Environmental Health & Engineering

What You Need to Know about Managing PCBs in Construction Materials - An Emerging Environmental Issue

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Ninety million dollars: that's the estimated environmental clean-up costs for a typical large academic institution or commercial real estate portfolio[1] *– all from a single emerging environmental issue – polychlorinated biphenyls, commonly known as PCBs.* PCB-containing building products (primarily caulking materials), commonly used during the late 1950's through the 1970's, now pose a significant environmental liability for owners of buildings constructed during this period.

Background

PCBs are a well-known environmental hazard to real estate and environmental professionals. Excessive or repeated exposure to elevated levels of PCBs has been implicated in several health issues, including skin disorders, neurological issues, disruption of the immune and hormonal systems, liver damage, and cancer (so far confirmed only in animals)[2].

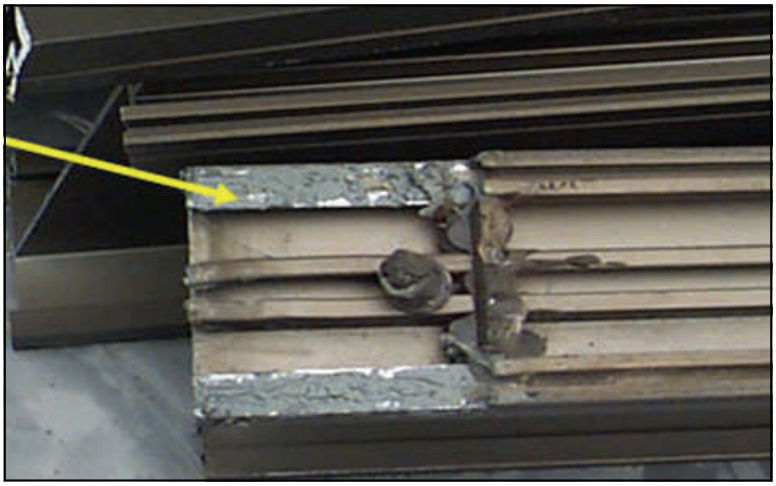

Figure 1: Caulking in contact with window frames. A recent study demonstrated that 1/3 of buildings contained caulking with levels of PCBs[4] well above allowable limits set by the EPA.

Unregulated disposal of this industrial synthetic oil has contaminated waterways and marine life in the Great Lakes, the Hudson River in New York, and the lower

Acushnet and Housatonic Rivers in Massachusetts, among other less notable clean up sites. The production and use of PCBs from 1929 to 1977 in transformers, capacitors, and other electrical equipment have been linked with the contamination of countless other sites. The cleanup costs associated with these environmental liabilities is staggering, and continue to escalate.

The potential liabilities from PCB-containing equipment are well-characterized and quantified. However, there are substantial "hidden" environmental liabilities from PCB-containing building materials. PCBs were used not just as a dielectric fluid in electrical equipment but were also added as a plasticizer to a variety of building products including paint and caulking. Recently, wood flooring varnish sold in the 1950's and 1960's has been identified as a source of PCBs in homes, schools, and public buildings[3].

The "hidden" liabilities posed by PCB-containing building materials may include a significant reduction in property value and require disclosure of this liability when the property is transferred. Recent changes to accounting practices for environmental obligations associated with owned assets may impose financial reporting requirements for this liability.

A recent study demonstrated that 1/3 of buildings contained caulking with levels of PCBs[4] well above allowable limits set by the U.S. Environmental Protection Agency (EPA). Based on data provided by the National Institute for Occupational Safety and Health (NIOSH), the "peak" production years for PCB-containing caulking were from the 1960's through the early 1970's[5]. Buildings constructed or renovated during this period are at high risk for having PCB-containing caulking. U.S. Census Bureau data for this time frame indicate that approximately $335.8 billion of private and public educational buildings were constructed in this "high risk" timeframe[6].

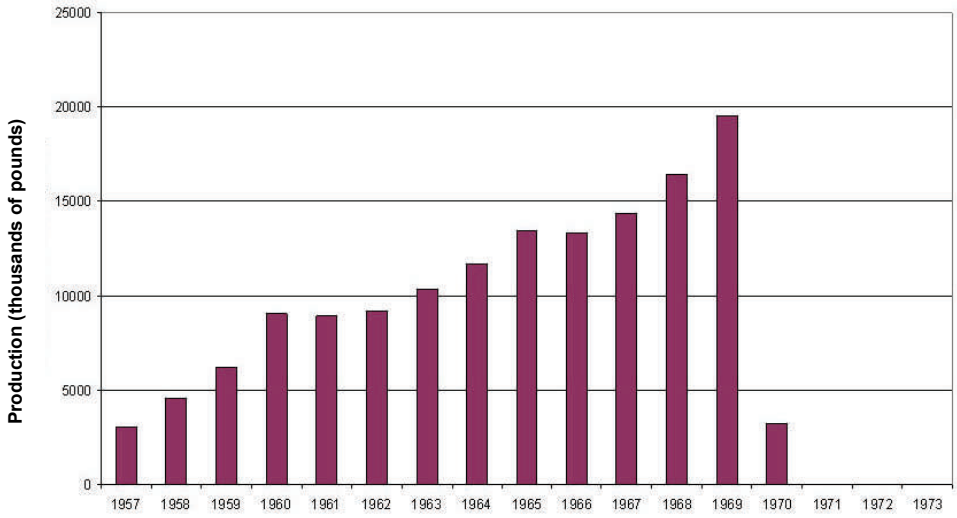

Figure 2: Production of PCBs used as plasticizers (data from Monsanto Industrial Chemicals Company, 1975)[5].

Potential Impact

U.S. environmental regulations classify almost all products that contain PCBs greater than 50 parts per million (ppm) as "unauthorized", making their continued use illegal. PCB-containing building products (primarily caulking materials) must be removed and disposed of as TSCA (Toxic Substances Control Act) classified waste. Additionally, all building components that were in contact with the caulking may require further, more invasive cleaning and restoration efforts. The associated remediation requirements can be costly and disruptive.

The TSCA regulation does not require a building owner to test for PCBs in building materials. However, once caulking is shown to contain PCBs above 50 ppm, the building owner must embark on an expensive, invasive, and time-consuming remediation program.

EH&E's 4-Step PCB Risk Assessment Includes:

- Building characteristics profile
- Site and building inspection
- Mechanical systems evaluation
- Air and surface wipe sampling

Based on EH&E's extensive project experience and review of multiple studies on behalf of clients, we estimate that abatement costs associated with the removal and disposal of PCBs as currently required by the EPA average about $15 per square foot per building. Costs may vary based on window and/or façade construction and the concentration of PCBs found at the building. Therefore, the need to have a clear, well-considered strategy to deal with this potential liability is necessary in order to effectively control costs, maintain project schedule, and still achieve the desired project outcome.

Figure 3: PCB remediation projects often include the removal of materials in contact with the PCB caulking due to unacceptable levels of residual PCB contamination.

The "discovery" of PCBs in building materials has generally occurred once a project has been contracted. These discoveries result in costly project change orders that significantly impact the construction schedule and increase the costs. Health risk and exposure to PCB are chief concerns to occupants and a proactive risk communication strategy should be implemented once PCB-containing products are identified in buildings.

The following strategy is appropriate for a building project where PCB caulking and associated materials may need to be remediated. A more comprehensive,

enterprise-wide strategy is necessary to proactively manage all the risks associated with PCB-caulking for an entire building portfolio.

EH&E Recommendations for Managing PCBs in Construction

Awareness of this issue by regulatory agencies and the construction industry is spreading rapidly. Therefore, a proactive approach is recommended to avoid regulatory mishaps and to accurately assess the costs of required remediation efforts for incorporation into the project budget. EH&E recommends the following proactive steps.

Step 1: Perform a Pre-Construction Risk Assessment at Project Design

By evaluating the age, type, and renovation history of the existing structure, an assessment can be made of what materials should be tested for PCBs, if any. This assessment can often eliminate the need for expensive testing.

Step 2: Carefully Design the Materials Testing Protocol

If materials testing is warranted, a review of the testing protocol and analysis of the results by a knowledgeable expert can potentially save the owner a great deal of time and money. The experience of the University of Massachusetts on a recent project provides a useful illustration of this point. Random testing results from a large multi-wing facility were initially interpreted as requiring remediation of all caulking. A follow-up stratified sampling program designed by EH&E identified two wings of the structure where no remediation was necessary. This review and additional sampling saved the university approximately $2.5M and reduced scheduling delays on the project, which was already in progress.

Step 3: Get Expert Help with Remediation Project Design

When remediation of PCB-contaminated materials is warranted, EH&E recommends a knowledgeable review of the remediation design prior to implementation. Regulatory requirements call for removal of all PCB-contaminated materials as well as PCB-containing materials. Masonry or other

building components that come in contact with caulking will often become contaminated to various degrees based on the porosity of the material. Analyzing the extent of the contamination can often make a significant difference in remediation effort and cost. Wholesale removal of sections of a façade may be avoided by accurately determining the extent of PCB penetration into surrounding materials, which can significantly reduce the cost and time for remediation. Further, the regulations allow for both a prescriptive clean-up procedure as well as a risk-based clean-up procedure. Both approaches have their merits and drawbacks, and it is important for any building owner to carefully consider each clean-up option; and select the approach that best satisfies his/her unique needs and asset management strategy.

Step 4: Develop a Proactive Communication Plan for Building Occupants and Regulators

Should testing determine that building materials require removal, keep tenants and regulators informed. Inform regulators of your activities and share both the testing protocol and the final remediation plans. Keep occupants informed of the precautions in place to protect them from exposure during the remediation process. A carefully designed monitoring program may be necessary if work will occur while the building is fully or partially occupied. All communications should be structured to align with the goals of a proactive risk communication program considering all the stakeholders; including occupants, regulators, investors, workers, media, and the community.

Summary

PCB-containing building materials represent a newly discovered and significant liability for building owners, real estate developers, REITS, financing institutions, and contractors. The regulation-driven remediation efforts can dramatically impact the cost of renovation or demolition, quickly costing millions of dollars for a single project. Public and private owners of real estate should be advised on the regulatory requirements and legal implications and on the best

ways to minimize their risk and the overall costs to remediate. The unique regulatory framework of the TSCA PCB rule needs to be understood; and wholesale proactive sampling to identify PCB caulking should not be undertaken without understanding the potential regulatory risks. This emerging environmental risk requires careful consideration and planning, and building owners should work with individuals experienced with this particular issue to avoid costly mistakes.

Understanding the true magnitude of PCB risks to building occupants is the key to maintaining a healthful building environment and is the basis for effective communication. Having a well thought out, documented, and proven methodology for PCB risk assessment can help minimize unnecessary and costly building material evaluations.

1 Based on an average of 10 million square feet and $15 per square feet of remediation cost, estimating that 60% of building stock is potentially vulnerable based on age of construction and rehabilitation practices.

2 Agency for Toxic Substances and Disease Registry (ATSDR). ATSDR. 2000. Toxicological Profile for Polychlorinated Biphenyls. Atlanta, GA: Agency for Toxic Substances and Disease Registry.

3 PCB-Containing Wood Floor Finish. Environmental Health 2008, 7:2, January 17, 2008.

4 Herrick RF, McClean MD, Meeker JD, Baxter LK, Weymouth GA. 2004. An Unrecognized Source of PCB Contamination in Schools and Other Buildings. Environmental Health Perspectives 112(10):1051–1053.

5 National Institute for Occupational Safety and Health (NIOSH). Current Intelligence Bulletin: Polychlorinated Biphenyls (PCBs). PCB Manufacture and Sales Monsanto Industrial Chemicals Company, 1965 Through 1975 (Thousands of Pounds).

6 U.S. Census Bureau data on construction of public and private educational facilities, 1964 – 1975, values have been adjusted in terms of constant 2006 dollars. Statistics compiled by Margaret M. Parks and Maximilian P. Chang of EH&E.

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