United States
Environmental Protection
Agency

Region 9
Pollution Prevention Program
San Francisco, CA 94105

EPA 909B-00-002
May 2001
www.epa.gov/region09

A Guide for School Maintenance Personnel

Removing PCBs from Light Fixtures:

Protecting Students from Hidden Dangers

2
Introduction

Step 1: Identifying PCB Ballasts

4
Step 2: Act Immediately if Ballasts are Leaking or if there is a Fire

Accidental Exposure and What to Do

5
Health Effects of PCBs

7
Step 3: Avoid Problems - Make a Lighting Retrofit Part of Your Modernization Plan

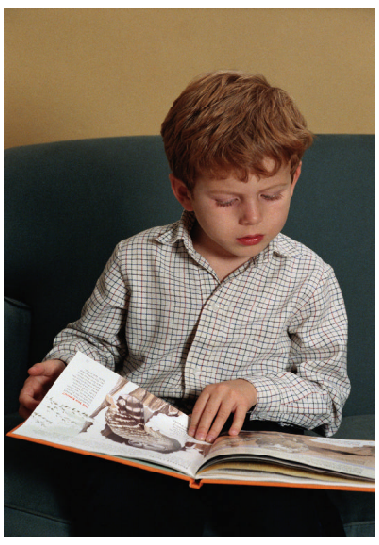
10
Resources for School Retrofits

Conclusion

The U.S. Environmental Protection Agency (EPA) recommends removal of all pre-1979 fluorescent light ballasts in schools to prevent accidental exposure of students, teachers, and other school personnel to highly toxic polychlorinated biphenyls (PCBs) through fires or leaks. This guide provides step-by-step instructions for identifying, properly managing, and ultimately replacing PCB-containing light ballasts in your school.

Introduction

Until the late 1970s, PCBs were commonly used in small capacitors and in the potting material used as insulation in fluorescent light ballasts because of their low electrical conductivity. The Toxic Substances Control Act (TSCA), enacted in 1976, banned the production of PCBs in the U.S. in 1978.



However, the continued use of PCB-containing items, such as fluorescent light ballasts, manufactured before the ban was not prohibited. That is why PCBs in light ballasts manufactured before 1978 are a potential problem for many schools in the U.S. today. As the ballasts age, they can break down and pose a potential health and environmental hazard due to increasing risk of leaks or even fires. To remove this potential hazard and increase energy efficiency, the U.S. Environmental Protection Agency (EPA), recommends a complete lighting retrofit — removal and replacement of all potentially PCB-containing fluorescent light fixtures — for all affected schools. A complete lighting retrofit is the best option because:

- It removes the hazard posed by PCBs in small capacitors and potting material in the fluorescent light fixture;
- The older fluorescent tubes used with PCB-containing (magnetic) capacitors typically do not work with the new electronic capacitors;
- The newer fluorescent tubes contain less mercury, also a toxic substance, than the older tubes;
- The newer fluorescent tubes and capacitors increase energy efficiency and lead to long-term savings; and
- The new fluorescent tubes produce better quality light and contribute to a better and safer learning environment for students and teachers.

Lighting retrofits should be conducted as part of overall school modernization efforts to ensure safety and cost-effectiveness.

This guide provides step-by-step instructions for identifying, properly managing, and ultimately replacing PCB-containing light ballasts in your school.

Step 1: Identifying PCB Ballasts

Figure 1 (right) can help you determine whether there may be PCBs in your school. If you determine that your lights might have PCBs, you should conduct a visual inspection. The ballasts are contained within the light fixture. Because you may need to remove the fixtures to view the ballasts, select a representative number of ballasts throughout the school to inspect first. Inspection may also be accomplished by removing a portion of the fixture, such as the metal panel covering the ballast. Expand your inspection if you find PCB ballasts. To prevent possible exposure if leaking ballasts are discovered, wear protective clothing, including chemically resistant gloves, boots, and disposable overalls. Make sure the survey is performed in a well-ventilated area to reduce the potential for breathing in fumes. Be sure to keep a record of the areas (e.g., classroom 101) and location of the lights surveyed.

An intact ballast.

PCBs are found only in magnetic ballasts. If your ballasts are electronic, they are

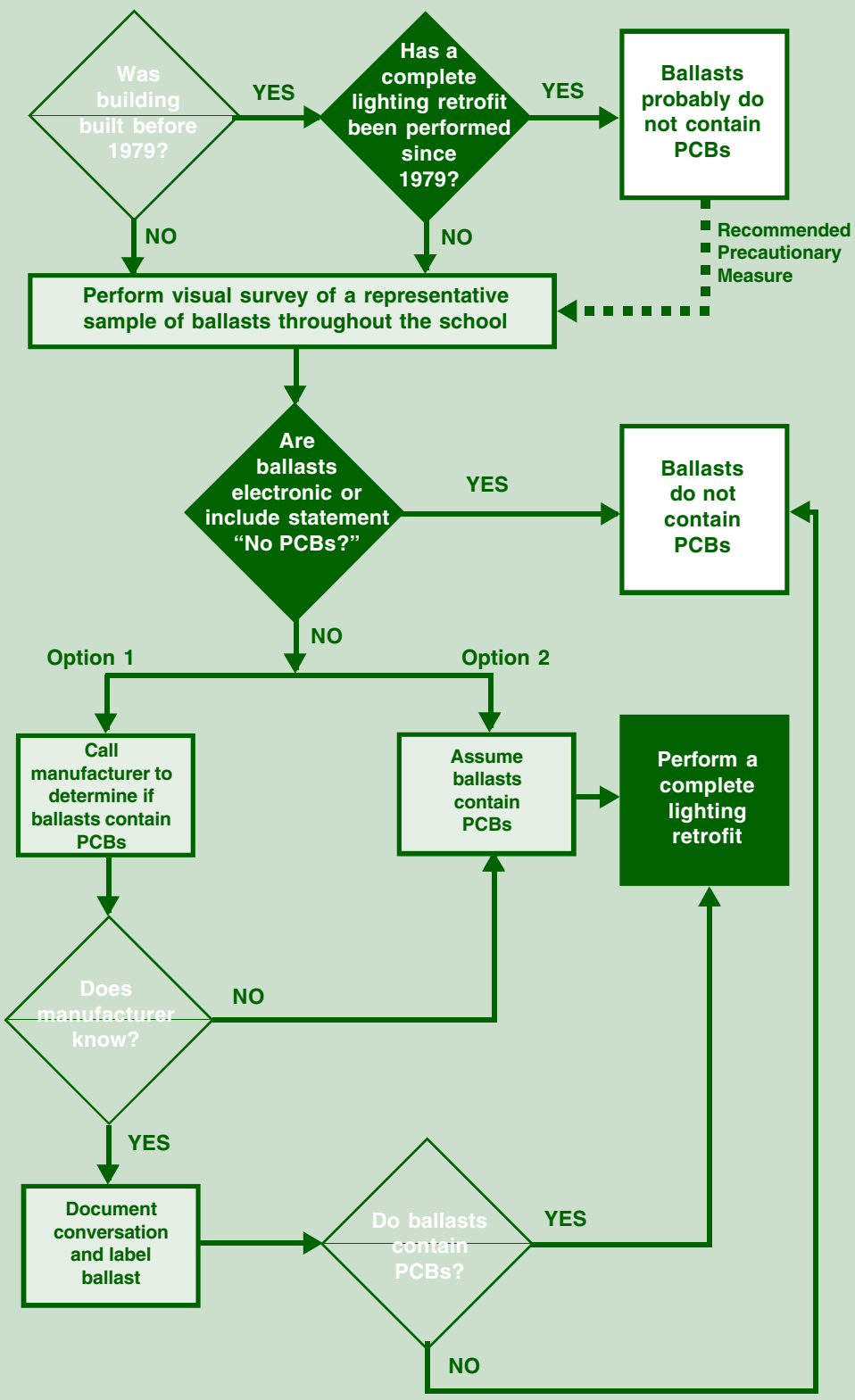
PCB-free. Electronic ballasts should be clearly marked as electronic. After July 1, 1979, magnetic ballasts manufactured without PCBs in their capacitors or potting material required the statement "No PCBs." Even if the ballasts in your sample are magnetic ballasts labeled "No PCBs," a lighting retrofit is recommended because of the educational and energy saving benefits.

If the magnetic ballasts do not have the statement "No PCBs," you have two options:

1. Assume that the ballasts contain PCBs and consider performing a lighting retrofit, OR
2. Contact the manufacturer to determine whether the ballasts contain PCBs.

If the manufacturer is not sure whether the ballasts contain PCBs, assume that they do and consider retrofitting. If the manufacturer does know whether the ballasts contain PCBs, document the conversation with the manufacturer. Then, if the ballasts contain PCBs, EPA recommends a complete lighting retrofit.

Figure 1: How to Identify PCB-containing Ballasts



Step 2: Act Immediately if Ballasts are Leaking or if there is a Fire

Leaking Ballasts - What to Do:

☑ Evacuate the area (e.g., classroom, hall way) immediately to prevent any accidental exposure through touching or breathing in fumes from the leak. Do not close off the area of the leak by shutting doors and windows as this may create a hazardous situation for personnel responding to the leak. It is important to keep students and staff as far away from the leak as practicable (approximately 100 feet minimum) to minimize potential exposure.

This ballast sparked a fire at a school in Southern California in 1999.

☑ Call 911 and inform them that the leaking ballast may contain PCBs. 911 personnel will send the appropriate local emergency response team to respond to the leak.

☑ Notify the appropriate local and state authorities.

☑ Engage a contractor to manage the decontamination and prevent further leaking. If a school has PCB-containing ballasts and is not planining a lighting retrofit, school administration should consider setting up a contract now to facilitate the decontamination process should it become necessary. Otherwise, the area of the leak could be off-limits for several months instead of just several weeks because of paperwork requirements.

Leaks typically take two forms: a clear to yellow, oily liquid, the PCB oil itself, or a tar-like substance, the liquefied potting material. Of the two, the oil contains much higher levels of PCBs, sometimes 100%, and is therefore more dangerous than the potting material.

Accidental Exposure and What to Do

To prevent accidental exposure of workers cleaning up the leak, be sure to observe the following safety precautions: wear protective clothing, including chemically resistant gloves and boots, and disposable overalls; ensure that the area of the leak is well ventilated to minimize the potential for breathing in fumes; use a respirator if proper ventilation of the area is not possible or not advised due to potential exposure.

Some of the warning signs of exposure include irritation of the eyes, nose, and throat, and an acne-like skin rash, called chloracne. Below are some tips to follow if accidental exposure occurs:

Eye Contact - immediately flush with large amounts of water for at least 15 minutes, occasionally lifting upper and lower lids.

Skin Contact - remove contaminated clothing and immediately wash contaminated skin with large amounts of soap and water. Contaminated clothing must be disposed as PCB-contaminated waste.

Breathing - remove the person from the area and take to the emergency room. Begin rescue breathing if breathing has stopped and CPR if heart action has stopped.

Please note that any skin contact may constitute overexposure. For your safety, consult a doctor as soon as possible after skin contact.

Ballast Fires - What to Do

☑ Immediately call the Fire Department, and indicate potentially hazardous materials are present. Evacuate the area.

☑ Turn off electricity to the affected area.

☑ Notify the appropriate local and state authorities.

☑ Engage a contractor to manage the decontamination.

PCB-containing ballast fires are especially dangerous because burning PCBs produce other highly toxic substances such as dioxins and furans. It is best to allow the trained professionals in the Fire Department to respond to the fire. Any personnel expected to respond to fires must be trained and equipped in accordance with federal regulation 29 CFR 1910 156.

General Cleanup and Decontamination Procedures After a Leak or Fire

The cleanup and decontamination procedures for a leak are outlined below. Due to the hazards associated with PCBs, an experienced contractor should be retained.

Suggested responsibilities include:

- Cleaning up the leak and decontaminating the area, including testing and retesting as necessary.
- Providing appropriate storage and shipping containers for waste materials.
- Marking, labeling, and preparing the drums containing the waste material from the cleanup for storage, removal, transportation, and disposal.
- Preparing manifests and other related documentation for the removal, transportation, storage, and disposal of PCB wastes and ensuring submittal to appropriate authorities.
- Notifying the appropriate federal, state, and local authorities.
- Handling any federal, state, and local reporting and record keeping requirements.
- Transporting the drum containing the leaking ballasts to a high-temperature incinerator, the only approved disposal

Health Effects of PCBs

The EPA has classified all PCBs as probable human carcinogens (cancer-causing substances). Evidence suggests a possible association between PCB exposure and liver cancer. PCBs also have significant ecological and human health effects other than cancer.

The most likely way that staff may become exposed to PCBs from light ballasts is through breathing contaminated air or touching PCB oil or PCB-contaminated materials after a ballast leak or fire. No information is available on the short-term effects of PCBs in humans. However, long-term effects can occur at any time after exposure and may last for months or years. They include: effects to the nervous and reproductive system, immune system suppression; hormone disruption; respiratory tract symptoms; gastrointestinal effects; mild liver effects; and effects on the skin and eyes such as chloracne, skin rashes, and eye irritation. Infants of mothers exposed to PCBs can experience developmental effects impairing movement, visual recognition memory, and short term memory. PCBs may also be passed onto infants through their pregnant or nursing mothers.

method for leaking ballasts, and decontaminating the associated cleanup wastes prior to transportation to a PCB disposal facility or a RCRA Subtitle C (hazardous waste) landfill permitted to accept PCB waste.

- Ensuring disposal of the wastes in accordance with federal and state regulations.

The procedures for cleaning up and decontaminating a fire are essentially the same as a leak. However, after a fire, the area must be tested not only for PCBs, but for furans as well.

Management and Disposal of Wastes from Ballast Leaks or Fires

Federal law requires that leaking PCB-containing ballasts and any PCB-contaminated materials must be incinerated at an EPA-approved high-temperature incinerator. For a list of approved facilities, please call the TSCA information hotline at (202) 554-1404, or refer to the PCB web site at ***www.epa.gov/pcb.*** Schools should be aware that, as a generator of PCB-containing ballast wastes, they could be liable in any subsequent Superfund cleanup for any improper disposal or release to the environment.

Table 1, to the left, outlines the packing, labeling, storing, transportation, reporting, and disposal requirements for disposing of the waste streams resulting from cleanup of PCB-containing ballast leaks or fires.

As a generator of PCB (or hazardous) waste, you need to prepare a Uniform Hazardous Waste Manifest, available from the incinerator that will be receiving the waste. Please note that if the EPA previously has not issued a hazardous waste generator identification number to the school, the school must obtain one by filling out and submitting EPA form 8700-12 before disposing of any PCB-containing waste.

Table 1: Packing and Disposal of Leaking, PCB-Containing Ballasts and PCB-Containing Wastes[1]

Disposal Method	USEPA-approved high-temperature incinerator
Packing and Labeling	• Place ballasts in containers that comply with EPA and Dept. of Transportation regulations. Call the TSCA hotline at 202-554-1404 for information. • All containers must have label indicating PCB waste. • Label the containers as hazardous waste according to Department of Transportation regulations.
Manifests and Reporting	Uniform Hazardous Waste Manifest required
Storage	Permit required if storing over 270 days
Transportation	Registered hauler required

[1]Disposal of PCB-containing ballasts and PCB-containing wastes are regulated federally under the Toxic Substances Control Act (TSCA).

Toxic Substances Control Act Hotline
202-554-1404

Step 3: Avoid Problems - Make a Lighting Retrofit Part of Your Modernization Plan

Planning for a Retrofit

Lighting retrofits can improve classroom quality, save money and energy, and reduce worry and liability. Replacing the older ballasts with newer lighting ballasts, reflectors, an d tubes improves lighting quality, distributing the light more uniformly and thus providing a more comfortable and productive learning environment. The newer lighting technology also increases energy efficiency which means savings for the school in the long term. Replacing PCB-containing ballasts now will prevent a potentially costly cleanup later.

A lighting retrofit ideally should be performed as part of overall modernization efforts such as roofing or seismic bracing. It is critical to examine the modernization plan to determine where a lighting retrofit would best fit into the overall plan to ensure safe, cost-effective school upgrades. To ensure that all legal requirements are met, engage a contractor to review the relationship of PCB work to the design of all building systems and the removal and replacement of PCB-contaminated equipment. The architect should consult with electrical and demolition engineers to be certain that their work is coordinated and all building codes are followed.

An experienced contractor should perform the lighting retrofit. Suggested responsibilities include:

☑ Disconnecting all power to and de-energizing all electrical equipment to be retrofitted under the supervision of a licensed electrician.

☑ Inspecting all fluorescent light fixtures to determine if each individual ballast should be assumed to contain PCBs or is potentially leaking.

☑ Disconnecting and removing all ballasts, incidental PCB-contaminated items, and fluorescent tubes from the lighting fixture housings and compartments.

☑ Providing the appropriate containers and packing materials for packaging and storing the four possible types of waste streams:

1. Intact, non-leaking, PCB-containing ballasts;
2. Leaking PCB-containing ballasts and cleanup wastes generated by handling and decontaminating areas where leaking ballasts were discovered;
3. Ballasts that contain no PCBs; and
4. Fluorescent tubes.

☑ Maintaining a record for each area (e.g., classroom, hallway) where lighting fixtures are removed including how many leaking vs. nonleaking PCB-containing ballasts were removed from each area.

☑ Maintaining a record for each drum used to store PCB-containing ballasts including:

1. The number of ballasts in the drum;
2. The condition of the ballasts - leaking or non-leaking;
3. The date the first ballasts were placed in the drum;
4. The destination of the ballasts;
5. The name of the contractor packing the drum; and

6. The name and address of the waste generator (e.g., the school's name).

☑ Packaging and labeling the drums according to federal, state, and local regulations.

☑ Storing the drums according to federal, state, and local regulations until a transporter currently licensed for transportation of extremely hazardous waste removes them to the appropriate disposal facility for each type of waste stream.

☑ Preparing manifests and other related documentation for the removal, transportation, storage, and disposal of PCB wastes and ensuring submittal to appropriate authorities.

☑ Notifying the appropriate federal, state, and local authorities.

☑ Handling any federal, state, and local record-keeping or reporting requirements.

Management and Disposal of Four Types of Retrofit Wastes

The sections below outline the notification, packing, reporting, storage, transportation and disposal requirements for the four types of wastes resulting from a lighting retrofit.

It is critical to check with state solid and hazardous waste agencies to ensure that wastes are handled properly.

Some states have adopted stricter requirements than Federal regulations. Contact your state hazardous waste program for information on the rules that apply in your area.

Schools also should be aware that, as a generator of PCB-containing ballast wastes, they could be liable under federal law in any subsequent federal cleanup at a hazardous or chemical land disposal site, incinerator, or recycling facility for improper disposal or release to the environment.

Waste 1: Intact, Non-leaking PCB-containing Ballasts

Under federal law, the EPA recommends non-leaking ballasts should be handled, transported, and disposed of as hazardous wastes. They can be sent to a chemical waste landfill, an EPA-approved high-temperature incinerator, or to an EPA-approved ballast recycler. If the EPA has not previously issued a hazardous waste generator identification number to the school, the school must obtain one by filling out and submitting EPA Form 8700-12 before disposing of any PCB-containing waste. The storage, labeling, notification, and transportation requirements vary depending on the volume of waste. Please contact the TSCA information hotline, at (202) 554-1404, for the full requirements for managing hazardous wastes.

Under TSCA, ballasts with PCB-containing small capacitors that are intact are regulated as non-hazardous waste. However, if the ballasts contain PCBs in the potting material, the ballasts are regulated as PCB bulk product waste and must be sent to an EPA-approved high temperature incinerator or disposed through other approved methods as listed in 40 CFR 761.62.

Waste 2: Leaking PCB-containing Ballasts and Cleanup Wastes

Leaking ballasts that contain PCBs must be managed as PCB waste and sent to an EPA-approved high-temperature incinerator. Any material that is contaminated by leaking PCBs should also be considered PCB waste. For proper packing, storage,

transportation, and disposal information for leaking ballasts and clean-up wastes, refer to Table 1 on page 6, call the TSCA hotline, or check the EPA website at *www.epa.gov/pcb.*

Waste 3: Non-PCB-containing Ballasts

Non PCB-containing ballasts manufactured after 1979 may contain di-2-ethylhexylphthalate (DEHP) which has been classified as a probable human carcinogen. DEHP was used as a PCB replacement in fluorescent light ballasts until 1991. However, most manufacturers stopped using it in 4-foot fixtures in 1985. Though not required under federal law, the EPA recommends you treat DEHP ballasts as hazardous waste to avoid potential releases to the environment. However, if you are disposing of more that 100 lbs. of DEHP (the equivalent of approximately 1,600 ballasts) in a 24 hour period, you must notify the National Response Center at 1-800-424-8802.

Waste 4: Mercury-containing Fluorescent Tubes

Disposal of mercury-containing fluorescent lamps is federally regulated under the Resource Conservation and Recovery Act (RCRA). Because of the high cost of testing a fluorescent lamp for mercury (approximately $140 per lamp) and the likelihood that the lamp will fail the test, USEPA recommends assuming that all fluorescent lamps contain mercury and handling them as hazardous waste. Some states have added mercury-containing fluorescent lamps to their universal waste rule, which allows streamlined storage, handling, and transportation requirements for specific types of waste. Table 2, below, summarizes the general notification, packing, labeling, transporting, storage, reporting, and disposal requirements.

Table 2: Packaging and Disposal of Mercury-Containing Fluorescent Tubes[2]

Disposal Method	Hazardous Waste Landfill	Recycling
Notification	Notify the National Response Center at 1-800-424-8802	
Packing and Labeling	• Pack lamps in cushioning material to prevent breakage • Place lamps in containers that comply with federal law. Call the RCRA Hotline at 1-800-424-9346 • Label the containers as hazardous waste according to Department of Transportation regulations	
Manifests and Reporting	Uniform Hazardous Waste Manifest required	Record waste on bill of lading
Storage	Permit required if storing over 90 days	
Transportation	Registered hauler required	No requirements

[2]Disposal of mercury-containing fluorescent tubes is regulated federally under the Resource Conservation and Recovery Act (RCRA).

Resource for School Retrofits

Energy Star Program

The U.S. Environmental Protection Agency's Energy Star Program supports corporations and organizations in installing energy-efficient lighting technologies. The program offers assistance through workshops and information services that can be accessed from the Internet. These include: Lighting Upgrade Technologies; Financing Your Upgrades; New Building Design Guidance; and Service and Product Providers. These materials are available at *www.energystar.gov*. EPA's Office of Pollution Prevention and Toxics also offers lists of approved storage and disposal facilities through its web page at *www.epa.gov/opptintr/pcb.*

State Programs

Many states provide additional incentives for lighting retrofits. Check with your state energy commission or with your local utility for more information.

Energy Providers

Both public utilities and private energy companies may offer programs to support energy efficiency improvements such as lighting upgrades. Programs may include technical assistance, rebates, or other funding assistance to support lighting upgrade projects. Contact your local energy provider for more information.

Conclusion

To eliminate the potential hazard posed by PCB-containing light ballasts, USEPA recommends removing PCB-containing ballasts as part of a complete lighting retrofit. A complete lighting retrofit includes removing old fluorescent tubes as well as ballasts and replacing the entire lighting fixture with newer, more energy efficient fixtures. A complete lighting retrofit not only eliminates the hazard, but also improves the school's learning environment, and increases energy efficiency. It's an investment that pays off with long-lasting returns to your students, your community, and the environment.