES OP POTENTIAL EXPOSURE

1. Equipment and materials containing PCB's: .

a. Electrical transformers	g. Paint & ink pigments
b. Alternating current capacitors	h. Heat transfer systems
c. Locomotive transformers	i. Electromagnets
d. Fluorescent light ballasts	j. Natural gas pipelines and compressors
e. Carbonless paper	k. Plastic adhesives
f. Hydraulic fluid	l. Mounting medium in microscopic slides

2. Most often encountered sources of PCB's

   a. Electrical transformers

      (1) Size: 20-600 gals. or more

      (2) Physical Characteristics:

         (a) Round like a drum

         (b) Large square tanks with cooling radiator tubes on the side.

(3) Location

(a) Outside within a secured area

(b) On a platform mounted on a pole

(c) Inside a special electrical room

b. Capacitors

(1) Size: 2-4 gals.

(2) Physical characteristics:

(a) Square box

(b) Rectangular box

Note: PCB's from capacitors which have exploded, may be black in color.

(3) Location

(a) At ceiling level throughout building.

(b) Mounted on walls or in storage room.

(c) On power poles.

Methods of Identification

1. Trade Names

Some trade names describing PCB's are:

a. Askarel	g. Dykanol	l. EEC-18
b. Pyranol	h. Diaclor	m. Phenoclor
c. Clorphen	i. Chlorol	n. Aroclor-B
d. Elemex	j. Kaneclor	o. Inclor
e. Fenclor	k. Inerteen	p. Encarel
f. Asbestol		

Although these trade names may alert you to the potential of PCB's being present, the only positive method of identification is chemical analysis.

2. Placards

No placards are required under D.O.T. regulations. However, PCB's do get an ORM-E Waste (Other Regulated Materials-"E") classification on the shipping papers.

3. Warning Signs

All Water and Power capacitors, transformers, regulators, and resistors are labeled with a 2" x 2" yellow and black sign with the following warning:

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.

NOTE: This warning label is usually placed on the transformer or appliance, and will probably not be visible during an emergency due to distance, height, smoke, flames, etc. Positive identification of locations where PCBs are present can be obtained from the Water and Power Emergency Dispatch Center through OCD.

Toxicity (Possible Carcinogen)

1. TLV's (Threshold Limit Valve) and STEL's (Short Term Exposure Limit)

a. Skin

(1) 42% chlorine concentration in molecule

(a) lmg/m^3 - TWA (time weighted average over 8 hours)

(b) 2mg/m^3 - STEL

(2) 54% chlorine concentration in molecule

(a) 0.5 mg/m^3 – TWA

(b) lmg/m^3 - STEL

Skin exposure has resulted in a skin condition similar to a rash known as "Chloracne."

b. No TLV's or STEL's have been established for inhalation or ingestion.

Although laboratory animals subjected to PCB's have exhibited negative health effects, no significant health effects (except for chloracne) have occurred to the human population exposed to PCB's in an occupational setting.

PCB's have a cumulative effect in the body and are retained in the fatty tissue, thymus, adrenal gland and the nervous system. Scientific studies have shown that in some cases liver disorders have been detected in laboratory animals infected with small concentrations of PCBs. In persons who have suffered systemic intoxication, the usual signs and symptoms are nausea, vomiting, loss of weight, jaundice, edema, and abdominal pain. Where the liver damage has been severe, the patient may pass into a coma and die. Currently research is being done to determine if PCB's are carcinogens.

2. Contaminated levels as classified by EPA

a. "PCB Transformers" - those containing 500 ppm or higher of PCB' s

b. "PCB - Contaminated transformer" - those containing less than 50 ppm of PCB's

In decontamination as required by EPA, the level of PCB concentration must be reduced to less than 50 ppm.

3. Decomposition under fire conditions

When heated to above 134° F, PCBs release the known poisons; Dibenzyl-Furon and Hexochlorobenzine. Decomposition occurs when the fluid is heated to approximately 662° F to 725° F, producing Dioxin, Polycyclic aromatic hydrocarbons, and aldehydes. Dibenzyl-Furon and Dioxin are the most hazardous to ones health.

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CURRENT TECHNOLOGY IN NEUTRALIZING PCB's.

1. Incineration at temperatures in excess of 2285° F

   a. Treatment plants are located in Texas and Arkansas

   b. Incinerator ships are currently being used by other countries, but because they lack EPA approval, they are not treating PCB's originating from the United States.

2. Cement Kilns - in developmental phase

3. Neutralizing agents

FIRE DEPARTMENT OPERATIONS

1. Pre-Fire Planning

   a. Determine location where PCB's are stored or in-use and describe under "Hazards" on the building inventory program written sheet.

   b.. Formulate plans for containment and extinguishment.

2. Emergency Procedures

   a. 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.

   b. Approach fire from an upwind location. Area of leak or spill shall be adequately ventilated to prevent accumulation of vapors.

   c. Contain runoff to the immediate area (e.g. diking, etc.)

   d. Evacuate immediate area and downwind locations.

   e. Avoid contact with smoke and liquid if possible.

   f. Use dry chemical or $C0_2$ extinguisher for small fires.

   g. If possible, use water or light water sparingly to reduce pollution.

3. Notifications

   a. Have Haz-Mat Squad and/or Mobile Lab respond

b. Have OCD notify:

(1) Medical Liaison

(2) The Department of Water and Power (for response to the scene to determine positive identification of PCB's).

(3) County Department of Health Services

(4) County Flood Control and/or the City Bureau of Sanitation if the spill has entered their systems.

(5) EPA

c. Inform the responsible party of their clean-up responsibilities.

4. Decontamination

a. If PCB' s are confirmed

(1) If liquid or solid PCB's are splashed into eyes, they shall be irrigated immediately with copious quantities of running water for at least 15 minutes.

(2) If an employee is found to be exposed to PCBs, control measures shall be initiated. The employee shall be made aware of the exposure, and of the control measures being implemented. Medical Liaison will monitor and coordinate medical protocol.

(3) Contaminated clothing and equipment should be bagged and isolated pending disposal or cleaning.

(4) All exposed apparatus shall be thoroughly washed and rinsed prior to returning to quarters.

b. If PCB' s are not confirmed

(1) Handle as if PCB contamination has been confirmed.

(2) Determine the perimeter and isolate area of contamination.

(3) Set-up decontamination procedure with Haz-Mat Squad and Mobile Lab.

(4) Isolate all contaminated clothing and equipment in contamination area until a positive identification of PCB's (or lack thereof) has been confirmed.

(5) If exposed personnel are sent to the hospital notify the hospital of possible PCB contamination beforehand.

(6) Insure that contaminated run-off water is contained within contamination area.

(7) Coordinate activities with the County Health Officer.

Documentation:

The Medical Liaison Unit shall be notified of any possible exposure to PCBs. This exposure shall be documented by a Form Gen. 166 and an F-225 (Refer to Vol. 5, Form Gen. 166, IOD Procedures). Handle all suspected PCB incidents as if PCB contamination has been confirmed until notified otherwise.

APPLICATION/ DISCUSSION: Explain the significant difference in toxicity between a PCB spill. and a PCB fire. Discuss the difference in tactics involved.

TEST:

1. What do the letters PCB stand for?

2. What is the best method of identifying PCB's'?

3. Give three proprietary names for PCB's.

4. For regulatory purposes, a “PCB Transformer” is one containing _____PCB, and is treated as if it contained pure PCB’s.