

# PCB's: A Closer Look



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Photo courtesy  
N.Y. Daily News

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On September 9, 1981, Box 460 was transmitted at 1527 hours for a fire and explosion in a Consolidated Edison generating station located on East 14th Street in Manhattan. The fire and explosion involved switch gear and an electrical transformer containing mineral oil. Although the fire caused major disruptions in electrical service to portions of lower Manhattan, the extinguishment of the burning oil followed the standard operating procedure, and the fire situation was under control in a relatively short period of time.

In February of 1981, a fire involving an electrical transformer forced the shutdown of an 18 story office building in Binghamton, N.Y., causing the relocation of over 700 workers. In this fire, toxic smoke was spread through the structure's air handling equipment. Soot and ash were deposited throughout the entire building, necessitating a massive cleanup program that continues at the time of this writing.

In 1976, an electrical transformer fire in a fish meal house in Puerto Rico contaminated stored chicken feed. Approximately 400,000 chickens that had eaten the contaminated feed, and millions of eggs, had to be destroyed.

In 1968, over one thousand people in Japan were poisoned by using contaminated rice-bran oil. The disease, known as "yusho" was traced to a heat exchange unit that was used in processing the rice-bran oil.

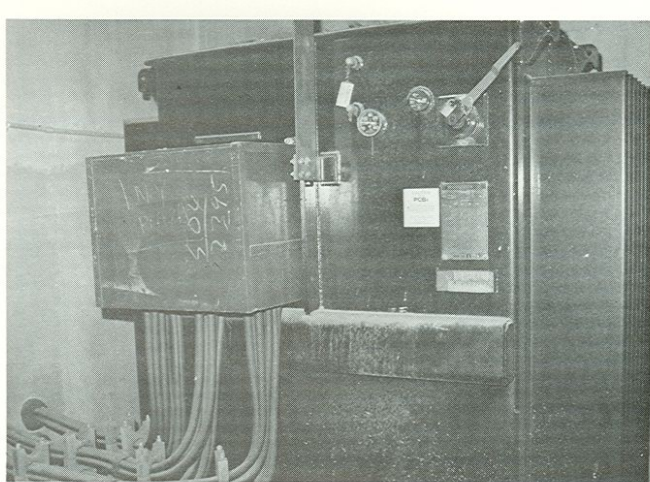
Each one of the above mentioned incidents involved a chemical called polychlorinated biphenyl, or PCB for short.

#### PCB—WHAT IS IT?

The chemical known as PCB is a double benzene radical, which is chlorinated by replacing any or all of the hydrocarbon atoms with chlorine. There are many isomers of PCB's. These isomers have the same chemical composition, but differ in structural arrangements and properties. (See illustration.)

Fluids containing varying percentages of PCB's are desirable in many commercial applications because of their low flammability, high boiling point, low water solubility, low vapor pressure, high dielectric constant, thermal stability, general inertness, and basic and acidic resistance.

Because of these properties, PCB's are used in electrical and locomotive transformers, alternate current capacitors, fluorescent light ballasts, carbonless paper, hydraulic fluid, paint and ink pigment, heat transfer systems, electro magnets, natural gas pipeline compressors, plastic adhesives, as a mounting medium in microscopic slides, and as a contaminant in some waste oils. This article will be limited to PCB's in transformers.



Shown above is a typical askeral-filled transformer installed in 1 New York Plaza, a high rise building located in lower Manhattan.

Under fire conditions, PCB's may decompose into dibenzofuran and, under the right conditions, dioxin. In addition, polycyclic aromatic hydrocarbons (PAH's) may also develop. This decomposition occurs when the temperature of the fluid heats up to approximately 350° to 400° C. (662° to 752° F.). PCB's are drained from electrical transformers and shipped by truck to locations approved by the federal Environmental Protection Agency (EPA), and incinerated at a temperature in excess of 1250° C. (2282° F.). Presently, only Texas and Arkansas have facilities that are permitted to incinerate PCB's. However, recent developments on the disposal of this material have focused on the use of incinerator ships, cement kilns, and neutralizing agents.

#### PCB's: A HEALTH HAZARD

PCB's can enter the body by:

- Inhalation
- Ingestion
- Absorption

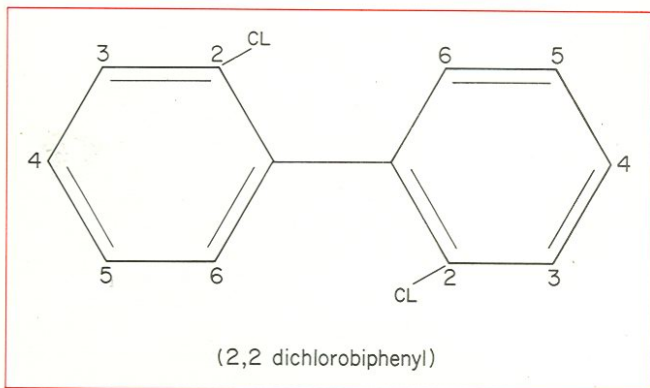
Once in the body, PCB's may cause a wide variety of problems, over an extended period of time. As a result of available test data, the federal government has labeled PCB's as a possible carcinogen. In laboratory tests on animals, the EPA reported reproductive failures, birth defects, gastric disorders, skin lesions, swollen limbs, cancers, tumors, and eye and liver conditions, among other problems. In addition, exposed workers and others contaminated by PCB's may experience a skin condition known as chloracne.

According to medical experts, PCB's are a stable chemical that is stored in the fatty tissue of the body, in certain glands such as the thymus, in the adrenal glands, and in the nervous system. Because of the stability of the chemical, and the fact that it cannot be neutralized in the body, the concentrations are cumulative. Increased health hazards are associated with higher cumulative levels.

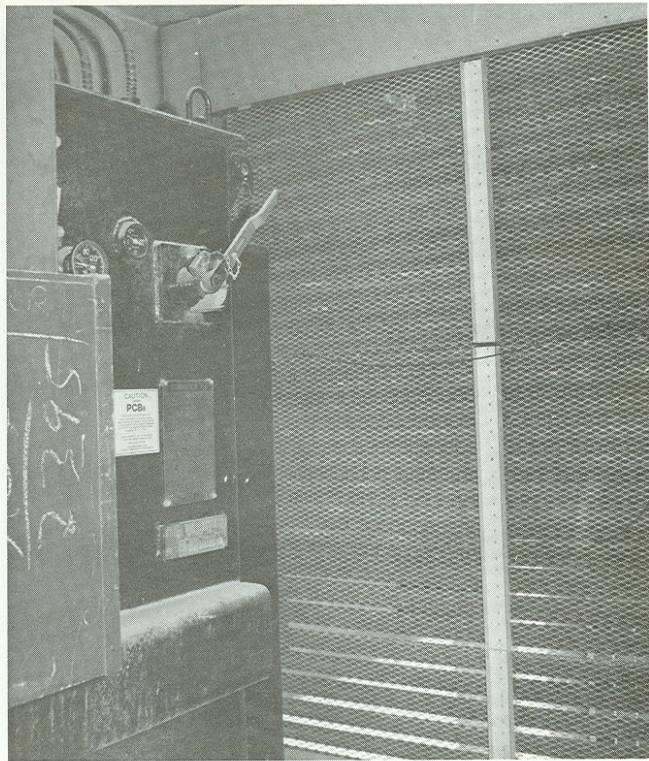
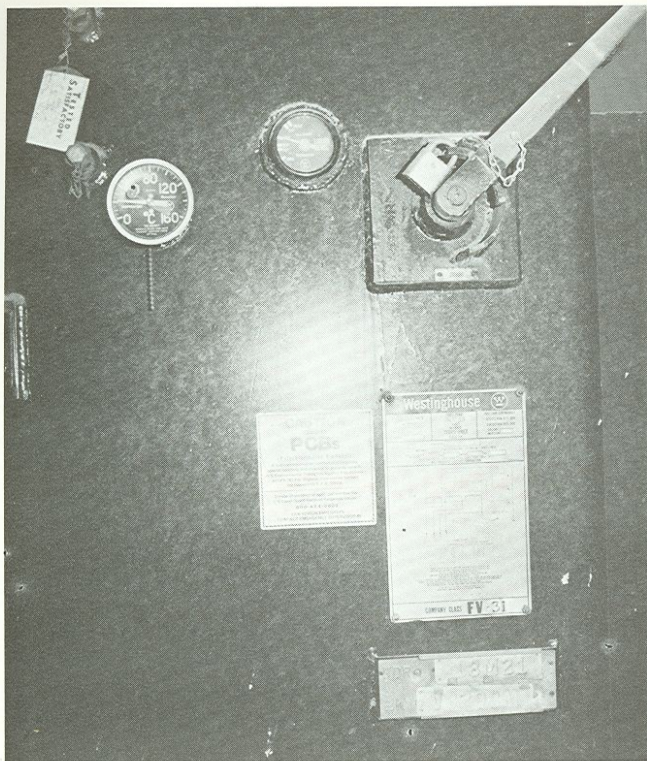
#### TRAINING

Data concerning PCB's should be included in the regular company drill schedule. This information should include:

- The pinpointing of sites in the company's response area where transformers containing PCB's are located.



Biphenyl Molecule and Ring Numbering System.



Above left: Close-up of the transformer that is shown on page 17. Warning signs indicating that this transformer does, indeed, contain PCB's are clearly displayed on the front of the transformer. Above right: Another angle shot of the same transformer, showing that the only thing separating this particular transformer from the adjoining area is an obvious fire-vulnerable louvred wall.

- Operating procedures to be employed when encountering a fire in, or adjacent to, a transformer containing PCB's.
- Measures to be used to safeguard the public and firefighters, both during and after operations.
- Notification to the dispatcher when this material is encountered, or suspected to be contained in a transformer or storage tank.

Training should include information on the hazards of PCB's and the products that are produced by their

decomposition. The importance of decontamination and personal hygiene following an exposure to PCB's or the products of their decomposition should be stressed. Appropriate Department resource material should be used to support the lesson plan.

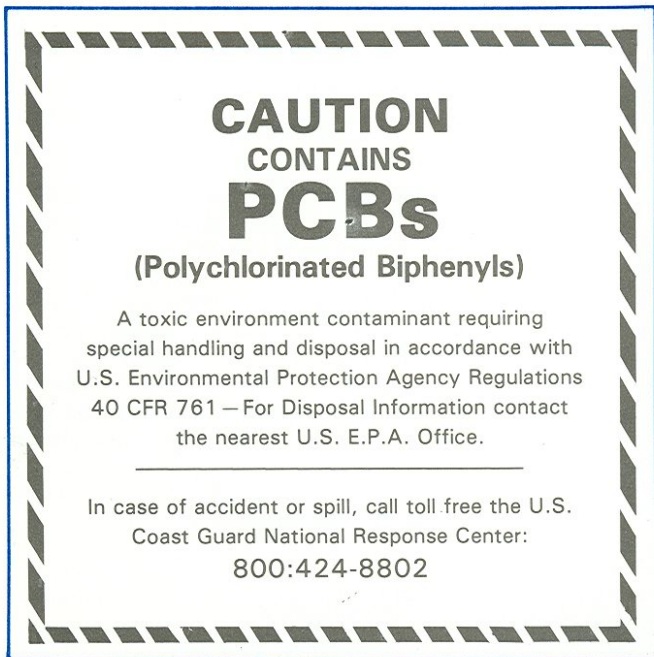
In order to identify the sites of PCB's in the City, the Bureau of Fire Prevention has developed a city-wide inspection program using inspectors from this Bureau and representatives from Con Edison. Based on results that will be obtained, recommendations will be made to the agencies having jurisdiction, and pertinent information will be relayed to field units.

Recommendations have been made that warning signs be posted on approaches to the transformers, transformer vaults, and on the transformer itself. When the transformer is located in a high rise building, additional information will be located in the Fire Safety Plan at the Fire Command Station, and on the inside of the stairway door on the floor on which the transformer is located.

The locations of transformer vaults containing PCB's, or PCB contaminated transformers, should be included in the TIPS program. Ultimately, this information will be programmed into the Computer Assisted Dispatch System (CADS).

PCB transformers are classified by the EPA as:  
 1. PCB Transformer. These are transformers that contain PCB's at concentrations of 500 parts per million (ppm) or greater. The term also includes transformers containing 40%, or greater, PCB's, or transformers not designed for 500 ppm of PCB but, in fact, containing 500 ppm of PCB.

2. PCB Contaminated Transformer. This category includes transformers containing between 50 and 500 ppm of PCB. Transformers with this range of PCB are included even if the source is from a contamination of mineral oil. According to the *Federal Register* of May 31, 1979, "... as many as 38% of the thirty-



Typical warning sign (black printing and border on yellow background) that is used to indicate equipment containing PCB's.



Warning sign on door leading to transformer vault. The Bur. of Fire Prev. recommends that such warning signs be placed on all approaches to transformer vaults, and on transformers themselves.

five million mineral oil transformers contain between 50 and 500 ppm of PCB."

3. Non-PCB Transformers. A transformer containing less than 50 ppm may be considered non-PCB.

The term "askarel" is generally used to denote PCB's containing 500 ppm or more. This is a generic term, however, and other names may also be used. Among these are included: inerteen, pyranol, clorphen, eucarel, aroclor, and fenclor. If, at an emergency, a liquid is found that is suspect, Chemtrec may assist you in determining its contents, and the protective measures that should be employed.

### OPERATING PROCEDURES

- Members who are operating at locations where the presence of PCB's are confirmed, or even suspected, shall operate with full protective firefighting gear and SCBA.

- The minimum exposure of manpower shall be employed.

- Emergency procedures shall be immediately established when PCB material is involved. These procedures shall include:

#### Chlorobiphenyl (54% Chlorine)

##### Physical & Chemical Properties

Specific Gravity: 1.5 (Water = 1)

Vapor Density: 11.2 (Air = 1)

Melting Point: 50° F.

Insoluble in Water.

Molecular Weight: 326

Flash Point: 432° F. (222° C.)

Boiling Point: 689° - 734° F. (365° - 390° C.)

Extinguishment: Foam, Dry Chemical, Carbon Dioxide.

Description: Pale yellow; viscous liquid with a mild hydrocarbon odor.

1. The special-calling of the Division of Safety to supervise decontamination procedures.
2. The special-calling of Rescue Company 4 for use of their hazardous materials equipment.
3. The notification of the Medical Officer on emergency duty.
4. The notification of the Department of Environmental Protection for technical assistance.
5. The Notification of other concerned agencies, i.e., Con Edison, Police Department, Emergency Medical Service, etc.

- Decontamination procedures conducted by EMS at the scene shall include the washing off of members' protective clothing with a booster line, or other suitable means. All clothing that was worn shall be collected, tagged, and placed in plastic bags that are labeled with the time, date, and location of the incident, and specific material involved. The importance of close supervision during an incident, and the use of technical assistance cannot be overstressed.

- Members who were exposed to PCB's shall thoroughly shower with soap and water, with particular care placed on exposed areas.

- All apparatus used at the scene shall be washed with a soap and water solution and thoroughly rinsed before returning to quarters.

- All tools and SCBA that were used during the emergency operations shall be collected and bagged. Bags shall be tagged, indicating the contents, and the time, date, and location of the incident.

- Members not directly used in the operations shall be kept in a staging area, upwind, and at a sufficient distance from the incident. No member shall eat any food, drink any liquid, or smoke while in the contaminated area.

- Members injured at the scene of a PCB incident shall inform hospital personnel *before* entering the hospital that they were exposed to PCB, and PCB contaminated products.

- The control of toxic runoff shall be maintained, using diking procedures for hazardous materials incidents.

- The officer in command of incidents involving PCB's shall notify the dispatcher, who will contact the appropriate Federal, State, and local agencies. These agencies may provide technical assistance during and after the incident.

### CONCLUSION

All of the information available at this time continues to point to the lack of complete data concerning health problems that may occur as a result of exposure to this chemical. This lack of concrete evidence mandates the Fire Department to continue to take all the necessary steps to ensure the safety of the public and its members, by reducing the exposure hazard that this chemical may present. In order for the Fire Department to be effective in this effort, it is incumbent upon all its members to be aware of the locations of PCB or PCB-contaminated transformers, where the liquid is stored, and where and how it is being transported.

Although the manufacture of PCB's has been eliminated, the use and storage of this material will continue for years. The continued efforts of the Fire Department, in maintaining a high standard of safety for its members and for the public, will assist in minimizing the danger that these chemicals present. ▲