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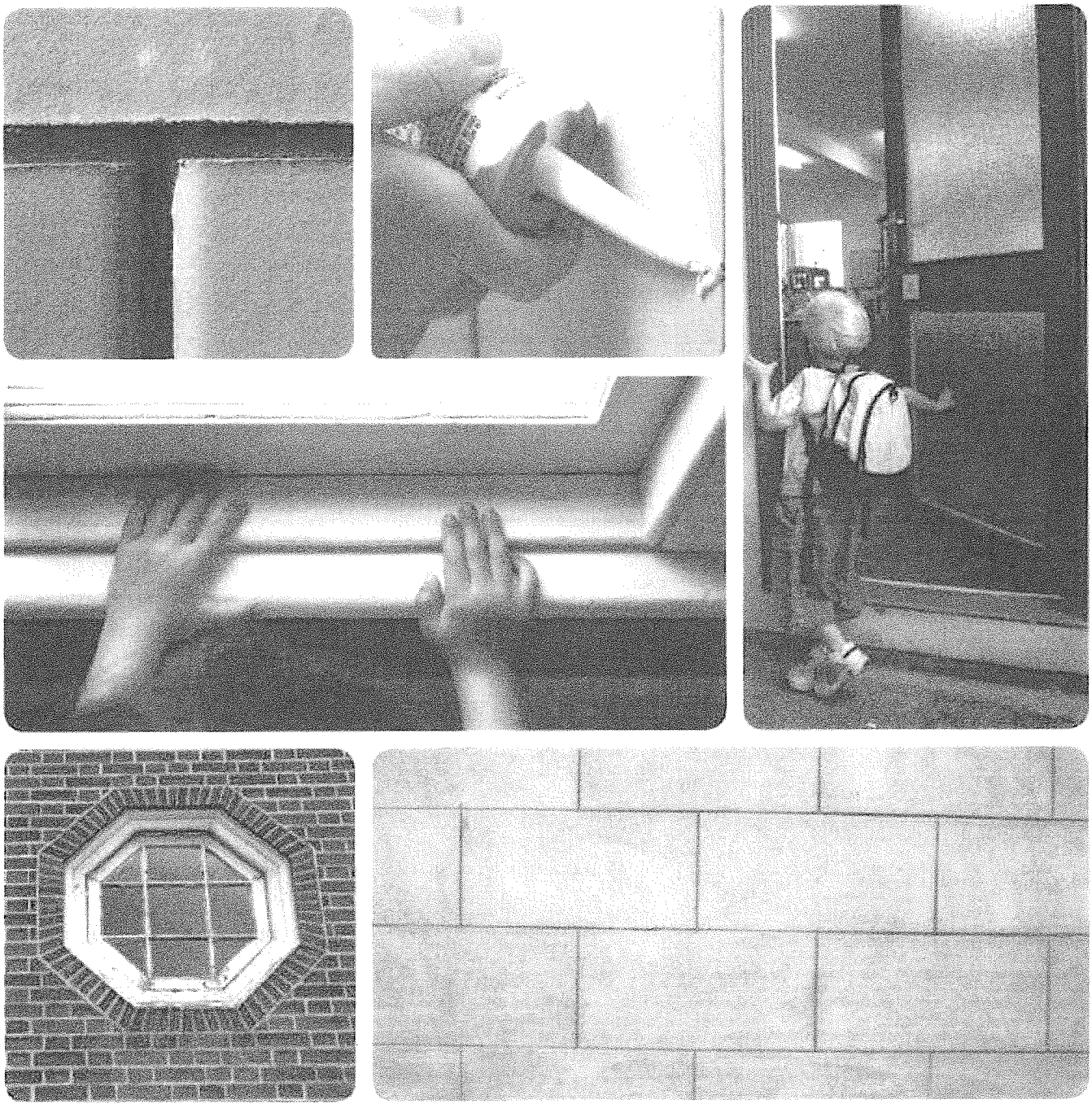
EPA Preventing Exposure to PCBs in Caulking Material



PCBs are found in high levels in building caulk

Caulk containing high levels of PCBs (polychlorinated biphenyls) has been found in many schools and other buildings built or remodeled before 1979. Because PCBs can migrate from the caulk into air, dust, surrounding building materials, and soil, EPA is concerned about potential PCB exposure to building occupants.

Health impacts of PCB exposure

PCBs are man-made toxic chemicals that persist in the environment and bioaccumulate in animals and humans. PCBs were manufactured in the United States between 1950 and 1979, before their manufacture was banned by Congress due to concerns about their potential for adverse effects on human health and the environment. Exposure to PCBs can affect the immune system, reproductive system, nervous system, and endocrine system. In humans, PCBs are potentially cancer-causing.

Protect children and other building occupants

An important step to protect children and other building occupants is to minimize the potential for PCBs to be present in the indoor air. Indoor air levels of PCBs within a school can be reduced by ensuring that the ventilation system is operating as designed, and to repair or improve the system if it is not.

The following additional steps described below can help reduce exposure to PCBs in caulk until it can be removed.

- Clean frequently to reduce dust and residue inside buildings.
- Use a wet or damp cloth or mop to clean surfaces.
- Use vacuums with high-efficiency particulate air (HEPA) filters.
- Do not sweep with dry brooms and minimize the use of dusters.
- Wash hands with soap and water after cleaning and before eating or drinking.

Test for PCBs in buildings built between 1950 and 1979

If school administrators and building owners are concerned about exposure to PCBs and wish to supplement these steps, EPA recommends testing to determine if PCB levels in the air exceed EPA's suggested public health levels. If testing reveals PCB levels above these levels, schools should attempt to identify any potential sources of PCBs that may be present in the building, including testing samples of caulk and other building materials (e.g., paints, floor and ceiling tiles) and looking for other potential PCB sources (e.g., old transformers, capacitors, or fluorescent light ballasts that might still be present at the school).

If elevated air levels of PCBs are found, schools should also have the ventilation system evaluated to determine if it is contaminated with PCBs. Although the ventilation system is unlikely to be an original source of PCB contamination, it may have been contaminated before other sources of PCBs were removed from the school and may be contributing to elevated air levels. Contaminated ventilation systems should be carefully cleaned. Ideally, such cleaning should be planned in concert with removal of any sources of PCBs that are found to avoid re-contamination of the system.

During the search for potential sources, schools should be especially vigilant in implementing practices to minimize exposures and should retest to determine whether those practices are reducing PCB air levels. EPA will assist in developing a plan to reduce exposure and manage the caulk. Your EPA regional PCB coordinator can direct you to a PCB testing lab; see the back cover for more information.

PCBs were not added to caulk after 1979. Therefore, in general, schools built after 1979 do not contain PCBs in caulk.

Avoid exposure to PCBs in building caulk

PCBs may be released to air from intact, undisturbed caulk through off-gassing, and people may inhale the released PCBs. The condition of the caulk is not an indicator of the presence of PCBs. The only way to be sure that caulk has PCBs is to have a professional test the caulk. In addition to inhalation from PCBs in the air or dust, exposure may occur when a person comes in contact with the caulk and any surrounding materials into which the PCBs may have been released (e.g., brick, concrete, wood). Exposure may also occur through contact with PCB-contaminated soil adjacent to buildings. Soil may become contaminated with PCBs when caulk weathers.

Protections during removals, renovations

Schools, building owners, and day-care providers in public and commercial buildings need to follow PCB-safe renovation practices to minimize potential exposures resulting from renovations to workers, teachers, and children.

It is important to manage the removal in a way that minimizes workers' exposure to the PCBs (e.g., use protective clothing such as facemasks, gloves, etc.) and prevents the release of PCBs into the environment. The work practices described below can help reduce exposure to PCBs in caulk until it can be removed.

In addition to the safeguards mentioned above:

- Wear appropriate protective clothing when conducting cleanup activities.
- Dispose of all cleanup materials (mops, rags, filters, water, etc.) in accordance with all federal, state, and county regulations.
- For caulk used on windows, walls, columns, and other vertical structures that people may come into contact with, use heavy-duty plastic and tape to contain the area so that caulk or dust and debris from the surrounding masonry do not escape. The plastic should cover the caulk and surrounding areas of masonry.

EPA is helping to address the issue of PCBs in caulk

EPA has conducted research on how the public is exposed to PCBs in caulk and on the best approaches for reducing exposure and potential risks associated with PCBs in caulk. Based on EPA's Office of Research and Development's laboratory research, encapsulation was found to be most effective for interior surfaces that contain low levels of PCBs (i.e. several hundred parts per million). Depending on the PCB reduction goal, the performance of the encapsulant, and the conditions of the building, the upper limit of the PCB concentration for successful encapsulation may vary. Therefore, post-encapsulation monitoring is an essential part of the encapsulation process. Building owners should consult EPA's research on this issue for more specifics (see ORD report). Encapsulation may be useful for the reduction of emissions from secondary sources such as contaminated building materials under and around PCB-containing caulk or paint that has been removed. Encapsulation was not found to be effective in reducing emissions from sources that have a high PCB content (for example caulk) for more than a short period of time. Because each site will present unique circumstances, please consult your EPA PCB Regional Coordinator (www.epa.gov/pcbs) regarding the application of encapsulation measures on a case by case basis.

Where PCBs have been found in caulk, EPA is committed to helping schools and communities enact plans to reduce exposure. Please contact your regional PCB coordinator for help with assessing contamination and exposure and developing cleanup plans. A list of the regional PCB coordinators can be found at www.epa.gov/pcbs, or call EPA's Toxic Substances Control Act (TSCA) Hotline at 888-835-5372.

Summary

EPA is particularly concerned when PCBs are present during renovation or remodeling activities because these activities increase the potential likelihood of exposure.

- Keep people out of areas where renovation or remodeling activities are occurring.
- Promote safe work practices during renovation activities.
- Take actions to safely remove caulk during PCB removal or renovation projects and undertake and complete the work in a timely fashion.

PCBs in Caulk—Q&A

Background on PCB Exposure and Risk

1. What are PCBs?

Polychlorinated biphenyls, PCBs, are persistent manmade chemicals that were widely used in construction material and electrical products before 1979. In 1976, Congress banned the manufacture and use of PCBs because of concern about their health and environmental effects and they were phased out except for certain limited uses in 1979. The use and disposal of PCBs before the phase-out resulted in their widespread presence in our soil, air, water and food. Despite the federal ban, they remain present today in caulking and sealants used in the construction or renovation of older buildings before 1979.

2. What are the potential health effects of PCBs?

PCBs build up in our bodies over time, and PCB exposure over a long period of time can be harmful to our health.

Short term exposure to large amounts of PCBs can lead to skin conditions such as acne and rashes, decreased liver function, neurological effects, and gastrointestinal effects. These types of acute toxic effects due to high levels of exposure are generally rare. Chronic exposure to lower levels of PCBs may also cause health effects. In animal studies, PCBs have been shown to cause effects on the immune, reproductive, nervous and endocrine systems. PCBs have also been shown to cause cancer in animals. Some studies in humans provide supportive evidence for these health effects. Studies also show that PCBs in pregnant women can have an impact on their children's birth weight, short-term memory, and learning.

3. How are people exposed to PCBs?

Though PCBs were banned from production in 1979 they still typically exist in low-levels in our environment – in the food we eat, the air we breathe and in dirt and dust – and they build up in our bodies over many years. This long-term build-up of PCBs is what potentially causes harm. The levels of PCBs in our environment and in the bodies of people in this country have decreased significantly over time.

Food is a major source of exposure to PCBs. Fish (especially fish caught in polluted waters) contains small amounts of PCBs, as do meat and dairy products. People can also be exposed to PCBs by handling products that contain them, or by breathing in contaminated air or dust in areas where a product containing PCBs was disturbed or disposed. Workers whose jobs involve repairing or dismantling PCB-containing products are at the highest risk for exposure in this way. Indoor air and dust may also be a significant source of PCB exposure from PCB-contaminated caulk, electrical products, other building materials or products that contain PCBs.

4. What do we know about dietary ingestion of PCBs?

PCB concentrations in U.S. foods are generally decreasing. However, despite significant reductions, the dietary ingestion of PCBs remains a major source of PCBs for most members of the U.S. population. Fish, dairy products and meat, generally contribute the most to the total dietary intake of PCBs.

5. How do PCBs persist in the environment and bioaccumulate in people?

PCBs continue to be present indoors in buildings, and outdoors in cities and even remote wilderness locations more than thirty years after their production was banned in the United States. PCBs are stored in the fat of animals and humans, which means that humans may be exposed to PCBs through their diet when eating fish, dairy products or meat.

6. Although here are multiple sources of exposure to PCBs, isn't food the highest exposure?

Generally, this is true. However, PCBs are widespread in the environment and people are potentially exposed through multiple pathways. Levels in air, water, sediment, soil, and food vary over several orders of magnitude, often depending on proximity to a source of release into the environment. Estimates of average daily intake via diet vary widely depending on geographic area and eating habits. People whose diet is high in some types of fish, game animals, or products of animals contaminated through the food chain will have higher exposures to PCBs. People exposed to elevated air or dust levels may also have higher levels, although research to determine the relationship between these routes of exposure and PCB levels in human blood and tissue is lacking.

7. Should I be concerned about PCB exposures?

Though this is a serious issue, the potential presence of PCBs in buildings should not be a cause for alarm – there are steps building owners can take to protect students, teachers and others, as described in EPA's Fact Sheet and later in these Q&As.

PCB-Containing Caulk in Schools and other Buildings

8. What is known about use of PCBs in caulk?

PCBs were used widely in caulking and elastic sealant materials, particularly from 1950 through the 1970s. These materials were primarily used in windows, door frames, stairways, masonry columns, and other masonry building materials. PCBs were used in these building materials because of its properties as a plasticizer.

9. What PCB levels have been detected in caulk from this time period?

PCBs have been detected in caulk in buildings, including schools, with concentrations ranging from as low as 50 ppm to as high as 440,000 ppm. In many cases, PCBs were used in caulk with a concentration as high as 30%.

10. What percentage of schools and other buildings constructed between 1950 and 1979 contain PCB-contaminated caulk?

No national survey of PCBs in caulk has been conducted so EPA does not have precise information on the prevalence of PCB-containing caulk in schools and other buildings. Based on the small number of test samples gathered from different parts of the country and because of its excellent properties as a plasticizer, EPA believes that the presence of such caulk in schools and other buildings built or renovated in this period could be widespread. This is why EPA is alerting the public to this issue and providing information on how to address this concern.

11. What about caulk in single-family houses or other places?

EPA has found PCBs in large scale apartment complexes and public buildings. To date, EPA has not found PCBs in caulk in single-family houses, although the use of PCB contaminated building materials in residences is not well-documented. There is a limited published literature indicating that PCBs may be found in single-family homes, but generally at air concentrations below the public health exposure levels developed by EPA and noted in this announcement.

12. Aren't there reports that PCB-containing caulk may have been used in public drinking water systems?

Yes, PCBs have been found in public drinking water basins in California and Colorado. In each case, the caulk was removed and replaced. The water in these basins is also being regularly tested to make sure that there is no residual PCB contamination.

Exposure to PCBs from Caulk in Schools and other Buildings

13. What are potential sources of PCBs in schools and buildings?

Potential sources of PCBs in buildings built or renovated between about 1950 and 1979 include caulking used around windows, door frames, masonry columns and other building materials. This caulk may be present inside and on the exterior of the building as well as surrounding surfaces. PCBs may also have been used in building expansion joints, mastics and other adhesives and in the manufacture of some ceiling tiles and other acoustic boards. Many old lighting systems contain ballasts manufactured with PCBs. These PCBs can get into the air if the ballast fails or ruptures. PCB-containing building materials such as caulk; and light ballasts are considered by EPA to be potential primary sources of PCBs in buildings and schools. PCBs

from primary sources can lead to elevated concentrations of PCBs in indoor air that later adsorb or leach onto other surfaces, which then become secondary sources of PCBs. These secondary sources can cause elevated indoor concentrations even when primary sources have been removed.

14. Why is the Caulk a Potential Source of Exposure?

If caulk contains PCBs, the PCBs may be released to air from intact, undisturbed caulk through off-gassing, although the mechanism for such release is not well-understood. There have also been reports of school buildings where exterior caulk has peeled off and contaminated the surrounding soil, and the soil was removed to protect children from unsafe exposure.

15. What do we know about PCB concentrations in the indoor air in those schools constructed or renovated using PCB contaminated building materials?

Although we do not have extensive data on indoor air concentrations in schools and buildings, elevated levels of PCBs in air have been measured inside schools and in laboratory experiments and other buildings. The measurements from reported studies indicate that PCB indoor air concentrations are highly variable from school to school, and from room to room within the same school. Measured air concentrations depend upon many factors including the source or sources of PCBs, the age and condition of building materials, and building ventilation rates. Measured values range from a few nanograms (one nanogram = one billionth of a gram) per cubic meter to several thousand nanograms per cubic meter.

16. Are PCB Air Levels in Schools a Significant Exposure Source?

This depends on the levels present. The highest levels that have been measured would exceed the health levels that EPA has developed to define a prudent level of health protection. It is important, however, to recognize that we lack extensive data on the presence and levels of PCBs in indoor air in schools and other buildings.

17. What do we know about PCB concentrations in indoor dust in those schools constructed or renovated using PCB contaminated building materials?

Indoor dust is a potential source of non-dietary ingestion of PCBs and is, therefore, a potentially important route of human exposure to PCBs. While PCBs have been measured in the dust inside schools and buildings constructed or renovated using PCB contaminated building materials, the levels are not well documented. The measurements that we do have indicate that PCB concentrations in dust are highly variable from school to school, and from room to room within the same school. Indoor dusts are composed of multiple types of materials, potentially including crumbling building materials, outside soils tracked into buildings, and various kinds of organic matter. Measured values range from less than 1 to 100 micrograms (one millionth of a gram) of PCBs per gram of dust. Touching PCB-contaminated caulk may result in short-term exposure to PCBs. Although EPA has not yet determined what the long term effects may be from these exposures, touching caulk should be avoided as much as possible and minimizing indoor dust should be encouraged.

18. What do we know about PCB concentrations in the soils surrounding schools constructed or renovated using PCB-contaminated building materials?

The soils surrounding schools can be contaminated with PCBs originating from building materials. Soils contaminated with PCBs from building materials are not well understood. Generally, we would expect that higher concentrations of PCB contaminated soils would be closer to school buildings.

Research Studies

19. What research has EPA conducted?

EPA research on PCBs in schools was designed to identify and evaluate potential sources of PCBs in order to better understand exposures to children, teachers, and other school workers, and to improve risk management decisions. EPA has investigated PCB-contaminated caulk, as well as other potential sources of PCBs in schools. Specifically, EPA's Office of Research and Development has:

- characterized potential sources of PCB exposures in schools (caulk, coatings, adhesives light ballasts, etc.)
- investigated the relationship of these sources to PCB concentrations in air, dust, and soil
- evaluated methods to reduce exposures to PCBs in caulk and other sources.

Measures to reduce PCB exposure in Schools or Other Buildings

20. Are my children in danger if my school or building has PCB-containing caulk?

PCBs may cause serious harm when exposure occurs over a long period of time. That is why EPA has recommended a goal of minimizing students' and teachers' exposure to PCBs. It should be recognized that exceeding EPA's levels for a school exposure does not mean that adverse effects will necessarily occur. Because PCBs accumulate over such long averaging times, short term exceedances of the levels will likely cause only small changes to human blood concentrations, and these can be offset by other periods of exposure to lower air levels. Comparing total exposure from all sources to the levels is a conservative, health protective estimate, as it assumes that most of the inhaled PCB is absorbed and none exhaled.

21. What are the best near-term actions to reduce PCB exposures in buildings with PCB-containing caulk?

It is important to minimize exposure to PCBs from caulk and its residues through inhalation, skin contact or ingestion. Where schools or other buildings were built or renovated between 1950 and 1979 an important step that can be done is to minimize the potential for PCBs to be present

in the indoor air. Indoor air levels of PCBs can be reduced by ensuring that the ventilation system is operating as designed, and to repair or improve the system if it is not.

Other actions to minimize exposure include:

- Clean frequently to reduce dust and residue inside buildings
- Use a wet or damp cloth or mop to clean surfaces
- Using vacuums with high efficiency particulate air filters
- Do not sweep with dry brooms; minimize the use of dusters near areas with caulk
- Wash children's hands with soap and water often, particularly before eating• Wash children's toys often
- Wash hands with soap and water after cleaning, and before eating or drinking.

22. Should air be tested for the presence of PCBs in schools and buildings?

School administrators and building owners should also consider testing to determine if PCB levels in the air exceed EPA's suggested public health levels. If testing reveals PCBs in the air above these levels, schools should be especially vigilant in implementing and monitoring practices to minimize exposures. EPA has calculated prudent public health levels that maintain PCB exposures below the "reference dose" – the amount of PCB exposure that EPA does not believe will cause harm. Further explanation of this dose and EPA's public health levels is included further down in this document in the "Suggested Concentrations of Indoor Air" section. In short, EPA developed a reference dose (RfD) of 20 ng PCB/kg body weight per day. Maximum values are based upon EPA's understanding of average exposure to PCBs from all other major sources. Maximum concentration values were developed for all ages of children from toddlers in day-care to adolescents in high school as well as for adult school employees.

23. What do I do if PCBs are found in air?

If PCBs are found in the air at levels above maximum concentration values, EPA will work with school administrators or building owners to develop a plan to minimize exposures including, where necessary, plans to remove the PCB contaminated caulk.

If elevated air levels of PCBs are found, schools should also have the ventilation system evaluated to determine if it is contaminated with PCBs. Although the ventilation system is unlikely to be an original source of PCB contamination, it may have been contaminated before other sources of PCBs were removed from the school and may be contributing to elevated air levels. Contaminated ventilation systems should be carefully cleaned. Ideally, such cleaning should be planned in concert with removal of any sources of PCBs that are found to avoid re-contamination of the system.

Building owners or managers should also consider air monitoring after they have removed the caulk or taken other remedial actions to determine if inhalation exposure is still a concern. If the

air monitoring shows elevated levels remain, there may be another source of PCBs other than in the caulk that may need to be investigated.

24. Does deteriorating caulk require special attention?

Not necessarily. EPA research has found high levels of PCBs in caulk that is largely intact and still somewhat flexible and not deteriorating. It is the caulk with high PCB concentration that have the highest potential for release of PCBs into the air through direct emissions.

25. Should students and teachers be removed from buildings with elevated levels of PCBs in the air?

EPA does not believe evacuation is generally necessary. Since possible health effects are the result of cumulative exposure over long periods, elevated exposures for brief periods should be acceptable. If PCBs are found in air at levels above EPA's public health targets, the number one priority should be to reduce exposures as soon as possible.

26. Should PCBs be removed during building repair and renovation activities?

Yes. Where schools or other buildings were constructed or renovated between 1950 and 1979, EPA recommends that PCB-containing caulk be removed during planned renovations and repairs (when replacing windows, doors. roofs, ventilation, etc.). EPA recommends testing caulk that is going to be removed as the first step in order to determine what protections are needed during removal. Where testing confirms the presence of PCBs, it is critically important to ensure that they are not released to air during replacement or repair of caulk in affected buildings. EPA is recommending simple, commonsense work practices to prevent the release of PCBs during these operations.

27. What special procedures are needed when doing repairs that may disturb PCB-containing caulk?

When PCB-containing caulk is removed and disposed of, it can contaminate surrounding surfaces. If repairs are necessary in areas that may contain PCBs, schools should test the caulk to determine whether it contains PCBs at or greater than the regulatory threshold. Repairs that disturb PCB-containing caulk, such as window removal and replacement, should be conducted by trained workers who use safe work practices to minimize dust and contain contaminated waste. Once the window replacements have been completed, the area should be thoroughly cleaned using recommended methods. EPA has developed guidance for minimizing exposures when conducting remediation and renovation activities.

Steps contractors should take include:

- Ensure workers are properly trained and are using gloves, eye goggles, skin protection and approved particulate breathing masks,.
- In dusty work areas, have showers available and separate changing areas so that dust on clothing is not brought home.
- If working with solvents, provide respirators.
- Cover work areas with plastic.
- Use heavy plastic sheeting to cover floors and other fixed surfaces like large appliances in the work area.
- Close and seal vents in the work area and, if necessary, turn off forced-air heating and air-conditioning systems.
- Regularly clean the work area with industrial (HEPA) vacuum and wet mopping.
- Properly dispose of personal protective equipment and cleaning material.

EPA is aware of situations in which PCBs have moved or leached from the old caulk into the surrounding building materials. Based on EPA's Office of Research and Development's laboratory research, encapsulation was found to be most effective for interior surfaces that contain low levels of PCBs (i.e. several hundred parts per million). Depending on the PCB reduction goal, the performance of the encapsulant, and the conditions of the building, the upper limit of the PCB concentration for successful encapsulation may vary. Therefore, post-encapsulation monitoring is an essential part of the encapsulation process. Building owners should consult EPA's research on this issue for more specifics (see link to ORD report). Encapsulation may be useful for the reduction of emissions from secondary sources such as contaminated building materials under and around PCB-containing caulk or paint that has been removed. Encapsulation was not found to be effective in reducing emissions from sources that have a high PCB content (for example caulk) for more than a short period of time. Because each site will present unique circumstances, please consult your EPA PCB Regional Coordinator (insert link to webpage) regarding the application of encapsulation measures on a case by case basis.
Additional details about EPA's research findings may be found at:
http://www.epa.gov/pcbsincaulk/caulkresearch.htm

27. Why shouldn't all schools be testing all caulk to determine whether it contains PCBs?

The regulations do not require testing for PCBs. While testing the caulk to determine whether PCBs are present is useful in some instances, EPA at this time recommends air testing as the next step for schools that are concerned about potential risks and wish to supplement the protections provided by EPA's recommended best practices. As EPA gains new information from ongoing research, it will make further recommendations regarding testing and removal of

PCB-containing caulk. School administrators and building owners should consider testing to determine if PCB levels in the air exceed EPA's suggested public health levels. It is possible that PCBs may be released to air from intact, undisturbed caulk through off-gassing, although the mechanism for such release is not well-understood.

28. How will the results of research affect EPA's recommendations?

Research conducted by EPA and others has helped to clarify three issues: 1) potential sources of PCB exposures in schools (caulk, coatings, mastics and adhesives, light ballasts, etc.); 2) the relationship of these sources to PCB concentrations in air, dust, and soil; and, 3) methods to reduce exposures to PCBs in caulk and other sources. Read about the results of this research.

29. What procedures should I use if my school or building will be conducting air testing?

For determining the presence of PCBs in indoor air, EPA has two approved methods: Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air – Compendium Method TO-4A (high air volume) and Compendium Method TO-10A (low air volume). These two methods can be found respectively at:

www.epa.gov/ttnamti1/files/ambient/airtox/to-4ar2r.pdf
and www.epa.gov/ttnamti1/files/ambient/airtox/to-10ar.pdf

30. If I decide to test the caulk itself for the presence of PCBs, how should I do it?

There are several methods for determining the presence of PCBs in caulk. You can have a sample of the caulk tested by an analytical lab. The lab should follow the recommended approach referenced in EPA's PCB regulations, such as method 3500B/3540C from EPA's SW-846, Test Methods for Evaluating Solid Waste; or an alternative method validated under subpart Q, for chemical extraction of PCBs. For analyzing extracts, Method 8082 from EPA's SW-846 or a method validated under Subpart Q is appropriate.

31. Shouldn't contaminated caulk simply be encapsulated to prevent the release of PCBs?

EPA has looked at the effectiveness of encapsulation techniques to prevent the release of PCBs. Based on EPA's Office of Research and Development's laboratory research, encapsulation was found to be most effective for interior surfaces that contain low levels of PCBs (i.e. several hundred parts per million). Depending on the PCB reduction goal, the performance of the encapsulant, and the conditions of the building, the upper limit of the PCB concentration for successful encapsulation may vary. Therefore, post-encapsulation monitoring is an essential part of the encapsulation process. Building owners should consult EPA's research on this issue for more specifics (see link to ORD report). Encapsulation may be useful for the reduction of emissions from secondary sources such as contaminated building materials

under and around PCB-containing caulk or paint that has been removed. Encapsulation was not found to be effective in reducing emissions from sources that have a high PCB content (for example caulk) for more than a short period of time. Because each site will present unique circumstances, please consult your EPA PCB Regional Coordinator (insert link to webpage) regarding the application of encapsulation measures on a case by case basis.Additional details about EPA's research findings may be found at:
http://www.epa.gov/pcbsincaulk/caulkresearch.htm

32. Why should my school system spend money on removing PCBs when we have limited funds for educational needs and we may also have lead-based paint and asbestos in our schools, which may be worse?

EPA understands that school districts have constrained resources and must balance several needs. Our recommendations are designed to be flexible and cost-effective so that schools can focus limited resources on those problems that pose the greatest risks to human health.

Nonetheless, because our bodies can be exposed to PCBs from numerous sources outside of the school (such as through the consumption of fish or meat and inhalation of non-school air), and because they accumulate in our bodies over time, EPA believes it is prudent to reduce potentially significant exposure to PCBs in schools. In addition, on-going use of PCBs is prohibited by Federal law. EPA encourages managers of schools and other buildings to be aware of not only PCBs but the range of chemicals that may be present in facilities of a certain age and take steps to identify whether or not they are present in specific facilities. Each of these substances are addressed through similar approaches, including identification, containment, minimizing contact, and remediation. Ideally, strategies can be developed for simultaneously addressing PCBs, lead, asbestos, and other environmental substances during maintenance, repair or remodeling activities. Through these actions, coupled with production and use restrictions and various bans, we have seen remarkable overall PCB exposure reductions in recent decades.

33. Why has EPA not addressed this previously?

Although EPA has been dealing with PCB-contaminated building materials for several years, more data have become available recently demonstrating the high levels at which PCBs can be found in caulk, their occurrence in a number of schools and other buildings, and their potential to migrate to the air, surrounding masonry, soil and dust. EPA believes this is an important public health issue which should be addressed.

34. Does EPA provide any financial help to assist in the testing or removal of the caulk?

EPA does not have any specific financial assistance, loan or grant programs available for addressing PCBs in caulk; however, EPA is working with the Department of Energy to encourage the use of weatherization stimulus funds for the proper removal of PCB-contaminated windows.

Suggested Concentrations of Indoor Air

EPA PCB Exposure Estimates

35. What are EPA's PCB exposure estimates for the general U.S. population? How does exposure compare to the reference dose?

For background, uncontaminated air, dusts and soils, EPA estimates that average total PCB exposure ranges from approximately 2 ng PCB per kg body weight per day for adults to 8 ng/kg/day for children 1 to <2 years old. Younger children are generally more exposed per body weight due to activities that place them in greater contact with potentially contaminated dust, soils, and surfaces, and higher dietary and inhalation rates per bodyweight. At average, or background, uncontaminated concentrations, all age groups have exposures below the RfD.

36. What routes of exposure were considered in EPA's exposure evaluations?

The exposure routes considered included several exposure sources that can occur away from school: inhalation (indoor and outdoor), indoor dust ingestion, outdoor soil ingestion, indoor dust/soil contact, and total dietary ingestion. EPA also considered several kinds of exposures that can occur at a school: school building inhalation (indoor and outdoor), indoor dust ingestion, outdoor soil ingestion, and indoor dust/soil contact. EPA did not include direct ingestion of, or direct contact with, potentially contaminated building materials because this happens infrequently and exposure estimates were developed for averages over the course of a year.

37. What are the largest sources of exposure for the general population?

A major source of PCB exposure for most individuals in uncontaminated buildings is diet, which contributes about 40% of to total PCB exposure in adults and about 30% of total PCB exposure in children. Typical indoor and outdoor air contains a small amount of PCBs and inhalation exposure accounts for another 40 to 50% of total exposure. Together, these non-school sources of PCBs generally result in exposures that are significantly below the reference dose. It is worth noting that the PCB concentrations in food have been decreasing.

38. Using EPA reference values, what air exposure levels does EPA consider to be health protective for different age groups?

EPA advises that total exposure to PCBs from all sources be kept below the reference dose of 20 ng/kg-day. Based upon a background scenario limiting total exposure to the RfD, EPA has developed maximum values for the concentrations of PCBs in indoor air in schools that would result in total PCB exposures below the EPA's public health target. For a typical school day, these values range from a low of 70 ng/m^3 for toddlers age 1 to <2, to a high of 600 ng/m^3 for high school students, age 15 to <19. Details for each age group are provided in the table below.

Maximum Concentrations of PCBs in School Indoor Air (ng/m3) (considering other school and non-school background pathways) Assuming all other school exposure concentrations (e.g., dust, soil, outdoor air) are the same as non-school background concentrations , these concentrations should keep total exposure below the reference dose of 20 ng/kg-day.						
Age 1-<2 yr	**Age 2-<3 yr**	**Age 3-<6 yr**	**Age 6-<12 yr Elementary School**	**Age 12-<15 yr Middle School**	**Age 15-<19 yr High School**	**Age 19+ yr Adult**
70	**70**	**100**	**300**	**450**	**600**	**450**

39. For exposure estimates, what assumptions is EPA making about the amount of time children spend in school?

EPA assumed typical values for the number of days per year and the number of hours per day children spend at school. Depending upon age, these values were 180 to 185 days per year, and 6.5 to 8 hours per day at school. However, exposure assessments can also be made with other values that reflect school-specific activities.

Again, school administrators and building owners should also consider testing to determine if PCB levels in the air exceed EPA's suggested those levels. If testing reveals PCBs in the air above these levels, schools should be especially vigilant in implementing and monitoring practices to minimize exposures. Schools are encouraged to retest to determine whether these practices are reducing the potential for PCB exposures. Should these practices not reduce exposure, caulk and other known sources of PCBs should be removed as soon as practicable.

40. What are the limitations of EPA's exposure estimates?

EPA exposure values are estimates based upon PCB concentrations in environmental media (air, dust, soils) and average contact rates. Because PCB concentrations in environmental media are not well understood and may be variable, depending upon school-specific conditions, exposure estimates should be used with an appreciation of the uncertainty surrounding the estimates. The values do not consider the direct ingestion of, or contact with, PCB contaminated building materials; this route would generally be infrequent and would be an activity not shared by many individuals. These values should not be used to estimate occupational exposure associated with building or site clean-ups.

EPA's Enforcement Approach for PCB-Contaminated Caulk

41. Don't the regulations prohibit caulk containing PCBs above 50 ppm? Will EPA require all such caulk to be removed?

EPA regulations implementing the Toxic Substances Control Act (TSCA) prohibit the use of PCBs at levels above 50 ppm, including continued use in caulk that is already in place. While TSCA regulations do not require building owners to test caulk for PCBs, if testing shows PCB concentrations above the regulatory limit, then the regulations require the removal of those PCBs. Schools that are planning renovations or repairs should take the opportunity to test for PCBs and remove caulk found above the regulatory limit.

42. Does EPA intend to enforce the requirement that caulk above 50 ppm be removed?

Although EPA does have enforcement tools which it can use as appropriate where the PCB concentration in the caulk is above the regulatory limit, EPA is most interested in ensuring that schools undertake the recommended steps it has announced today. EPA believes that enforcement may not be the most effective tool to reduce health risks where schools are following these recommendations. Thus, such schools will in most cases be a low priority for enforcement. Nonetheless, EPA will not hesitate to act in situations where there are significant risks to public health.

43. Should schools speak with EPA about their potential enforcement exposure?

A school's top priority should be to implement the best practices described elsewhere in this announcement to minimize exposure as soon as possible. Schools do not need to enter into an agreement with EPA to implement the majority of these actions, except where noted. For school administrators or others who want to formalize their actions, EPA will make available a streamlined model administrative consent order confirming the school's commitment to implement the current EPA recommendations.

44. If the 50 ppm regulatory standard applies to PCB levels as contained in the caulk, why are you telling people to test the air?

Where schools or building owners are concerned about PCB exposure and want to supplement EPA's best management practices, testing the air is the most meaningful way of assessing the potential for exposure and risk.

45. Does EPA have authority to require testing for PCBs – in caulk or air?

EPA regulations do not require schools to test for PCBs in caulk or air, although it encourages testing in certain circumstances as noted above. EPA retains authority to obtain an order to address situations presenting an imminent hazard.

46. What will EPA do if schools don't test? Or if they test and find PCBs well above 50 ppm in the caulk or above EPA's risk thresholds in the air?

EPA regulations do not require schools to test for PCBs, but EPA encourages schools to conduct air testing where PCB use is suspected and to take action to reduce exposure where EPA's public health levels are exceeded. Although EPA does have enforcement tools which it can use as appropriate where the PCB concentration in the caulk is above the regulatory limit, EPA is most interested in ensuring that schools undertake the recommended best management practices. EPA believes that enforcement is generally not the most effective tool to reduce health risks where schools are following these recommendations. However, EPA will consider its enforcement options where PCBs in schools or other buildings present serious risks to public health that are not being addressed.

Public Health Levels for PCBs in Indoor School Air

The U.S. EPA has calculated prudent public health levels that maintain PCB exposures below the "reference dose" – the amount of PCB exposure that EPA does not believe will cause harm. EPA's reference dose (RfD) is 20 ng PCB/kg body weight per day. Indoor air levels are based upon EPA's understanding of average exposure to PCBs from all other major sources, and were calculated for all ages of children from toddlers in day-care to adolescents in high school as well as for adult school employees.

In calculating these indoor air levels, EPA considered potential sources of PCB exposure from both school and non-school environments. Non-school sources of PCB exposure include both indoor and outdoor air, indoor dust, outside soils, and diet. Although the concentrations of PCBs in environmental media are not well characterized, mean or median values from the scientific literature, and average contact rates, were used to estimate exposure. For non-school sources, the largest single source of PCB exposure for most individuals in uncontaminated buildings is diet, which contributes roughly 50 to 60% to total PCB exposure. Typical indoor and outdoor air contains a small amount of PCBs, and inhalation exposure accounts for another 25 to 35% of total exposure. Together, these non-school sources of PCBs generally result in exposures that are significantly below the reference dose. In addition, it is worth noting that the PCB concentrations in food have been decreasing and this trend would further decrease exposure.

School sources of PCBs that were considered include school indoor and outdoor air, indoor dust, and nearby outside soils. In calculating these public health levels for indoor air in schools, EPA assumed that the PCB concentrations in dusts and soils in and around schools were the same as in average homes or other buildings without elevated PCBs. EPA also assumed an 8-hour school day for adults and children less than 3 years old, and a 6.5 hour school for all other children. EPA also assumed children would be in school 180 days per year. Using estimates of exposure for sources except indoor air in schools, EPA calculated the school indoor air PCB concentration that would result in a total exposure equal to the reference dose. These calculated indoor air concentrations are the air concentration values provided in the table below.

EPA recommends that the concentrations of PCBs in indoor air be kept as low as is reasonably achievable and that total PCB exposure be kept below the reference dose level. The concentration values provided in the table below are based upon average situations. Spending less time in schools would decrease school exposure and cause the values to be higher. Spending more time in schools would have the opposite effect and would decrease the values. PCB concentrations in outdoor soils, indoor dusts, or indoor surfaces greater than those in background, non-school environments would suggest that exposure sources other than air in schools increase total exposure and, therefore, would decrease these air concentration values.

Building owners and school administrators wishing to make similar calculations based on their own specific circumstances should contact their regional PCB coordinator.

Public Health Levels of PCBs in School Indoor Air (ng/m3) Assuming a background scenario of no significant PCB contamination in building materials and average exposure from other sources, these concentrations should keep total exposure below the reference dose of 20 ng PCB/kg-day.						
Age 1-<2 yr	Age 2-<3 yr	Age 3-<6 yr	Age 6-<12 yr Elementary School	Age 12-<15 yr Middle School	Age 15-<19 yr High School	Age 19+ yr Adult
70	70	100	300	450	600	450