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Renaissance *of the* American School Building

A story of blending health, safety and environment with American education.

Bruce Bomier, Board Chair
Environmental Resource Council

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Foreword

We published the first version of the *Renaissance of the American School Building* over a decade ago, then updated it just prior to the COVID-19 pandemic and the obvious focus on reforming unhealthy school environments.

As health professionals we had toured European schools with American school facility engineers and architects and understood the need to reform American school environments—especially indoor air. There are reasons why many European schools could be opened while American schools were closed during the pandemic.

The book defines and supports the health and safety challenges for those who govern American school property. Understanding the history of local school control, successful and failed health and safety policy, and especially the uniqueness of school facility management is the best foundation for a health and safety Renaissance in the management of American schools.

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Chapter 1. OUTRAGE

It sometimes takes genuine outrage to change an imbedded tradition that has gone wrong, sometimes terribly wrong. Often, the outrage comes from someone from outside with a fresh perspective.

Stephan Tanner is a respected international architect who has drawn upon his Swiss origins in creating remarkable building complexes throughout Europe and Asia. He settled in the United States in the late 1990s. In Stephan's native Swiss school system, buildings are oriented toward natural light and abundant fresh air. Energy efficiency and environmental sensitivity reflect the Swiss' traditional identification with nature; they are seen not just as "nice add-ons" but a necessity. Majestic mountain ranges and thick pine forests have isolated and protected the Swiss from wars throughout the centuries, and honoring natural environment is basic to their lives.

Stephan Tanner, standing, and the author touring Swiss school architecture in Zurich.

As a new American citizen, Stephan learned to appreciate the strength of the American work ethic. He did find our tendency to take the natural environment for granted and the rapid, sometimes unstable development and sprawl somewhat unsettling, but accepted it as being due to his new country's turbo-charged style and abundant natural resources. He didn't really focus on the dark side of American mass production of buildings until the day he dropped his son off at his new school.

Because we have been desensitized to the unnatural architecture we wrap around our children, most of us would never have noticed, but Stephan felt shock and outrage on behalf of his son and the other students and educators. In his eyes, the box-like, stifling, mass-produced, sprawling properties that typified American schools at that time were an obscenity.

What Stephan saw were flat, nearly windowless squares with recklessly fragile roofing, low-mass walls separating occupants from daylight and fresh air, and unnatural interiors that could (and probably did) depress anyone over time. These buildings "breathed" through poorly planned, crude and overburdened

ventilation systems that were so complex to access and maintain that they rarely ran effectively. The carpets were filthy from retained debris and moisture from hundreds of dirty shoes, human dander, food and other contaminants.* The consequent carpet mold, along with occasional overuse of toxic cleaning chemicals, increased the burden of foul air. Many classrooms smelled like the inside of a gym shoe by the middle of the day. Gathering dirt and moisture, the porous "fresh air" ducts often spewed debris from mold and degrading insulation. These buildings were, at a minimum, uncomfortable and possibly even dangerous places to learn or work.

This compromised environment had become normal to school staff and students, but to Stephan, it was unnatural—a crowded, smelly, ugly place, a national disgrace.

One issue not apparent at first glance was the wasteful financial drain tied to these properties. The weather in Switzerland was generally similar to that where his son's elementary school was located, so Stephan could compare heating and cooling costs using a simple mathematical formula. For a typical American school building, energy use levels were at more than 80,000 BTUs (British Thermal Units) per cubic foot, per year. In the beautiful, light and airy Swiss schools, the rate was around 20,000 BTUs. In projecting energy costs over 10, 20, 30 or 50 years, he could easily see that the poorly built, standardized American school was a costly monstrosity.

Although confidentiality of medical records makes the issue of asthma rates among young Americans difficult to measure, it is likely that escalating rates among children are aggravated by the school building environment. It is also obvious that unwholesome environments directly influence the educational process, itself.

In reviewing American school buildings of past eras, Stephan admired the pre-World War II architecture, with its easily controlled environments. There were large, easy to open windows, heat radiators could be

In early American school houses, the desks and chairs were ergonomically superior, the heating and ventilation were controlled by the teacher on a room by room basis, there was plenty of daylight and fresh air, and all building products were high quality wood products, glass or stone.

*Following World War II the required amount of fresh air introduced into schools by standard building codes was reduced every few years. By 1981 ASHRAE 62, the standard building code for fresh air exchange, had literally been cut in half.

readily adjusted room by room by teachers, transoms over classroom doors provided nearly perfect cross-ventilation, and lofty ceilings, soft, indirect lighting, solid, easy to clean wood floors and thick, high-mass walls, all this contributed to a clean, well-lit, ecologically high quality environment.

There was a point in time when American builders and school leaders knew how buildings could be constructed and maintained to enhance and inspire health, comfort and a quality learning environment. What happened? How had an enlightened, prosperous and, by all accounts, caring nation become so lost?

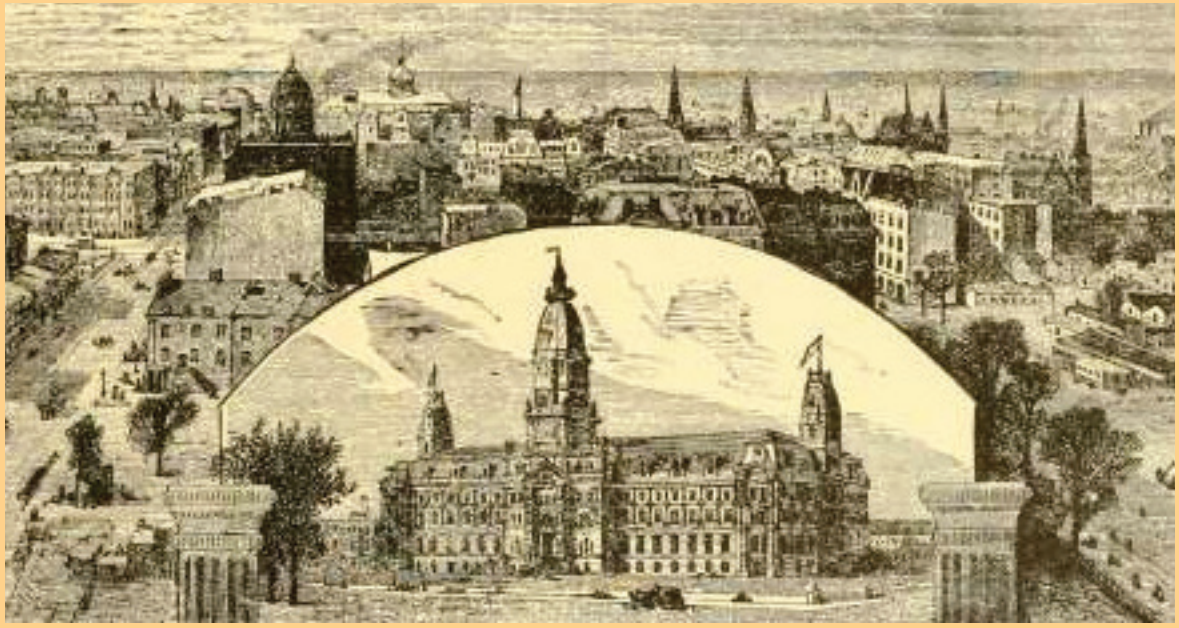
As Stephan observed a classroom, he saw how the teacher had tried, without success, to brighten the windowless room with colorful cutouts and pictures. Then, under the glaring fluorescent lights, he saw something familiar. Children were conducting a science experiment to demonstrate the effects of environment on bean plants. With adequate water, good soil and enhanced light, one beanstalk was thriving. Another plant was suffering from lack of sunlight, another from lack of water, and a third from poor soil. The inevitable conclusion: a healthy environment equals a healthy life. Didn't Americans see the correlation, he wondered? "How do they expect their children to thrive in these degrading environments?"

Stephan decided he would try to change something that he felt was wrong because that, too, was the way of his new nation. Decent, concerned citizens can make a difference in America.

Stephan Tanner became part of a movement concerned with the condition of American schools.* The movement includes architects, public health specialists, engineers, physicians, parents, teachers and elected officials who have come to realize that standard operating procedures for building and maintaining post-World War II schools must significantly change.

Although today they are mostly historical curiosities, the small, well-constructed regional school house was, in many ways, the engine that both symbolized and built a prosperous America.

*Today, Stephan Tanner is a principal in Factor 10, a Minneapolis-based property development corporation. He is deeply involved in the school property reform movement. He has led teams of American school administrators to Europe to study Swiss and German school architecture, and worked with State education professionals to help create responsible school building development guidelines.



In the 1800s emerging American communities took profound pride in developing strikingly beautiful civic buildings to ennoble their communities. Foremost among these public buildings was the school building, which often came to define the strength and values of the community. It would not be religious buildings nor some civic edifice but the functional school building which would best symbolize the quality of a local American community.

Chapter 2. A GOOD START

In the late 1700s, as the United States was just beginning to establish its public institutions, compulsory, universal education was already the norm in several European nations. Even in countries still practicing medieval torture, schooling of its young citizens had become mandatory. The educational infrastructure was generally under centralized national control. In Scotland and several German provinces, strict educational guidelines were imposed upon local communities by a central authority that mandated how all community schools would treat their children. Not until the mid-20th Century would America even have a national department of education.

Mandatory, nationwide education greatly impressed early American leaders and was seen as the best path to national enlightenment. They also believed, however, that centralized federal control was inherently dangerous. At a time when debate swirled around how the American government should evolve, there were a few areas where nearly all agreed, and the approach to education was such an area of general agreement. Hamilton, Jefferson, Madison and Adams all felt that local communities, represented by local "committees," should create and watch over their local educational process. The final resolution was that each community (township) would use revenues from the sale of a predetermined section of its plotted land for the purpose of constructing a local schoolhouse and getting a locally controlled school system financially off the ground. Money would be provided, but how much and how it was controlled in the future would be the function of the local community. Benjamin Franklin and other early civic leaders worked to build local schools, hire teachers and firmly establish educational systems. In major urban communities, such as Philadelphia and Boston, local leaders formed school committees. The same process occurred in rural areas; a trusted farmer or respected merchant would form or be elected to a "committee" to oversee the local educational system. That system, symbolized by the local school building, would come to denote the quality of the community. *

Hamilton, Jefferson and Madison all felt that local communities… should create and watch over their local educational process.

Photo Source: Wikipedia

*The post-American Revolution emphasis on education is described in detail by Paul Monroe in his Cyclopedia of Education (volume 4, 1911) and in the consequent amazingly high American literacy rate, (at least among males) by 1800. That remarkable literacy rate approaching 90% in some communities, is documented by Barker and Burrows in Press, Politics, and the Public Sphere page 141 (2002).

The first formal involvement of states in schools occurred in 1839 with the formation of the Commissioners of Common Schools of Connecticut. Connecticut was attempting to make certain that local governments were running responsible schools. In his 1965 historical work on American society, *The Americans: The National Experience,* Librarian of Congress Daniel Boorstin was surprised to find in this early Connecticut report on schools the amount of focus on the environment of school buildings. The Commission calculated the average per-student space of the state's 1,663 schoolhouses and expressed concern for those that had compromised environments. They especially encouraged local school officials to pay attention to ventilation. One of the report's writers, in a follow-up commentary in 1842, comprised insufficient air and space in schoolhouses could be compared to "slave-ship type stowage of children."*

As time went on, the states often took greater responsibility, yet, today, in all states except Hawaii, the management of schools remains primarily a local responsibility; the local school board runs the school.

The school building, itself, took on the semblance of a "community memorial." Even more than the largest church in a Spanish city, or local government palace in Central Europe, the American school came to define the community as a central gathering point and as an example of the finest local architecture. Often built on prime land in the center of town where it was both accessible and visible to all, schools served as a symbol for supporting the community's greatest asset—its children. In a nation founded upon the principles of The Enlightenment, this made sense. These early simple but sturdy one-room schoolhouses and their assigned schoolmasters or schoolmistresses were sources of community pride. From Boston Public (one of the first "consolidated," multi-story, urban American school buildings) to schools in the farthest reaches of the frontier, the local community did what it could to enrich the educational process. Soon, in major

As schoolhouses evolved into the early 20th Century, a focus on ventilation and maximum use of daylight involving large windows and quality construction continued.

**The Americans: The National Experience, Boorstin, Daniel J., Pg. 44, 1965, Random House, Inc.*

municipalities, large, crafted structures based on the Boston model replaced or blended with one-room schoolhouses into a "district." The ubiquitous "Central High School" really was at the community's center, both physically and socially.

As Stephan Tanner noted in his studies of pre-World War II American schools, one is struck by the thoughtfulness and resources that went into their construction. Artwork was often crafted into the buildings. Their heavy wall mass served as energy saving insulation. There was always a focus on fresh air and daylight, with high ceilings and large windows. These were some of the first American buildings to incorporate fresh air-enhancing ductwork. The builders seemed to understand the advantages of fresh air, full-spectrum lighting and energy efficiency. Traditional building products were wood, rock and glass, instead of the synthetic "filler" products that came into fashion after World War II. The buildings were usually several stories high, allowing for a more modest footprint and greater window space, with more natural fresh air and less opportunity for roofing failure, water penetration and consequent mold contamination of the ambient air.

I recall going through an old pre-World War II school building in rural Iowa and finding a creative "humidifier," built in the early 1900s. Some unknown craftsman had carefully wrapped string around wooden dowels and worked out a wind-driven system whereby the string would dip into water, then go through a primitive passive air system to introduce humidity into the dry winter air of prairie school rooms. One marvels at the ingenuity necessary to provide a quality school setting during that time. For a century and a half, the local school was the paragon of local architectural excellence, always working to blend with and enhance the surrounding community environment. If the school was not something akin to sacred space, it was at least the best space a caring American community could provide for its children. After World War II, everything changed.

As America grew and prospered, so did its functional buildings. Up until post-World War II, there was always an emphasis on fresh air and light, which at first involved many windows. As early as the mid-1800s, larger American buildings began to include the first make-up fresh air ventilation systems, and some of the earliest crude central heating systems in the Western World originated in Chicago. It was Willis Carrier, a young 25-year-old New York engineer who invented functional air-conditioning in 1911, which was quickly institutionalized in many American public buildings. Americans built good, healthy buildings.

Chapter 3. GETTING LOST

School boards (as the colonial "committees" were eventually termed) and school administrators have always had to face community problems quite removed from education, per se. When you are the primary local institution, that is just the way it works. A century ago, schools were confronting the reality of cholera, typhus and, later, polio, for which they often served as local diagnostic and vaccination sites. They housed "bomb shelters" in the 1950s and '60s, during the Cold War. The social angst of integration in the 1960s and '70s most decisively played out within local school systems. Periodically, they have also dealt with an influx of non-English speaking students as immigration rates have waxed and waned over the decades. The same classroom that today teaches Somalia, Hmong or Hispanic citizens English, did the same for German and Swedish students 100 years ago.

American school systems cope and help mediate the social stresses of the time. After World War II, the major crisis faced by school administrators was the gigantic surge in student numbers—the "Baby Boom." Profoundly shifting demographics, driven by an automobile-centered lifestyle, created growth everywhere, but overwhelming growth in suburban areas. It began with Levittown, in New Jersey, the first mass-produced "suburb," and was quickly duplicated by developers across the nation. To accommodate this growth, there was panic construction of schools, using what was termed the "California construction" method. America had won a global war relying upon mass production—Detroit's standardized production methods profoundly out-produced the crafted exotic weaponry of the Ruhr Valley. Now, mass-production of school buildings ensued, relying on synthetic, low-cost building products, and standardized approaches blind to subtle and even major local environmental conditions.

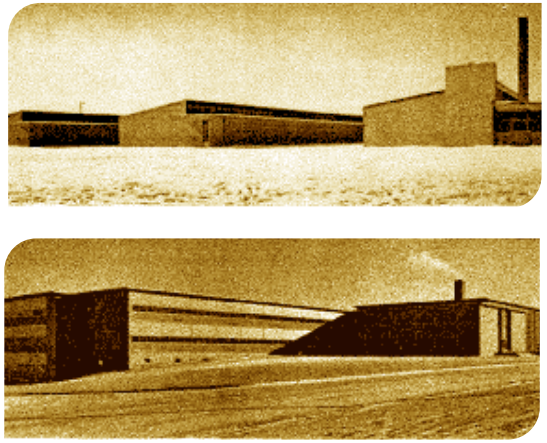
These new school buildings bore little resemblance to pre-war schools. They had the appearance of a one or two-story factory or warehouse, were unresponsive to local weather or other environmental conditions, and had a thin shell of lightweight, porous brick supported by low-grade iron coated with feather-light asbestos fireproofing. These buildings were blatantly indifferent to the world around them. The crafted hot water radiator and sheet metal systems that had enabled individually controlled, passive heating in pre-war schools

Organized, formal, local community dialogue, or, in other words, the American school board, was the institution that would, and still does, primarily govern American education.

were replaced by massive, centralized controls that were unable to address comfort in large building areas, let alone individual rooms. Local building codes supported the "tight building" concept by reducing introduction of fresh air. Stale, warm air was simply recycled to make up for heating loss inherent with deficient wall mass. Codes for bringing auxiliary air into classrooms became known as the "make-up air system," i.e. fresh air introduced at some ratio with stale air into heating and ventilation systems. At first, a 50% ratio of fresh air had to be brought into schoolrooms by code, but as the cost of heating these inefficient shells increased, the fresh air ratio was lowered to 33-1/3%, then to 10%. The "lungs" of post-war schools were operating like someone trying to re-breathe stale air through a tighter and tighter gag.

Another change for schools was in the loss of centralized locations. With pre-war schools, there was a conscious effort to build in areas easily accessible to students who walked, biked or rode local transit systems from home, and to incorporate these buildings into the concept of "community." The pre-war school was typically within walking distance of the local library, ballpark and YWCA/YMCA, as well as being accessible to fire and police departments and the community at large. High schools constructed after the war were far less accessible to the community and, rather than share local resources, they seemed to strive to become a self-contained community unto themselves. This new architecture required great acreage and huge parking lots, usually on the outskirts of the community. School boards went for the cheapest land possible—cheap sometimes because it was undesirable. It may have been located in low-lying wetland, near high-voltage, direct current power lines, or even previously used as an industrial dumping area. They inadvertently drained the fertilizer- and pesticide-loaded runoff water, especially from athletic fields, into local rivers or lakes. Often, these locations translated into nightmare environmental problems in future years.

Another, more obvious consequence of sprawling school construction was the inevitable failure of the roof membrane due to its huge size and cheap construction. Moisture typically penetrated ceiling and wall cavities, allowing establishment of mold and fungal colonies. This led to release of



In May of 1950 one of the state's major business magazines, "Greater Minneapolis," published a dramatic article celebrating the two new "modern" school buildings that were being constructed in the rapidly developing suburbs of Richfield and Edina. They lauded what they termed the "new modern engineering methods."

microscopic mold and fungal effluent into the building's already compromised ambient air. The consequence was an increase in asthma aggravation among children.

As part of the changing architecture, schools made extensive use of synthetic compounds created during the war to supplement threatened supplies of raw materials. Wood, stone, and glass were replaced by materials containing formaldehydes, asbestos*, benzene and polymers or hydrocarbon based products. Synthetics were new not only to the construction industry, but also to the human immune system. As these products degraded or off-gassed, new types of irritating exposures were introduced into the environment of building occupants. A new generation of cleaning products, pesticides and fungicides was added to the "soup" of chemicals in the ever-tightening atmosphere of schools. Formaldehyde in carpeting and pressed wood, mercury-treated drywall and, of course, asbestos used en masse for fireproofing and as cheap filler in most ceiling tile, floor tile and virtually all sprayed-on insulation—all contributed to future problems with school indoor air.

In newer school buildings, recessed fluorescent lighting was the rule.

The introduction of chemical-based carpeting in schools in the post-war era could also be considered an environmental misstep. This type of carpeting, first manufactured in the 1950s, was inexpensive and durable, allowing school districts to replace or re-cover their floors at lower cost than with wood or other flooring. The chemicals in the carpet would off-gas for a period of time after installation, and the continual introduction and retention of moisture and dirt from the hundreds of wet, dirty shoes trooping across it daily allowed colonies of mold and fungus to thrive. Beyond the additional risk to young children who played on the carpeting, the district took on a huge waste stream problem with the need for periodic disposal of worn-out, non-degradable carpets.

*While asbestos had been used for centuries, the concept of blowing it onto low-grade iron as fireproofing in low-mass buildings was relatively new. Even in the 1950s, it was a known carcinogen and, by the '60s, elevated cancer rates were detected among electricians, pipe fitters and other tradespeople exposed to small amounts of asbestos in their occupations. It absolutely did not belong in schools, but the disconnect between health/environment and school property development was so complete that this well documented risk was rarely a consideration.

One of the most aesthetically unfriendly aspects of school construction in the 1950s was the type of lighting commonly installed. Pre-war buildings featured lights attached to rods suspended from the ceiling. This allowed a 360-degree radius of softened, indirect, reflected light, complementing the full-spectrum daylight that entered classrooms from large, high windows. In newer school buildings, recessed fluorescent lighting was the rule. The harsh, pulsating glare was not only unattractive, but also caused eyestrain because it beamed directly down with a limited spectrum. If a fluorescent tube broke, residue of the heavy metals in the tube, including mercury, would end up bound into the carpet and become part of the increasingly toxic dust matrix in the school. Also, the small capacitors in each fluorescent light ballast contained polychlorinated biphenyls (PCBs)*, a toxic compound that is extremely persistent once introduced into an environment or a building occupant. Once spilled, it almost never can be completely removed, and once in the human body, its burden is retained for a long period. The "cooking off" and consequent dripping of this toxin into the classroom from overheating ballasts and other electrical equipment increased the body burden of PCBs in American children. The ultimate health risk of this is not well understood and may or may not have had serious consequences, but it was a thoughtless construction decision.

The architectural change that had the greatest impact on school building environment was the configuration of ventilation systems. Ventilation went from being primarily teacher-controlled and passive (windows, radiators), to being building-wide and mechanically activated from a central point buried deep in the bowels of the mechanical room.

Fall and spring are challenging times for regulating temperatures in schools. Because the indoor temperature is almost equal to that outdoors, the air exchange system isn't triggered, and air becomes especially stale. Until the 1950s, teachers in almost any school could control comfort in their individual classrooms; in contrast, teachers in the 1970s usually had only two options—endure what the

*Certain PCBs have been shown to correlate with health problems, especially after being heated and transformed into a dioxin compound. They typically bio-accumulate in tissue and organs.

central system gave them or complain to the custodian, who was generally unable to do much to improve the situation. In general, pre-programmed mechanical air handling systems were installed in school buildings with an indifference to the orientation of various parts of the building to sun and prevailing winds. Responsive, sectionalized, or individual room controls were impossible. In some schools, univents or classroom controlled air exchangers were mercifully introduced, but these were extremely difficult to maintain and clean and frequently delivered far less fresh air than they were designed to provide. In some regions the flat, sealed, mass-produced school buildings baked; in other areas the poorly insulated brick work almost defied the occupants ability to keep warm.

Contributing further to the degradation of a school's indoor air were the chemical-producing activities of its laboratories, fine arts classes, industrial arts departments and food service areas.

It is wrong to blame school boards and administrators of the time for the chronic corner-cutting and environmental insensitivity that were part of this "dark age" of school property creation. Consider the times. The ever-increasing numbers of children heading toward schools in the baby boom era placed a disparate set of demands on those responsible for school property. The old, slow-paced, handcrafted approach to constructing school buildings was lost in the drive to find cheaper land, and cheaper and faster ways to construct buildings. Necessity as much as arrogance caused us to believe we could disconnect from the natural environment without penalty.

Even by the end of the 1950s, a few people, especially health professionals, were beginning to understand that "something wrong" was occurring in our general society in terms of environmental contamination.

Wilhelm Hueper*, a brilliant physician with the National Cancer Institute, was one of those who began to sense that we were stumbling down a dangerous path. He issued projections about the potential relationship

Wilhelm Hueper (1978).
Courtesy of the National Library of Medicine

*During the 1930s, Dr. Hueper had given laconic warnings regarding possible inhumane subject testing by Nazi medical researchers. In *The Secret History of Cancer* (2007), researcher/author Derea Davis describes chemical industries' efforts to silence Dr. Hueper. He was a man with strong values and uncommon insight.

between massive chemical exposures and disease rates. Although the data were scattered and unorganized, it was obvious that cancer rates in the Western World were rising in tandem with chemical exposures. What had changed the most was the environment in which people were working, living and learning. We were being exposed to chemicals to which there were no previous widespread human exposures. Some specific diseases in humans had been connected to specific environmental exposures, but the idea that widespread public health problems related to such exposures was difficult to grasp, whether the issue was tobacco or a fouled building atmosphere. Still, thoughtful research in medical science kept pointing to a relationship.

To Dr. Hueper, exposing humans to high quantities of compounds to which they had no genetic history of response represented an obvious potential risk. He called for an epidemiologic investigation into population-based environmental exposures to chemicals. Did we know for sure that DDT was safe, as the chemical industry told us? The chemical houses quickly responded to these challenges with nationwide public relations campaigns (smiling children dancing in a field and singing, "DDT is good for me!") Ironically, the advertising phrase, "Better living through chemistry," coined in this time period by a major chemical house, eventually became a satirical slogan used in exasperation by future generations of environmentalists.

Dr. Hueper was eventually silenced by the National Institutes of Health and generally ignored by policymakers, almost certainly because of pressure from the booming and indignant American chemical industry. At the same time, however, a certain group of people did listen, and these men and women, most of whom were scientists, would become our first "environmentalists."

Rachel Carson, a scientist (oceanographer) and poet, became a believer in Dr. Hueper's technical views on environment and disease. Her style was not to focus on publishing in technical journals but instead to appeal to the general public. In 1962, she authored a short but remarkable book, *Silent Spring*, which lamented the indiscriminate proliferation of "new" chemicals in modern society. She made the case that the reliance on chemical compounds in defiance of sensitivity to the world around us would result in an increase in disease. *Silent Spring* jolted the public and people began questioning the viability of "better living through chemistry." Although the analytical data were shallow by today's standards, Ms. Carson organized enough information

It destabilized many to see workers in toxic-oriented hazardous material handling outfits working in schools, especially with asbestos.

to effectively indict the chemical industry for indiscriminately flushing compounds into the environment known to cause disease. She also had a specific animosity toward public officials who were too myopic to see beyond the status quo or too timid to regulate powerful and dangerous industries.

It is probably not inconsequential that Ms. Carson had been diagnosed with cancer. Her writing was beautiful but, as with Stephan Tanner, a sense of outrage was evident. She unapologetically used the term, "Neanderthal," in referring to professionals who blindly accommodated the new, risky and toxic way of life. The first paragraph of *Silent Spring* set the tone:

> *There once was a town in the heart of America where all life seemed to live in harmony with its surroundings… Then,… a strange blight crept over the area and everything began to change. Some evil spell had settled on the community… No witchcraft, no enemy action had silenced the rebirth of new life in this stricken world. The people had done it themselves.*

Though her specific focus was on pesticides, Carson's general theme was the need to better understand environmental impacts before rushing headlong into institutionalizing new and potentially damaging chemicals among the general population.

In her writings, Ms. Carson speculated that the federal "war on cancer" was likely to fail. She felt that, as the populace was exposed to progressively more unnatural and unhealthy environments, there would be a steady spread of certain diseases, and it made sense to her that cancer would be foremost among them ("the diseased jumbling of life's code").

We now understand the direct and sometimes clear relationship between specific diseases and exposure to certain chemicals, including many in building products institutionalized in American schools in post-war years.

Rachel Carson, author of Silent Spring.

Research associations that were strongly influenced by the chemical industry indignantly attacked the concepts described in Silent Spring. Initially, *Time Magazine* published an angry critique of the book, defining it as an "assault" on our way of life. But Ms. Carson was hardly writing to make friends. She wanted outraged converts.

The heightened awareness among scientists that began with Dr. Hueper in the 1950s achieved a growing level of acceptance among a thoughtful public by the mid-1960s, in large part because of *Silent Spring*. As they say, Rachel Carson "took it to the streets." The book exploded onto the best seller list and was quoted in President John Kennedy's policy papers.

While some of the right questions were starting to be asked, the emerging "environmentalism" had little influence on American school construction and maintenance. It would take a lot to shake up the building traditions entrenched in virtually every community across post-war America.

Toward the end of her life, Rachel Carson expressed a degree of optimism because of the number of letters she received from high school students who had read *Silent Spring*. Perhaps there was a subtle connection between the depressing and compromised environments of their schools and the way these young Americans responded to her book. Then, too, the social convolutions of the late 1960s and '70s enabled people to challenge 1950s thought. Whatever the cause, it is pleasant to believe that, in her final years, Rachel Carson sensed that her young readers would come to better appreciate environmental concerns, and perhaps even change the world around them.

As Berkeley environmental science professor Robert Hass put it, "Thoreau read Wordsworth, Muir read Thoreau, Teddy Roosevelt read Muir, and you got national parks." In a free society, important things tend to work out, but getting to the right place can be painful.

As Kenneth Burns put it, national parks are among America's greatest ideas.

Chapter 4. CONFLICT

The years between 1968 and 1976 were the most socially divisive America had experienced since the Great Depression, perhaps even the Civil War. Along with a lost war and a president's resignation, the nation experienced its first serious, non-war related energy crisis.

Because of the first actual oil shortage since World War II, it became symbolically patriotic and economically prudent to further tighten up school buildings to conserve energy. State and federal programs encouraged tighter building architecture and the already stressed atmosphere in schools was pushed to the breaking point. There were incidents of students fainting from lack of oxygen in school assembly rooms. Sets of physical symptoms, later identified as "sick building syndrome," were commonplace. Lethargy, dry throat, sore eyes and muscle pain became an accepted medical etiology directly relating to unhealthy buildings.

Environmentalists and others pondered the possible correlation between general discomfort of school building occupants and a documented increase in certain diseases, especially upper respiratory infections and asthma. The national trend downward in academic performance was conveniently blamed on "drugs" or "the counter-culture." It didn't seem to enter the public consciousness that the problem could be closer to home, i.e. the children's school environment. From bonding to construction to maintenance, school property was rigidly viewed from a post-war mindset. Environmental considerations were out of the line of vision of those who traditionally planned and developed school properties.

It was another matter for those charged with maintaining school property, who were on the receiving end of mechanical malfunctions and desperate complaints. One would have thought that the architecture and engineering companies that installed school indoor air systems would have gotten the message, but there was a wall between those who designed and built school buildings and those who maintained them. The greatest disconnect, however, was between those who controlled properties and those who worked with health and environment. Some of this had to do with how school districts were run but, at some level, it

A new sort of professional needed to evolve who had the skills and values to blend responsible environmental policy with the realistic functioning of the American school building.

The quality of education is at some level dependent upon those who maintain the property. Maintenance professionals are truly the custodians of the school environment, and that includes the learning environment.

also reflected how American society was then functioning. Environmentalists were seen as "out there," and inconsequential to those who constructed and ran real-world institutions.

"Environment" in a school often meant the pragmatic struggle by maintenance staff to secure enough fresh air to make classrooms habitable. For them, working with traditional air exchange systems was like trying to use a towel as a blanket—no matter how they tried to adjust it, it just couldn't do the job. By now, there were 20 to 30 years of tradition in building square, cheap, sealed "factories," and memories of a better way were long forgotten by professionals. Fundamental change was not within the planning parameters of those who specialized in school construction, but fundamental change was exactly what was needed. Apparently, change would have to come from outside. Unfortunately, things "outside" were chaotic.

It is architecture that often comes to define the nature and even quality of a society.

The 1970s were a confusing time in environmental history, a time of conflict. The first "Earth Day" occurred in the spring of 1970, at almost exactly the same time as the Kent State anti-Vietnam War student protest shootings. The so-called "Green Movement" encompassed a difficult to understand set of agendas, often typified by a confronting, antagonistic style. These new "environmental shock troops" made a lot of noise and enemies, while accomplishing little. Somehow, "environmentalism" became identified with anti-war sentiment and was seen as a general assault on productive society. Social issues such as saving whales, old trees and Victorian homes were jumbled together with serious public health threats.

The thoughtful scientific insights of Dr. Hueper and the artful lament of Rachel Carson degenerated into boisterous confrontations and pseudo-scientific, improbable predictions. One of the most-read environmental books of the time was *Ecotopia*, a bizarre tale by Ernest Collenbach, in which all "environmentalists" move to the West Coast to create a cash-less, sensuous "Eden," and industrialists move to the East Coast, where they choke to death on their own over-consumption, pollution and greed. It was an unworthy descendant of the *Silent Spring* message, but a good metaphor for how

"environment" was viewed at the time. As one editor observed to radical environmentalists, a person either lived in a tree, or conspired to chop it down.

During this time, a corrupted version of the American Flag, with a green and white motif, was flown upside-down at environmental demonstration sites. To many Americans, this was an act of desecration. Some so-called "deep environmentalists" even resorted to violence, driving steel spikes into old-growth trees to injure lumbermen, or vandalizing construction sites. Just as reasoned environmentalism was moving toward mainstream acceptance, it was pushed at least two steps backward. Those identified with efforts to "change the environment" had moved so far outside mainstream thinking that they were seen as irrational and possibly dangerous. Understandably, there was a political backlash, and public support for environmental policies became polarized.

In 1980, Ronald Reagan successfully ran for President, in part by railing against "environmentalists," whom he described as wanting us all living in "birds' nests." Major institutions considered environmentalists the enemy of progress and order. Certainly, neither the school purchasing agent, who unknowingly ordered toxic, lead-based fingerpaint, nor the custodian who in error spread a PCB spill around a classroom with a mop and soapy water, envisioned him or herself as having anything to do with "environment."

The separation between national and state government authority and locals running the community school was the administrative template for American education. It wasn't until the mid-1800s that a few of the states began to comment on and set standards for local school districts, typically involving the quality and management of the school building, itself. It wasn't until post-World War II, influenced by concerns regarding racial segregation undermining the Constitutional rights of children of color, that the federal government even established a Department of Education.

To this day, the controlling force for education is the local committee or school district, envisioned by the founding fathers to have the closest possible link to the community and its values. Still, regarding environmental matters and health and safety of students, both federal and state law and regulation are now part of the ongoing governance of American school facilities.

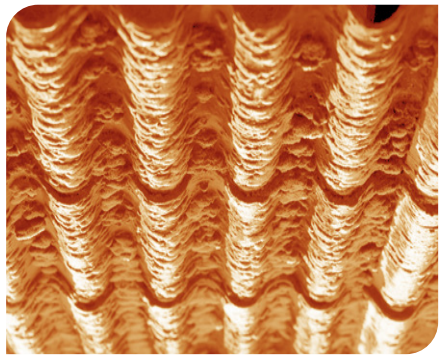
Chapter 5. MIS-REGULATION

In the early 1980s, schools operated with no real sense of need for environmental risk assessment or risk management in day to day operations. Forward thinking schools might teach environmental concepts at middle and high school levels, but there was no focus on living those concepts. School district policy in this area remained largely the same as it had been 30 years before.

A certain level of federal regulatory awareness evolved from President Nixon's "war on cancer." The newly established Environmental Protection Agency couldn't help but notice that the asbestos applied in large quantities to products used in post-war schools was beginning to degrade into the breathing zone of occupants. The agency had mandates regarding cancer risk—asbestos was a carcinogen and they had to do something.

Federal asbestos policy initially treated independent school districts as though they were subordinate agencies and simply sent them confusing technical memos and bulletins. When no one responded, they produced a short, equally confusing training video. Among other suggestions, it told school administrators to "face away" from degrading asbestos so they would be less likely to inhale its toxic fibers. The video, too, had virtually no response from schools. School administrators answered to the local community, not to a federal department head. If change were to occur, school districts would have to get more than an "interoffice memo" from an anonymous federal employee.

The first actual federal environmental regulation involving schools covered PCBs (polychlorinated biphenyls), the fire resistant fluid used to insulate electrical equipment. PCBs are essentially part of the family of chemicals termed, "halogenated hydrocarbons." Many have a demonstrated impact on health and, above all, can be "persistent." They become part of the environmental background and will steadily migrate into and accumulate within those who share that environment. The negative consequences of having a burden of PCBs in one's body are not well understood, but there is reasonable concern that their presence may relate to long-term health effects.



After World War II, the spraying of fireproofing asbestos coating over piping, and electrical conduits, and as general insulation over low-grade iron was institutionalized. It was also blended into many building products, including ceiling and floor tile.

Many people became especially alarmed about the presence of PCB compounds in school environments when they learned that one of its forms related to the principal component of Agent Orange, a highly toxic herbicide used in Vietnam and connected to Non-Hodgkin's Lymphoma and other cancers. Confusion regarding this type of "dioxin" was probably the reason PCBs in general became the first area of focus for federal environmental regulations for schools.

The federal tendency to at times detach from reality was apparent in early PCB regulations. Every time a fluorescent light ballast burst, spilling PCBs, school administrators were supposed to follow a long, drawn-out federal protocol that included "calling the Coast Guard." It was federal regulation at its worst, just about impossible to understand, and hopelessly out of the frame of reference of school administrators. Few schools complied. Why should they? No FBI agent would arrest a custodian who improperly mopped up a PCB spill.

Checking material safety data sheets.

The ineffective PCB regulations were shortly followed by the somewhat more successful, typically state-regulated Employee Right-to-Know (ERK) OSHA regulations. These regulations required easy access to product safety information on-site, and training regarding potentially dangerous chemicals to which employees might be routinely exposed. In some states, enforcement and compliance actually occurred. This led to an awareness that schools were loaded with hundreds of toxic compounds used extensively in cleaning regimens, and in fine arts, laboratory sciences and industrial arts classroom activities.

At first, school districts just tried to find the easiest path to technical compliance with ERK, usually without a strong link to health considerations. It was a case of form, not function. Schools made an effort to stockpile the highly technical material safety data sheets on every "dangerous" product in their buildings. Volumes of inaccessible and perpetually unused technical data were stored away in files or cardboard boxes. One school district, in a bizarre attempt to comply, made overheads of hundreds of safety data sheets, then had their employees sit before a screen while the chemical information was flashed before their eyes.

However clumsy the approach, between PCB regulations and chemical right-to-know, there emerged the disquieting—and accurate—notion that school environment might have a dark side.

The next environmental focus, a revisiting of the risk from asbestos, had a more profound impact. When it was over, American schools found themselves submerged in "environmental business."

In some ways, asbestos policy in the late 1980s and early '90s can best be defined as a comedy of errors—an expensive comedy. Yet, by any reasonable measure, this became the outside force that jolted school districts into the world of environmental awareness.

Dr. Irving Selikoff, a renowned public health researcher, had deduced in the early 1960s that plumbers, electricians and those in other trades who were even minimally exposed over time to inhalation of degraded asbestos fibers were dying in disproportionately higher numbers from lung cancer, and especially cancer of the mesotheme, or lining of the lung. Dr. Selikoff initially looked at 370 asbestos insulation workers; 24 of 280 cigarette smokers in that group had died of bronchiogenic carcinoma during a four-year study period. Five years later, 42 more of the cigarette smoking asbestos workers had died. By 1968, Dr. Selikoff published his work in the *Journal of the American Medical Association*, proving a shocking relationship between asbestos exposure and cancer. Essentially, public health data showed that asbestos fibers trapped in lung tissue inspired soft tissue cancers, especially among smokers with already compromised respiratory systems. This revelation concerned a number of people in the area of public health, especially knowing that virtually every school building in the country since 1950 was saturated with sprayed-on and bound-in asbestos as a basic building product. Something would have to be done, and the government would have to do better than they had with their incoherent PCB regulations.

William Ruckelshaus,* EPA Director in 1983, 1984 and 1985, devised a plan that would shake local school districts into action. He had no budget to entice schools to change, and no national policing force to regulate them into compliance, but he knew their soft spot; he understood the anatomy of the local school district. The "hot button" was with the local realtor, parent, dentist, or insurance agent who served on the

locally elected school board. He would go to the people, themselves, and use their love of children to panic them into action. He would begin with the media.

Mr. Ruckelshaus began his crusade with a series of press releases based on the simple but traumatizing message that asbestos in schools can cause cancer. As he pointed out to his EPA staff, a key aspect of federal asbestos policy was to *"get mothers to form a vigilante mob to storm the school committee."*[1] Formal public outreach campaigns began in 1985, most quoting a now discredited epidemiological projection that there would be in excess of 40,000 cancer deaths per year among our children from asbestos exposures. The likelihood of "death by negligence" of thousands of American children made for a sensational burst of press. To quote a news article in *USA Today*, which followed the federal warnings, *"There's a killer loose in the corridors, gyms and boiler rooms of 40,000 schools across the U.S.A."*[2]

Fear and panic passed along like lightning from concerned parents and teachers to startled school board members. Since the warnings were issued without public health guidance, the school boards, to be safe, often ordered all-out asbestos removal at exorbitant cost and with few safety controls. They had no frame of reference and sometimes badly blundered. Irving Reed, Chairman of Accuracy in the Media, later estimated the public waste to be on a parallel with the crippling cost of the savings and loan crisis of the 1980s. Though the issue had to be taken seriously, this was a financial broadside schools simply couldn't handle. The EPA had created fear without providing coherent direction or funding. It was like screaming "Fire!"

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*I once heard William Ruckelshaus speak at an environmental policy meeting where he talked about how he had gotten his start in environmental work. He said he traveled around with several "dead" rubber fish, which he would place in various wetland areas and then photograph them. He would then show the photos to local newspapers, which would put pressure on local politicians to protect wetlands. He seemed genuinely proud of his misrepresentation and use of the media. It struck me that it set a prophetic tone for his profound mismanagement of the nation's asbestos policy for schools.

[1] *The Asbestos Racket*, Michael J. Bennett, Page 14

[2] *The Asbestos Racket*, Michael J. Bennett, Page 41

in a crowded theater with no exit signs. The truth was, asbestos was capable of causing risk only if degraded, which unfortunately would happen if improperly removed, leaving behind carcinogenic fibers that could be stirred up and inhaled. In this mass removal, the asbestos, much of which had started out in a safe, solid-state condition, was pulverized into dangerous, inhalable debris.

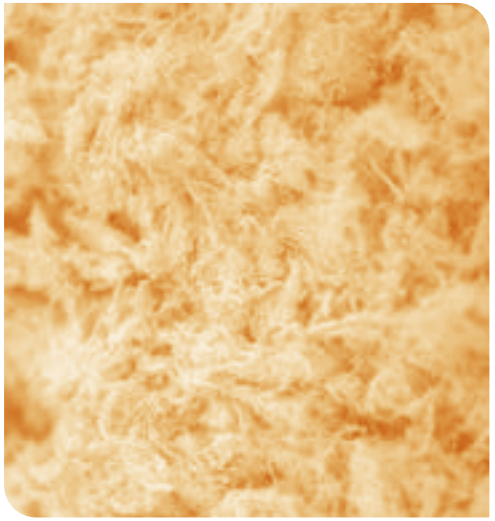
This policy had the dual result of financially bleeding districts white, while endangering building occupants.

While a known carcinogenic material should never have been incorporated in schools, the federally inspired panic to remove all of it as soon as possible was ill conceived and dangerous. For a time, the schools had no idea what created the "risk," or which engineering controls or maintenance procedures should be used to prevent exposures. They did know how to hire low-bid contractors. When the only tool they had was a hammer, everything was treated like a nail.

Soon, these low-bid asbestos contractors were smashing away at asbestos fireproofing and other building products. If the work was not properly monitored, the battered and frayed asbestos particles became part of the ambient air and breathing zone of students and other occupants. School districts that hired responsible hygienists to monitor asbestos abatement were in the minority.

Congress and a new EPA administrator, William Reilly, finally realized that something was terribly wrong. Shortly after Mr. Reilly was confirmed by the Senate, he was told by a group of Catholic bishops that asbestos removal policies "question the very survival of parochial schools in America." He issued the following statement:

The mere presence of asbestos poses no risk to human health… Only when asbestos fibers are released into the air and breathed into the lungs do they become a health risk.[3]



Asbestos fibers used as insulation and product filler.

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[3] *The Asbestos Racket,* Michael J. Bennett, Page 13

He went on to accurately state that improper removal "may actually pose a greater health risk than simply leaving it alone." That belated pronouncement began to temper the school asbestos panic, which medical author Michael Bennett had termed, *"The greatest environmental fraud of our era."*[3]

In 1992, the EPA published a document entitled, *Asbestos Concentrations Ten Years After Abatement*, involving highly sensitive air tests in 17 large schools. The research substantiated that the disturbance of asbestos in most of these schools had exacerbated exposures. The damage done to occupants' lung tissue by the EPA's tactics and the schools' naiveté will never be fully understood, but the financial devastation to schools was obvious. After a pivotal *Wall Street Journal* article documenting that the asbestos panic had caused a crippling waste of school monies, editorial cartoons such as the one shown below appeared.

Dr. Morton Korn, Director of Environmental Health at Johns Hopkins Medical Schools, and B.J. Mossman of the Pathology Department at the University of Vermont, also published detailed reviews describing the waste and increased human risk created by inept handling of the material. Eventually, a sobered EPA acknowledged that "many millions of dollars have been wasted on unnecessary removal operations."

Today, the approach to asbestos in schools involves, first, a careful audit of where it actually exists in buildings, then, removal only as necessary, under hygienically controlled conditions, usually in coordination with controlled renovation or remodeling. The process is typically managed by a third party who is financially detached from the removal contractor—a public health consultant knowledgeable in toxic exposures and engineering controls who represents the public health and interests of the school district.

If there was a positive side to this asbestos misadventure, it was that school administrators now absolutely understood that issues related to "environment" had penetrated their world and that of everyday school building construction and management.

Our thanks to the Colorado Springs Gazette Telegraph for allowing us to reprint this editorial cartoon.

[3] *The Asbestos Racket,* Michael J. Bennett, Page 13

Chapter 6. REALIZATION

By the mid-1990s, environmental health and safety issues were part of day to day operations of every school district. Administrators had been burned badly by not understanding the risks of asbestos and now realized that "environment" was part of their lives. This perspective did not as quickly penetrate the values of many old-line school architects and engineers, who continued to design school buildings as they had for 40 years, and didn't like school administrators pressuring them to change. The old line school construction companies argued for "turn-key" contracts, i.e. give us money, get lost, and come back later for a key. But the school district leadership typically knew better and understood that they wanted a role in crafting the building for which they would be responsible.

Toward the end of the 1990s, it was common for school board candidates to run on the promise of providing "healthier schools and a better physical environment," and the voters responded. Schools that had made health and safety procedures part of everyday administration were operating smarter. New air exchange regulations required higher ratios of fresh make-up air and had increasingly better software controlling their operations. Right to Know laws created a new sense of the importance of using environmentally safe products, and manufacturers responded by quickly producing and marketing healthier and safer products for schools.

In small and large districts, consultants were hired to provide general environmental advice and counsel, and unions in some states began to argue for better job site environments, particularly improved indoor air quality. The new approach to assuring safer, more comfortable surroundings was termed, "environmental controls."

"Radical" environmentalists became easily differentiated from school environmentalists—one would throw a pie in the face of a state legislator who supported controlled timber harvesting, the other would ask that same legislator for bonding authority to remove lead paint from kindergarten classroom walls.

Indoor air quality (IAQ) emerged as an issue during this time and today is the principal environmental health concern for schools. It probably has always been the most serious health and comfort issue, but two events occurring simultaneously focused the thinking of school administrators on indoor air quality. The first was the increase in reported asthma rates among young Americans. Between 1982 and 1996, there was a 55% increase in diagnosed asthma rates among American children. It had become the most reported chronic childhood illness in America, affecting 4.7 million children. Pediatricians began commonly inquiring about school hygiene procedures on behalf of their patients. Students spend 1,250 hours a year in the often compromised air quality environments of school properties. It was easy to see a connection.

The second occurrence that caught administrators' attention was the increasing level of complaints of general discomfort by occupants, which would come to be termed "sick building syndrome." Symptoms such as muscle pain, fatigue, sore eyes and sore throats would appear in clusters, often due to improper air exchange in a section of a school building and especially as a reaction to mold. Sick building syndrome formally became defined as a disease caused by a compromised building environment.

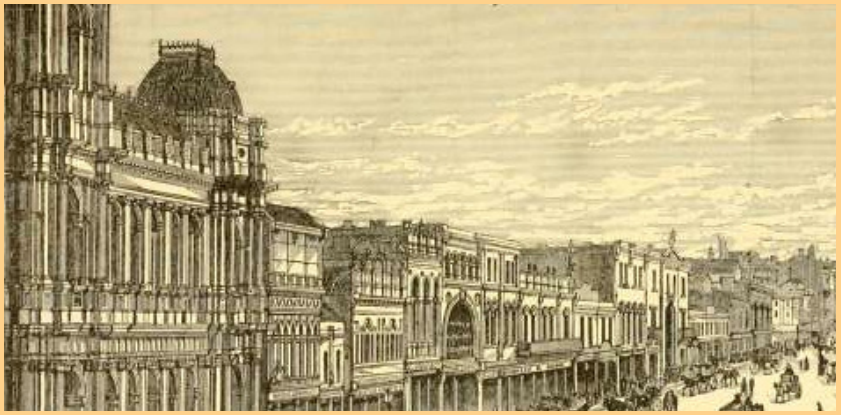
A number of situations can lead to unhealthy indoor air. Natural wood contains essential oils that retard mold and fungal growth, but post-war schools replaced wood and plaster with drywall. Drywall is a blended wood product, or cellulose, from which the essential oils have been bleached. With the addition of moisture, so common in these poorly constructed properties, drywall offers an excellent food source for mold and fungus. It is not unusual to find well-established colonies of mold on the interior of school drywall. The large, flat roofs, given to leaking, combined with the use of drywall, set up an IAQ nightmare for all but the best-maintained schools. Making this unhealthy situation worse was the massive use of chemical-based carpeting. Normal vacuuming removed the larger debris particles but would launch smaller particles up into the breathing zone of occupants. A paper on moisture control approaches in school buildings is included in the materials section of the ERC website (www.envrc.org). This is important for safeguarding school air quality. If moisture is controlled, so is the mold.

Asthma or other respiratory challenges became a major source of public health concern in the 1970s and was directly tied to indoor air quality.

As stated, poor air quality has been the result of the many mistakes made in post-war construction of America's school buildings. Increasingly, school engineering and architectural construction principles were being seriously questioned by administrators, and a more aware public demanded a new approach. Some of the most dramatic changes have been litigation-driven, and some, legislatively mandated. A fundamental change in how Americans view school environment is evident in the steps taken in many areas across the country from the 1990s onward.

In 1996, the U.S. General Accounting Office reported that 60% of the nation's more than 80,000 schools had building features that required major repair to preserve the health and safety of occupants. It stated that 14 million children were spending significant portions of their days in "unsafe and environmentally hazardous buildings." The nation responded. In New York City, a court-ordered remodeling of over 1,000 buildings "served as a wake-up call to thousands of school districts and administrators from Maine to California, and states in between," according to American School and University (AS&U) Magazine. The Clinton Administration proposed legislation several times to help correct environmental problems in schools and, in 1998, supported a partially enacted plan to provide no-interest tax credits to initiate $22 billion in school construction, renovation and remodeling.

There still was a tendency for a few poorly advised school districts to misstep, yet, somewhere between adherence to post-war approaches and overreaction, school administrators sought out a path to responsible construction, remodeling and renovation of school buildings. For most school districts, the approach to healthy buildings was becoming well understood and they and their environmental consultants could distinguish between overreaction and reality.



"An ordinary man believes through looking at architecture."

—Carl Bosl, 1653

Chapter 7. RENAISSANCE

As the new millennium dawned, it is safe to say that all but the most poorly managed school districts had built a responsible protocol for keeping their buildings safe and comfortable. As opposed to a panicked mass removal of asbestos, building material removal was now a careful part of responsible, planned renovation and remodeling. Costs were controlled under this protocol and occupants were not exposed to carcinogenic fibers, as in previous fear-driven, mass abatements. Electrical equipment containing PCBs was phased out and usually disposed of in accredited landfills.

Air exchange has been especially difficult to correct. Fixing post-World War II construction required a real focus on controlling bad air through increased air exchange and more thoughtful controls, managed by a new generation of computer-driven pneumatic control systems. Control of moisture to combat establishment of mold colonies was, and is, a major issue. It remains a complicated issue, particularly given the high density of occupants in the school buildings and inherent pre-war roofing problems.

Perhaps one of the most significant indicators of the evolving maturity of school property management was the professional manner in which school districts generally have learned to handle the environmental "crisis of the month."

In the late 1990s, the Environmental Protection Agency formed a radon division and sent out warnings to school districts and health departments across the United States suggesting that all school rooms at or below grade be tested. Soon, opportunistic companies began popping up to both test for and provide elaborate, expensive radon mitigation. School districts listened, but most were appropriately cautious. Some testing was done, but the level of picocuries (the basic unit of radon measurement) was sporadic and trends were hard to nail down. Dr. Robert Sawyer, a physician, mechanical engineer, and Director of Preventive Medicine at Yale University, quickly determined that the new radon "engineering controls" would either have no impact or theoretically could make things worse. Schools had learned to approach

new environmental warnings with sophisticated caution. One seasoned superintendent of schools, after receiving a scary EPA radon warning, sent her board a memo entitled, *"Been Burned… Have Learned,"* recommending caution and consultation with a trusted independent expert prior to jumping into the matter.

Not long after the EPA appeal to the schools, Dr. Bernard Cohn, Professor of Physics and Radiation at the University of Pittsburgh, tested 170,000 households and could not correlate the picocuries from radon to any form of disease. Both in respected medical and public health publications, as well as the *New York Times*, the radon phobia was soon identified as having been blown out of proportion. *The Times* termed it an "Emperor's new clothes" phenomenon. The American school administrators had learned. This measured approach to new environmental issues would become institutionalized among better managed districts.*

Response to the issue of lead, often found in the degrading paint in post-World War II schools, was a different matter. Here, medical research had clearly shown that children, particularly those under eight, who ingest even small amounts of dust containing lead over a period of time, may develop neural problems. Schools began calmly and professionally taking steps to protect their students. Careful rules were established for lead-bearing toys and art products; when there was renovation or remodeling that could degrade lead-bearing paint, appropriate guidelines were enacted for construction material isolation, cleanup, and sanitation. Drinking fountains that had lead fixtures or solders containing lead were replaced. Children's physicals began to include blood tests for thresholds of even small amounts of lead, and if found, the parents were contacted and given rules about lead poison prevention hygiene in the home. Schools were informed so they could implement protocols for testing areas where the child or children studied. These responses were fast, inexpensive, and anchored in knowledgeable procedures and responses.

Generally, American schools have come to terms with environmental health and safety. They have learned to distinguish between phobia and reality and, either directly or through responsible consultants, are steering a calm, healthy and safe course. That course now is encompassing more than health and safety.

Lead fixtures common to many drinking fountains installed after World War II had to be removed to stop the leaching of lead into drinking water.

*Radon measurements and even remediation may make sense but a qualified third party, working for the school district, should both test and advise on the need and characteristics of any response.

There is an emerging focus on environmental stewardship and ecology. It started with water.

The concern for water purity goes beyond human health. School buildings and property were and are usually the major nonagricultural source of surface water contamination in the community. Post-World War II school buildings were "cities" unto themselves, typically constructed outside central community areas and almost always near a lake, river or holding pond area for sloughing off the massive amounts of contaminated water runoff they generate. Huge, highly-fertilized and pesticide-burdened green spaces, including athletic fields and play areas, as well as general school grounds, were sources of constant, contaminated runoff. The large, flat roofs of these buildings poured debris and gray water into drainage areas created to quickly flush it into community surface waters. Adjacent parking lots also contributed road salt and suspended particles into surface water.

School property was an environmental disaster area for an American population coming to terms with contamination of water ecosystems. These public buildings were meant to be architecturally symbolic of the American community, but instead, they were seen as environmentally unwholesome to many thoughtful 21st Century eyes.

The steps taken toward creating environmentally positive school buildings is ongoing and much is happening today among forward thinking districts.

The Green Building Council, the standard for commercial property and environmental quality, established a School Division and created a ranking system for ecology and school property. Points are given for windows that are operable, and water conservation is seen as key; the use of rain gardens, water ponds, and/or reuse of gray water for plantings inside and outside of buildings, all are a source for points. Approaches to energy savings have become an art, and balance in terms of the use of thermal energy and reusable materials is sought after in school construction. Exposure to fresh air and sunlight, and even bike racks to encourage students and faculty to bike to work and school to reduce carbon emissions from driving or busing provide "ecology points" in the Green Building Council's School Rating System. In some places,

The Green Building Council took on the responsibility of blending in practical environmental issues with the development and operation of the American school building. Points are awarded for environmentally sound construction practices as well as encouraging activities like biking to schools.

constant classroom monitors for carbon dioxide are maintained to assure comfort, and strict protocols for purchase of ecologically sound new building products and disposal of old ones are institutionalized.

Most interesting of all, students are encouraged to engage in hands-on participation regarding the environmental/ecology plans and programs of their school buildings. This is a beautiful process and practical in the sense that it opens up some truly solid career development opportunities for young people as they grow into an environmentally sensitive world.

This effort toward responsible ecology approaches in schools is still a work in progress. To be sure, there are a number of silly Rube Goldberg-type environmental devices and approaches being touted (at a recent national green school conference, there were almost more product vendors than school administrators). However, the ethics of being a responsible, hands-on environmental ecology participant is being properly taken up by school districts. From our observation, this new value appears to be embraced by students, a pleasure for the faculty, and appreciated by the community.

We have moved a long way from the depressing school building that Stefan Tanner visited, and even further from the dangerous school building monstrosities from Rachel Carson's 1950s. There are still problems and challenges, but there should be optimism. If there is one truth in the long, painful adventure of environment and schools, it's that John Adams was right about education in America. We might take a wrong turn now and again, but Americans care deeply about our children and schools, and we will both learn what is right and make it happen.

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