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ABSTRACT

This primer was prepared by the Healthy Buildings committee of the Child Proofing Our Communities campaign and is the third in a series of reports. The campaign aims to connect local efforts across the country, raise awareness of toxic threats to children's health, and promote precautionary approaches most protective of children. Following an introduction, chapter II, "Special Vulnerabilities of Children," discusses why children are more susceptible to toxins and how inadequately they are protected. Chapter III, "Toxins in Schools and Building Materials," explains the threat from the most common toxic substances found in schools. While the threats from building materials such as lead and asbestos are subsiding, mold, vinyl, and toxic fumes from carpeting present a new generation of hazards. Chapter IV, "Building Materials: From Hazardous to Healthier Choices," puts the hazards identified in Chapter III in context, identifying especially problematic building materials. Chapter V, "The Indoor Environment," discusses ways to improve indoor air quality and lighting as well as maintenance practices that avoid the use of toxic chemicals. Chapter VI, "Designing a Healthy School," outlines the lengthy process of designing and renovating a school from conception to completion. It explains how to construct or renovate a healthy school to avoid or minimize toxic hazards. Chapter VII, "Getting Your School Community Involved," explains how to mobilize support for a healthy school building and work with architects, school boards, and contractors to ensure that children's health is protected at school. Finally, chapter VIII, "The Safety of Our Children Is in Our Hands," describes steps that parents can take to identify and address some of the most common environmental health problems in schools. (Contains 70 references and 23 resources.) (EV)

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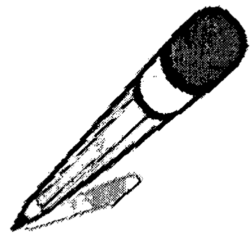

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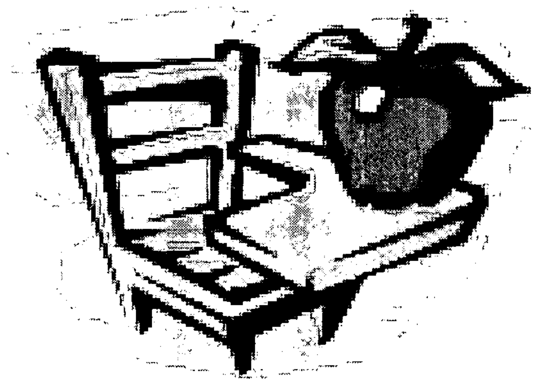

# of Healthy Schools

A Primer of the
Child Proofing Our Communities Campaign

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Creating Safe Learning Zones: The ABC's of Healthy Schools

This report is a joint effort of member organizations of the Child Proofing Our Communities campaign's Healthy Buildings Committee. Child Proofing Our Communities is a locally-based, nationally-connected campaign formed to protect children from exposures to environmental health hazards in or near public schools.

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Chapter I

INTRODUCTION

Creating a safe environment for learning and for the social, athletic and artistic activities that students participate in at school is a goal shared by national leaders, school administrators, and parents everywhere. This "safe environment" is typically interpreted as a zone free of weapons, drugs, offensive clothing and bullying behavior. Measures such as strict disciplinary policies, plain-clothed police officers, random locker searches, video cameras, and school uniforms have been adopted for security.

This approach to safety, however, neglects hazards that may be more prevalent and harmful to a greater number of students. These dangers may already lurk in a school at its initial dedication and remain through successive graduating classes. There are dozens of chemicals that are present in carpeting, indoor wood products, vinyl floors, toilet bowl cleaners, graffiti removers and weedkillers. Many of these substances are volatile and will offgas into the air, accumulating in well-insulated rooms or areas. The fumes from the offgassing of these chemicals may be inhaled. When children attend class, they may be exposed to low-level chemical mixtures about which scientists understand very little.

We do know that there are epidemic rates of childhood cancers and learning/developmental problems in school-aged children (CDC/NCHS, 2002; NCI, 1999). While many studies have linked arsenic and formaldehyde to certain cancers and have shown that lead causes neurological problems, there are many unknowns. Most toxicity studies are based on adult males, who can tolerate higher levels of exposure before experiencing adverse health effects.

With smaller bodies, children breathe more air and eat more food, relative to their size, and may be harmed in different ways at lower doses. For example, you wouldn't think to give a child the same strength and number of aspirins as you would an adult.

Alarmingly, only an estimated 10-20% of childhood diseases and developmental disorders are attributed to genetic factors. While the remaining causes are not well understood (Landrigan, 2000), we do know that over the past 50 years, children have been at risk for exposure to more than 75,000 synthetic chemicals, especially the 15,000 high-volume chemicals that are widely dispersed. Less than one-half of the high-volume chemicals have been tested for toxicity, and even fewer have been tested for toxicity to children (NAS, 1984; US EPA, 1998).

It is likely to take many years before scientific research will be able to confirm the links between chemical exposures and the incidence of adverse health effects in children. For now, the best course of action is to limit and if possible prevent exposure to these chemicals. Rather than waiting for synthetic chemicals to be regulated, for children's sake, they should be considered hazardous until proven safe. Parents, teachers, community members, custodians, architects and school board members can become public health stewards by preventing the intrusion of toxic chemicals into the fabric of school buildings. This can be most effectively done before a school has been constructed, when there is time to find an uncontaminated site and to select the safest building materials.

Unfortunately, the situation now is that children must actually become ill, whether it be a throat and mouth irritation, nausea, asthma or a learning disability, before we do anything. The school is then put on the defensive. Teachers and parents are often held accountable for children not succeeding in school when, in fact, environmental conditions at the school may deserve part of the blame. It has been observed, and is reasonable to expect, that environmental improvements will have positive results for individual students and the school as a whole. Absenteeism may decline, students' concentration may be enhanced, and quality instruction time increased.

There are no federal laws governing the environmental health conditions in schools. The U.S. Environmental Protection Agency has been the most responsive agency, producing resources that individual schools can use to diagnose and alleviate indoor air quality problems (US EPA, 2000). However, promising federal initiatives--the Healthy High Performance Schools Act and health and safety grants for emergency school renovations--have had funding withdrawn. As a consequence, parents, teachers, and community members must step in to fill the void. At the local level, the communities need to galvanize and sustain efforts to prevent hazardous school environments or remediate existing problems. While legislation remains elusive, perhaps the urgent need to address these problems will compel voluntary measures to protect children's health, creating learning spaces where children's abilities are not compromised by toxins.

Constructing or renovating a healthy school needs to be a cooperative effort between parents, students and professionals from the fields of architectural design and children's health. Architects and engineers are adept at designing structurally sound schools. These professionals also specify what materials will be used in construction--from walls and shelving to plumbing fixtures. While they may fully understand building integrity and durability issues, very few are trained to consider the health effects of the chemicals these materials contain.

Creating Safe Learning Zones: The ABC's of Healthy Schools is the outcome of a nationwide effort to eliminate practices that place children at risk from chemicals in their environment – particularly schools, parks, and playgrounds.

This primer was prepared by the Healthy Buildings committee of the Child Proofing Our Communities campaign and is the third in a series of reports. The other reports are *Poisoned Schools: Invisible Threats, Visible Actions,* released in March 2001 (CPOC, 2001) and *Creating Safe Learning Zones: Invisible Threats, Visible Actions*, released in January 2002 (CPOC, 2002). The campaign aims to connect local efforts across the country, raise awareness of toxic threats to children's health, and promote precautionary approaches most protective of children.

We see this primer as the first step in preparing an in-depth report on constructing, renovating, or maintaining a healthy school. We are distributing the primer to local school activists, PTAs, health committees and others. Their comments will help us create a practical and useful resource.

The chapter summaries that follow are intended to serve as a guide to the primer.

Chapter II, "Special Vulnerabilities of Children," discusses why children are more susceptible to toxins and how inadequately they are protected.

Chapter III, "Toxins in Schools and Building Materials," explains the threat from the most common toxic substances found in schools. While the threats from building materials such as lead and asbestos are subsiding, mold, vinyl, and toxic fumes from carpeting present a new generation of hazards.

Chapter IV, "Building Materials: From Hazardous to Healthier Choices," puts the hazards identified in Chapter III in context, identifying especially problematic building materials. Materials containing toxins are not essential to the structure or furnishing of a school, and healthier alternatives are available.

Chapter V, "The Indoor Environment," discusses ways to improve indoor air quality and lighting as well as maintenance practices that avoid the use of toxic chemicals.

Chapter VI, "Designing a Healthy School," outlines the lengthy process of designing and renovating a school from conception to completion. It explains how to construct or renovate a healthy school to avoid or minimize toxic hazards.

Chapter VII, "Getting Your School Community Involved," explains how to mobilize support for a healthy school building and work with architects, school boards, and contractors to ensure that our children's health is protected at school.

Chapter VIII, "The Safety of Our Children Is in Our Hands," describes steps that parents can take to identify and address some of the most common environmental health problems in schools.

Chapter II

SPECIAL VULNERABILITIES OF CHILDREN

During a critical period of their growth and development, children spend a large part of the day at school. To needlessly place them in settings that increase the risk of disease, hyperactivity, or lower IQ is therefore irresponsible, especially in light of recent health studies that document an increased incidence of childhood cancer and disease (NCI, 1998). Expressed first by parents, health concerns about exposures to chemicals in the environment are now being echoed nationally by the US Environmental Protection Agency, the National Academy of Sciences, Physicians for Social Responsibility and the National Parents Teachers Association.

All these groups agree that society should take steps to prevent childhood exposure to toxins that pose unnecessary health risks. Children attend school at least 180 days a year. Taking measures to prevent children from being exposed to toxic chemicals at school must be a critical part of any effort to protect children's health.

What makes children especially vulnerable to environmental chemicals?

Children are not little adults

Children are more often exposed to environmental threats than adults and are more vulnerable to environmentally-caused diseases. Of small size and still developing, they take in more food, drink, and air per pound of body weight than adults do. Also, children behave like children.

Children are still developing and remain vulnerable through adolescence

During prenatal development, infancy, and adolescence, children are growing and adding new tissue more rapidly than at any other period of their lives. Because their tissues and organ systems are still developing, they are susceptible to environmental chemical influences over an extended time.

Children move through several stages of rapid growth and development. Growth is most rapid from conception to age 7. The ensuing years, through adolescence, bring continued growth as crucial systems, such as the reproductive system, mature. Insulation of brain nerve fibers is not complete until adolescence. Similarly, air sacs in the lungs, where oxygen enters the blood stream, increase in number until adolescence (Needleman, 1994).

During these critical years, as structures and vital connections develop, bodily systems are not suited to repair damage caused by toxins. Thus, if neurotoxins assault cells in the brain, immune system, or reproductive organs, or if endocrine disruption diverts development, the resulting dysfunction will likely be permanent and irreversible. Depending on the organ damaged, consequences can include lowered intelligence, immune dysfunction, or reproductive impairment (Landrigan, 1998).

Children's immature systems are less able to handle toxins

Because organ systems are still developing, children absorb, metabolize, detoxify and excrete poisons differently from adults. In some instances, children are actually better able to deal with environmental toxins. More commonly, they are less able and thus much more vulnerable (Landrigan, 1998). For example, children absorb about 50% of the lead to which they are exposed, while adults absorb only 10-15%. Their less developed immune systems are also more susceptible to bacteria such as strep, to ear infections, to viruses such as flu, and to chemical toxins (Needleman, 1994).

Children eat more, drink more, and breathe more

Children consume more calories, drink more water and breathe more air per pound than adults. Their body tissues more readily absorb many harmful substances, and outside play heightens their exposure to environmental threats relative to adults.

U.S. children ages one to five eat three to four times more per pound of body weight than the average adult. Infants and children drink more water on a body-weight basis and they take in more air. Differences in body proportions between children and adults mean that children have proportionately more skin exposure (NRC, 1993).

Children behave like children

Normal activities increase children's vulnerability to environmental threats. Their natural curiosity, tendency to explore, and inclination to place their hands in their mouths often exposes them to health risks adults readily avoid.

Young children crawl and play on the ground or floor and play outside. These natural proclivities expose them to contaminated dust and soil, pesticide residue, chemicals used to disinfect or clean, garden weed killers, fertilizers and other potentially hazardous substances.

Air pollution impacts children more readily because they are frequently outdoors and physically active. They thus breathe more pollutants directly and deeply into their lungs.

Children's natural curiosity leads them to explore situations that could expose them to environmental hazards. For example, they may enter fenced-off areas or polluted creeks and streams (Bearer, 1995).

Children have more time to develop disease

Children's longer remaining life span provides more time for environmentally induced diseases to develop. Exposure to carcinogens as a child, as opposed to adult exposure, is of particular concern since cancer can take decades to develop (Landrigan, 1998).

Chapter III

TOXINS FOUND IN SCHOOLS AND IN BUILDING MATERIALS

You're reading the local paper when a headline in thick black letters catches your eye, "Growth Brings Need for New School." Reading further, you discover that this new school will be built in your neighborhood. This is the school where your children will spend many hours listening, singing, sharing information, creating art, running and playing.

Perhaps you don't have children that will attend school, but you work at a school or across the street from one. Perhaps the school is merely a big project to which your tax dollars will contribute. Whatever your relationship to this school, everyone's interests demand and justify a building that will not only foster academic success but protect the health of students, teachers and employees.

In late summer, the "back to school" frenzy kicks into high gear. Students and their parents hurry to stores to purchase notebooks, folders, paper, and other supplies for the upcoming school year. One item that appears annually is a box of tissues. Stockpiling begins on the first day of school for the runny noses and coughs that seem to be an inherent part of the academic year. While these symptoms may be caused by germs, often overlooked are other culprits, such as mold, or toxins in carpet glues, wood preservatives, cleaning products and other building materials. Toxic chemicals in these products can accumulate in schools to be breathed, eaten or touched by students, triggering an immediate reaction or subtly harming them over long periods of time.

Building materials such as paints, floor coverings, and sealants are often laden with toxins that emit harmful fumes after children and staff have occupied the building. The heating, ventilation and air-conditioning system (HVAC) can transport these toxins throughout the school, and it can exacerbate a problem by distributing contamination from one part of a school to another. Air quality further deteriorates from indoor or outdoor pesticide applications, the routine use of harsh cleaning chemicals, and the release of potent ingredients in markers and paints. Biological contaminants, such as mold and mildew, can waft through the air and quickly spread over surfaces. These sources create poor indoor air quality, but can be controlled or eliminated by careful practices and by using effective, alternative products.

Volatile Organic Compounds (VOCs)

The VOC family includes a variety of toxic chemicals, some with recognizable names – formaldehyde, benzene, and toluene. As the name suggests, these substances are volatile--meaning that they easily evaporate into the air. VOCs are dangerous to people since they can accumulate indoors and can be readily inhaled.

VOCs can cause short-term or long-term health effects, depending upon the toxic properties of the substance, length of exposure, the VOC concentration, and the individual's susceptibility. Symptoms associated with exposure may occur for a short time (acute) or last for long periods (chronic) and perhaps, permanently. Acute effects include nose and throat discomfort, headache, shortness of breath, nausea, dizziness, and fatigue. Cancer and damage to organs and the central nervous system are examples of chronic effects that begin to develop during exposure but appear years later (US EPA, 1995).

VOCs are found in paints and paint strippers; carpeting; pressed wood used in desks, shelving and wall materials; cleaning supplies, glues, caulks, and adhesives; and pesticides. Formaldehyde, for example, is used in the glue that holds wood fragments together to form particleboard, plywood, and fiberboard (see Chapter IV). Sixty percent of the total content of oil/alkyl paints can be VOCs, added as carriers for the pigment (Bower, 1993). The adhesives used between the layers of carpeting, backing, and the subfloor emit VOCs.

Brand new products contain higher levels of VOCs that are slowly released over time into the surrounding air. In heat and humidity, VOCs evaporate more easily. Tight, energy efficient buildings tend to trap VOCs, allowing the vapors to accumulate indoors. VOC-containing materials should be well ventilated before installation to allow as many toxins as possible to escape. However, the length of this airing-out period depends on the product. Some VOC levels, such as those in latex paints, fall significantly after a few weeks, while others, in wood products and carpeting, persist for years. Airing out VOC-containing materials will reduce but not eliminate VOC fumes.

Many of the VOC-containing building materials have safer counterparts such as paints that have low or zero VOC emissions. A synthetic, low offgassing sealant or shellac may help prevent VOCs from escaping into the air from materials in the classroom. However, the most prudent route is to avoid the use of materials that contain VOCs when safer options are available.

Mold

Mold, sometimes called the "new asbestos," looms as a tremendous problem. The cost of mold infestation in schools is formidable: health problems, disrupted learning time due to school closings or relocations, and the price of fixing the problem.

Approximately 1,000 species of mold exist in the United States (NYC DOH, 2001). Moisture is the key to mold growth. Indoor mold typically grows in damp or wet areas such as bathrooms, basement walls, around windows, and near leaking water pipes or faucets. Common sources or causes of moisture problems include roof leaks, deferred maintenance, condensation associated with high humidity or cold spots in buildings, localized flooding due to plumbing failures or heavy rains, slow leaks in plumbing fixtures, malfunctioning or poorly designed humidification systems, uncontrolled humidity in hot, humid climates, and damaged or failed gutters and drainage systems (US EPA, 2001). Ceiling tiles, carpeting, drywall, and insulation can serve as food sources for molds, which require dead or decaying organic matter to survive.

Molds produce tiny spores for the same purpose that many plants produce seeds – to reproduce. These tiny spores can be found in both indoor and outdoor air. When they settle on wet surfaces, they quickly begin to grow, digesting whatever they are growing on, eventually destroying the surface. Some spores can easily be resuspended by air movement while others are "sticky" and can move only by direct contact. Some compounds produced by molds are volatile and can evaporate from a surface. These substances can be the source of the strong odors commonly associated with molds.

Indoor mold problems have become more common since the 1970s and the advent of tightly sealed energy efficient buildings. The lack of exchange between indoor and outdoor air allows dampness to collect on some surfaces. When spores land on these "reservoirs," mold can grow uncontrollably. Heating and air conditioning systems can exacerbate mold growth by spreading spores throughout a building and depositing them on "fertile ground." Buildings with elevated relative humidity (greater than 45-50%) present an optimal environment for fungal growth, especially if there is an abundance of absorbant material, such as carpeting, paper, and pressed wood. These materials absorb moisture from the air, promoting mold growth.

All molds have the potential to cause health effects. Molds produce allergens, irritants, and in some cases toxic substances called mycotoxins. More than 200 mycotoxins have been identified. *Stachybotrys chartarum* (also called *Stachybotrys atra*), which is often found in indoor environments, produces a variety of potent mycotoxins, including satratoxin. Exposure to molds or mold spores can trigger a wide range of reactions including headaches, breathing difficulties, skin irritation, allergic reactions, aggravation of asthma symptoms, bloody noses, and eye irritation (US EPA, 2001).

The extent of the response and the degree of symptoms depends in part on the types of mold present, the extent of exposure, the individual's age, and their existing sensitivities and allergies. Presently, there are no national standards or guidelines that define a "safe" level of mold in air. As a result, air sampling to detect the presence of mold spores is not routinely done in schools. Fungal loads also vary substantially over time.

Ideally, preventative methods should be in place to thwart mold growth. Custodians, staff, and students can be responsible for reporting leaks or moisture buildup. Wet areas should be dried or removed since mold growth can set in after just 24 to 48 hours. Existing mold must be dealt with promptly by trained experts. In all situations, the underlying cause of the

Teacher Becomes Anti-Mold Activist

Newtown, Connecticut—In June, 1998 Joellen Lawson, a twenty-three year career special education teacher, educational consultant, and seminar leader found herself in a hospital emergency room after removing mold-contaminated materials from her classroom closets at McKinley Elementary School in Fairfield. Her exposure to mold mycotoxins left her unable to work and she was forced to accept a disability retirement. Two years later, McKinley was permanently closed due to pervasive mold contamination, but not before over fifty other students and school staff reported health complaints such as migraines, seizures, severe asthma attacks, and chronic sinus infections.

In response to the publication of her story in *NEA Today* magazine, Joellen began to make contacts with other teachers and parents of sick children with similar horror stories about mold. Turning her tragedy into action, she testified before the Connecticut General Assembly to promote indoor air quality (IAQ) legislative initiatives. To ensure the passage of effective IAQ legislation next session, she has joined with concerned teachers, parents and medical professionals to form the Canary Committee, a grassroots political action group. Despite poor health, Joellen continues to work to ensure that others won't have to go through the same hell. "Networking and supporting other afflicted teachers and parents of sick children has been the most healing and empowering part of this experience," she explains.

moisture accumulation must be eliminated or the mold growth will continue. The goal of any remediation should be "to remove or clean contaminated materials in a way that prevents emission of fungi and dust contaminated with fungi from leaving a work area and entering an occupied or nonabatement area, while protecting the health of the workers performing the abatement" (NYC DOH, 2000).

The US EPA (2001), the city of New York (NYC DOH, 2001 and NYC DOH 2000), and the state of California (CDHS, 2001) offer excellent resources on how to investigate and remediate an indoor mold problem.

Polyvinyl Chloride (PVC)

PVC, or vinyl, is a fine, white powder to which petroleum-based plasticizers (phthalates) and stabilizers (lead, cadmium, organo-tins) are added for flexibility, strength, and heat resistance. In schools, PVC is used in piping, flooring, carpet fibers and backing, windows and door frames, vinyl siding, blinds, electrical cables, and wall coverings.

The greatest concern about the use of PVC materials is the pollution generated during manufacture and disposal (Greenpeace, 1997). PVC manufacturing is based on chlorine, which releases dioxins when heated or ignited. Dioxin is one of the most toxic substances ever tested. It causes cancer, reproductive and developmental effects, and can disrupt the hormonal, immune, and neurological systems. This toxin, which builds up in fatty tissue, is also released when PVC is incinerated. The creation and disposal of PVC is most harmful to exposed workers and surrounding communities since the chemicals may contaminate soil, water and air (HB, 2000).

PVC products also pose threats. A study published in the *American Journal of Public Health* showed that children exposed to PVC flooring in nurseries, bedrooms, and other rooms have an 89% higher risk of bronchial obstruction due to the offgassing of plasticizers (Jaakkola, 1999). The long-term health risks associated with plasticizers include immune system damage, asthma, reproductive problems, and cancer. Moreover, if there is a fire and PVC materials burn, extremely toxic gases, such as furans and dioxins, will be released.

While PVC is cheap and easy to install, its toll on the environment and human health is harsh. Alternative materials are available and vary depending on the intended use. Flooring options, for example, include wood, cork, and linoleum while alternative piping materials include copper, clay, and galvanized steel. Greenpeace has compiled an informative resource that describes the alternatives to PVC building products (Greenpeace, 2002).

Chromated Copper Arsenate (CCA)

Chromated copper arsenate (CCA) is a wood preservative made with arsenic, chromium and copper that is intended to reduce damage from insects, mildew, and fungi. This pesticide mixture, which is 22% pure arsenic, is forced into the wood under pressure. CCA does not permanently bind to the wood but leaches into surrounding soil, offgasses into the air and rubs off on skin, clothing, and shoes. This "bleeding" may continue for years after the wood has been set outside (EWG, 2001).

CCA-treated wood is common in playground equipment, picnic tables, gazebos, and other outdoor equipment. The freshly treated wood has a greenish tint. Unless it is cedar or redwood, which remain untreated, most

Getting the Poison Out of Playgrounds

Rochester, New York—Two years ago, Judith Braiman, a long-time consumer rights activist, became concerned about her grandchildren playing on public playgrounds contaminated with arsenic from the chromated copper arsenate (CCA) used to treat wood. When she and other members of Rochestarians Against Misuse of Pesticides (RAMP) began testing the playgrounds in Rochester and surrounding communities, they found high levels of arsenic contamination. Last October, RAMP held a press conference to announce that most Rochester playgrounds contained unsafe levels of arsenic and to call on the State Health department to test all New York playgrounds with CCA-treated wood. Following the press conference, several playgrounds were closed and state-wide legislation was introduced to clean up arsenic-laced playgrounds and ban the use of pressure-treated wood in new playgrounds. The legislation has passed through the New York Senate and Assembly and is currently awaiting Governor Pataki's signature. Meanwhile, RAMP continues to test playgrounds and has found that even where the pressure-treated wood has been resealed, Rochester playgrounds continue to have unsafe levels of arsenic.

outdoor wood in the U.S. is treated with CCA (US CPSC, 2002). CCA is also used indoors in new construction for any wood that comes in contact with the ground or that is placed above brick and block foundations.

Children absorb arsenic through the skin by touching the wood, or they ingest it by putting their hands in their mouths after touching the wood or eating food off a CCA-treated picnic table.

Arsenic is recognized as a human poison and causes a wide range of adverse health effects. The immediate effects of exposure to high levels of arsenic include seizures, nausea, vomiting, abnormal heart rhythm, and blood vessel and permanent nerve damage. Ingestion of a large amount can cause death. Long-term effects include cancer of the lung, bladder, and skin (ATSDR, 2000).

After health and envionmental activists exposed the potential health risks to children and launched a campaign demanding that major home-product stores take the contaminated wood off their shelves, the industry and US EPA came to an agreement to phase out some uses of CCA by December 31, 2003 (US CPSC, 2002). The ban will cover wood used for decks and patios, picnic tables, playground equipment, walkways and boardwalks, landscaping timbers, and fencing. However, until that date, existing supplies of CCA-treated wood can continue to be sold and used.

The Environmental Working Group has published a resource on arsenic-treated wood and children's health called *Poisoned Playgrounds* (EWG, 2001). The US Product Safety Commission has published a useful question and answer fact sheet on CCA-treated wood (US CPSC, 2002).

Asbestos

Asbestos is a very thin and lightweight mineral fiber that can remain suspended in the air for a long time. Asbestos is most likely to be found in schools that were built during or before the 1970s. Used for insulation and fire retardation, asbestos is typically found in insulation around pipes, ductwork and boilers; on surface materials sprayed for fireproofing or insulating; in ceiling tiles, floor tiles, and wall boards; and in caulking, adhesives, and glues. Asbestos is particularly dangerous because the nearly invisible particles can be inhaled and settle deep in the lungs. Symptoms of asbestos exposure may not show up until years later in the form of lung cancer, mesothelioma (cancer of the chest and abdominal linings), and asbestosis (scarring of the lungs). Children are at greater risk from asbestos harm because they have higher respiration rates, and asbestos fibers remain in their bodies for longer periods of time.

Asbestos materials do not become hazardous until they are "friable"-- i.e., they crumble or become powdery, which results from handling or applying gentle pressure. Improper cutting, sanding, renovation activities, and general wear and tear can release fibers into the air.

The 1986 Asbestos Hazard Emergency Response Act (AHERA) requires schools to inspect for asbestos and, if found, to develop a management plan to control the asbestos. Each school district appoints an "AHERA-designated person" to implement the management plan, which must be available for review upon request. In addition, the local education agency must inspect schools for asbestos, safely maintain the asbestos, take action to remove or encapsulate it, if necessary, and notify the public at least once per year of asbestos-related activities at each school. The

Asbestos Contamination Shuts Down Entire School District

Brookfield, Connecticut—Music teacher Margaret Fitzgerald and her colleague Lynn Orzolek at the Huckleberry Hill Elementary School (HHES) had complained for years to the school administration about the problems with dust, dirt, mold and ventilation in their classroom. Each day, in order to teach in the room, they sprayed, sprinkled and spread carpet freshener to cover up the odor in the room and then vacuumed it thoroughly.

In 2000, during renovation work at the school, several parents began looking into irregularities with the district's Asbestos Management Plan. After asbestos ceiling tiles were removed from the school, pressure from parents resulted in testing that revealed high asbestos levels in schools throughout the district. One of the asbestos "hot spots" was right outside Margaret and Lynn's classroom. The school board and superintendent maintained that the schools were safe and being properly cleaned, rebuffing parents' efforts to get the district to move aggressively to reduce asbestos levels.

In May of 2002, Kathy Hulce, one of many parents frustrated with the asbestos policy, had dust from the music classroom tested for asbestos. When it came back positive, Margaret, without the knowledge of the school administration, followed up by having a local environmental firm do micro-vac samples in the music room. These tests showed that asbestos levels in the classroom were extraordinarily high. Shortly thereafter, tests by both Margaret's independent environmental assessor and the school district resulted in the closing of HHES for further testing and cleaning.

At a public forum following the school's closure, parents demanded that all the district's schools be tested—which led to the closing of all four schools due to asbestos contamination. Brookfield is now spending over $4 million to clean up its schools, leaving parents wondering what would have happened if Kathy and Margaret hadn't acted on their own to find out the truth about asbestos at HHES.

overall effectiveness of the asbestos management program largely depends upon the "designated person." This individual does not have to be accredited or have graduated from a training program, but should, according to AHERA, have adequate experience (Miller, 1995).

Regular inspections, by a local authority, are required to ensure that all asbestos-containing materials in the schools are not deteriorating or crumbling. Asbestos that is not friable is best left in place since removal increases the risk for exposure. Where damage has occurred, repair should follow promptly. Spraying a sealant over the material or placing a barrier around it can stop or minimize exposure until the asbestos is removed.

Ideally, students and staff should not be in the building when removal occurs. Only experienced workers should handle the asbestos removal. Some states have their own training and certification program for asbestos removal contractors. The US EPA is a good resource for information about asbestos contractors by state. If there is an established program in your state, only certified contractors should be working with asbestos on school property.

Radon

Radon is a gas that is naturally present at low levels outdoors but may reach harmful concentrations in tightly sealed buildings or near uranium mining activities. Invisible and odorless, radon forms when uranium decays in soil or rock. Areas of the country that lie above undisturbed uranium beds are more prone to higher background levels of radon. Radon becomes problematic for school children and staff when it seeps into the school's water supply or through cracks in the foundation, floors, walls and other openings near or below ground level and accumulates inside schoolrooms.

The major risk from radon is lung cancer. Radon gas latches onto airborne particles such as dust, which are then inhaled. These small particles are carried deep into the lungs, emitting radiation into the surrounding tissue. Radon-contaminated water, when heated for showering, bathing, washing and cooking, releases gas vapors that can be inhaled. Children are particularly sensitive to radon because they breathe more quickly and receive a higher dose than an adult exposed at the same level (US EPA, 1992).

Radon contamination, however, is not widespread and is easily detectable and preventable. The EPA recommends but does not mandate radon testing. In areas prone to radon problems (this information can be provided by state radiation health departments), the indoor levels of this gas should be closely monitored. Qualified testing contractors who meet EPA's Radon Measurement Proficiency (RMP) Program requirements will carry an RMP identification card. The EPA has established a Radon Contractor Proficiency Program to certify people to evaluate radon problems and help with a remediation plan (US EPA, 1995).

Your state radon office has a list of these contractors and may have information on available financial resources to defray expenses. Local school districts may also provide information on any radon issues they have confronted.

Prior to school construction, assess whether radon might become a problem and take preventive steps to avoid sky-high correction costs. Soil at the proposed site should be tested for radium and uranium. Radon gas can be prevented from entering a building foundation by installing a series of pipes running through a concrete slab foundation. The soil gases will collect in the area of low pressure within the pipes and a fan, placed beneath the slab, will draw the gases away from the foundation (Miller, 1995).

The US EPA maintains radon maps showing the risk for radon contamination at the county level. This agency also maintains a list of state radiation health departments (US EPA, 1992).

Lead

One of the environmental health success stories of this century has been the removal of lead from gasoline and paint, causing blood lead levels to decline by 94% between 1976 and 1997 (CDC, 1997).

Lead, however, remains a concern in school buildings, especially those dating to the 1970s and earlier. The sources of lead include plumbing, chipped and peeling lead-based interior paint, contaminated soil from exterior paint or vehicle exhaust fumes, and dust that is generated when painted surfaces containing lead rub together, such as windows.

If ingested or inhaled, lead can be carried by the bloodstream to organs and tissues throughout the body. In some instances, such as lead in gasoline, lead can be absorbed through the skin. Children are especially vulnerable to lead, which can affect the brain and nervous system, lower IQ levels, delay physical development, shorten attention spans and increase behavioral problems (US EPA, 1995). Some effects on the central nervous system may be permanent.

Due to lead's widespread notoriety, lead has been banned in paint and its use in building materials has fallen sharply. If lead is present in a building, the building should be inspected to assess the likelihood for lead exposure. Air and dust should be tested regularly and, if necessary, the lead materials should be removed and replaced.

Ideally, children should not be in a lead-contaminated building during any remediation, renovation, or construction activities. Some paint removal techniques, such as sanding and scraping, grind the lead to a fine dust and create a dangerous increase in air lead levels. Puncturing or tearing out walls and opening and closing painted windows can produce inhalable lead dust. Any maintenance work in areas containing lead-based paint should be scheduled when school is not in session, and the areas should be isolated to prevent the spread of lead dust.

Taking samples from every faucet and fountain can reveal the presence and extent of drinking water contamination. Lead may leach into drinking water from corroding pipes, solder used to connect the pipes together, or lead-lined water cooler tanks. As recently as 1988, lead solder was used to bond copper plumbing (Miller, 1995). If lead exceeds safe levels, the dangerous plumbing should be removed and replaced with more stable materials, such as copper or galvanized steel and lead-free solder.

Carbon Monoxide and Carbon Dioxide

Carbon Monoxide (CO) is a colorless and odorless gas that forms when fuel, such as gas, oil or kerosene, is burned. Malfunctioning furnaces, boilers, cooking equipment, and vehicle exhaust can spew harmful levels of CO into the air. When a space is poorly ventilated, CO gas accumulates and has varying health consequences. Breathing carbon monoxide interferes with the blood's ability to carry oxygen to the body's organs and can cause a range of symptoms depending on how much CO is present, how long it has been there, and the overall health and age of the person exposed. Low levels of CO gas can result in dizziness, headache, weakness, fatigue, nausea and vomiting, while high doses can bring on a coma and heart and lung failure (NSC, 1999).

Carbon monoxide poisoning usually can be avoided with the proper care and use of fuel-burning equipment and adequate indoor/ outdoor air exchange. Entrance ways and vents placed away from traffic areas can prevent vehicle exhaust from entering the school (NSC, 1999). Carbon monoxide detectors that meet the Underwriters Laboratories or similar standards are not a substitute for preventive measures and should only be used as a secondary line of defense. Though much improved in recent years, these devices are not perfect. They are not sensitive to low levels of CO and false alarms can be a problem (Donnay, 2000).

The burning of heating fuels can also produce carbon dioxide (CO_2), another odorless gas. When the indoor/outdoor air exchange is stagnant, carbon dioxide levels rise. Poor air exchange in a room or building can also lead to CO_2 buildup from the respiration of people using the space. Above a certain threshold, mental clarity begins to suffer. A continuous, plentiful supply of fresh outdoor air prevents carbon dioxide buildup and supports an environment conducive to instruction and learning.

Dust

Common dust is often thought of as little more than a nuisance, unsightly perhaps, but hardly a health hazard. Dust, however, is not merely the innocuous dirt that kids like writing their names in. Dust can contain plant and animal materials, such as cotton, wool, feathers, and animal hairs, from materials used in the home; stuffing from mattresses, pillows, and upholstered furniture; human skin scales, animal dander, insect parts, mold, bacteria, viruses and pollen; and contaminants from tobacco smoke, cosmetic powders, and cleaning products (OSUE, 1996). Inhaling these substances can cause allergic reactions in some children.

Dust can also contain a wide range of toxic substances. Researchers have identified some 30 different chemicals in dust samples, including many known to cause cancer in people or animals (Roberts, 1999). Dust can include cadmium, lead, and other heavy metals, as well as pesticides, polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), phthalates and other persistent organic pollutants. If truckloads of dust with the same concentration of toxic chemicals that can be found in most carpets were deposited outside our homes, these areas would be considered hazardous waste dumps (Ott, 1998; Roberts, 1999).

Chapter IV

BUILDING MATERIALS: FROM HAZARDOUS TO HEALTHIER CHOICES

Healthier building materials are available. However, it often requires some work to find out about the best alternatives to commonly-used toxic products. This chapter reviews some of the materials that can be used for large surface areas in schools – floors, walls, and furnishings. There are several good resources, including the book *Prescriptions for a Healthy Household* (Baker-Laporte, 2001) and the Collaborative for High Performance Schools' (CHPS) *Best Practices Manual* (CHPS, 2001), which we have relied on for our discussion of healthier construction materials. Additional resources are mentioned at the end of several sections.

When weighing options for building materials, estimates need to include the cost of maintaining the material throughout its life as well as the upfront costs. What needs to be done with the material to keep it in top shape? How frequently? What supplies are needed? These factors must be taken into account for an accurate estimate of the true cost of a product.

Flooring

Carpeting

Wall-to-wall carpeting is a popular choice for flooring, but it is not the healthiest. School carpets are usually tufted nylon attached to a backing with latex (Miller, 1995). The installation requires glues, synthetic fiber backing and pads, all of which can introduce pollutants into the environment. Even after installation and airing out, carpeting can still pose problems by becoming a reservoir for dust, mites, mold, pesticides, and chemicals tracked in on shoes.

Area rugs offer very little advantage over wall-to-wall carpeting. All carpeting acts like a magnet to collect and hold mold spores, dust, and other contaminants from the air. Area rugs can also be a significant saftey hazard. Smaller, light-weight rugs easily slide, presenting a significant tripping, slipping, and falling hazard. (FCDBH, 2001). Larger area rugs may also roll or slide. Tape is often used to secure area rugs to the floor, but doing this makes it difficult to clean under the rug and to clean the rug itself.

Carpeting and carpet installation material can contain up to 120 chemicals, many of them toxic (Duehring, 1996). New carpets may emit fumes, some with distinct odors from volatile organic compounds (VOCs) such as 4-PC (4-phenylcylohexene), toluene, benzene and the chemicals in the fungicidal and stain-proofing treatments applied to some carpets. Typically, the VOC levels decrease substantially several months after installation, but they may persist for a year or longer. The offgassing chemicals in new carpeting may trigger ear, nose and throat irritation, headache, nausea, fatigue, rashes, respiratory problems, asthma and multiple chemical sensitivity (Miller, 1995). Regular carpet maintenance also requires cleaners and shampoos that often contain toxic solvents.

In response to concerns about the health effects attributed to carpeting, the Carpet and Rug Institute, which represents 95% of the industry, launched the Green Tag Program in 1992. The label on the rug claims that after measuring the levels of certain substances, such as 4-PC and total VOCs, the carpet has met indoor air quality testing criteria. The Green Tag label, however, does not mean that the carpet is safe since the carpet has not been tested for all chemicals. Moreover, industry has not sought to obtain independent safety standards for these chemicals (Baker-Laporte, 2001).

There may be some locations where carpeting may be appropriate, such as libraries and music rooms. If a carpet must be installed, there are several ways to reduce the toxins entering the school. Carpets should be chosen that have not had stain-resistant, fire-retardant or pesticide treatments. Untreated, natural fiber carpets such as wool or cotton are the best choices (Duehring, 1996).

Carpet backings are notorious for causing adverse health effects. To minimize the potential problems, avoid backings containing polyvinyl chloride (PVC), styrene, butadiene and rubber. Jute, a natural fiber, provides a naturally durable surface that does not require toxic treatments to endure heavy traffic (Duehring, 1996).

Carpet installation is least problematic at the beginning of the summer, when students and staff are away and won't be returning for several months. Once the carpet has been laid down, the building needs to be well ventilated with fans to draw the fumes outside.

Regular cleaning of carpeting is important for maintaining clean air. The carpet fibers act as a sink, trapping pollutant particles. However, data from the Carpet and Rug Institute indicates that it takes four passes with a vacuum to remove "a satisfactory quantity of soil" from the surface of the rug (CRI, 2002). The rest stays and accumulates in the carpeting. Few custodians are aware that they need to pass the vacuum over carpeting four times to do a thorough cleaning, and fewer still would have the time to do it

Hard-surface flooring

Concrete, wood, terrazzo, and ceramic tiles are examples of hard flooring offering several opportunities for safer school construction. While the installation process is not hazard-free, these floors emit far fewer toxins once they are laid down, and they last for many years. Concrete may seem dull, but pigments can added for color, and brick or cobblestone patterns can be used to give the concrete a different texture. Concrete holds up very well in high traffic areas such as hallways, cafeterias and foyers. Concrete can be finished with a sealant and wax, which require periodic reapplication.

Solid wood floors are usually reserved for gymnasiums or special areas. This material costs more upfront, but its natural durability reduces the need for preservative chemical treatments and reinstallations. The lifespan of a wood floor is expected to be at least 38 years (CHPS, 2001). If the costs are prohibitive, consider wood floors for areas where students spend a majority of their time, such as the classrooms.

A material with similar benefits and appearance to wood is bamboo. A type of grass, bamboo creates a surface that is more durable than hardwood--12% harder than rock maple.

Wood and bamboo are nailed or glued to a subsurface and then sealed for protection. Nailing is preferable since most adhesives contain harmful solvents. If adhesives are used, solvent-free or 100% silicone adhesives are better (Baker-Laporte, 2001). Selecting a safe topcoat sealer is especially important because porous materials such as carpeting or fabric-covered wallboards will absorb toxic vapors from freshly sealed floors. A clear water-based sealer with no or low-VOC emissions is a good choice. Natural sealers, such as those with linseed oil, are the least toxic, though linseed has a strong odor during and shortly after the application.

Ceramic tiles are made from combinations of different earth materials, such as shale, clay, and gypsum, which are fired into a hard, non-reactive surface. Ceramic tile is naturally resistant to moisture buildup and can prevent mold and mildew problems. The tile may be glazed or unglazed, but the glaze holds up better under heavy foot traffic and does not require a sealer. Imported ceramic tiles, however, may contain lead or radioactive metals in the glaze (CHPS, 2001). The tiles are laid in a mortar bed that secures them to the floor after drying. Grout is a porous mixture that runs between the individual tiles and should be sealed for resistance to water and staining.

All of these installation materials--mortars, grouts and grout sealers--can be a source of toxic chemicals. Specify water-based/acrylic and low-VOC mortars and sealers. The grout should be free of harmful additives, such as fungicides.

Terrazzo is a polished surface made of rock chips, such as granite or marble, which are incorporated into a cement or epoxy mixture. For a long-lasting surface for high-traffic areas, cement-based terrazzo is an excellent choice. The epoxy terrazzo, however, should be avoided since it contains several toxic chemicals. Terrazzo should be coated with a water-based sealer (CHPS, 2001).

The California High Performance Schools' *Best Practices Manual, Volume II* provides a good overview of various flooring materials (CPHS, 2001).

Resilient/composition floor coverings

Composition flooring includes vinyl, the most popular material, and synthetic rubber, as well as healthier materials, such as cork and linoleum. Composition flooring comes in rolled sheets and tiles and may be quite soft due to added plasticizers, such as phthalates in PVC, which offgas readily.

Steer clear of vinyl and synthetic rubber sheet materials for any cushioned floor covering. These surfaces can emit chemical fumes long after installation (See section on PVC in Chapter III). Airing out the vinyl composition tile (VCT) in a warehouse to allow the fumes to dissipate before installation would be one way to address the problem. This, however, would be a time-consuming activity since VCTs are packaged in stacks; the tiles would have to be individually laid out prior to arriving at the construction site.

Cork is a viable alternative to vinyl that provides some cushioning underfoot. This material, harvested from trees, is pressed into tiles that may be finished and stained like wood surfaces. Cork floor tiles are mold resistant, thermal insulators and sound absorbent. A water-based adhesive can secure the tiles to the subfloor, and a linseed-based sealer will strengthen the cork and provide water resistance. Once they are sealed, cork tiles require vacuuming or damp mopping for maintenance.

Linoleum, made from flaxseed oil, wood powder and jute, contains no petrochemicals or plasticizers. Available in sheet or tile form, linoleum is naturally antimicrobial and antistatic and strengthens with age. The average lifespan of a properly installed, well-maintained linoleum floor is 30-40 years. Linoleum requires regular upkeep, including vacuuming and wet mopping, but not as much as vinyl composition tile (Wilson, 1999). While linoleum does have a characteristic odor, this can be masked with a water-based sealer.

Paints/Surface Coverings (sealers, caulking)

These materials are divided into solvent (oil) or latex (water) based. Latex products are considered less hazardous only because they contain smaller amounts of harsh ingredients. Petroleum-based (oil/alkyl) paints can contain up to 60% VOCs while water-based paints will have up to 10% VOCs (Bower, 1993). Water-based paints, however, often contain biocides (essentially pesticides) added as preservatives to ward off mold and mildew. Low-biocide (95% free of preservatives and fungicides) and VOC-free paints are available.

These additives, including biocides, may cause adverse health effects. It can be difficult to uncover the identity of these ingredients because information is often considered proprietary. Green Seal, an independent, nonprofit, standard-setting organization has evaluated coatings for VOC emissions, heavy metals and 21 toxic compounds and identified healthier options (Green Seal, 1993). Oil-based products derived from natural plant oils, such as linseed, are generally better and usually free of other harmful additives (Baker-Laporte, 2001). Be aware that some products may be less durable, requiring more coats or frequent applications, which can undermine "environmentally friendly" claims. Oil-based paints have generally been regarded as longer lasting, but latex paints today often have comparable durability.

Interior Wood

Particleboard, plywood, and medium density fiberboard (MDF), are formed by pressing small pieces or sheets of wood together with a formaldehyde-based glue. MDF and particleboard are used for flooring, roofing, walls, cabinetry casing, shelving and doors, drawer fronts, and furniture tops. Plywood used to be the primary choice for interior wood subflooring, walls and roofing, but most builders today are using MDF and particleboard due to lower costs. These materials, however, pose a greater risk than plywood. MDF and particleboard are made from very small pieces of wood, requiring more glue to form a solid sheet.

These formaldehyde-containing wood products are made with one of two types of glue: a mixture of formaldehyde with urea or a mixture of formaldehyde with phenol. The urea formulation releases formaldehyde when exposed to heat and humidity and thus generally releases substantially more formaldehyde than the phenol mixture, which forms a stronger bond with the formaldehyde (EWG, 1999). Most of the particleboard, plywood, and fiberboard sold in the U.S. use a glue mixture of formaldehyde and urea (CEH, 2002).

The air in portable classrooms, which have formaldehyde-containing wood in the flooring, wall paneling and ceiling, is prone to contain high levels of formaldehyde. These tight structures usually have few windows and poor ventilation systems to dissipate the offgassing fumes (Ross, 1999). See the discussion of portable classrooms in Chapter VI.

There are healthier alternatives to using formaldehyde–containing wood products. Formaldehyde-free particle and fiberboard is available, although it is more expensive (EWG, 1999). One alternative product is Medex and Medite II made by SierraPine. This product uses a polyurea resin matrix adhesive rather than urea or phenol formaldehyde. According to the manufacturer, "There is almost no formaldehyde out-gassing..." and the formaldehyde that is in the product is limited to natural formaldehydes that are contained in the wood prior to manufacture (EBN, 1992).

Other alternatives include wheat straw board and salvaged wood. Wheat straw particleboards are made using wheat fibers in place of wood fibers. One product, made by Natural Fiber Boards, mixes chopped wheat straw with a non-formaldehyde (MDI) resin and presses the mixture into panels (EBN, 1995). A Green Seal report on wallboard, fiberboard, and flooring evaluates this and other alternatives to formaldehyde–containing wood products (Green Seal, 1996).

If a board with formaldehyde must be used, it should be coated with at least 3 coats of sealant to reduce offgassing. Some hospitals and libraries have used formaldehyde–free particleboard, a precaution that makes obvious good sense for schools as well (EWG, 1999).

Exterior Wood

The most common wood preservative used in the U.S. is chromated copper arsenate (CCA). As discussed in Chapter III, CCA-treated wood is found everywhere wood is used outdoors: playgrounds, picnic tables, fences, decks, and foundations. Arsenic leaches out of the CCA-treated wood where it can be absorbed or ingested by children.

Healthier options to CCA-treated wood exist. The most common alternative is alkaline copper quat (ACQ) which is a mixture of copper and didecyl dimethyl ammonium chloride (EWG, 2001). Other options include copper boron azole (CBA) and copper citrate (CC). Research studies indicate that the toxicity of ACQ is relatively low compared to CCA (Solo-Gabrielle, 2000), though recent tests indicate that copper does leach out of ACQ, as well as CBA and CC, at much higher levels than from CCA. This presents a problem because copper is considered to be

Building an Energy Efficient and Healthy School

Somerville, Massachusetts—When the Somerville school district began planning for a citywide early education center, Mayor Dorothy Kelly-Gay challenged the city's project manager, Mike Foley and HMFM architect Doug Sacra to design an energy efficient school that would reduce costs, improve learning conditions, and enhance the health of children and staff. The city married this project with a renovation of a public park in a dense urban neighborhood.

Under a state mandate to replace all recreational space encroached upon by the building, the city bought 12 lots adjacent to the site. Asbestos was abated, houses were demolished, and PCB-contaminated soil was removed. Although lead levels in the existing topsoil were under the allowable levels set by the Department of Environmental Protection, the soil was replaced as part of the mayor's "best environment for our children" position. The city renovated the park to provide soccer fields, a basketball court, community gardens, and playgrounds without arsenic or chromium wood preservatives.

The designers included a number of features to ensure good indoor air quality. Continuous under-slab insulation and a thermally improved exterior envelope will reduce opportunities for condensation, which leads to mold growth. A continuous air barrier is provided throughout the building's shell that eliminates uncontrolled air leakage. Fiberglass acoustic ceiling tiles will prevent mold growth, as well as improve the sound absorption by 80%. Materials with minimal offgassing, including low-VOC paints and adhesives, were used.

To reduce energy and maintenance costs, the design team modeled many energy conservation measures to create a truly high performance facility. These improvements are projected to reduce the energy use by 35% compared to a facility that just meets code. The building will save the city $53,000 per year in energy costs and has already garnered utility rebates over $100,000. It will also reduce greenhouse gas production by 278 tons annually. In addition, a solar-panelled roof, funded through a grant from the Massachusetts Technology Collaborative, will generate clean electricity.

a "potent aquatic biocide" that is harmful to marine life. Despite these findings, researchers feel that the risks are much greater for CCA, especially where humans are concerned (Ban CCA, 2002).

If your school grounds have CCA-treated wood, it should be removed, along with any contaminated soil. As a last resort, in case removal will be delayed or disputed, a sealer should be applied to the wood at least once per year to prevent the arsenic from leaching out. A sealer, however, does not guarantee a safe surface, and sanding and scraping the wood to prepare it for the sealant can release high doses of the preservative into the surrounding area (US CPSC, 2002).

Windows

Windows affect more than the thermal and lighting conditions in a school; they also play an important role in the health of teachers and students in the classrooms.

Depending upon the placement of the windows and the materials that go into them, heat gain or loss and glare can be minimized. High-quality, triple-glazed windows are recommended for thermal and moisture control and to promote energy efficiency and reduce heating and cooling costs. "Low-e" (low emissivity) glazing is a metallic coating applied to glass that reduces the transmission of heat between indoors and outdoors, while allowing high or low amounts of solar light to get through. Windows that open and close allow greater ventilation and can reduce HVAC costs.

Window frames also play a role in energy efficiency and are available in wood/wood-clad, metal, composite, vinyl, and fiberglass. The section on PVC in Chapter III explains why vinyl should be avoided. While fiberglass frames filled with insulation offer the best thermal performance, metal frames are superior when health concerns are weighed.

Metal frames, either steel or aluminum, function best with thermal breaks that prevent outdoor temperatures from affecting the indoor air. Wood frames are an option, though they are sometimes treated with chemicals to resist moisture and rot.

For more resources on windows, the Efficient Windows Collaborative offers brief explanations of the varieties of glass, frames and other technologies (EWC, 2002).

Chapter V

THE INDOOR ENVIRONMENT

Heating, Ventilation and Air Conditioning (HVAC)

The HVAC system has a major impact on indoor air quality. The HVAC system can transport pollutants throughout a school building, and it can exacerbate a problem by distributing contamination from one part of the school to another. When dirty or poorly designed, it can introduce additional pollutants into the school environment.

The HVAC system helps the air to circulate between classrooms, hallways and offices and to exchange with outside air through windows, vents, ductwork and fans. Separately-vented fans should be designed to remove air from specific areas, such as custodians' closets, locker rooms, and science labs, and send it outside. The air handling system relies on fans and ductwork to continuously circulate indoor air and replace a given volume of it with filtered and conditioned outdoor air.

The HVAC system also regulates temperature and humidity levels. The American Society of Heating, Refrigerating and Air Conditioning Engineers has created standards for acceptable ranges of temperature and humidity levels within a building depending upon the season (AHSRAE, 1992). In addition to bringing discomfort, excessive humidity encourages the growth of mold and mildew, while very low humidity levels help disperse mold spores (seed-like bodies that attach to surfaces and mature into mold). Very low humidity also causes eye, nose, and throat irritation.

Ventilation Problems Plague New Schools Too

Girard, Ohio—The large, new Girard Intermediate School has been plagued with fungi and mold since it opened in the fall of 2000—the result of problems with the school's construction. (For example, the ductwork and insulation were exposed to moisture before being installed.) Chris Notareschi's fifth grade science students became so sick that she persuaded her colleagues, whose students were similarly affected, to teach their classes outside to avoid the stench, but the superintendent quickly forced them back indoors.

After significant pressure from the newly formed Girard Concerned Parent's Group, extensive testing was done in the building, revealing that there were high levels of fungi in the carpeting, airborne particulates, VOCs, pathogenic bacteria, and high levels of carbon dioxide. The group pushed for removing the carpet and replacing it with tile and replacing the fiberglass-insulated ductwork, which the Girard Board of Health has said should not be used in hospitals and schools. The school may finally reopen in September 2002 after 16 months of renovation work that cost a half million dollars.

The group is also working on removing the Girard Board of Education, which withheld information on the problems at the school for six months, including information on student illnesses. After the group collected over 2,000 signatures supporting the board's removal, a state court ordered that the board be dismissed. The case has gone to the Ohio Supreme Court, which will decide whether the lower court has the authority to remove the board.

Natural ventilation, i.e. air moving through open windows and doors, is necessary for healthy indoor air. The HVAC system and natural ventilation can lessen the impact of indoor pollutants by drawing contaminants outside and diluting indoor concentrations with adequate doses of outdoor air. Modern schools that are tightly sealed to save on heating and cooling costs thwart natural airflow through open windows and doors. Natural ventilation, however, may only be available on a limited basis in some climates, which means a greater reliance on the HVAC system.

The placement of vents, fans, and windows should be designed to collect the cleanest air possible. For example, a fan that pulls in outdoor air should not be situated near a parking lot where diesel buses and cars idle or near garbage dumpsters, a vent that releases contaminated air, or other contamination sources.

The air circulating in a school should be a mixture of outdoor air and air that is recirculated, filtered, and heated or cooled. The HVAC system must be capable of moving enough air with enough velocity to reach all interior spaces to prevent significant temperature differences between floor and ceiling. During the design process, insulation between walls and under flooring should be considered to help regulate temperatures so that actual comfort levels and thermostat readings match. Large windows, while important for ventilation, cause hot or cold spots to develop that can be corrected by drawing blinds or curtains (US EPA, 1995).

Good quality, properly installed HVAC systems demand higher prices initially. Over their life cycle, however, savings accumulate. In addition to consuming fewer natural resources, energy efficient HVAC units reduce costs through prevention of such problems as poor indoor air quality and mold.

Fresh Air for Vermont Students

Newport, Vermont—Jessica Trahan was a freshman at North Country Union High School (NCUHS) when she lost consciousness and was hospitalized. When Jessica was unable to return to school, her mom Cindy started looking into the school's indoor air quality and how it had affected her daughter's health. She began to attend school board meetings and campaigned for and won a seat on the board. After two teachers instituted separate "sick building syndrome" lawsuits against the school, the community approved a bond issue to improve ventilation and the board moved ahead with an ambitious renovation project.

In addition to replacing room heating units with new fresh air intake ventilators, a complete air exhaust duct system was installed; science labs were gutted and rebuilt with fume hoods and a ducted chemical supply closet; ventilation was upgraded in auto, building trades, and metallurgy classrooms; and a wood chip boiler replaced the oil burning boiler system.

Mary Scarpa, the school district's business manager, not only oversaw the successful implementation of the project but took additional steps to protect students' health by reducing diesel fumes in the building. Buses were moved off-site, no longer permitted to warm up next to the school or to idle while waiting for or discharging students. All vendor deliveries of heating fuel, propane and diesel fuel have to be made prior to the start of school or after school hours. Mary's diesel idling policy was incorporated into the Vermont Healthy Schools Act of 2000 (VPIRG, 2000).

Jessica, the student who was made so ill by the school's poor air quality, eventually returned to school and graduated in the top 10 of her class, earning a fully paid scholarship to a local state college. And in recognition of its accomplishments, in August, 2001 NCUHS received one of 10 U.S. EPA Indoor Air Quality Tools for Schools Excellence Awards.

A poorly designed HVAC system can lead to costly expenses for mold remediation due to high humidity levels or for engineering services to address drastic temperature differences within a building. Indoor air problems are pricey not only in dollars but in terms of their impact on learning and on students' health.

Ducts and vents should be regularly inspected and cleaned as needed, with special attention given to problematic areas, such as water damage or debris blocking the airflow. Duct cleaning/replacement should be scheduled when the school is unoccupied, as there is a chance that particles will become dislodged from the duct lining and recirculate in the air. Only HEPA or micro-filtration vacuums should be used to collect the debris, and neither biocides nor sealers should be applied (US EPA, 1991).

If you suspect a HVAC-related problem, you need to justify your suspicions. You may be able to tell there's a problem just by walking through the school because of obvious temperature changes between rooms, stuffy, humid air, or foul odors. Other indicators, however, may be subtle and show up as symptoms of illness: irritation of the eyes, nose and throat, headaches, dizziness, fatigue, rashes, asthma, and other respiratory signs. The next step, pinpointing the cause, may require enlisting professional help. The HVAC system should be examined to ensure that it is being properly maintained. There should be adequate intake of fresh air that is distributed to all areas of the building. The ductwork, drip pans, filters, vents, and heating and cooling coils should be clean and free of debris. Since the HVAC system may exacerbate an existing problem, deal directly with the polluting source. Eliminating the source of an indoor air quality problem is far more effective than merely increasing the ventilation and air conditioning to dilute the contamination.

Lighting

Since the 1960s when school architecture favored designs with smaller and fewer windows, the harsh glare from fluorescent lights has become the standard. Studies indicate, however, that natural daylight has benefits for students that designers of healthy schools should be aware of.

While not all classrooms can enjoy large windows overlooking a panoramic view, natural light greatly contributes to brightening school interiors. Daylight is a softer, diffuse light, which, ideally, reaches all areas of a classroom.

The amount and types of lighting in a school building play a significant role in learning. A 1999 study conducted by the Heschong Mahone Group examined the standardized test performance of 21,000 elementary school students in 3 districts in California, Washington, and Colorado. The conclusions demonstrate that natural lighting is a wise investment. In California, students in the classrooms with the greatest amount of natural light progressed 20% faster in math and 26% faster on reading tests. The same study indicates that children in classrooms with the largest window areas progressed 15% faster in math and 23% faster in reading. In Seattle and Fort Collins, students in classrooms with the most daylight scored 7 to 13% higher than other students on end-of-the-year tests. The results from all school districts consistently support daylighting as a factor affecting academic performance (HMG, 1999).

Another convincing study, conducted in Sweden among eight-year olds, found a significant connection between daylight exposure, hormone levels, and student behavior. Children were sent to work in four classrooms, each receiving different types of natural and artificial light.

Disrupted hormone patterns were observed in the absence of daylight. The authors have concluded that these disrupted hormone patterns may impact a student's ability to concentrate and cooperate (Kuller, 1992).

The incorporation of daylighting into the school design requires careful consideration by the design team. Windows and skylights can also create patches of extremely bright light or glare. The challenge for the design team is to capture daylight and, using the right materials, spread the light throughout a space.

Integrated Pest Management

Pests that take refuge and multiply in a school or on school grounds can damage the building and disturb students and teachers. Pesticides, however, pose risks that substantially outweigh any temporary relief they might provide.

Hundreds of pesticide products on the market are lethal to pests. Not surprisingly, many of these chemicals are also dangerous to people, especially children. Even though health risks have been associated with many of these substances, they continue to be used in close proximity to children. The risk is great that children and school staff will inhale, swallow, or touch residues of these products applied on school property.

Many pesticides are neurotoxins and adversely affect the developing brains and nervous systems of children. The effects of prolonged exposure include neurological and reproductive damage and cancer. Acute health effects include eye and throat irritation, skin rashes, nausea, vomiting, diarrhea, headache, flu-like symptoms,

Parent Fights to Reduce Pesticide Use

Glenwood, Maryland—After Veronika Carella's two previously healthy children became seriously hyper-sensitive to chemicals while attending elementary school, she became concerned that pesticide use at the school was the cause. She began advocating right-to-know and integrated pest management (IPM) policies in order to reduce toxic pesticide use in schools. Through her efforts and those of the PTA's Health and Environment Issues Committee and other children's advocates, Maryland became one of the nation's first states to pass legislation mandating that public schools adopt integrated pest management policies and notify parents when pesticides are used.

Still concerned about her children returning to school, Veronika and other parents worked with the Howard County Public School System (HCPSS) to implement lower risk, less toxic alternatives to traditional chemical pest control techniques. Some of these techniques have been put into practice at Triadelphia Ridge Elementary School (TRES) and at Lime Kiln Middle School (LKMS) and will be studied as part of a two-year US Department of Agriculture grant. As part of the study, parent volunteers were asked by HCPSS to continue the PTA-organized volunteer grounds maintenance at LKMS and TRES until 2004. These volunteer efforts were implemented as part of an agreement to suspend herbicide use at these two schools. Because of these efforts, Veronika's children and other chemically-sensitive students were able to return to school. The school superintendent has been asked to consider making the voluntary low-risk maintenance program permanent at both schools, with the goal of eventually expanding these IPM and maintenance techniques county-wide.

upper respiratory distress, and, in extreme cases, death (US EPA, 1999). Moreover, in most states, these chemicals are being applied without any notification to parents. Most states do not even require that signs be posted when pesticides are used in schools or on school grounds.

What is IPM?

To avoid the risks presented by pesticides, some schools are opting for Integrated Pest Management (IPM). IPM is a strategy that aims at preventing pest problems and that uses pest control methods that do not pose health risks to people. Under IPM, pesticides (which include herbicides, insecticides, fungicides, rodent poisons, and miticides) are applied only as a last resort and only the least-toxic chemicals are used.

IPM relies on "pest proofing" to prevent pest access and on monitoring to determine whether problems exist and to what degree. Routine housekeeping and maintenance strategies eliminate pest attractions and habitats. IPM never applies pesticides on a calendar schedule. Successful programs reduce not only health hazards, but also costs, by avoiding expensive chemicals and unnecesary treatments.

The Child Proofing Our Communities' Poisoned Schools campaign, in conjunction with other groups working nationwide to eliminate school pesticide use, has developed a "Gold Standard" IPM policy (CPOC, 2001). The "Gold Standard" policy entails monitoring, prevention, non-chemical techniques to get rid of pests, and the use of least-toxic pesticides as a last resort.

The five core principles of the Gold Standard IPM policy are:

- Participation in a school IPM committee is available to parents, age-appropriate students, teachers, and community members.

- Preventive and alternative pest controls should be used first: sanitation measures to eliminate pest habitats, structural remedies to block pest access, and maintenance measures to prevent pest infestations.

- Only use least-toxic pesticides if pests present a documented health or safety hazard and never for strictly aesthetic purposes.

- If pesticides are used, they should be the least toxic available and their use strictly limited. Under no circumstances should pesticides be used that can cause cancer, reproductive damage, nervous system damage, disruption of the hormonal (endocrine) system, damage to the immune system, or are acutely toxic.

- If least-toxic pesticides are to be applied, parents, students, and teachers should be informed at least 72 hours in advance through written notification and posting. Notification should include what pesticides will be used, the health effects associated with exposure, contact information, documentation as to why use is necessary, and the right to request alternatives (CPOC, 2001).

Unfortunately, the term "integrated pest management" has different meanings, depending on who is using the term. The IPM policies of some states and localities are similar to the Gold Standard; other so-called IPM policies give equal emphasis to the use of toxic pesticides. In fact, because of its growing popularity, the term "IPM" is being adopted by many commercial pest treatment companies, despite their routine use of high-hazard pesticides (CPOC, 2001).

IPM programs have been successfully implemented in many schools nationwide. In Montgomery County, Maryland, elementary school principals must send written notification to parents and staff 24 hours prior to the application of any pesticide, and must include information on the pesticide to be used, where and when it will be applied, and an EPA statement warning people with chemical sensitivities to avoid unnecessary exposure (MCPS, 2000). Pesticides are now used so rarely in Montgomery County that this procedure is not often activated.

These programs are not only effective at controlling pest entry into schools, but often are cheaper than conventional pest control. Montgomery County reduced its pesticide use from 5,000 applications in 1985 to zero in 1989. The county also saved $1,800 per school and $30,000 at the food service warehouse (Schubert, 1996).

The *Poisoned Schools* report explains the need for IPM; provides examples of current practices, which vary considerably in the absence of federal regulation; lays out a 10-step plan for implementing an IPM program; and suggests specific IPM strategies for different areas of a school (CPOC, 2001).

Precautionary Principle Provides Protection from Pesticides

Los Angeles, California—Four years ago, Robina Suwol was dropping her sons off at Sherman Oaks Elementary School when she noticed a man in a hazardous materials suit spraying chemicals on the school grounds. Her youngest son suffers from asthma, and that night he suffered a severe attack from the chemical exposure. This incident provoked her to found California Safe Schools and embark on a campaign to rewrite the Los Angeles Unified School District's policy on pesticides and parents' right-to-know. One year after Robina's children were sprayed, Los Angeles Unified passed the most stringent pesticide policy in the nation. The policy, which is explicitly based on the "precautionary principle" and requires integrated pest management, has become a model for school districts and communities nationwide.

Cleaning and Maintenance

Young elementary students see helping teachers with housekeeping chores as a privilege. They clamber to sponge down the chalkboards and rinse off desks and tabletops. Their spirit of pride and cooperation should be emulated.

The primary purpose for mopping, scrubbing and vacuuming should be to remove harmful contaminants so that they neither become a threat to health nor damage the building systems. Cleaning to maintain appearances is of secondary importance (Berry, 1993).

Although the budgets for school construction and for ongoing cleaning and maintenance are completely separate, ongoing cleaning and maintenance issues must be addressed during the design phase since it is counterproductive to use finishes and other materials that the school cannot afford to maintain. The annual budgeting process should include appropriate funding for cleaning and maintenance. Unfortunately, far too often "deferred" maintenance is simply the politically correct way of saying that the work simply is not going to get done, which can place students at risk.

Maintaining and cleaning schools is an enormous undertaking, yet many schools lack adequate staffing and planning. This can result in poor cleaning, which places students, teachers and others at increased risk from harmful exposures.

A maintenance plan that focuses equally on preventing and responding to problems should be established and followed. Because all schools are different based on their age, construction materials, geographical location, type of school (an elementary school needs to be cleaned differently from a high school), staffing levels, and the specific requirements of individual students and staff, it is necessary to develop a cleaning plan that meets the specific needs of the individual school. A good resource to help school districts tailor an appropriate operations and maintenance plan is the American Society of Testing and Materials, which has developed a national cleaning standard for commercial and institutional buildings (ASTM, 1998). This document will help school officials with a process that ensures the protection of children's health, while reducing environmental impacts and meeting all regulatory and other requirements.

The ASTM guide recognizes that everyone who uses the school shares responsibilities for preventing problems. Custodians who are familiar with normal building conditions and functions will be able to monitor for unusual smells, sightings, or sounds and attend to the source. Students and staff should also participate in preventing situations that might require the use of harsh chemicals. If eating is only permitted in the cafeteria and an outdoor area, students should obey this rule so that they do not attract insects and rodents to other areas. Teachers, in turn, should uphold school rules. For example, teachers should not bring personal cleaning items to the school for use in classrooms since these may include toxic substances.

Many indoor air quality problems can be averted or quickly addressed by an observant, trained maintenance staff. For example, because mold grows readily in moist, warm environments, maintenance staff should carefully monitor temperature and humidity levels. Ductwork, vents and filters should be inspected regularly to see that surfaces are clean and free of mold (US EPA, 1991). This attention can prevent mold from reaching levels that trigger symptoms, preventing the use of hazardous disinfectants or fungicides.

Preventing asbestos contamination also requires a watchful eye and frequent inspections. By examining the areas where asbestos is found – around pipes, boilers, ceiling tiles, and wall boards – maintenance staff should be able to detect any crumbling or cracking that could signal the release of asbestos fibers. If sealers are applied to keep the asbestos from deteriorating, an accurate log should indicate when the next application is due.

Lead sources also require constant monitoring. If there is lead paint in the school, friction points need to be checked for flaking and chipped paint, which could be ground into a fine dust or chewed on by young children. Where lead pipes or solder have been used in the plumbing, the water needs to be tested.

The first line of defense is the school's perimeter, especially doors and vents where students, staff, and outside air enter the building. To avoid dirt-caked shoe bottoms from leaving a trail throughout the school, pathways to entrances should be regularly swept clean and washed. Dirt paths leading into the building, which become muddy during rainy periods, can be paved or covered with stones to reduce the amount of soil entering the building. Shrubbery, fences, and other obstacles can be placed to encourage people to use the appropriate sidewalks and entrances.

Double-entry doors can confine outside debris to an enclosed area. Large mats, grates, and grills capable of capturing large particles should be placed outside the doorways. Walk-off mats placed immediately inside the doors to capture smaller particles and to dry wet shoes should extend inwards 9 to 15 feet. These mats should be vacuumed throughout the day. Hard flooring, especially in entryway areas, should be dust mopped, vacuumed, or damp mopped daily. These good health strategies also save labor and money by capturing and removing the dirt before it spreads throughout the building.

Ideally, vacuuming should be done several times a day in high traffic areas. However, unless the custodians have the proper equipment, their efforts may be futile. Vacuums need micro-filtration bags so that everything sucked through the hose remains in the bag. Micro-filtration disks and bags are capable of capturing 99.79% of particles as small as 0.3 microns in size and are effective at a fraction of the cost of more expensive HEPA bags and filters, which capture 99.97% of the same size particles (Shideler, 2002).

Both micro-filtration and HEPA vacuums typically offer multiple filtration stages, including disposable bags that are multi-layered and more efficient at retaining particles. Standard paper or cloth bags release dust particles into the air through the bag and hosing, actually increasing potential health problems. It is important to recognize that some manufacturers sell vacuum cleaners with HEPA filters so poorly constructed or designed that fine particles escape from leaks in the machine. The Carpet and Rug Institute has developed a testing program for vacuums that certifies the machine's ability to remove soil, capture fine dust particles, and maintain the appearance of the carpet (CRI, 2002).

A poorly functioning HVAC system can also undermine the benefits of vacuuming. To keep circulating air clean, the HVAC system needs to be inspected and cleaned as needed – vents, filters, ducts, heating/cooling coils, and fans. A log containing the dates of maintenance and which activities were performed can ensure timely inspection and replacement of filters and other components.

Routine housekeeping contributes to healthy air quality only when the cleaning products do not introduce new toxins. Art rooms, locker rooms, science labs, and swimming pools pose formidable cleaning challenges. Custodial closets are often stashed with products that contain ingredients that may be toxic to children, teachers, and of course the cleaning staff.

For example, 2-butoxy ethanol, an ingredient in some graffiti removers, heavy-duty degreasers and floor strippers, is highly toxic, causing acute reactions, such as headaches, dizziness, lightheadedness, and eye, nose, and throat irritation. It may also cause long-term effects, including kidney, liver and reproductive damage (JP4, 2002). Some graffiti removers contain toluene, a known reproductive toxin. Many toilet bowl cleaners contain dangerous concentrations of hydrochloric acid, which burns skin on contact and produces toxic fumes when mixed with water (JP4, 2002). Others use a type of detergent called a nonylphenol ethoxylate, which may be an estrogen mimic and has been banned in most European countries. Even some very common cleaning products contain hazardous ingredients such as chlorine, which in addition to being a respiratory irritant can burn eyes and skin. When mixed with other commonly used cleaning products, chlorine can produce deadly fumes (JP4, 2002).

As cleaning demands have increased because of swelling classrooms and longer hours of operation, schools have purchased more aggressive and toxic products to get the job done faster. While children may not be exposed to large amounts of cleaning chemicals at once, they are exposed to low levels over long periods of time. Science is only beginning to address the impact of exposures to low-level mixtures of chemicals on children. In some cases, children have developed chemical sensitivities to low-level chemical exposures. The sensitivities are difficult to diagnose and treat and are therefore not considered by many mainstream medical practitioners to be "valid" problems.

Cleaning staff can, however, perform their duties without compromising the health of everyone at the school. Standard cleaners should be used prudently and infrequently. For example, if carpets are vacuumed regularly and common spills soaked up quickly, or if food is not permitted in the classroom, the need for using toxic spot removers will be reduced. Also, instead of using a harsh, chlorine-based disinfectant on desks, tables and doorknobs, detergents, and water are safe and effective substitutes.

The Pittsburgh (PA) Public School District has implemented a program to reduce the use of toxic products in their 96 school buildings (Ashkin, 1999). The process began in the elementary schools because younger children are more at risk. Smaller, rural districts, such as the Shelburne (VT) Public School District have found similar opportunities to replace their traditional products with safer alternatives and procedures (Ashkin, 2000).

In both cases, the process of reducing toxic products in cleaning and maintenance was based on the ASTM Standard. This process began with developing a baseline, which identified many cleaning products containing ingredients that were hazardous to children, including those that were both known and suspected human carcinogens, mutagens, poisonous, asphyxiates, known environmental hazards, and strong irritants. In addition, the baseline identified cleaning procedures and other pollution prevention strategies (e.g., using walk-off mats at all entrances) that can be incorporated into a comprehensive and cost-effective program. A baseline is extremely important for identifying all opportunities for improvement, prioritizing the improvements, and examining the drawbacks and benefits of replacing toxic and less efficient cleaning strategies with better alternatives.

An alternative method for evaluating cleaning products has been developed by Green Seal, whose mission is developing product standards that reduce environmental and health impacts during manufacture, use, and disposal. Green

Seal's standards are described in *Institutional and Commercial Cleaning Products* (Green Seal, 2000). Green Seal's guide recommends specific, brand name products, making it easy for purchasers to find what they are looking for.

The products recommended by Green Seal meet the following criteria. They are

- Not toxic to humans;
- Not carcinogenic (cancer-causing) or reproductive toxins;
- Not corrosive (will not burn) to skin or eyes;
- Not a skin sensitizer;
- Not toxic to aquatic life;
- Non-flammable/combustible;
- Low VOCs (organic compounds that evaporate into the air) to reduce indoor air quality problems;
- Biodegradable.

Prohibited ingredients include heavy metals such as arsenic, lead and mercury.

The Janitorial Products Pollution Prevention Program (JP4) is another resource for good maintenance practices. The JP4 program is a venture of the US EPA, California EPA and regional governments in southern California and aims to protect the health of workers and building occupants by using safe, low-impact cleaning products that work well. It began in 1998-99 with two projects in the San Francisco area, then expanded to southern California. In both projects, janitors were interviewed about the products they used. The type and frequency of janitorial accidents involving chemicals was noted, and cleaning products were reviewed for hazards and use. Based on this information, the program produced fact sheets and guide materials for purchasing and using janitorial products. JP4 materials also explain how certain cleaning techniques can help reduce the amount of chemicals used (JP4, 2002).

Establishing a policy for using safe cleaners in schools will require speaking tactfully with a district facilities manager and/or one of their staff members about adopting effective child-based health standards for purchasing cleaning products and equipment. Referring school buyers to specific criteria, such as those developed by Green Seal, should make it easier for schools to change their purchasing practices. If the entire school district is not prepared to adopt an across-the-board policy, perhaps several schools could pilot the program.

Chapter VI

DESIGNING A HEALTHY SCHOOL

Building a healthy new school or renovating an existing school requires the involvement of parents, teachers, administrators, school board members, students, and the custodial staff. The parties should all be committed to creating a clean and safe learning environment. Prior to beginning any design work, these parties should come together to define needs, set priorities, and establish goals.

Important issues to be discussed include what building materials should be used, how these materials will affect cost, what performance standards need to be achieved, how long materials will last, and what the operations and maintenance requirements are for such materials. These and other basic issues need to be resolved early on so that the group can communicate its objectives clearly and consistently to the designers. Clarity on these matters will make it less likely that changes will have to be made during the design phase.

It is also important to build community support for building a healthy school (see Chapter VII, Getting Your School Community Involved). While it may seem obvious that everyone would support building a healthy school, the cost may initially be higher and the planning requires thinking outside of the box. Generating community support and enthusiasm can give the project momentum and perhaps coax some donations. Write to newspaper editors, speak at PTA and school board meetings, talk to parents, teachers, and architects about the health, academic and long-term cost benefits a healthy school would provide. Once informed about the school construction process, you can confidently direct your input to the appropriate people and prepare for future action.

This section describes the design process, which usually takes place at a high level within the school administration. The design sequence is based on the California High Performance Schools Best Practices Manual (CHPS, 2001).

Setting Goals and Objectives

The most important step in building or renovating a healthy school is to set clear goals and objectives. Your overall goal may be to create a safe learning environment for the children of your community. Objectives may include building the school on property that is not contaminated with toxic chemicals, using non-toxic materials in construction and in supplies and furniture, and designing the building and HVAC system to ensure good indoor air quality. Although changes are bound to occur along the way, goals that are established at the outset should guide the project through completion.

A permanent committee can be formed to ensure that your key goals and objectives are included in the design and to monitor the construction and eventually the operations and maintenance at the school. This committee can also proactively educate the school board, contractors, and designers about healthy schools.

Once healthy school goals are established, thinking shifts to how goals can best be implemented. How can you avoid building materials that contain formaldehyde? What can you substitute for PVC products? What are the alternatives to wall-to-wall carpeting? How can you ensure that the HVAC system is designed to provide clean indoor air?

After considering all of these issues, a written report should be prepared summarizing the results of the initial planning phase, including goals and objectives, performance standards for achieving these goals and objectives, what materials should be used or avoided, information about the types and variety of spaces needed, the area requirements, how the spaces should relate to each other, and space requirements for the mechanical, electrical, and technology systems (heating/cooling, plumbing, computers, cafeteria appliances). The goals and program points are the backbone of the project and will affect the rest of the design and construction process.

Site Selection

The location of a new school can sabotage or enhance the remainder of the design process. New schools are still being built on contaminated property or near hazardous waste sites. Selecting a school site requires a keen eye, curiosity, and some research. When a plot of land is proposed for a school site, visit and note the surroundings. Are there houses, forests, another school, agricultural fields, stores, busy roads, or factories nearby? A background check on the previous uses of the site is imperative. Using legislation passed in California and a related state environmental review process as a model, the Child Proofing Our Communities' School Siting committee developed school site acquisition guidelines and recommendations for existing schools with contamination problems and for siting new schools (CPOC, 2001). These guidelines and recommendations are intended as an interim guide for making decisions. A more complete, scientifically-based set of guidelines must be developed that considers children's special vulnerability to multiple chemical exposures.

These guidelines define a four-step process for evaluating sites:

- **Step One: Involve the Community.** A school district should notify parents, staff, the surrounding community and "feeder" schools of plans to build a new school and solicit their participation in writing. A committee should be formed comprising the school district governing board, parents, teachers, the school nurse or health unit director, age-appropriate students, surrounding community members, local public health persons and environmental advocacy groups.

- **Step Two: Site Assessment.** Once the site is proposed, the school district should contract with an environmental assessor to conduct a three-phase environmental assessment. The assessment should include a history of current and past uses of the site; sampling and analysis of soil, water and, if warranted, air; and identification of property within two miles of the site including industrial sites and discharges, chemical storage facilities, waste treatment plants, landfills, military sites and research facilities.

- **Step Three: Determine the Need for a Preliminary Endangerment Assessment (PEA).** Based on the information gathered, the environmental assessment should conclude that either 1) no recognized environmental hazards were identified, or 2) a more extensive site assessment--PEA-- is necessary. If a PEA needs to be conducted, a school district has two options. It can either contract with a qualified environmental assessor to conduct a PEA of the property, or it can drop the school site from further consideration.

- **Step Four: Remediation and Response.** If the PEA concludes that site remediation is necessary, the school district must do all of the following or not acquire the site: 1) prepare a financial analysis to estimate and compare soil cleanup costs for those methods that meet the most protective standards; 2) evaluate the suitability of the site in light of recommended alternatives; 3) contract with the departments of environmental protection and health for oversight and request reimbursement for them for all costs related to review and/or cleanup work (CPOC, 2001).

Siting decisions are not applicable for existing schools, but if suspected site contamination is endangering efforts for a healthy building renovation, steps need to be taken to determine if the site needs to be cleaned up. Samples of soil, groundwater, air, or surface water will need to be analyzed for contaminants. Depending on the outcome, further tests may be necessary before action is taken. The *Creating Safe Learning Zones* report provides guidance for existing schools that face possible site contamination (CPOC, 2002).

Living on a Landfill

New Orleans, Louisiana—Residents of Gordon Plaza—1,000 low- and middle-income African Americans—discovered only after they moved in that they were living on the former Agriculture Street Landfill—the city's municipal waste dump for more than 50 years. Household, industrial, and medical waste had been dumped and incinerated at the site, and when it closed in the mid-60s, the landfill covered 95 acres and was more than 17 feet deep. The landfill was never properly capped, and residents began almost immediately to dig up trash and building debris in their backyards.

Construction of Moton Elementary school—intended to serve 850 students from Gordon Plaza and a nearby housing project—was completed in 1987 despite residents' concerns about high levels of lead and other toxins at the school site. Parents faced a choice of either busing their children to troubled schools in other parts of New Orleans or building on a contaminated site. During the three years the school was open, children and staff were sick with rashes, vomiting, respiratory problems, and headaches, and plumbing problems made it impossible to use the school cafeteria and toilets. In 1990, the superintendent overruled the school board and shut the school down.

The U.S. EPA added the Agriculture Street site to its Superfund list in 1994 and began a $20 million cleanup in 1998, replacing two feet of soil while residents remained in their homes, exposed to contaminated dust throughout months of cleanup work. Concerned Citizens of Agriculture Street Landfill (CCASL) opposed the cleanup as inadequate and dangerous and have continued to demand that the entire community be relocated. The president of the CCASL, Elodia Blanco, whose daughter developed breast cancer at 14 and who has three friends who live within 20 feet of her home with brain cancer, says, "I continue to fight for environmental justice because at this point, I have nothing to lose. Nothing means anything to me if I don't have good health."

Moton Elementary School reopened in September of 2001. In some areas on the school grounds, only six inches of soil were replaced. Despite its history, 900 students currently attend the school. "This is a poor community," explains Elodia, "and many families cannot afford to send their children to other schools. So they are burdened with health problems at home and school."

Building a New School

Selecting the Architectural/ Engineering Team

After the site for the new school has been selected, an architectural and engineering team will be chosen to design the building. The school district writes a Request for Proposal (RFP) explaining the planning committee's project and goals and inviting interested architects and engineers to submit proposals for designing a healthy school. The RFP should clearly state that the design team must be able to meet the planning committee's goals and objectives and adhere to the agreed upon specifications, such as the use or prohibition of certain building materials, or designing for ample indoor/outdoor air exchange.

Fees should be negotiated only after the design has been selected. The architects and engineers must commit to developing final design and construction plans that meet the planning committee's healthy building standards.

Commissioning

Hiring a building commissioner ensures that the actual construction matches the design and specifications. As building designs become more complex, commissioning is increasingly used to make sure that all of the structural, mechanical, and electrical components work together. Ideally, a building commissioner is hired early in the design phase and becomes familiar with the project's objectives. In the early design phases, a commissioning agent can help predict how certain systems, such as HVAC and lighting, will perform. Throughout construction, and afterwards, the commissioner inspects the work to ensure it meets the planning committee's specifications. When checks are performed during the construction, it avoids the time and expense of calling contractors back to the site to correct a problem. High costs are incurred when the bills are paid and these failures are not caught before the contractor leaves the site. Commissioning also includes training for the school's operations and maintenance staff so they can take care of the school according to healthy building standards.

In addition to design expertise, the commissioning agent should be familiar with local building codes, indoor air quality, energy conservation, construction practices, and key members of the design and construction teams. The commissioning agent may be a third-party engineer, designer, or a member of the construction team (US DOE, 2002).

Design Phase

Rough ideas are sketched out in the schematic, or predesign, phase and later refined. Drawings created by the architects and engineers will show how the school might look from a variety of perspectives. Depending upon the feedback, the drawings will probably be reworked several times. During this phase, the work becomes more detailed as key building systems (architectural, structural, mechanical, and electrical) and materials are selected. The decisions will reflect costs and personal preferences, inevitably leading to trade-offs and compromises between parties.

Before these trade-offs become final, it is crucial that the designers weigh the impacts to the entire building. For example, if wood floors are to be finished with a sealer, this choice should be low outgassing and nontoxic once cured. The sealer should withstand enough foot traffic so that only annual applications are necessary. It is also important to look at the maintenance requirements to make sure that the upkeep will not involve toxic treatments.

As the design progresses, reflect back to the original goals of the project. Reviews, to which the community should be invited, can be scheduled by the percentage of the design completed, e.g., at the quarter mark, halfway, three-quarters finished, and completed.

Construction Documents

The construction papers are the drawings and specifications for the building systems, materials, equipment and furniture to be used; they are the blueprints for the new school. When the construction documents have been drafted, begin talking with the contractors who will build the school. Many contractors are unfamiliar with the concepts and materials needed for a healthy school building. This is especially true of indoor products such as carpets, paints, glues, and surface finishings. Introducing contractors to healthy building products can prevent costs from creeping up, which tends to happen when contractors must work with an unfamiliar product.

Expect changes to the final construction documents. If wood flooring is deemed too expensive and a substitute material is used, the new material must also be non-or low-toxic. A substitution review process needs to be established that includes the design team and school district and allows ample time to thoroughly examine a request and approve or deny it.

Healthy School Receives Pennsylvania Governor's Praise

Radnor Township, Pennsylvania—In August 2001, Radnor Elementary School in Delaware County opened its doors as the first newly constructed green school in Pennsylvania. Designed by Lancaster-based Gilbert Architects, the new school incorporates numerous elements of environmentally friendly green design. Both the school district and the architectural firm received the Governor's Award for Environmental Excellence in 2001.

Prior to construction, the school site was home to a historic mansion. When the building was dismantled, the community and the site contractor hauled the components of the mansion offsite for reuse, recycling more than 75 percent of the building.

Thanks to the advocacy of local parents Steve Saul and Karin Saul-Lazaurs, children's environmental health was the primary goal of the project from its outset. Along with the installation of a state of the art heating, ventilating, and air conditioning system, the building is maintained with ecologically safe products, such as floor finishes with no heavy metals, non-toxic cleaners, and HEPA vacuum systems. To further reduce toxins, only low- or no-VOC paints were used. The flooring is a combination of terrazzo, a polished product composed of rock chips and vinyl composite tile without toxic adhesives. An extraordinary 30-day offgassing period was allowed for the tile and the entire building before children started using the school.

Other features of the project are a geothermal well field beneath the playground that will heat and cool the entire school without fossil fuels and help save the district money in energy costs, the preservation of 100 mature trees on site, and the future use of solar energy to power the technology lab.

Costs

A school designed to maintain and enhance children's health requires special attention and is likely to cost more initially. But when the costs for the entire lifecycle of the school are calculated, schools built with healthy building materials should prove less costly. For example, the use of little or no carpeting obviates the need for deep cleaning treatments and replacement patches for stained or worn areas. The careful placement of air vents, ducts, and fans can prevent the need for costly reconfigurations. The overall use of less or non-toxic material reduces the chances that certain materials might have to be replaced or dismantled once they are found to pose a threat to people in the school – for example, the arsenic-treated wood at playgrounds.

To help your school district manage costs, programs may be available that provide special financing options for schools that are healthy, durable, and energy efficient. The Department of Energy's Energy Smart Schools is one such program. The National Educational Facilities Clearinghouse has many resources on financing (NCEF, 2002). It is worth investigating financial assistance for designs that are environmentally friendly or energy efficient. Outcomes that are good for the environment almost always benefit children's health.

Bidding

The project will be competitively "bid" to determine which contractors will work at the site. A bidding announcement should emphasize the need for experienced and qualified contractors. Contractors will respond to an invitation for their services by providing a detailed description of the services they will provide and the costs. This is the time to prep the contractors about the goals and special design considerations of this project and to make sure that these considerations are included in their bids. Contractors may have to be educated so that they understand why you have made the choices you have in the design of the building or renovation. In a bid, a contractor may choose to substitute some materials for the original ones, but any substitutions will have to meet the goals of the project to be approved.

Construction

Construction can begin once funds are available and the contractor has been hired. This phase can last one to three years, with small renovations taking less time. While monitoring the building process, the school district will have to watch out for unapproved design changes and substitutions of one material for another.

The more unusual materials (due to high quality standards) arriving at the site will have to be carefully tracked to ensure they are installed properly. The school district will also need to keep on eye on energy and water usage and how wastes are disposed of.

Occupancy

Once the building is deemed fit for use, reflect back to the planning and goal-setting phase of the process. How do these goals enhance the building's use for teaching? The school may have some unique features or policies, and the occupants--maintenance personnel, teachers, staff and students – need to understand how to use the building to maximize the building's performance and their health and comfort.

Renovation/Remodeling

Renovation/remodeling projects have the same potential as new construction to contaminate a school with toxins, jeopardizing the health of students and staff. This is a serious problem because the poor condition of our schools makes an upsurge in remodeling projects and renovations likely. The average age of public school buildings in the U.S. is now 42 years, and these schools are increasingly overcrowded and in disrepair (NCES, 2000).

Tearing out walls, tarring a roof or applying paint generates fumes or particles that can be carried throughout the building via the HVAC system and inhaled by children in distant classrooms. Welding and machinery with combustion engines can produce harmful gases, such as carbon monoxide and nitrogen oxides. Moreover, noise, vibrations and temperature changes associated with the renovation create an inhospitable learning environment.

Workers at the construction site should prepare for and be capable of managing problems in the existing structure. Construction crews in schools dating to the 1970s or earlier need to be vigilant about encountering asbestos or lead paint. Lead paint could be ground to a fine dust or asbestos could become airborne during cutting and sanding.

One of the key concerns about renovations is the timing. Ideally, major construction work should be done when students are *not* in the building. This restricts the work to summer vacations, nights and weekends. The other option is to close the school during the renovation and temporarily relocate the students to another suitable location.

If construction must proceed during the school year, the work area, including HVAC portals, should be sealed off from other parts of the building. A local exhaust system can be set up with floor fans pulling air outside, or portable ventilation units with flexible ducting may be used. In preparation for construction work, the area should be cleared of furniture. Placing walk-off mats, cleaning equipment, and removing work clothes before moving to other areas of the building can contain the spread of contaminants. Additional safe practices include keeping lids on containers when not in use, pouring materials into containers when taking a break and promptly cleaning up spills (American School and University, 1998).

Renovation Unleashes Problems

Lockport, New York—During a renovation to remove asbestos from Gasport Elementary School, several children became ill. One six-year old, Larissa, had to visit the doctor 14 times in one school year because of repeated sinus infections. (Since being removed from the school, she has only needed medication three times in two years.) Larissa's mother, Sue Hughes, tested the school for mold without authorization and found that her daughter was indeed allergic to the molds identified by the lab.

Sue and other parents at the school have faced an administration and a school board that refused to acknowledge a problem. Some vocal parents were even subject to retaliation by school officials, making others afraid to openly pursue the causes of their children's illnesses. However, over the last two years, the community has elected three new board members who are parents of children in elementary school, and the board is now willing to take a closer look at environmental problems at the school. Parents of children who are still experiencing medical problems are hopeful that school officials will address the issues they've raised.

Maintaining an open channel of communication between school administration, staff, students, and parents throughout the renovation/remodeling process is good practice. The school district should develop a hazard minimization and hazard communication plan that would be distributed to interested parents and community members. The staff and students should receive regular updates on the project and know the areas of prohibited access. Parents and community members should also be informed of the purpose of the project and progress, including problems or setbacks, as the work ensues.

Before the construction is completed, the indoor air quality must meet the initial, agreed-upon criteria. All surfaces should be wiped with a wet cloth and cleaned with micro-filtration-equipped vacuums. The HVAC system should be inspected for components, such as filters, that need to be cleaned or replaced, (Marshall, 2002).

While renovations and remodeling projects may seem to present minor challenges compared to new construction, they occur more frequently and can provide opportunities for positive change on a broader scale within the school district.

Good things Happen When Children's Health Is Considered First

Franklin County, Ohio—The Franklin County Health Department has developed Ohio's most aggressive school health and indoor air quality improvement program. Paul Wenning, school inspector for Franklin County, began the program in 1997 in response to parents' concerns that renovations being done during the school year were making students and staff ill. The department reformulated its program to include the major components of the EPA's Tools for Schools Program. The department also advocated removing carpeting and area rugs from the schools since carpeting is hard to maintain, harbors contamination, and is a prime reservoir for mold spores. Simultaneously, the department initiated assessment of the indoor air quality of all 200 schools in its district.

The South-Western City School District in southern Franklin County was, at its own request, one of the first school districts assessed by the Health Department. During the summer of 1998, two of the district's high schools, which had serious, extensive mold contamination, were cleaned before the schools reopened. Wenning then did an assessment of the district's other 30 school buildings and worked with its administrators to develop a phased program for improving environmental conditions.

Since 1999, South-Western has implemented Tools for Schools recommendations and removed much of the carpeting from 14 of its buildings. The health department has noticed a decreased rate of absence among teachers and students and fewer indoor air-related illnesses. Throughout the district, schools are much cleaner and safer.

South-Western has also built seven new schools as "green" buildings to accommodate new students. This was accomplished by choosing durable, environmentally friendly materials, such as solid block walls instead of wallboard, which will reduce potential mold growth. Carpets were only used in small, specialized areas. New classrooms were designed to receive plenty of natural light. Best of all, the school district completed its green building projects under budget and on schedule.

Portable/Modular Classrooms

With increasing frequency, school districts face overcrowding due to rising student populations, aging buildings, and the lack of funds to build or maintain existing classrooms. Students may also need to be temporarily housed while contaminants such as lead, asbestos, or mold are cleaned up. These circumstances have led many school districts to turn to "portable" (or "relocatable") classrooms. In California alone, over 86,500 portable classrooms are used during some part of the day by more than 35% of the students (CHE, 2002).

Like renovation/remodeling projects, constructing portable classrooms have the same potential as new construction to affect the health of students, teachers, and staff. Portable classrooms are especially susceptible to poor indoor air quality. Many of the materials used in portable classrooms are volatile organic compounds (VOCs) that release chemicals that are easily inhaled by students, teachers, and others using these structures. As described in Chapter III, VOCs can cause a variety of adverse health effects, including headaches, fatigue, loss of concentration, irritation of the eyes, nose and throat, asthma, allergic reactions, skin rashes, reproductive problems, and cancer.

The most common VOC found in portable classrooms is formaldehyde. Formaldehyde is found in glue used in wood products such as particleboard, plywood, chipboard, and medium density fiberboard (MDF); in foam insulation; and as glue in carpeting and other floor coverings (Miller, 1995).

In addition, furniture often used in portables, such as desks, books cases, and shelving are made from wood products containing formaldehyde glues.

Other common contaminants include carbon dioxide from inadequate ventilation; carbon monoxide due to incomplete combustion in heating systems; molds, allergens, and microorganisms; and plasticizers found in vinyl flooring (see Chapter III). In addition, outdoor pollutants may enter structures through poorly designed ventilation systems.

Portable classrooms are small and tightly constructed with few windows, leading to poor ventilation and the buildup of contaminants. Ventilation systems are critical to providing and maintaining good air quality, but portables are rarely connected to the HVAC system of the main school building. Instead, window units or other individual ventilation units have been installed. These systems, however, are often not used or are turned off routinely by teachers because of the noise and lack of certainty about how to operate them or manipulate filters that may need to be changed or cleaned.

In selecting a ventilation system for portable classrooms, builders may want to consider the system's noise level or capacity to interfere with learning. Teachers should be able to operate and maintain the system with ease. Teachers will be more willing to use a system that takes care of itself or involves a minimum amount of time away from their children.

A more detailed discussion of portable classrooms can be found in "Reading, Writing and Risk, Air Pollution Inside California's Portable Classrooms" prepared by the Environmental Working Group (EWG, 1999) and in "Portable Classrooms: Healthy Learning or Health Risks?" prepared by the Center for Environmental Health (CHE, 2002).

Chapter VII

GETTING YOUR SCHOOL COMMUNITY INVOLVED

If you have read the primer to this point, you have a basic understanding of the hazards in most school buildings, some ideas for eliminating these hazards and the flow of the design and construction process. This knowledge can become a powerful force for change when publicly shared. Certainly there are other parents, community members, perhaps elected officials who share your feelings and can help convert these ideas to actions. Having contractors actually apply nontoxic paints, adhesives, and surface coatings is a victory that will come only after a lot of outreach and discussion with parents, teachers, friends, adversaries, architects, engineers, custodial workers, and school board members. This chapter provides a framework for mobilizing people toward creating a healthy school environment. The organizing model we present here has been adapted from *Reducing Pesticide Use in Schools: An Organizing Manual* by the Pesticide Watch Education Fund (PWED, 2000).

STEP 1: Initial Research

This is the information-gathering phase. Before you begin speaking to architects, planners, and other experts in the school design field, you want to level the playing field. Comments based on thorough research will resonate more with your target audience and provide you with greater leverage during the design process. Statements that are grossly exaggerated or just personal preferences risk undermining your credibility. Some background research and exploration can help you clarify and articulate your demands. In your research, consider these basic questions:

1) Why do you want to take extra precautions to design a school that will be constructed from healthy building materials and operated in a safe manner?

2) What are some of the main differences that will distinguish this school from others?

3) Are there local architects/engineers who have experience in this type of design?

After reading this primer, consult the resources list in the back for more detailed information. Your local reference librarian may be able to help you locate resources in your area, including environmental and community groups likely to support your cause. Learn from the experience of others; call or write to a PTA/PTO at a school that is the result of a healthy school building effort. What was their experience in planning, designing, and building the school? Are there any post-construction problems or surprises? What were their greatest challenges? Perhaps call an architectural/engineering firm with experience in this type of construction to find out the major obstacles they typically face. Once you are comfortable with the basic process of school construction, draft a list of priorities – things you feel would yield the greatest benefits for the children if implemented.

STEP 2: Build Core Support and Establish Your Platform

After completing your initial research, begin to recruit a core group of individuals to work with you on getting your message out. Remember the list of priorities you identified. Concentrate on presenting these issues convincingly, but concisely. At this point you do not need a detailed building plan. There will be many changes, compromises and challenges along the way, and while you don't want to surrender your main principles, getting caught up in all the details too early might put others off.

It takes the power of many to achieve change. By working with others, you'll accomplish much more; alone, you'll be overwhelmed by all that needs to be done. It is important to bear in mind that a group is less vulnerable to accusations of being fringe than is an individual; alone, you are an easier target for opponents.

Most school campaigns begin with a handful of dedicated people. Several tactics can help you locate others to join your group. Talk to neighbors or other parents within the school district. Contact the local PTA/PTO, or other school-based parent groups, such as special needs program staff and parents, the teachers' union or the health and safety committee, and local environmental and health organizations. Try to imagine which community organizations might be open to or already share your concerns. A healthy school environment benefits everyone--from children, teachers and staff regularly at the school to parents and other community members who live in the area or use the school grounds and buildings for activities.

Hosting your first meeting

Having identified your core group, hold an initial meeting. Create a written agenda to be available before the meeting since many who may want to join the campaign are likely to be balancing careers, parenting, and other commitments. A long disorganized meeting is likely to deter them from returning. Try to limit the meeting to no more than 90 minutes.

The agenda for the initial meeting might include:

- Introductions, including why people are attending
- Overview of project based on your research
- Goals discussion: What does the group want to accomplish?
- Discussion of next steps, including recruitment ideas
- Assignments for action before next meeting
- Setting a date and time for next meeting

Establishing goals

You and fellow community members should determine exactly what you want the school district to do. Clearly defining the steps you want the school district to take will ease your progress and discourage the school district from ignoring your input. While you may have a slew of suggestions, begin with the ones that address the most pressing issues.

STEP 3: Approach the School District to Support Your Goals

After determining your goals, meet with the school administrative staff responsible for decisions related to school construction/ renovation. The earlier and more involved the school district is, the better the chance that your goals will succeed. Attend the meeting as a group representing the community that will be impacted; bring in teachers, parents, and students. Representatives from organizations such as the PTA, unions and environmental and health care organizations are also helpful. Present your concerns and goals clearly.

This initial meeting may follow any of several scenarios. In the best case, staff will agree with your ideas and a committee will be formed to keep the design process attuned to environmental health concerns. More often, the administration will react with skepticism and express concerns about adding a new twist to standard construction procedures. Listen carefully. These concerns may indicate lack of understanding of how your ideas can benefit the school children and staff.

STEP 4: Power Map the School Board/Planning Board

To achieve your goals, you must convince the majority of the school board or planning board that a healthy school building is essential and achievable. In some areas, a planning board has the authority to approve building permits. In these cases, it is better to work with the planning board than a school board. This is also true where school board members are appointed rather than elected and may be less responsive to community interests.

Always keep in mind that these individuals are your primary targets. You need to "power map" the board to determine how to achieve your goals. This tool is used for determining how to influence decision-makers and entails five basic steps.

1. Find out who has decision-making authority. Ask what the process for constructing/renovating a school is and whether a committee or the full board oversees these issues. It is important to have the planning timetable for your district so that your actions do not come too late.

2. Determine the best board target(s). Examine the politics of the board to determine who will likely support the project, oppose it, or remain undecided. Who are the most powerful board members? PTA and teacher union representatives are often good sources of this information.

3. Determine which individuals or institutions are likely to influence your targets. Individual board members are influenced by a variety of forces. As elected or appointed officials, they must respond to their constituents and supporters in order to retain office. Thus, other board members, school staff, the PTA and other teacher and parent organizations, unions, media, the member's family, environmental and public health organizations, community leaders, students, and many others are possible sources of influence.

4. Among those who influence the targeted board member(s), determine who you have influence over or access to. Perhaps you have excellent connections to the PTA and environmental groups but limited access to the board member's family. However, maybe a close personal friend known through church is a board member and that relationship can be brought to bear on the target.

5. Calculate which influences are required to move your target. You will be unable to use all potential influences over your target but will not necessarily need to. You must determine which are the most appropriate and accessible.

STEP 5: Develop and Implement a Strategic Plan of Action

You know your goals and whom you need to influence. Now it is crucial to develop a strategic plan, which involves thinking through what steps may and may not work. Properly done, it will make campaign efforts most effective and efficient, maximizing use of energy, time, and resources. Your strategic plan should focus on how to influence the school board.

Recruitment

Recruitment is a critical component of any successful campaign. Your success may in part depend on recruiting from a broad spectrum of audiences, including school staff, board members, the PTA/PTO, and teachers. Recruitment serves to educate the public, enlist volunteers, demonstrate broad support, and many other purposes.

How do I recruit people?

- Designing and distributing a short educational fact sheet is one of the best ways to get your message out. Fact sheets are easy to prepare and highly effective. The fact sheet should describe the project and your approach and what people can do to get involved; indicate upcoming meetings, important hearings, or which school board members need to be contacted; and provide a contact person and phone number for more information.

- Collecting petition signatures educates the public about your campaign, demonstrates support for your platform, and recruits volunteers. It also allows you to collect addresses and phone numbers of supporters. Keep a copy of all signed petitions.

- Handing out informational flyers to recruit support and board members is often combined with petitioning.

- Making educational presentations to groups such as the PTA/PTO, other local school, environmental, and community groups activates potential supporters. Presentations are easy and fun. Contact organizations with a potential audience and ask to be placed on an upcoming meeting agenda. Ascertain how much time you will have to present. Prepare appropriately; consider your audience and what would be most likely to persuade them to support healthy school construction. Interactive presentations are particularly interesting and informative for you and your audience. A CHEJ slide show about the vulnerabilities of children to toxins is available to borrow.

- Placing informational tables in high traffic locations, such as school events, farmers markets, heavy shopping areas, and public transportation centers allows easy distribution of campaign materials.

- Phone bank or create an e-mail list of interested individuals so you can keep people up-to-date on activities, invite them to meetings, and ask them to participate in campaign activities.

- Holding regular, well-planned meetings that run 90 minutes to 2 hours, at most, keeps supporters involved with minimal intrusion into their busy schedules.

Media

Use the media to effectively educate the broader public about your issues and influence school board members. Several tactics can help you get your message out. Press conferences are the best means to release new information, a report, or updates on breaking issues. Radio talk shows are increasingly becoming popular news sources, and many allow for public discussion of important community events. Call your local station and sell them on your proposal.

Editorials in newspapers cover a wide range of topics, including local issues that impact schools. To set up a meeting with an editorial board to discuss your concerns, send a letter of request. Include information about the issue you want to discuss and who you would like to bring to the meeting. Follow the letter with a phone call. At some newspapers, it is fairly easy to get a meeting, at others, all but impossible.

Opinion pieces sent from the public regularly appear in newspapers. Opinion pieces are an ideal way to communicate with the public because you control the content. When a reporter or editor presents your issue, they are free to put their own slant on your message through what they exclude and include, the tone they use, and the context in which they place it. Consult your local paper to determine opinion piece guidelines. If the piece is co-authored by an influential community member considered an authority on the subject, such as the PTA chair, the paper is more likely to print it. Newspapers generally publish letters to the editor. Consult the paper for special requirements, such as the number of words permitted.

Grassroots Pressure

Grassroots tactics are essential. Send letters or postcards to targeted school board members. As part of your public education effort, distribute a sample letter people can work from.

Advocating

Meet with key school board members to lobby for their support. Bring other community residents to the meeting, including, if possible, some who personally know board members. Provide appropriate materials, including fact sheets, petitions and a list of coalition members and other supporters, and a copy of the actions you want people to support. Ask sympathetic board members to commit their support and for names of other members to approach.

Coalition Building

Coalition building effectively demonstrates broad-based support for your project. Many constituencies are likely to endorse your efforts and should be approached, including environmental and public health organizations, the PTA, unions within the school, and local community groups. Other essential targets are important community figures, local elected officials, former school board members, and prominent businesspersons.

Choosing Strategies

Analyze what resources you have before deciding on what strategies and tactics to adopt. Determine how many volunteers you can count on; what funds are available to print fact sheets and other materials to educate school board members, the media and the public; and how much time you can commit to the project.

STEP 6: Submit Your Proposal to the School Board for Formal Adoption

The commitment to build a healthy school must become official school district policy in order to ensure that the goals are not sabotaged during construction. Present your proposal to the school board for official adoption. Be prepared for a likely public hearing on the proposal.

Sharpen your message

Everyone who presents to the board should send a uniform message agreed upon by coalition members. Line up your votes. Before the hearing, know where each board member stands on the issue. Know which people are more likely to pay attention to your focused message than to general speeches. Should you discover that you have insufficient board support to win passage of your plan, you may want to delay your request for a vote; a plan is more difficult to pass after it has already been rejected. Still, at every opportunity use a hearing's open public comment period to educate the board.

Pack the hearing

The greater the number of supporters at the hearing, the more likely the outcome you desire. School board members concerned about re-election find it difficult to vote against a popular proposal.

Stage your presentation

Consider the most effective way to present your plan. Your numerous supporters could, for example, carry visuals such as signs and wear symbols on their clothes indicating support.

Parents Organize to Rid School of Mold

Mt. Morris, Michigan—Staff and students at 100-year old Central Elementary School have been sickened for several years with bronchial and sinus infections, asthma, and migraines. In 1999, a longtime school employee, Bethany Richards, discovered that the interior of the basement was covered with black mold. After pressure from staff, the district administration demolished one wall of the basement, but more than 900 people continue to use the other three and a half floors of the building. Despite the illnesses and visible signs of mold contamination, school officials continue to maintain that the school is safe and that no one can get sick from several months of mold exposure. The Concerned Parents Group formed at the school have responded to the inaction of the school board by leafleting school parents and contacting local media. The group continues to challenge district administrators, demanding that mold growing inside walls, above ceilings, and under floors be properly remediated—or that the school be shut down.

Prepare for the opposition

Identify your probable opposition, know their main arguments, and be prepared to counter with your own information. Remember not to get caught up only arguing scientific or technical details. Use common sense arguments: Why take unnecessary risks when alternatives are available?

STEP 7: Publicize Results

Let people know about your efforts through the media. If you win passage of your proposal, media coverage gives your organization and elected officials a positive public image. If passage fails, coverage allows you to demonstrate outrage at the board's vote against protecting children and public health. In either event, you will reach a wide audience of the voting public who will select the next school board.

STEP 8: Form a School Environmental Health and Safety Committee

A school environmental health and safety committee is a very positive step not only for building a healthy school but also for safeguarding against future problems. The committee should include parents, teachers, age-appropriate students, custodians, administrative staff, and architects/engineers. The committee itself can consist of smaller committees with responsibilities for implementing and monitoring construction/renovation; identifying safe property and/or oversight of the process of locating safe property; and, monitoring and improving indoor air quality once the school is in operation.

School Receives Environmental Grants

Milton, Massachusetts—When the Milton school district began the process of renovating their six school buildings, Laurie Stillman, a parent with two children in the system, voiced the widely-shared concern that new schools being proposed would have similar air quality problems. The Milton school board, well aware that some of its schools were already under investigation for indoor air quality problems, worked with Laurie to establish an Environmental Health and Safety Committee (EHSC). The EHSC, which is comprised of administrators, teachers, parents, custodians, and fire and health department officials, now oversees the health and safety of the town's existing and new schools.

During its first two years, the EHSC has moved quickly to improve environmental conditions at Milton's schools. The EHSC has received a "Green Schools Grant" from the Massachusetts Technology Park Corporation to examine ways to incorporate renewable energy sources into school design, including solar and wind energy sources, and to improve daylighting and ventilation systems. The committee has also received grants from the Toxics Use Reduction Institute to develop and implement policies for reducing the use of toxic chemicals in schools. In addition, the Massachusetts Department of Environmental Protection has provided funds for the disposal of hazardous chemicals that had been stored at some schools. Members of the EHSC are working with the town-wide school building committee to ensure that new school buildings provide students with a healthy environment from the start.

STEP 9: Watchdog Construction or Renovation

Monitoring the construction or renovation is important. There are many reasons, some justified and others not, why the school board or your local school might not follow the goals set down by the planning committee or the school environmental health and safety committee. If there is no group of people watchdogging the process, then actions could be taken that pose risks to the school population, undoing the good work that has been done. For example, if the school board decides to use toxic pesticides because of a recent infestation in or around a new building, that building could have toxic residue on the floor, baseboard, or ground for months.

Or, let's say an agreed-upon cleanup plan called for the removal of four feet of soil and then the plan was changed to two feet; once the school was built it would be very expensive and difficult to go back and remove the remaining two feet of soil. The same is true with monitoring cleaned-up property. If someone isn't watching, school administrators may choose not to inform the parents and staff if something is found to be leaking into the school property.

Yesterday's Garbage Is Today's Environmental Crisis

Palos Verdes, California—At Rancho Vista Elementary School in Rolling Hills Estates, more than 500 students learn their ABC's just a few hundred feet from a landfill containing 47 billion pounds of hazardous and municipal waste. The old Palos Verdes Landfill, which was a Class I industrial waste landfill and accepted hazardous waste from 1952 to 1980, has no bottom liner to contain toxic leachate and no cap. Millions of gallons of liquid wastes were buried in the landfill, including 55-gallon drums of TCE (trichloroethylene). Groundwater contamination has already been documented, forcing the Los Angeles Sanitation District to build wells and take other steps to try to contain the problem. Heavy concentrations of metals have been found in the three- to five-foot dirt cover. The Palos Verdes Fault is 1,200 feet away, and Country Hills homes, some as close as 10 feet from this landfill, are being evacuated due to landslides.

In February of 2002, citizens from the five cities surrounding the landfill formed South Bay Cares to defeat a proposal for building a golf course on top of the landfill. The group is especially concerned that the heavy use of water on the golf course (at least 400,000 gallons a day) will cause extensive groundwater contamination. The group has been diligently attending city council and school board meetings and distributing literature to create public awareness of the health risks. The group was successful in having the usual 30-day comment period on the notice of preparation extended to 60 days. Within a few of months of getting started, the group had collected 3,000 signatures on a petition to stop the project. South Bay CARES is pushing for comprehensive testing to be done and demanding full disclosure of information regarding the landfill and the health effects on the children and residents surrounding it.

Chapter VIII

CONCLUSION: THE SAFETY OF OUR CHILDREN IS IN OUR HANDS

School-based issues are local. Local school boards control school issues and decisions, with some oversight by state agencies. Few laws govern the "school environment." In most states, school districts can actually build a school on top of a dumpsite, and schools can routinely use toxic chemicals such as pesticides without restrictions and having to notify parents. Generally, it takes a crisis such as children becoming sick from pesticides, mold, or poor indoor air to get the attention of parents and school administrators. Consequently, parents need to lead the charge to change the way schools are built, maintained, and renovated.

Parents have been lulled into believing that schools are "safe" for children. To a certain extent, this is true. School officials work diligently to keep out drugs, alcohol, and violence. Yet, when it comes to chemicals and other contaminants in the school environment, most schools haven't even begun to tackle the issues and problems.

A healthy school environment can be achieved. The campaign's research clearly shows that alternatives are available for building healthy schools that avoid the use of chemicals in building materials, furniture, and supplies that offgas and build up in classrooms. Many of these same alternatives can be used during renovations and in portable classrooms. Alternatives also exist for maintaining and cleaning school buildings and for controlling pests in ways that avoid the use of toxic chemicals. But parents and teachers will have to press for change if we are to achieve a healthy school environment for all children, teachers, and school staff.

The campaign has worked with many groups across the country who have successfully promoted healthy building practices in their schools. Many of these groups have set up school-based environmental health and safety committees. Members of the campaign can put you in touch with these groups so that you can learn how they created change at their schools. Please contact the campaign for assistance. We'll do our best to identify someone who can help with your specific needs.

Getting Started: Steps you can take to find out about the use of toxics at your school

Here are several simple steps that parents can take to see if their children are being unnecessarily exposed to toxins or contaminants at school. If a problem is identified, you will find that you can be more effective working with others who share your concerns. Chapter VI shows how you can work with parents, community members, and school officials to take action. Forming a group will make it easier to work with the school administration to correct problems and/or suggest needed improvements. Identifying the places that pose a risk is the first step.

Has the indoor air quality been tested at your school?

Contact the school's principal and find out when the last time the heating, ventilation, and air conditioning (HVAC) system was checked out. Talk with the school custodian and find out how often the filters are cleaned or replaced. Also, ask if the indoor air quality was ever evaluated to identify what pollutants might be present in the school. Since the HVAC system can transport pollutants throughout a school building, it can exacerbate a problem by distributing contamination from one part of a school to another. Make sure to deal directly with any existing problems. Eliminating the source of an indoor air quality problem is far more effective than merely increasing the ventilation or air conditioning to dilute the contamination.

Does your school have a mold problem?

Look, or ask teachers, custodians, and others if they have noticed roof leaks, damaged gutters, condensation on windows or walls, localized flooding, or wet carpets. Moisture accumulation must be eliminated or mold growth will continue. Mold can be very harmful to the health of children, teachers, and staff. Constant monitoring is needed to prevent the problem or catch it before it quickly spreads.

Where do school buses idle while students are entering and leaving the building?

Many school buses line up near air intake vents or near open windows and doors, allowing diesel fumes to enter the school. To identify air intake vents, walk around the building and look for an area with a grate or ask the school custodian where it is. Advocate that school buses warm up and wait in an area as far away from the school building as possible.

Is the school playground made from wood treated with arsenic?

If your school has a wooden playground, contact the school's principal and find out what the wood is treated with. Many wooden playgrounds are made of wood treated with the preservative chromated copper arsenate (CCA). The arsenic leaches out of these wooden structures into the surrounding soil and will get onto children's hands when they climb on playground equipment. Exposure to arsenic is known to cause cancer and other illnesses. Some schools and parks have already removed toxic wood from playgrounds but others have not. If your school playground was built using arsenic-treated lumber, consider the following steps:

- Replace the arsenic-treated wood with alternative material.

- Seal the arsenic-treated wood every year with polyurethane or a hard lacquer.

- Don't let children eat at arsenic-treated picnic tables, or at least cover the table with a coated tablecloth.

- Make sure children wash their hands after playing on arsenic-treated surfaces, particularly before eating.

How does your school handle pests such as ants and cockroaches?

Contact the school's principal and find out what the school does when they have a pest problem. Ask if pesticides are used. Many schools routinely spray with pesticides even if there isn't any evidence of problems. Other schools have adopted an integrated pest management (IPM) approach to manage pest problems and to reduce the use of toxic pesticides. If you find out that pesticides are being used at your school, ask that all parents and school personnel receive notification before any applications are done. The notice should include the name of the pesticide, the chemicals present in the formulation, and a description of the health effects associated with exposure to these chemicals. This way parents can make informed decisions about whether to send their children to school following the application, while simultaneously advocating for the use of less toxic pest control methods.

What types of cleaning products are routinely used in the school?

Talk with the school's custodian and ask what he/she uses to clean the school. You may also have to talk with a school administrator who purchases supplies for all the schools in your district. This person may know more about what products are used to clean and maintain the schools. Many schools use extremely powerful chemical-based cleaning products that can aggravate asthma problems and affect children's nervous systems. Carpet cleaners and bathroom disinfectants are some of the most worrisome products. Alternative disinfectants and cleaning products are available that will do the job just as well without posing risks for children. See the section "Cleaning and Maintenance" in Chapter V for resources listing these products. Working with other concerned parents to make sure these resources are available to your school or school district's business manager will make it easier for them to order products that can safely clean your child's school.

How many rooms in your child's school have carpeting?

Take an inventory of the number of rooms in your school that are carpeted. How many have wall-to-wall carpeting and how many have area rugs? Carpets are reservoirs for contaminants, including pesticide residues, mold spores, and airborne toxins, as well as dirt and dust. These contaminants can pose a health risk to children. In addition, wall-to-wall carpets are often glued to the floor with chemicals that will evaporate into the air and pose health risks. The powerful chemicals that are used to clean carpets represent another health threat. Concerned parents should meet with the school's principal to advocate removing much of your school's carpeting, especially in classrooms. Carpet floors can be replaced with traditional flooring material like wood, terrazzo (ceramic) tiles, cork, or linoleum.

Does your school contain asbestos?

Contact the person at your school or district who has been designated to oversee asbestos-related activities. The principal should know who that person is. This person will know if the school has been tested for asbestos and whether it was found. If your school was built in the 1970s or earlier, it's likely to have been built with asbestos insulation or with asbestos in ceiling or floor tiles. Each school where asbestos is found must have a management plan available for public review. Federal law requires that the public be notified at least once a year about the asbestos activities in each school. Notification should be given to all parents, teachers, and school staff. Familiarize yourself with the asbestos management plan or insist on the creation of such a plan if asbestos is found in your child's school.

Does your school contain lead?

Contact your school principal or administrator and ask if the school has been tested for lead paint or lead in drinking water. If you know or suspect lead paint is in the school, look for areas where there may be flaking or peeling paint. Lead is found in interior paints and plumbing fixtures, primarily in buildings built prior to the 1970s. Lead affects the brain and central nervous system, causing permanent damage. Children are exposed through ingestion or inhalation, particularly of peeling paint flakes or lead dust. Lead dust can be created through friction of a window or door or during renovation projects that disturb materials containing lead.

Painted areas that may contain lead should be especially well maintained to prevent peeling or flaking. If you have reason to believe that children are being exposed to lead paint or dust, ask the school administration to test for lead and to provide you and other concerned parents with a copy of the results. You could also easily collect a sample yourself using a "wipe" test from an area such as a window or doorway. The sample would then have to be sent to a lab for analysis.

Are dust mats used at your school?

Look at the areas inside the different entranceways to your school, especially those doors that are primarily used by the children. How many have dust mats? Dust mats should be placed immediately inside the doors to capture dust and dirt particles and should extend inwards for 9 to 15 feet, providing plenty of room for students and staff to stomp off excess dirt. Dust mats are extremely effective in reducing dust and dirt contaminants in schools. They should be cleaned daily with vacuums using micro-filtration disks and bags.

Contact the Child Proofing Our Communities campaign if you have any questions or need any assistance in addressing how to build or renovate a healthy school. We can be reached by phone at 703-237-2249, ext. 21 and by email at childproofing@chej.org. Please visit our web site at www.childproofing.org/

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RESOURCES

American Federation of Teachers represents K-12 teachers, other school employees, health care professionals, and public employees. It provides technical assistance to members on indoor air pollution and other environmental problems in schools. 555 New Jersey Ave., NW, Washington, D.C. 20001-2079; (202) 879-4400; www.atf.org.

Beyond Pesticides/National Coalition Against the Misuse of Pesticides (NCAMP) is a national network of membership organizations committed to pesticide safety and adoption of integrated pest management strategies that reduce or eliminate toxic chemical use. 701 E. St., SE, Suite 200, Washington, D.C. 20003-2841; (202) 543-5450; info@beyondpesticides; www.beyondpesticides.org.

California's Coalition for Adequate School Housing (CASH) promotes state and local funding alternatives for public K-12 school construction, maintenance, and modernization. Its membership comprises over 500 CA school districts. C/O Murdoch, Waalrath and Holmes, 1130 K St., Ste. 210, Sacramento, CA 95814; www.cashnet.org.

Center for Children's Health and the Environment (CCHE) is the nation's first academic research and policy center to examine the links between exposure to toxic pollutants and childhood illness. The center is part of the Department of Community and Preventive Medicine at Mount Sinai School of Medicine. Mount Sinai School of Medicine, Box 104 One Gustave Levy Place, New York, NY 10029; (212) 241-7840; fax: (212) 360-6965; Lauri.boni@mssn.edu; www.childenvironment.org.

Center for Health, Environment and Justice (CHEJ) provides organizing and technical assistance to grassroots groups addressing threats to public health from toxic pollution. CHEJ coordinates the Child Proofing Our Communities and Stop Dioxin Exposure campaigns. P.O. Box 6806, Falls Church, VA 22040; (703) 237-2249; fax: (703) 237-8389; chej@chej.org; www.chej.org.

Children's Health Environmental Coalition researches the environmental causes of childhood cancers. The organization has compiled a guide for creating a healthy house and maintains a listing of numerous suppliers of alternatives to pressure-treated wood, plywood, and particleboard. P.O. Box 1540, Princeton, NJ 08542; (609) 252-1915; fax: (609) 252-1536; chec@checnet.org; www.checnet.org.

Children's Environmental Health Network is a national multi-disciplinary effort that focuses on education, research, and policy to promote a healthy environment and to protect children from environmental hazards. 110 Maryland Ave. NE, Ste. 511, Washington, D.C. 20002; (202) 543-4033; fax: (202) 543-8797; cehn@cehn.org; www.cehn.org.

Collaborative for High Performance Schools (CHPS) is a California-based group that is developing programs and information for school districts and designers on the construction and modernization of high-performance facilities. It is addressing such issues as student and teacher health, student performance, operating costs, and environmental impacts. 142 Minna Street, 2nd Floor, San Francisco, CA 94105; (877) 642-2477; chps@eley.com; www.chps.net.

The Green Roundtable, Inc. promotes green building projects by providing resources, training, education and consultation. Its membership includes community organizers, educators, facility managers, engineers, architects, environmental groups and contractors. 201 Winchester Street, Brookline, MA 02446; (617) 374-3740; fax: (617) 731-8772; info@greenroundtable.org; www.greenroundtable.org.

Green Seal promotes the purchase of environmentally responsible products by developing environmental standards and making product recommendations. Green Seal works with manufacturers, industry sectors, purchasing groups, and all levels of government. 1001 Connecticut Ave., NW, Suite 827, Washington, DC 20036-5525; (202) 872-6400; fax: (202) 872-4324; www.greenseal.org.

The Health Information Network is the nonprofit health affiliate of the National Education Association. It provides health information to 2.6 million educational employees and more than thirty million students. The Health Information Network has a program on indoor air quality in schools and a web site on asthma and schools. 1201 16th St. NW, Washington, DC 20036; (202) 822-7570; www.neahin.org/programs/environmental/index.htm

Healthy Building Network (HBN) is a national network of environment and health activists, socially responsible investment advocates, green building professionals, and others interested in promoting healthier building materials. HBN provides current and comprehensive resources on arsenic and PVC. 2425 18th St., NW, Washington, DC 20009-2096; (202) 232-4108; fax: (202) 332-0463; info@healthybuilding.net; www.healthybuilding.net.

Healthy Kids: the Keys to Basics works with educators, health professionals, community officials, organizations and parents to promote a better understanding of the health and educational needs of students with asthma and other chronic health conditions. 79 Elmore Street, Newton, MA 02459-1137; (617) 965-9637; erg hk@juno.com; www.healthy-kids.info.

Healthy Schools Network, Inc. promotes environmentally responsible schools by providing guides, reports, and technical assistance to parents and others in the education community. The organization also works with local, state and national parent, public health, environment, and education groups for systemic reforms. Its publications include *Healthier Cleaning and Maintenance Practices and Products for Schools* (1999) and *Sanitizer and Disinfectants Guide* (2001). 773 Madison Avenue, Albany, NY 12208; (518) 462-0632; fax: (518) 462-0433; www.healthyschools.org.

IPM Institute of North America, Inc. assists with developing and maintaining IPM requirements, training and certifying compliance verifiers, and heightening consumer awareness of and support for IPM-identified products and services. Its manual, *IPM Standards for Schools: A Program for Reducing Pest and Pesticide Risks in Schools*, provides guidance on least-toxic pest management practices. 1914 Rowley Ave., Madison, WI 53705; (608) 232-1528; fax: (608) 232-1530; ipminstitute@cs.com; www.ipminstitute.org.

Janitorial Products Pollution Prevention Program (JP4), sponsored by US EPA, CA EPA Department of Toxic Substance Control, and regional CA governments, offers tools for custodial staff for reducing the use of toxic cleaning products. Resources include information on high risk products, ingredient information, guidance on setting up an environmentally preferable purchasing program and workshop materials on how to select and use safe janitorial products. Contact Carol Berg, Environmental Analyst, Santa Clara County Pollution Prevention Program, 1735 North First Street, Suite 275, San Jose CA 95112; 408-441-1195; fax: 408-441-0365; carol_berg@qmgate.pln.co.scl.us; www.westp2net.org/Janitorial/jp4htm.

Leadership in Energy and Environmental Design (LEED) Building Rating System evaluates the environmental performance of commercial, institutional, and large residence buildings over their lifecycles. A self-assessing checklist assigns point values for the incorporation of certain green features in categories such as site location, building materials, indoor environmental quality, and water and energy efficiency. United Stated Green Building Council, 1015 18th Street, NW, Suite 805 Washington, DC 20036; (202) 828-7422; fax: (202) 828-5110; Info@usgbc.org; wwwusgbc.org.

Massachusetts Healthy Schools Website sponsored by the **Massachusetts Public Health Association** promotes healthy indoor air environments and sustainable school buildings by providing resource listings for understanding air quality, maintaining healthy schools, reducing toxins and safety hazards, and building green schools. 434 Jamaicaway, Jamaica Plain, MA 02130; (617) 825-SAFE, ext. 19; www.mphaweb.org/pol schools.html.

National Clearinghouse for Educational Facilities (NCEF) provides extensive information resources for people who plan, design, build, and maintain K-12 schools. NCEF is part of the US Department of Education's Educational Resources Information Center (ERIC). Resources address school siting, design, construction, renovation, maintenance and operation, financing, and planning; issues addressed include indoor air quality, pest management, and sanitation. National Institute of Building Sciences, 1090 Vermont Ave., NW, Suite 700, Washington, DC 20005; (202)289-7800; fax: (202) 289-1092; www.edfacilities.org.

National Parent Teacher Association represents the interests of children and youth before government bodies and other organizations. It has issued position statements and resolutions concerning environmental issues that impact children's health and supports integrated pest management. 330 N.Wabash Ave., Suite 2100, Chicago, IL 60611-3690; (312) 670-6782; fax: (312)670-67783; info@pta.org; www.pta.org.

US Environmental Protection Agency has a number of web pages that offer more information on the issues addressed in this primer. For the web page of the Office of Children's Health Protection, see yosemite.epa.gov/ochp/ochpweb.nsf/homepage. The EPA offers information about asbestos, including a link to remediation contractors by state, at www.epa.gov/opptintr/asbestos. EPA maps of radon zones can be viewed at www.epa.gov/iaq/radon/zonemap.html. The EPA suggests that the zone maps be supplemented with the Map of Radon Zones Document (EPA-402-R-93-071) and any available local data. You can order EPA documents from the National Center for Environmental Publications (NSCEP), P.O. Box 42419, Cincinnati, OH 42419; (800) 490-9198; fax: (513) 489-8695.

University of Minnesota Extension Service and **Department of Environmental Health and Safety** jointly maintain a web site on school indoor air quality, which was developed to answer questions generated by Minnesota K-12 school health and safety personnel and school custodians: www.dehs.umn.edu/iaq/school.

Vermont Public Interest Research Group (VPIRG) is spearheading the Healthy Schools Initiative. The *Parents' Guide for Improving School Environmental Health* (available online) provides guidance on clean indoor air, the elimination of pesticides at schools, and safe cleaning and maintenance supplies. 141 Main St., Ste. 6 Montpelier, VT 05602; (802) 223-5221; fax: (802) 223-6855; info@vpirg.org; www.vpirg.org.

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