ENVIRONMENTAL HEALTH
& ENGINEERING, INC.

WHAT YOU NEED TO KNOW ABOUT MANAGING PCBs IN SCHOOLS

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Two million dollars: that's the estimated environmental clean-up cost for a single issue in an average-size older school -polychlorinated biphenyls, commonly known as PCBs. Building products that contain PCBs were commonly used in construction from the late 1950's through the early 1970's. The presence of elevated levels of PCBs (polychlorinated biphenyls) in some K-12 schools has recently garnered attention in the media. PCBs are suspected of being a factor in cancer and adverse effects on the nervous, immune, and reproductive systems. Manufacturing, new uses, and most existing uses of PCBs in the United States were prohibited in 1978. PCB-containing materials that remain in buildings pose a significant environmental liability for school systems. Practical approaches to both proactive and reactive management of PCBs in building materials can alleviate the complications that surround the discovery of PCBs in buildings.

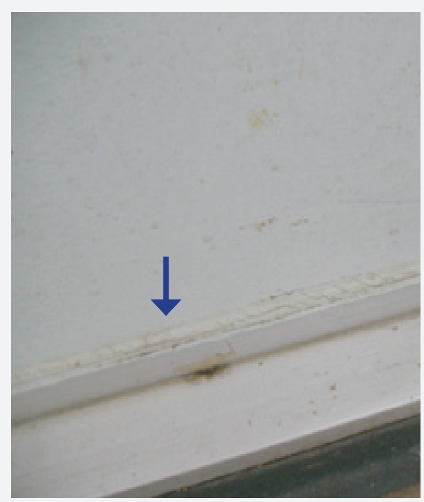
What are PCBs?

PCBs, or polychlorinated biphenyls are a family of 209 closely-related individual chemicals that had numerous commercial uses prior to being banned in the U.S. in 1978. These individual chemicals were combined together in different amounts to develop the commercial mixtures commonly known as Aroclors. PCBs, primarily Aroclor 1242 or Aroclor 1248 were used to insulate transformers, capacitors and other electrical equipment.[1] Other heavier-weight Aroclor mixtures, such as Aroclor 1254, were added to caulk, adhesives, and paint.[2] PCBs remain in the environment for very long periods of time. Low levels of PCBs are commonly present in fish, other animals, soil, meat, air, and people.[3] Because of concerns about their impact on the environment and health, manufacturing and new uses of PCBs were banned in the United States in 1978.[4]

Why are PCBs in Schools?

PCBs are found in school buildings that were constructed with materials or products that were manufactured with PCBs. Over 160 million pounds of PCBs were sold from 1958 – 1971 for use in caulk, glue, and other sealants.[5] These products were applied inside and outside of some school buildings. In addition to their use in construction products, PCBs were also used to absorb heat generated by fluorescent light fixtures that remain in some schools.[6]

FIGURE 1 PCB-containing caulk along the building envelope of a school.



We estimate that approximately 55,000 public and private elementary, middle, and high schools were constructed between 1958 and 1971, the period when PCBs were known to have been a component of certain construction materials.[7,8] This total represents 46% of schools in the United States. However, environmental testing demonstrates that not all schools from that period are constructed with PCB-containing materials.

Although a national survey of buildings has not been done, we do know that PCBs have been reported in many schools. Caulk, adhesive, paint, or fluorescent light ballasts that contain PCBs have been found in nearly 100 schools in the New England and Mid-Atlantic states, plus other buildings in Washington State, California, Ohio, and Illinois.

PCBs are present in schools in three primary ways.[9] First, building products manufactured with PCBs are a primary source of these chemicals in buildings. Second, PCBs released from primary sources can accumulate in other building materials over time, creating secondary sources of contamination in a building. Secondary sources observed in schools include ceiling tiles, molding, window glazing, insulation, brick, and concrete. Finally, PCBs can be released from primary and secondary sources and subsequently enter indoor air, dust and soil.

FIGURE 2 PCB-containing fluorescent light ballasts remain in some schools.

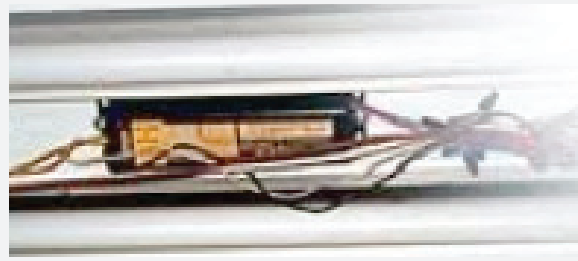


FIGURE 3 Brick and concrete block that absorbed PCBs from adjacent PCB-containing caulk has been removed from some buildings.

Testing is the only way to know for certain if PCBs are present in a school. Proactive assessments that screen school buildings based on their age, type of construction and ventilation systems are useful for controlling costs and schedules.

Do PCBs Cause Adverse Health Effects?

Like other chemicals, the potential for health effects from PCBs depend on how much, how often, and how long someone is exposed. For most people, their primary source of exposure to PCBs is through food.[10] Although PCBs have been banned for decades, they persist in the soil and are taken up by plants and animals in the human food chain, such as fish.

Studies suggest that neurological and behavioral problems developed among children whose parents regularly consumed food with high levels of PCBs. Elevated amounts of PCBs in blood have been linked to disruption of the liver, thyroid, and immune systems as well. In addition, PCBs have been classified as a probable human carcinogen based on studies of laboratory animals and results from limited studies of people.

Studies indicate that most exposure to PCBs in a school with PCB-containing construction materials occurs through breathing PCB vapors in indoor air of the building.

Research on people who have been in schools and exposed to PCBs for years provides information that is useful for evaluating the risk of PCBs in schools . Scientific studies have not linked being a student or a teacher in a school with PCBs to adverse health effects. In addition, this research has demonstrated that inhalation of PCB vapors is the primary pathway of exposure to these chemicals in schools. PCBs in the bodies of people who occupied these schools were largely related to their age and gender, and not the PCBs breathed from the air.[11-14]

In consideration of these and other studies, the U.S. Environmental Protection Agency has suggested health protective guidelines for PCBs in indoor air of schools.[15] The guideline values from EPA provide a starting point for managing PCB exposures to students and staff.

What Regulations Apply to PCBs?

PCBs in building materials of schools are subject to regulations stipulated in the Code of Federal Regulations, Title 40, Part 761. These rules define authorized and unauthorized uses of PCBs. Building materials that contain PCBs are generally not an authorized use of PCBs. The regulations also stipulate acceptable methods for disposal of PCB-containing materials that have been designated as waste.

A notable aspect of the regulations is that building owners are not required to test for PCBs in building materials. However, schools that do test and find unauthorized uses of PCBs are obligated to take the unauthorized product out of service eventually and dispose of the source material in an appropriate manner. In addition, the building owner may need to notify the regional EPA office of their findings. Notification initiates a regulatory engagement with EPA that typically involves removal of the PCB-containing materials or containment of the PCBs, clean up of PCB residues released by the unauthorized PCB-containing product, cleaning and restoration of PCB-impacted building materials and a deed restriction on the property. These programs can be lengthy, disruptive, and expensive.

The PCB regulations do not specify a schedule for making a decision as to whether or not PCB-containing materials are a waste. This aspect of the regulations provides an opportunity for property owners to identify a remediation strategy that is most appropriate for a particular

Nearly all PCB-containing materials in a school are subject to current federal regulations.

building. This is a critical period for a school system because remediation can involve large costs and significant disruption of building operations. Selecting the most appropriate strategy for remediation is important for maintaining the continuity of education and controlling expenses, while protecting the health and welfare of the occupants.

Impacts on Education

The 'discovery' of PCBs in building materials has generally occurred in conjunction with a building renovation project or as a result of testing undertaken by a municipality. In both situations, knowledge of PCBs in a building typically comes as a surprise to administrators and the school community.

The unanticipated discovery of PCBs in schools can produce numerous complications, some of which may disrupt the educational mission of a school. In the wake of a surprise discovery of PCBs, some schools have closed or delayed opening for months. Displaced students have been bused to schools that are miles away from their communities. Acute concern about health risks and clean-up may take the place of attention typically reserved for educating children. Financial resources intended to support students and staff are sometimes diverted to emergency responses.

The unanticipated discovery of PCBs in a school can lead to temporary or extended closings, relocation of students and staff, and diversion of resources to emergency response activities.

When a surprise discovery of PCBs occurs, it is important to ensure that the response is commensurate with the risk. Scheduled, proactive assessment of PCBs and mitigation of any elevated exposures can alleviate disruptions that surround the unanticipated discovery of PCBs in schools.

Economic Impacts

U.S. regulations classify almost all materials that contain PCBs that are not sealed from the environment as 'unauthorized', a determination that necessitates an EPA-approved plan for their eventual disposal. As noted earlier, the regulations apply to products intentionally manufactured with PCBs. Building materials that absorb PCBs over time are subject to the regulations as well, even though the potential for human contact with those surfaces is generally very low. Meeting health-protective guidelines for concentrations of PCBs in indoor air of schools can also be the impetus for a remediation program.

The economic implications of addressing regulatory requirements and public health objectives of building-related PCBs are substantial. Based on EH&E's experience at schools and a review of multiple studies done on behalf of clients, we estimate that the average cost for remediation of PCBs in construction materials has been about $15 per square foot of building space. For a 600-student school that is 100,000 ft^2 in size, that rate corresponds to a project cost of $1.5 million. Costs will vary depending on the type of construction and the location and concentration of PCBs found at the building. A clear, well-considered strategy is needed to control costs while complying with applicable regulations, ensuring health-protective conditions, and maintaining school schedules.

The costs of a removing primary and secondary sources of PCBs from an average-sized school are in the range of one to two million dollars. The cost of managing PCBs in place is substantially lower.

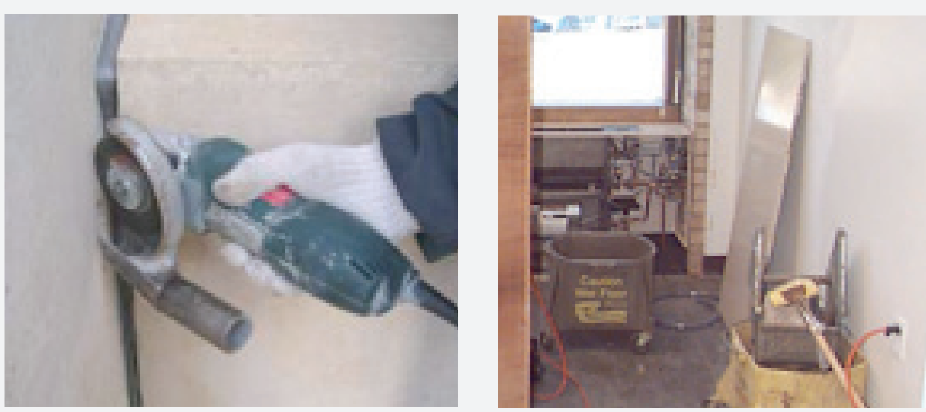
What Options Do Schools Have?

When not properly informed, the prospect of managing PCBs can be overwhelming due to the potential disruption, media attention, costs, and regulatory aspects. This in combination with limited budgets and strapped resources often forces schools into taking a position of inaction with regard to PCBs. PCBs are an emerging issue for schools and are not well understood, and this uncertainty causes schools to avoid directly addressing the issue.

While this reaction is understandable and may defer possible costs, not addressing the issue does present risks and liabilities. While 'business as usual' is the easiest path forward, it may involve silent releases of PCBs, uncontrolled elevated exposures, unlawful disposal of PCBs, and could eventually culminate in an emergency response to the unanticipated discovery of PCBs in a school building.

What option does a school have other than inaction? EH&E recommends a proactive approach that allows school administrators to manage the issue and work within their budgeting and scheduling needs.

FIGURE 4 Construction materials that contain regulated levels of residual PCBs have been removed from some buildings. The costs of these removal actions are often substantial even though the potential risks to health posed by the residual PCBs are typically very low. Risk-based approaches to managing PCBs in place can provide health protective conditions at a fraction of the cost of removing residual PCBs.



The 'business as usual' and proactive approaches to managing PCBs in schools are discussed more fully below.

Business as Usual

Deciding not to act is an understandable reaction in light of resource constraints, readily available knowledge of the issue, and what is effectively EPA's policy of "don't ask, don't tell' about PCB-containing materials in buildings. This 'business as usual' approach has some advantages such as avoidance or deferral of possible costs. However, choosing not to know about PCB-containing materials in schools can have serious consequences too.

Construction projects that result in the unwitting removal of PCB-containing materials pose avoidable risks to masons, other tradesmen, and occupants of the property. Workers may unknowingly handle PCB caulk without gloves, face masks, respirators or other appropriate personal protective equipment. Systems for containing construction debris contaminated with hazardous materials may not be employed. As a result, PCB laden dust and vapors may be spread around a building, presenting risks of exposure to building occupants, and potentially triggering a costly environmental clean-up overseen by the Massachusetts Department of Environmental Protection.

Another limitation is that construction waste that unknowingly contains regulated concentrations of PCBs may be disposed of in a landfill that is not designed to contain hazardous materials. These 'construction and demolition' (C&D) landfills are not nearly as secure as the disposal areas designed to hold everyday trash and hazardous waste. C&D landfills generally do not have protective liners and covers that prevent pollutants from moving into groundwater, soil and air. These disposal areas could eventually become a hazardous waste site. Inappropriate disposal of PCB-containing materials can therefore contribute to future environmental problems and liabilities.

Unrecognized PCB contamination of schools can also prolong exposure to building-related PCBs. While no adverse health effects have been associated with PCBs in buildings, exposures above typical background levels are known to occur in some building constructed with PCB-containing materials. The discovery of PCBs in certain schools in New York and Massachusetts led to remediation programs that reduced exposures substantially. It seems reasonable that those are not the only schools to have elevated levels of PCBs in indoor air and building materials.

In many cases, the news that PCBs are present in a school comes as a surprise to school administrators. They may be informed by a construction contractor, facilities staff member, or parent. Reaction is the only management option in this situation. When this happens, school officials must simultaneously address concerns about health risk to students and staff, abrupt changes to the school calendar, displaced students, and rapidly mounting costs. It is important to ensure that the response to a surprise discovery of PCBs is commensurate with the level of acute concern and actual risk.

An effective response to a PCB incident will include rapid assessment of potential exposure, analysis of best short-term outcomes, and engagement of parents, teachers, and other stakeholders. Following the acute phase of an incident, the focus should turn to identification of appropriate remediation strategies and recovery to normal conditions.

Proactive Management

EH&E recommends proactive management of PCBs in schools. This approach allows a municipality control over this important issue. For a proactive stance to be effective, school officials should follow a strategy that yields a *de minimus* level of risk, supports the educational mission, adheres to applicable regulations, minimizes expenses, and facilitates understanding among stakeholders. These concepts can be distilled down to Characterization, Containment, Continuity, Compliance, Costs, and Communication – six guiding principles for effective management of PCBs in schools.

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First and foremost, proactive management should encourage building owners to characterize the PCB profile of their building portfolio. By evaluating the age, type and renovation history of existing structures, an assessment can be made of what materials should be tested for PCBs, if any. This assessment can often eliminate the need for sampling and testing.

If warranted, an important next step is to characterize potential exposures to PCBs in indoor air of a school (the primary way people are exposed to PCBs in buildings), including the performance of buildings systems that influence PCB levels in indoor environments. Our experience has shown that a site-specific assessment that considers use of the building and demographic characteristics of students, staff and visitors can be useful for characterizing risks associated with exposure concentrations in a school. If indicated by an assessment of risk and evaluation of compliance with applicable regulations, schools should identify remediation strategies that are most appropriate for the site-specific disposition of PCBs in a building and any associated exposures. Proactive management provides the time needed for a school system to select the most appropriate remediation contractor as well. Finally, our experience demonstrates that early and frequent communication of conditions, risks, and plans is an essential element of managing PCBs in schools successfully. Proactive management of PCBs in buildings affords the time needed to establish effective channels of communication and engage interested stakeholders.

Summary

PCB-containing building materials represent a significant liability for school systems and municipalities. Regulation driven remediation efforts can dramatically impact the cost of a renovation or demolition, quickly costing millions of dollars for a single project. Elevated exposure concentrations in a school can lead to serious concerns about safety and disrupt pursuit of the educational mission. School and other community officials should be advised on the regulatory requirements and on the best ways to minimize health risks and their overall cost to remediate. The unique regulatory framework of the federal PCB regulations needs to be understood and wholesale proactive sampling should not be undertaken without understanding the potential regulatory risks. This environmental matter requires careful consideration and planning, and school systems should work with individuals experienced with this particular issue to avoid costly mistakes.

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