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Westinghouse Electric Corporation

Box 341, Bloomington, Ind. 474

January 14, 1972

Dr. A. Pozefsky, Chairman
C-107 Capacitor Working Group
General Electric Company
Engineering Department
Hudson Falls, New York 12839

Dear Dr. Pozefsky:

Attached is a copy of my first draft of the "Capacitor Plant House-keeping and Employee Safety" portion of the proposed ANSI C-107 standard on the use and disposal of PCB's.

In order to expedite consideration of the various parts of the proposed standard at the next meeting of the working group at the Marriott Hotel in Chicago on February 8 and 9, I am also sending a copy to each of the attached list of addressees.

Very truly yours,

Robert D. McClain, Manager
Capacitor Unit Engineering

RDMC:kb

Attachs.



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N. R. Clark
Universal Manufacturing Company
902 Crescent Avenue
Bridgeport, Connecticut 06607

J. F. Kuzela
Engineering Manager
Power Capacitors
Sangamo Electric Company
P. O. Box 359
Springfield, Illinois 62705

Dr. E. M. Moore
2427 St. Vincent Avenue
LaSalle, Illinois 61301

W. P. Papageorge, Manager
Environmental Control
Monsanto Company
800 North Lindberg Blvd.
St. Louis, Missouri 63166

P. G. Benignus
Marketing Manager
Dielectric Fluids
Monsanto Company
800 North Lindberg Blvd.
St. Louis, Missouri 63166

E. G. Hammer
McGraw Edison-Power Systems Division
P. O. Box 160
South Milwaukee, Wisconsin 53172

F. R. Lengefeld
Electrical Engineering Department Code 450
Union Electric Company
P. O. Box 149
St. Louis, Missouri 63166

Dr. T. K. Sloat
Fluid Insulation Section
Transformer Division
Westinghouse Electric Corporation
Sharon, Pennsylvania

A. M. Salazar
NETA
155 East 44th Street
New York, New York 10017

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CAPACITOR PLANT HOUSEKEEPING AND EMPLOYEE SAFETY

The following procedures and limits are intended to be minimum requirements to be met by manufacturers of capacitors using polychlorinated biphenyl. Handling, control and disposal procedures are given, together with exposure limits and indicated antidotes and cleanup procedures.

1. Material. Chlorinated biphenyl for use in capacitors shall consist of chlorinated homologues and isomers of biphenyl not exceeding the tabulated values:

Pentachloro (and higher % chlorine)	.40%
Tetrachloro	15.00%
Trichloro (and lower % chlorine)	(Balance)

Solvents include benzene, kerosene, acetone, amyl alcohol, ether, and chloroform. Other typical properties are:

Flash point, Cleveland open cup: 177°C, minimum

Distillation Range: 10% below 323°C; 90% below 356°C

Specific Gravity: 1.362 to 1.372, at 25°C/15.5°C

Vapor Pressure

0°C	=	0.001	mm
25°C	=	0.006	mm (est.)
150°C	=	4.3	mm
200°C	=	29.0	mm

At 25°C and 760 mm Hg pressure, saturated air contains 0. ____ mg/liter.

(1 mg/liter	=	98.8 ppm)
(1 ppm	=	0.010 mg/liter)

2. Bulk fluid shipment, receiving, and transfer: Shipment of polychlorinated biphenyl from point of manufacture to point of receiving shall be done in closed containers: rail tank cars; truck tanks; marine or barge tanks; or sealed drums. Containers shall be labelled as to contents, and carry a precautionary label against loss of fluid to the open environment. Containers used for transport of poly-

chlorinated biphenyl shall not be used for storage or transport of other material without being completely cleaned of all traces of PCB. (Cleaning procedures must take cognizance of precautions against excessive exposure and of the need for proper disposal of contaminated cleansing solvents and materials set forth below.) Transfer from shipping container to processing system shall be through closed piping or tubing with appropriate valves, pumps, etc. Provision shall be made for trapping and disposing of fluids lost by leakage or spills from the transfer system and from the storage containers.

Drums to be retired from use shall be cleaned before crushing, delivery to scrap dealers, or other disposal. Contaminated cleaning fluids and materials shall be disposed of as indicated below.

3. Handling during manufacturing operations: It is generally accepted that exposure to capacitor PCB is not hazardous, provided simple precautions are taken.

(a). Vapors. Maximum atmospheric concentration limit (8 hours) recommended: one milligram of capacitor PCB per cubic meter of air.

Breathing vapor or fume from heated PCB should be avoided. Provision of adequate ventilation and regulation of manufacturing operations to avoid open exposure of hot PCB (15°C, or higher) shall be made. The gases produced when askarel is decomposed by very high temperatures (such as that of an electric arc) in the presence of air or organic insulating materials contains a high percentage of hydrogen chloride, and small percentages of carbon dioxide, carbon monoxide, and oxygen. Minute concentrations of this combination of gases are very unpleasant and irritating, thus giving ample warning of their presence. When necessary, under emergency conditions, to enter a space containing a high concentration of PCB vapor or decomposition products, a hose mask with blower, or breathing equipment with a self-contained air supply should be used. [(Gas mask; air line

respirator, or hose mask without blower may be used if there is no danger of oxygen deficiency (considered to be a breathing atmosphere of at least 19% oxygen and not more than 2% PCB)]. If the odor of PCB is detected by the person wearing protective equipment, he should immediately go into fresh air. All gas masks, respirators and replacement parts shall have Bureau of Mines approval, and be maintained on a regular schedule in accordance with the manufacturers recommendation.

(b). Fluid. Unlike insulating oil, there is virtually no fire hazard in handling PCB. A limited solvent action (similar to that for paint thinner) on the fats and oils of the skin with prolonged contact may lead to drying and chapping of the skin. As with insulating oil, some people are allergic to PCB and continued exposure may result in skin irritation. Both the liquid and vapor are moderately irritating to eye tissues.

Operating procedures should avoid contact with hot fluids (^{above} about 55°C). Use of eye protection is recommended. The use of gloves is not recommended. Contaminated clothing must be changed and laundered. Use of enclosed transfer and handling equipment, processing equipment and the use of mechanical washers reduces direct contact.

Medicinal washes or detergents followed by an application of cold cream will eliminate any irritation resulting from askarel coming into contact with an open cut or abrasion. Eye exposure to liquid PCB should be irrigated immediately with large quantities of running water from an approved eye wash source for fifteen minutes and then be examined by a physician. Persons developing a skin irritation or respiratory tract irritation apparently due to contact with PCB should be placed under the supervision of a physician. (A drop of castor oil has been found to neutralize any irritation caused by contact of PCB with the eyes.)

Ingestion or swallowing of PCB's is not generally regarded as a problem of the industry. PCB's are regarded as being moderately toxic if taken internally. Swallowing several ounces could cause irritation of the digestive tract and internal reactions, and should be referred to a physician.

4. Manufacturing control of losses: Manufacturing equipment and operating procedures must safeguard against excessive loss of PCB to the environment through close control and disposal procedures.

Enclosed systems of sealed piping, properly gasketed joints, valves, containers, and processing chambers are to be used for any portion of the operation where PCB temperatures may exceed 55°C . Enclosure shall preferably extend to all other portions of the system insofar as practicable.

Drains shall be plugged and curbs installed around all "open" portions of the PCB processing area, to assure against inadvertent loss to sewer systems by spillage, leakage, or other uncontrolled loss.

Ventilation of the area and exhaust of pump and systems gases shall be directed through filter entrapment capable of restraining vapor losses to the atmosphere of mg/liter, peak and kg per day.

Spills of PCB shall be removed promptly by use of absorptive material, preferably sawdust, or trapped and removed by pumping, or by other suitable means.

Waste fluids containing PCB and not suitable for reconditioning or reuse shall be collected (by means of traps, drip pans, trays, etc.) from the various parts of the manufacturing and processing area (including washers or other cleaning devices).

Wiper rags, clothing and other extraneous materials saturated with PCB's shall be collected within the curbed area.

5. Disposal of PCB wastes: Methods for disposal of liquids and saturated solids generated by the manufacturing operation shall be in accordance with those outlined in subsequent portions of this standard, and shall include (but not be limited to) the following:

A) Liquid PCB contaminated by aliphatic materials and other substances such as to make it unsuitable for reclaiming as a dielectric fluid.

- ✓ B) Liquid PCB from solvent operations or water/detergent type washers.
- ✓ C) Saturated earth or other absorbent media from filtering operations.
- ✓ D) Saturated sawdust or other absorptive material from spills.
- ✓ E) Saturated filters from vapor control devices and other filters.
- ✓ F) Saturated wastes (paper, rags, etc.)
- ✓ G) Saturated, spent gasket materials.
- ✓ H) PCB contaminated vacuum pump oils.
- ✓ I) PCB contaminated steam jet vacuum pump condensates.

6. Miscellaneous Procedures:

A) Spills by leakage from sealed, finished capacitors should be cleaned up promptly by use of absorbent sawdust, which should then be moved to containers for that purpose within the curbed or drained area, and later disposed of properly.

B) PCB wastes should never be disposed of, deliberately, down effluent drains or sewers. The utmost care must be exercised to prevent accidental loss by these means.

C) Capacitors failing test or otherwise designated for disposal must be controlled and handled in accordance with the intent of the procedures above, finally being disposed of by one of the means outlined below.

7. References:

- A) Monsanto Company, Organic Chemicals Division: Tech. Bulletin #PL-306 Aroclor Plasticizers (December 1960).
- B) American Conference of Governmental Industrial Hygienists: Threshold Limit Values for 1964. AMA Arch. Environ. Health 9: 545 (1964).

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- C) Treon, J.F., F. P. Cleveland, J. Cappel, and R. W. Atchley: The Toxicity of the Vapors of Aroclor 1242 and Aroclor 1254. Amer. Ind. Hyg. Assoc. Quart. 17: 204 (1956).
- D) Elkins, H. B.: The Chemistry of Industrial Toxicology. John Wiley and Sons, Inc., New York (1959).
- E) Drinker, C. K., M. F. Warren, and G. A. Bennet: The Problem of Possible Systemic Effects from Certain Chlorinated Hydrocarbons. J. Ind. Hyg. Toxicol. 19: 283 (1937).
- F) Drinker, C. K.: Further Observations on the Possible Systemic Toxicity of Certain of the Chlorinated Hydrocarbons. J. Ind. Hyg. Toxicol. 21: 155 (1939).
- G) Greenburg, L., M. R. Mayers, and A. R. Smith: The Systemic Effects Resulting from Exposure to Certain Chlorinated Hydrocarbons. J. Ind. Hyg. Toxicol. 21: 29 (1939).
- H) Hygienic Guide Series "Chlorodiphenyls" by the American Industrial Hygiene Association, 14125 Prevost, Detroit, Michigan.

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