Impediments to Implementing P2 in the Public Schools

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Environmental, health, and safety hazards in public schools are often serious — and difficult to address.

When asked to think of an environmentally hazardous facility, most of us might imagine a chemical plant or a petroleum refinery. Very few would picture the local high school. Yet schools often harbor a surprising quantity (and array) of hazardous materials — and typically manage them with inadequate care.

A hazardous materials regulatory project in Barnstable County, Massachusetts highlighted these dangers for me, and offered some fascinating insights into the difficulty of implementing pollution prevention in "non-traditional" facilities such as schools.

Background

In the mid 1990s, the Barnstable County Department of Health and the Environment (BCDHE), working under a grant for aquifer protection, began a regional initiative to protect groundwater supplies by implementing local hazardous material regulations. The idea behind the approach was to prevent groundwater contamination by locally regulating and managing small private businesses that were historically responsible for contaminating our drinking water. The process that followed resulted in a completely new perspective regarding the sources of potential groundwater contamination within my community.

My original idea was to establish a relationship with local community officials, particularly fire and health officials, and to involve them in the process of promulgating local hazardous materials regulations. I thought that to be successful on the community level, they needed to endorse and take ownership of the program within their own community. I thus made it a point to individually interview local officials and get their perspective regarding hazardous material/waste issues in their town. I must admit, however, that I thought I already understood where their community priorities should lie.

As a traditional environmental/health agent, I had never worked with the local fire service, regarding them as interested only in public safety issues pertaining to fire hazards. I did not associate these officials with the management of hazardous materials.

Through my research, however, I came to realize that, although hazardous waste was highly regulated in Massachusetts, hazardous materials were not. In fact, the closest any agency came to dealing with these materials was the extremely vague wording contained within the state fire code. I discovered that each local fire prevention officer could individually interpret this language and dictate hazardous materials management requirements within his own community. Thus was born my fortuitous relationship with the local fire departments and the fire service.

Hazardous Materials in Schools: A Hidden Problem

While interviewing a local fire prevention officer from one of our communities, I discovered that his major community concern regarding hazardous material was not what I believed it to be. He removed from his cabinet a file that was about eight inches thick, and told me it was a written history of safety issues from our regional high school. The file represented five years of effort to improve conditions that he felt were a problem.

Blinded by my own assumptions regarding our educational institutions, I didn't believe him — but I humored him, wanting to get into his good graces. We arranged an on-site interview at the high school, where I was sure I would be able to point out that the facility was not as much of a problem as his "untrained eye" could see.

Our first on-site interview was with the science supervisor, a 20-year veteran of high school science teaching. While we were in his classroom discussing hazardous material management issues, a janitor worked quietly in the rear of the classroom sweeping the floor. The science supervisor was pleased to tell us that he had been disposing of his "heavy metal acids" for years using the "Flynn Method," by inerting them and pouring them into the sink, which connected to the "tight tank" outside his classroom.

I remember thinking to myself that the designers of the high school must have been incredible visionaries to have the forethought to install a tight tank in the early 1970s, when the facility was constructed. Before I could ask about this, however, the heretofore silent janitor sheepishly mentioned that they didn't have a "tight tank" at their school. Obviously embarrassed, we all remained silent. The "tight tank" mistake eventually resulted in a $55,000 environmental cleanup.

I soon discovered that my initial assumptions regarding the conditions at this school were grossly in error. I was astounded at the lack of even a basic understanding regarding simple concepts of health, safety, and environmental compliance.

My office conferred with the fire prevention officer, and we decided as a team to approach the school superintendent and his staff with a proposal to do a non-regulatory audit of his school. We spent a good deal of time developing an approach that framed the process in the least frightening, most positive light, stressing all the benefits with a promise of no embarrassments.

We made the presentation, begged the school's participation, and sat down silently. The superintendent stood and simply said, "This isn't a priority and it won't be until someone dies. No."

Dejected, we were hastening to make a limp retreat when the previously quiet fire prevention officer approached the super-

intendent. The fire prevention officer took an envelope out of his pocket, handed it to the superintendent, and said, "If you don't willingly participate in this process, we're closing your school Monday morning."

Tears welled in the superintendent's eyes. Although his acquiescence was not the enthusiastic participation I had envisioned, he grudgingly allowed us into the school. (This superintendent was later fired.)

To say that there was an element of synchronicity throughout this entire process would be wildly understating the truth. One of our most fortuitous chance encounters came from a wrong number dialed to the University of Massachusetts. Instead of the Underground Tank Division, I wrongly contacted an old acquaintance from Industrial Hygiene. While updating him about my current projects, I mentioned the health, safety, and environmental (HSE) project for schools.

He suggested that I talk to one of his graduate students, a Christa McAuliffe scholar who had done similar work in Maine cleaning out over 200 schools on a state grant. This student also had 20 years of experience teaching high school chemistry, and could provide chemical auditing services to our school for free as part of his thesis. He provided a level of expertise to the process that we couldn't conceive of at the time.

Initial Chemical Audit and Disposal Efforts

Approaching the first audit of the school with an open mind and a team of professionals from various backgrounds was instrumental in our future success. The learning curve was steep indeed. We used the process itself to educate ourselves about the needs within the facility.

We involved department heads, teachers, facility staff and administration. No one was left out; everyone's perception was of value. We asked many questions, and considered none too trivial or insignificant. By asking individuals where they perceived problems within their areas, we were amazed at the information we received. I can definitely say that had we not approached the process in this fashion, we would have missed a significant number of materials, issues, and challenges that were not to be found in the conventional areas or in the conventional ways.

Our initial efforts focused on science labs, where the team identified problems associated with improper chemical storage, use, and disposal. Many chemicals were aged and deteriorating, with the oldest dating back to 1840! They were stored without regard to safety, compatibility, or security.

There were chemicals from all hazard classifications: flammable, toxic, reactive, infectious, radioactive, and corrosive. Most of the material shared the distinction of being very poorly managed. Problems ranged from deteriorating containers and reacting bottles to material that had become shock-sensitive through aging. At one facility, 15 containers of shock-sensitive material (enough to blow the entire wing off the school) had been stored in the teachers' lounge refrigerator. There it sat quietly for over ten years, right next to their lunches and juice boxes.

In total, at all sites, we detonated over 250 pounds of explosive material. This material included numerous peroxide formers, such as gallons of isopropyl and ethyl ether (for the anesthetizing-the-fruit-fly experiment) and picric acid, as well as dozens of lesser known shock-sensitives such as dinitrotoluene (DNT), cyclohezene, tetrahydrafuran, and even nitrogylcerine!

The shock-sensitive material was the most immediately problematic. At first, we were perplexed about appropriate and safe disposal. It was once again the fire department that found the resources we needed — through the state bomb squad. They detonated material at nine Cape Cod sites. Their assistance saved the school districts well over $60,000.

A Frightening Lesson in Chemical Disposal

One of our most valuable (and potentially dangerous) lessons came early in the process. At the first site where we detonated material, the bomb squad came prepared for their first encounter with shock-sensitive material. Previously, their hazard experience with explosives had involved the *impact* kind. As a result, they had never thought about an inhalation hazard.

There was a low cloud cover that day (the first red flag) and the squad set up downwind (another warning flag). Among the chemicals they detonated were ethyl ether and cyclohexene, both potent inhalation hazards. Once detonated, these chemicals formed a large fume cloud, which proceeded to move right over the bomb squad. In a matter of moments, they were down. Luckily, we had an ambulance and truck on-site (also parked downwind!), and we managed to transport the bomb squad members to the hospital without further incident. They were treated and released for inhalation exposure, and suffered no long lasting injury.

After that first mistake, the local fire department drew up a Standard Operating Procedure (SOP) which was used, without incident, at all the other sites — yet another example of the kind of cooperative effort we shared.

Understanding the Hazardous Materials Problem in Schools

Poor materials management was universal at all the schools we visited. In the science areas, chemical storage occupied virtually every empty space — in classrooms, in storage areas, in the basement, in the attic, in out-buildings, under stairways, and even in open adjoining hallways. As areas filled, the materials simply spilled over into any space that could accommodate more.

And "spill" is the appropriate word here! We observed evidence of previous chemical spills and releases everywhere — from stains on shelving and floors, to corrosion eating up the metal brackets and supports on overloaded shelving units.

In one facility, I noticed that every metal surface on the painted metal supports holding the suspended ceiling was severely corroded. I inquired as to what the instructor had been using in the curriculum that was creating such a chronically corrosive environment. The instructor laughed and said it had been so hot the previous summer in the makeshift chemical storage closet that the bromine ampoule had blown up, sending deadly bromine gas throughout the entire area. Approximately three ounces of bromine had

corroded every painted metal surface it contacted in the entire room.

The instructor laughingly said he was glad that the incident had happened during the summer, when no one but the janitor was around. I said I felt sorry for the janitor, who could easily have been killed from the exposure. The instructor said he could smell the bromine every time he entered the class for months after the release. The incident was never reported.

Chemical Acquisition by Schools

It was clear from the massive inventory of chemicals we found that there was historically no restraint on ordering materials. Instructors could order whatever they wanted, in whatever quantities, at any time. Overwhelming amounts of excessively toxic materials, like potassium cyanide, brucine sulfate, and arsenic and mercury compounds (even dimethyl mercury!) were so commonplace that we started to speculate about the historic intentions of some of the instructors. Clearly, many had purchased materials to satisfy some personal hobby or inclination, such as an interest in pyrotechnics. We found pounds of material for making black powder and fireworks.

Instructors' curriculum choices also clearly favored the dramatic. We found gallons of carbon disulfide, sodium azide, and thermite, and pounds of sodium, potassium, and magnesium. Another staple was liquid mercury (from old barometer experiments); it was not unusual to find hundreds of pounds scattered throughout the larger schools.

Beyond the Science Lab: Other Departments Create Hazards Too

The science labs were not the only chemical problem spots in schools. Other areas of focus included art and graphic art programs, vocational/technical education, and janitorial supply departments. These were areas where we did not expect to see large accumulations of chemicals; we were amazed at what we found.

The art rooms were probably some of the worst areas, presumably because people believe "art can't be hazardous." There were often huge amounts of solvent-based inks and paints, heavy metal glazes and dyes for pottery and crafts, and adhesives and fixer sprays — to name only a few materials. Most of the material was ancient and in poor condition.

To make matters worse, there was often a total absence of ventilation or secure storage. One art area had long ago overgrown its classroom and had employed the nearby girls' restroom for material storage. There we found piles of paint and solvent containers rusting away in unvented, humid, and dank conditions.

Hazards in Facility Maintenance

In facility maintenance areas we found still another tremendous source of stockpiled materials, ranging from cleaning products to materials used in maintaining and operating the facility and grounds. We found dozens of containers in varying states of decay, with much of their contents beyond use.

In investigating facility maintenance areas, we found one of the most useful tools to be understanding the numerous processes that occur in the maintenance area of a school. In this way, we were able to project the materials we were likely to find.

Originally, we focused on cleaning products, thinking that these would be the majority of materials we would find. And we did find plenty of them — mostly corrosive and flammable materials. We were shocked by the sheer quantity. One can of "Gum/Graffiti Remover" (a class 4 flammable) found at every school doesn't represent much of a hazard. However, 60 cases are a different story. This chemical was found at every school; it was often poorly stored in wooden outbuildings or with massive amounts of paper goods.

In addition to cleaning, however, these departments usually did most, if not all, of the facility's maintenance. As a result, they stored large quantities of paints, stains, sealants, and adhesives, among other materials.

These departments also were involved in repairing and maintaining the facility heat, ventilation, and air conditioning (HVAC) systems, along with vehicles and small equipment. In addition, they often did welding and many other activities. Some facilities had on-site wastewater treatment plants and non-community drinking water wells that required treatment. This necessitated massive chemical storage. Even when these activities were subcontracted out, the facilities often left their chemicals and materials on-site — once again, often extremely poorly managed.

No Thanks! The Problem of Donated Materials

One area that can create a huge problem for schools is that of "donations" from private individuals, companies, or even government surplus. This material, which often is never used, creates an additional storage and management problem in an already over-taxed facility. In addition, it can cost school districts thousands of dollars to dispose of.

Removing Hazardous Materials

Working as a team with department heads and teachers/staff, our audit team compiled a list for chemical disposal from all locations. Together, we developed an innovative approach to waste removal.

The first problem was trying to convince instructors to give up their materials. Many lived within the confines of a "scarcity paradigm" due to the uncertainty of future budget allocations; we called it the "packrat" syndrome. Even though many instructors had not used their material in years, there was that outside chance that they would *someday* need it.

We achieved success in removal by using a variety of methods. The most successful was individually working with instructors, or the "hand holding" technique. This simply involved asking them some questions. The most obvious was, "How much material do you use in a year?" Amazingly, many teachers don't do the math.

In one case, an instructor had 30 pounds of thermite, an aluminum compound that creates an extremely dramatic display — burning at over 3000 degrees — but that has been responsible for many student and instructor injuries. I asked him how much he used in a year, and he said two ounces. We calculated that he had over 230 years' worth of the material! Since this instructor was retiring in seven years, I asked if he would compromise and retain only what he needed until retirement. He

agreed. In some cases, we found as much as 2000 years' worth of curriculum material stored on-site!

Playing Hardball

In only one case did we have to resort to a "hardball" approach. This involved bromine, an extremely toxic material — much too toxic to be appropriately managed in most, if not all, secondary schools. Despite the dangers posed by bromine, one instructor (who referred to us as "safety Nazis") refused to consent to having the material moved. On several occasions, he resorted to hiding the material in the classrooms.

Once again, the local fire prevention officer — who has a broad range of authority in the community regarding the storage and use of hazardous material — came to the rescue. The fire inspector printed a copy of the bromine Material Safety Data Sheet (MSDS) from an emergency response program and submitted it to the superintendent of the district. Along with the MSDS, he had written a notification letter letting the district know that, from this point on, the fire department would not respond to any contingencies at the school involving bromine.

The fire prevention officer stated that his department members were not trained in response for this material, and that they did not have adequate protective apparatus to ensure the safety of their firefighters in the event of a release. He let the school district know that they would have to call the regional HAZ-MAT response team, and that the team's response time would be over three hours. As an alternative, the fire inspector noted that the school district could buy the necessary equipment and train its personnel in appropriate response measures, but the superintendent declined this option. The bromine was ordered removed within ten minutes.

Finding Employment for Reusable Materials

From our completed list of materials, we were able to isolate reusable materials and found new "homes" for them. Among the reusable items were copier supplies (some schools had changed systems and could no longer use the material on hand), art materials (primarily solvent-based paints and inks and heavy metal glazes, which were donated to local artisans) and janitorial supplies.

At one facility, on the day of disposal, the facility manager ushered us into a room completely filled with unopened boxes of Xerox copier materials. There was easily several thousand dollars' worth of products, never used. The manager wanted us to dispose of these materials. We pointed out that he must have spent a fortune on purchasing the copier materials, and he would certainly pay a fortune to get rid of them. He responded that the school had changed copier machines and could no longer use it. I asked whether he had inquired if any other department in the town used the same material. He had not.

I collected the copier inventory and brought it to the county purchasing agent, who promptly found an abutting town that used the appropriate copier. Contacts were made and the next day a pick-up truck arrived for the material. Everyone was happy.

Other material, such as paint from industrial art programs, was recycled through a paint recycling company. In approaching the designated "wastes" in this manner, the team saved the school districts an additional $50,000 in waste removal costs.

The team also developed a collaborative bid, creating a "milk run" for waste removal from all sites, which resulted in an additional savings of many thousands of dollars.

The Roots of the Hazardous Materials Problem in Schools

Assessing the waste we had collected was extremely revealing. In all, we removed over 65 tons of accumulated hazardous waste from our schools. Incredibly, over 85% of that material had never been opened. The excess of material was so profound, and so universal at all the sites, that we began to question what the cause was.

Once the schools had removed their wastes, we initiated ways to control future chemical/hazardous material inventory and to reduce or eliminate stockpiled material that could require disposal. Here, interviews with school staff and administrators revealed an important fact: Most schools have *no* chemical/hazardous material inventory system or oversight process for chemical/hazardous material purchases.

We also found the following:

- Teachers and instructors were being given free reign to order any type of chemical or material, without regard to health, safety, or environmental management or use considerations.

- Rather than taking an inventory of chemicals on hand and assessing the need for future acquisitions, teachers often simply resubmitted old purchase orders to save time.

- Oversight of chemical purchases was nonexistent. No one questioned the need for, or quantity of, chemicals purchased, and there is no requirement for science or other departments to maintain current inventories or to justify chemical purchases.

- Multiple and scattered chemical/hazardous material storage rooms, and classroom storage of chemicals, resulted in massive duplication of materials. One teacher would be ordering chemicals, while five other teachers in the same facility had it on their shelves, not using it. The same was true of maintenance material. In one district, on the day of removal, we found 50 gallons of new and unopened oil-based paint at the middle school. This material, which was designated for removal, was the same wall paint used at the high school — which had ordered more!

- No schools were doing microscale chemistry experiments. As a result, they were buying much larger quantities of material than were necessary.

- There was a "bigger is better" mentality. Teachers often bought in bulk, believing that they were getting a bargain and saving money, while not considering materials management issues or shelf life and curriculum need.

- The way schools distribute money encourages each department to fully spend its budget, or else risk losing it the next year. This often results in unnecessary and excess chemical purchases.

- Teachers and instructors are sometimes forced to purchase more than a year ahead of time, without knowing the actual number of students likely to be in their classes.

The waste assessment process forced us to review our goals. Clearly, removal of stockpiled material would not be sufficient. The management infrastructure at schools supported the continuation of the hazardous materials acquisition process. Thus, we needed to analyze how we could effectively change the process itself. Not an easy task, we were to discover.

Rethinking Strategies and Approaches

This assessment process evoked a whole new way of thinking about our assumptions and approaches to dealing with hazardous materials in schools.

First, we had to figure out where our assumptions had come from. In addition to our own cultural experiences and expectations regarding academic institutions, we realized that we were basing many of our assumptions on the private sector pollution prevention model of hazardous material and hazardous waste. The public sector does not have a comparable model, and comparing its situation to that of private business was like comparing apples to dinosaurs.

What makes the two so different? The reasons were not apparent at first, but became glaringly obvious after we had completed our audits. Since we are not cultural analysts, we used our own common sense to figure out the most significant differences.

Analyzing the School Culture

We began our school audits by focusing on waste. We removed the waste we found, only to be called back later to remove more. As I found myself in the third waste removal for a particular school, packing up unopened lab chemicals recently purchased, I made a point to the school principal. I mentioned that the school had just paid to purchase these chemicals, and they were now paying triple the cost for disposal. I thought the gross waste of resources would affect the principal's attitude. Instead, she merely looked at me angrily and said, "I would have had to pay someone to inventory them anyway so we probably broke even." As this example demonstrates, while profit is a highly motivating force in the private sector, it is virtually nonexistent in the public sector.

Profit and cost/benefit analysis are integral to the private sector. The public sector, on the other hand, does not have a functional structure to support this. For example, the budget structure in local governments is set up to penalize individuals who save money and buy wisely. If an established line item in their budget is not fully expended by the end of the fiscal year, the budget is reduced by that amount for the next year. In addition, because there are controls regarding what can be purchased with any given line item, there is little if any purchasing flexibility; thus, for instance, staff members generally do not have the option of buying, say, paper instead of science chemicals.

Numerous interviews with a wide variety of staff, from administrators to janitors, all indicate that there is a frenzy of buying at the end of the fiscal year if unexpended money remains in the budget. This in itself explains why cases and cases of material are purchased, without any current need. Reevaluating this process will be instrumental in rewarding prudent buying practices instead of punishing them.

Moreover, public schools do not evaluate curricula, materials choices, processes, or practices with an eye to the overall cost and benefit to the institution. Our observations show that there exists no infrastructure at schools to support this evaluation process.

If anything, the school infrastructure actually impedes such a process from happening. There exists a type of caste system within the public schools. The teachers and instructors belong to the "academic sector." The principal, superintendent, and school and business managers belong to the "administration sector." Finally, the facility and maintenance division comprise the "facility sector." Each sector works relatively independent of the other; they overlap only when necessary, or when a crisis occurs and they need to conduct damage control.

Thus, for example, if an instructor decides to use bromine in the curriculum, he or she simply orders the chemical. The purchase order goes to the school's business manager, who probably has no clue what bromine is, yet assumes the instructor has made a wise and prudent curriculum choice; based on this assumption, the manager signs the order to be filled.

No one discusses the ramifications to the facility of this choice. Will it require a different ventilation standard? Can the school meet such a standard? Does the material require heightened security and special storage? Can it safely be used in the classroom? Does it require special training and/or personal protective equipment (PPE)? Does it require a specialized contingency plan? Are there special chemical hygiene requirements? Or requirements for special fire suppression material? What are the total direct and indirect costs to the facility? Is there something less toxic that will demonstrate the same curriculum principle? And, of course, nowhere in the process does anyone even ask if the chemical is already available somewhere else in the facility or district.

This decision making concept personally intrigued me. Why do teachers appear to have little or no accountability for their curriculum choices? We interviewed many individuals within the schools regarding what they thought the reasons were. We received several answers.

First, there is a core belief that limiting a teacher's development of his or her individual curriculum will lead to less creative and worthwhile classes.

In addition, teachers are sometimes assigned to teach subjects with which they are not familiar. In some school districts, particularly in the elementary and middle schools, we found numerous cases where an English or social studies teacher was recruited for science instruction due to need. Often, they described their experience as being "thrown into it" without any training whatsoever.

Most interesting was our discussion regarding continuing education unit (CEU) credits for science and tech teachers. At the outset of our project, we questioned why these teachers were not subscribing to current safety methods. We were told that they were contractually

required to get a certain number of CEUs each year, which arguably should have introduced them to updated safety training.

We discovered, however, that there often was no budget to pay the instructors for the time they spent on obtaining CEUs. As a result, many teachers did not get this training, and the administration simply "looked the other way." Teachers were not getting the knowledge they needed, and the administration was not paying for it, but everything looked good on paper. Since that time, Massachusetts has adopted education reform and some of these issues are being addressed.

There also exists the assumption within schools that teachers, instructors, and technicians know what they are doing and are making safe choices given their facility conditions and resources. This assumption exists even though most teachers have received no training in safe chemical practices and use. In reality, many teachers are alarmingly uninformed in this area. At one school, a science supervisor with 20 years' experience asked me what the hazards of mercury were. Furthermore, most instructors never communicate with their facility professionals regarding whether the school is equipped to handle their chemical choices.

Finally, there is no clear and established legal authority regarding who is ultimately responsible for providing a safe environment within the school. When we asked people within the schools about this, we received conflicting answers. We were told that responsibility rested with everyone from the school committee to the principal to the superintendent. What was particularly surprising is that few mentioned teachers, who are the ones actually making the materials choices.

Lack of Health, Safety, and Environmental Enforcement or Compliance

With very few exceptions, governments have a bad habit of not enforcing their own health, safety, and environmental laws and regulations against themselves. In fact, in some cases they intentionally exclude themselves from the scope of these provisions.

This situation affects the public sector in two definitive ways. First, the lack of applicable regulatory provisions ensures that public sector personnel will receive no training regarding such provisions. As a result, almost everyone within the public sector culture is clueless about HSE regulatory provisions.

This lack of understanding results in some remarkable differences in attitude between the public and private sectors. Consider this example: My agency began a countywide mercury recycling program open to public and private sector agencies and organizations. We organized the pick-ups and provided containers, as well as offering safety education to supervisors and employees. In other words, we handled all the logistics; basically, all the public and private entities had to do was provide storage and pay for the service. The general response in the private sector was gratitude that someone was relieving them of their compliance burden. The general response in the public sector was, "If the government wants us to be green, *they* should pay for it!"

Secondly, within the public sector, there is no fear regarding the ramifications of noncompliance. Much as I hate to admit it, fear and shame motivate organizations to action. I like to think that most people would comply once they understand the health, safety, and environmental effects of non-compliance. Many do. However, as Al Capone said, "You can get further with a kind word and a gun than with a kind word alone."

Occupational Safety and Health

In Massachusetts, the legislature decided in the early 1980s that the Commonwealth would not become a federal OSHA state, and instead chose to adopt the "right-to-know" provision alone. This translated into virtually *no* OSHA provision coverage for the public sector.

After discussions with many state officials on the subject, I discovered that the major reason for choosing this route was financial. Requiring cities and towns to comply with the occupational safety and health laws would have created a state mandate; this in turn would have required the state to reimburse localities for their compliance costs. This was simply considered to be too expensive.

As a result, Massachusetts became a right-to-know OSHA state, which was significantly cheaper than requiring full compliance. Even without full compliance, however, this arrangement would have provided some measure of occupational protection and education to public sector employees if there had been appropriate funding and enforcement.

Instead, initial funding and enforcement was spread over three separate state agencies. You can guess how well that worked. Slowly, over a period of five years, the agencies' resources and funding disappeared and the initially appropriated money was distributed to other programs, many of which are now impossible to trace.

I should add that my foray into the political arena regarding reinstating state funding in this area was about as enjoyable as sticking pins in my eyes. Needless to say, this remains an unfunded and unenforced mandate.

Another challenge is that, historically, many state environmental enforcement officials do not regard occupational health and safety as having any connection to environmental health and safety. This is a remnant of the media-specific evolution of our environmental laws.

Thus, the funding for our first small grant was not continued after we had successfully removed many thousands of pounds of hazardous waste from our schools and watersheds because the state environmental agency considered the project to be a public safety program that didn't qualify for environmental or water protection grant funds. The state environmental officials' inability to see the connection between hazardous waste removal and environmental protection was troubling, to say the least. Although the boundaries between agencies and media are now dissolving, the "merger" process remains incredibly slow and filled with much frustration.

Equally frustrating is the difficulty of making administrators, supervisors, and workers aware of the specific hazards, costs, and benefits of the materials they are using so they can choose less toxic or non-toxic materials instead. We have seen many times that, once individuals are

educated regarding health threats or chemical management requirements, they willingly make changes to their practices or their curricula, and switch to using less hazardous or non-hazardous material. This not only creates a safer environment, but also reduces the management headaches associated with more toxic materials.

Environmental Issues

In Massachusetts, there are many environmental regulations regarding hazardous waste, but none regarding hazardous materials. A "waste" is defined as a material that is "no longer needed or wanted." Thus, as long as a facility still considers a particular material to be "needed," it is not a waste, and therefore is not regulated.

For many years, when a compliance officer approached a school (usually only after a catastrophic event) and questioned the need for the immense amounts of stockpiled material, they were told it was still "needed," and therefore was not waste. This loophole is still being used at some facilities.

One reason the fire service was so instrumental to the success of this project is that their regulations (contained in the state fire code) offer specific language to regulate hazardous materials under the flag of public safety. These fire regulations proved to be quite useful and extremely effective, as illustrated by the bromine removal example mentioned earlier.

In the private sector, management of the environmental compliance burden has greatly encouraged innovation. Many environmental regulations necessitate extensive recordkeeping and paperwork, as well as intense efforts and substantial resource expenditures to keep up to date. I believe that if public schools were made to comply with some of the established environmental regulatory requirements, the resource expenditure necessary to accomplish this would force them into different choices — perhaps innovative alternatives that would encourage more pollution prevention.

Facility Maintenance and Resource Allocation

Another profound area of challenge is facility maintenance. Overall, school facilities are very poorly maintained. Interviews with multiple facility operators revealed that their budget for basic and preventive maintenance has been steadily declining for 20 years. At one facility, the operating budget had dropped by 45% and the facility staff had lost nine positions, while use of the facility had increased by over 500%. The school is being used by numerous groups for both revenue and non-revenue generating activities, meaning that there is hardly any facility downtime. A facility staff member complained that some rooms are hardly ever empty long enough for maintenance. In addition, the average time allowed for nightly cleaning and maintenance is only nine to 13 minutes per classroom.

In some facilities, when we questioned janitors about routine maintenance of air-handling systems, such as the number of filter changes per year, they replied, "Filters? What Filters?" In one facility, the filters had not been changed for 25 years!

Most notorious were the fume hoods located in science labs. The majority were not in operational order. Many had motors intact, but no drive belts. Thus, the motor would engage and make noise, but no exhaust was taking place because the belt had split or deteriorated years before.

In addition, many were incorrectly vented into attic dead space, and not through the roof as required. Sometimes these spaces were return air plenums — meaning that chemical fumes were being recirculated through the building. We even saw some that were hooked directly into the air delivery system, efficiently sending the fumes to the classroom next door or down the hall.

Furthermore, over the years, both the staffing and the needs of school facilities have changed. Alterations and repairs to school facilities have frequently been made without respect to original design or overall needs.

Other factors that have contributed to the creation of hazardous conditions in school facilities include legal requirements that mandate acceptance of the lowest bid, and a "crisis management" mentality.

Conclusion

As this article illustrates, extremely hazardous conditions can be found in facilities that most of us consider to be environmentally benign. I myself was shocked to discover large quantities of hazardous chemicals in my local schools, where the community's children spend many hours of their day.

What lessons can be learned from the experiences described in this article? Clearly, there are many insights to be gained. Perhaps the most important, however, is this: As environmental, safety, and health professionals, we should not be blinded by our long-held assumptions. Contrary to expectations held by many of us — and embedded in our very laws — the private industrial sector is not the source of all our environmental problems. Sometimes public sector facilities contribute as much, if not more, to the community's environmental burden. If we truly want to protect our environment, health, and safety, we must begin to apply to the public sector, including schools, the same standards that we impose on private facilities.