



U.S. Department of Education

# LESSONS LEARNED

## From School Crises and Emergencies

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### INCORPORATING CHEMICAL HAZARDS INTO AN EMERGENCY MANAGEMENT PLAN

Schools across the country use some types of chemicals or products containing dangerous materials as part of the science, art, industrial arts and technology curricula. While each school has unique reasons and circumstances for using any chemical, the need for effective chemical management is necessary to provide a safe and healthy learning environment for all students and staff. An emergency management plan that incorporates chemical hazards developed in collaboration with community and state partners can address preventive measures, minimize disruption to the learning environment, reduce cleanup costs and keep students and staff safe. The incident below illustrates how a chemical spill that went unreported for approximately seven years set off a series of responses from the school district's Environmental Health and Safety Department (EHS) and the state Pollution Control Agency (PCA).

#### The Incident

The Howard Street School houses students in grades K–8 and is one of the oldest school buildings in the Rice School District, located in a large Midwest urban city. During a 2006 holiday break, a former teacher assigned to the school came to clean out some items from the

basement. During his visit he told a current teacher at Howard Street about a mercury spill that had occurred approximately seven years before in his classroom, but was never reported to district officials by himself or the principal for reasons not known. The current teacher shared the news with the current principal who then called the district's EHS to report the incident. EHS advised the principal not to use the classroom and to lock the door until EHS staff could measure the level of mercury vapors in the room. The principal met with the staff to inform them of the report and teachers expressed concern about why the previous principal had not informed them of the incident when it occurred. The principal mentioned that EHS and PCA would be coming to the school to assess the mercury levels.

The next day staff from the EHS and PCA used an instrument to monitor the classroom for mercury vapor. The recommended standard for safe occupancy is a reading of 300 or less nanograms (ng) of mercury per cubic meter of air. Mercury vapor in the room was measured at 40 ng; however, elevated levels of mercury, ranging from 1,000–2,000 ng, were found in a one-foot-wide strip of carpeting that ran parallel to a blackboard. A spiked reading of 29,000 ng was found in half of this strip.

The lessons learned in this document are the reflections of one school district and are based on one chemical spill. They are suggestions to consider when developing an emergency management plan that incorporates planning for hazardous chemicals; they are not prescriptive best practices for every school or school district. The name of the district and school has been changed to protect identities.

In addition to monitoring the mercury levels, the EHS obtained contact information for the teacher who was assigned to the room at the time of the spill. EHS contacted the classroom teacher who concurred that the incident occurred almost seven years ago when a substitute teacher was in the classroom. When the classroom teacher returned to school, he learned that a student tipped an open-ended barometer that was hung from the blackboard to pour a small amount of mercury into a cup, and the mercury spilled onto the carpet. It was estimated that the spill involved no more than 10–20 ml of mercury.

The day following EHS's and PCA's tests, school district staff determined that cleaning the spill and replacing the carpet did not require an outside vendor. Thus, trained district staff wearing protective equipment (e.g., rubber gloves, eye protection, respirators with mercury and chlorine cartridges and suits with attached hoods and booties) began a cleanup process. Carpet, backing materials and nail strips were removed and placed into sealed plastic bags labeled "mercury contaminated waste." Based on the previous day's tests there were no visible droplets of mercury, therefore amalgamating powder was sprinkled on the floor and dampened with water to bind any mercury residue. Residual materials were added to the "mercury contaminated waste" plastic bags. To ensure that all traces of mercury were removed, the area of the carpet that contained the spill was removed and the floor was wiped with damp paper towels soaked with vinegar. Once completely dry, a final wipe was performed using fresh paper towels dampened with hydrogen peroxide. All contaminated wipes were added to the bagged waste. Finally, a mercury indicator powder was spread over the floor to determine if additional cleanup was needed; after two days, the powder had not changed color, indicating that no further sanitation was necessary.

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The district staff that cleaned the room took the bags to a hazardous waste shed for evaluation and storage prior to off-site disposal. The mercury levels were assessed after the cleanup and were found to be in the safe range for mercury exposure. Another teacher, still teaching at the school, was concerned that the student may have taken some mercury into one of the computer rooms. She informed the principal, and, as a precaution, EHS monitored all computer rooms and found no incidence of mercury. Since the incident, the state is attempting to make all schools mercury free by removing all products that contain mercury.

Letters, written in collaboration with the district's public information officer (PIO) and EHS were sent home with students to families outlining the incident, how it was resolved and reassuring them that the school environment was safe. When giving students the letters, the teachers talked with them about the incident. Likely due in part to the extensive amount of time that had passed since the spill, neither the students nor their parents expressed any concern about the incident or how it was resolved. The PIO also issued a press release about the incident, which was reported by only one radio station.

## Lessons Learned

Howard Street School's experience illustrates how an emergency management plan that incorporates the management of chemicals and other dangerous products is necessary to maintain a safe learning environment. Appropriate precautionary, response and recovery measures will help to prevent or minimize hazards, exposure and injuries due to chemical mismanagement by considering the lessons learned below.

### Develop an Emergency Management Plan That Incorporates Chemical Management

A component of the Rice School District emergency management plan addresses chemical management. The plan was based on the unique characteristics of the school (e.g., grades served, curricula offerings, size, age of building, location), and stipulated criteria for using the chemicals as part of the curriculum. For example, in the Rice School District, teachers of grades K–8 cannot use chemicals with high levels of poisonous substances for instructional purposes. Only those teachers in grades 9–12 who have been trained by the district curriculum supervisors and other community partners can incorporate those types of chemicals into the curriculum, as part of the instructional program. The plan included specific procedures and recommendations for purchasing, tracking, storing, using and disposing of chemicals that may be used in science laboratories, vocational and trade shops, visual and performing arts studios, maintenance areas, cafeteria, nurses' offices, photo laboratories, athletic fields and administrative offices. Figure 1, Illustrative Products Used in Various School Locations That Contain Hazardous Ingredients, offers specific examples to consider when creating plans to address chemical management.

The plan also should designate who, in addition to the principal or assistant principal, will be responsible for implementing and monitoring the plan to ensure that all procedures are followed as prescribed in the plan.

### Collaborate With Partners to Develop Strategies for Managing Chemicals

The Rice School District's EHS worked with partners to develop an all-hazards emergency management plan. Relevant partners related to addressing chemical hazards may include: local and state agencies, such as those dedicated to environmental safety, pollution control, hazardous materials, emergency medical services and public health; police and fire departments; and businesses and universities. Schools are encouraged to engage with partners who can make meaningful contributions and who are committed to continuous involvement and long-term commitment in managing chemicals in the school environments. Figure 2, Illustrative Partners for Addressing Chemical Hazards and Potential Contributions, offers some concrete

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**FIGURE 1: ILLUSTRATIVE PRODUCTS USED IN VARIOUS SCHOOL LOCATIONS THAT CONTAIN HAZARDOUS INGREDIENTS**

<b>LOCATION</b>	<b>PRODUCT TYPE</b>	<b>HAZARDOUS INGREDIENT (EXAMPLES)</b>
<b>Science laboratories</b>	Concentrated Acids (undiluted)	Hydrochloric acid, Nitric acid
	Concentrated Bases (undiluted)	Sodium hydroxide
	Solvents	Methanol, Methylene chloride
	Oxidizers	Lead nitrate
	Compressed gases	Oxygen, Cyanides
	Toxics	Chromates (VI), Lead salts, Mercury salts
<b>Vocational and trade shops (career and technical education schools)</b>	Solvents (used in paints, paint thinners, adhesives, lacquers, primers and other products)	Petroleum naphtha, Turpentine
	Cleaning supplies/detergents	Phosphoric acid, Sodium silicate, Acetylene
	Compressed gases	Nitrogen
	Fuels, transmission and brake fluids	Gasoline
<b>Visual and performing art studios</b>	Solvents (used in paints, inks, paint thinners, adhesives, lacquers, primers and other products)	Toluene
	Lacquers, primers and other similar products	Mineral spirits
	Pottery clear coating glaze	Lead, Other heavy metals
	Pigments for paints and coatings	Cadmium, Manganese, Chromium
	Dry clay for ceramics and jewelry	Silica
	Acids for etching	Nitric acid, Hydrochloric acid
<b>Custodial and maintenance areas</b>	Cleaning supplies and detergents	2-Butoxyethanol
		Trisodium phosphate
	Drain cleaners (alkaline)	Potassium hydroxide
	Drain cleaners (acidic)	Sulfuric acid
	Pesticides (including disinfectants/sterilizers)	Permethrin, Sodium hypochlorite
	Paint thinners	Toluene
	Solvents (used in paints, paint thinners, adhesives, lacquers, primers and other products)	Xylene
	Water treatment chemicals for swimming pools	Chlorine tablets
<b>Kitchens and cafeterias</b>	Pesticides (including disinfectants/sterilizers)	Permethrin, Sodium hypochlorite, CFCs
	Refrigerants	Ammonia
	Cleaning supplies/detergents	Ammonium hydroxide
<b>Nurses' offices</b>	Medical equipment	Mercury (thermometers and blood pressure manometers)
<b>Photography laboratories</b>	Intensifiers/reducers	Potassium dichromate, Hydrochloric acid
	Developers	Hydroquinone, Lactic acid, Acetic acid
	Stop baths and fixer	Chrome alum (potassium chromium sulfate)
<b>School grounds and athletic fields</b>	Pesticides	2,4-D
	Deicers	Sodium chloride
	Fertilizers	Ammonium nitrate
<b>Administrative offices</b>	Correction fluid	Ethylene glycol, Trichloroethane
	Solvents (used in paints, inks, paint thinners, adhesives, lacquers, primers and other similar products)	Methyl ethyl ketone, Petroleum distillates
	Printer/copier toners	Carbon black

Source: U.S. Environmental Protection Agency, *Chemical Management Resource Guide for School Administrators*, <http://www.epa.gov/oppt/pubs/chemgmt/resourceguide.pdf>. (Last accessed on Dec. 18, 2007.)

factors schools can consider in building relevant partnerships.

As the Howard Street School principal discovered, collaborating with partners from both the school district and state agencies is essential because the partners will have specific knowledge about the various aspects of the hazard, such as compositions of chemicals, adverse health effects of the chemicals, chemical compatibility, effects of the chemicals on the environment and regulatory standards. When developing partnerships, it is useful to develop memorandums of understanding (MOUs) to define roles, responsibilities, expertise and resource allocations. For example, the MOU signed by Rice School District and the PCA was instrumental in obtaining specialized equipment, such as the instrument used at the Howard Street School, for detecting and disposing of unsafe chemicals and products, and in the training of district and school staff on the procedures related to chemical hazards. Partners can be especially helpful when conducting walk-throughs to identify inappropriate use, storage or disposal of chemicals.

### **Allocate Resources for Responding to Chemical Spills**

All science, vocational, visual and performing arts and photography curricula should include budgets for the proper disposal of chemicals or accumulated chemicals and spill cleanup. The budget should account for performing routine chemical disposals, purchasing specialized monitoring and cleanup supplies and equipment, maintaining equipment and staff training. Partnerships with state agencies and local businesses can help to minimize costs that the school district or schools would spend on specialized equipment to detect and monitor any chemical spills.

### **Provide Training on the Specific Components of an Emergency Management Plan**

The plan should outline which staff (e.g., teachers, cafeteria workers, building engineers) are required to receive training about the specific procedures and a training schedule. The Rice School District conducts trainings, no less than annually, and provides practical information about chemical management procedures on ordering, handling, storing and disposing of chemicals. All trainings include the criteria for reporting a chemical incident to the principal or district office, resources for additional information and contact information for appropriate district and state offices that handle chemical incidents. Students who are enrolled in classes in which chemical use occurs should receive instruction on how to handle, store and dispose of the chemicals prior to using the substances.

Reaching out to partners in the business community who are knowledgeable about the school curriculum and environment and chemical management practices to serve as trainers is a cost-effective training approach. Opportunities to provide

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**FIGURE 2: ILLUSTRATIVE PARTNERS FOR ADDRESSING CHEMICAL HAZARDS AND POTENTIAL CONTRIBUTIONS**

ILLUSTRATIVE PARTNERS	POTENTIAL CONTRIBUTIONS
<b>Fire, Police, and Emergency Response Departments</b>	<ul style="list-style-type: none"> <li>■ Establish effective communication with the schools or school districts in the community.</li> <li>■ Provide schools/school districts with information on fire codes and identifying applicable requirements regarding chemical use, storage and disposal. This information could be conveyed through periodic walk-throughs.</li> <li>■ Offer training or guidance on responsible chemical management.</li> <li>■ Work with schools to identify potentially harmful and dangerous situations related to the use and storage of chemicals.</li> <li>■ Assist with the handling of dangerous chemicals.</li> <li>■ Help develop school-specific chemical management and emergency response plans.</li> </ul>
<b>Environmental and Health Agencies</b>	<ul style="list-style-type: none"> <li>■ Provide technical assistance to schools in conducting chemical inventories and cleanouts.</li> <li>■ Allow schools to dispose of some of their chemicals in household hazardous waste collections, if feasible.</li> <li>■ Assist schools with funding chemical management programs.</li> </ul>
<b>Colleges and Universities</b>	<ul style="list-style-type: none"> <li>■ Share expertise of environmental health and safety staff with area K–12 schools and help assess chemical cleanout, management and disposal issues with activities, such as:               <ul style="list-style-type: none"> <li>▪ Conducting a chemical inventory;</li> <li>▪ Offering courses and training in environmental health and safety for teachers and school district employees;</li> <li>▪ Considering offering opportunities to local schools to share in the college or university’s waste collection and disposal system;</li> <li>▪ Incorporating environmental health and chemical safety training into the curriculum of pre-service teachers; and</li> <li>▪ Encouraging teachers to evaluate the chemicals they use in their lessons and recommend the use of less toxic alternatives or lessons that create less chemical waste.</li> </ul> </li> </ul>
<b>Chemical Suppliers and Manufacturers</b>	<ul style="list-style-type: none"> <li>■ Provide technical assistance to schools on how to inventory their chemicals, manage and dispose chemicals responsibly.</li> <li>■ Offer cost-effective waste analysis and handling solutions for periodic cleanouts.</li> <li>■ Assist schools in establishing best practices and developing a chemical management plan.</li> <li>■ Offer training and workshops to teachers and facilities personnel.</li> <li>■ Promote product stewardship through full-service chemical management.</li> </ul>

Source: U.S. Environmental Protection Agency, *Building Successful Programs to Address Chemical Risks in Schools: Recommendations from an Evaluation of Selected Schools Chemical Management Programs*, <http://www.epa.gov/epaoswer/osw/consERVE/clusters/schools/pdfs/recommend.pdf>. (Last accessed Dec. 18, 2007.)

instruction may include teacher in-service days, existing trainings for each type of professional (e.g., nurse, cafeteria worker, science teachers) or online trainings. District- and school-based administrators who have the direct responsibility for implementing and monitoring the plan also should participate in annual trainings. Topic-specific articles in newsletters or other written or electronic information can supplement the training.

The incident at Howard Street School involved a substitute teacher. It is important to train all substitutes who will be assigned to classes in which chemicals are used. Another alternative is to have a policy, as the Rice School District does now, prohibiting the use of chemicals in classrooms when a substitute is present.

### **Develop Information About Chemical Management in Collaboration With a Public Information Officer or a Media Representative**

It is important to work with the district PIO to establish procedures and protocols for communicating timely and consistent information to the staff, students and families during and after a chemical incident. The Howard Street School principal worked with the district's PIO to modify a letter template for the families that provided a brief, yet clear, description of the incident in nontechnical language, discussed cleanup procedures and reassured families that the school

environment was clean, healthy and safe for the students. If needed, the letter should be translated into the predominate language(s) spoken by the majority of the families in the school where the incident occurred. During a chemical spill incident, it may be helpful for the letter to include a brochure or Web site address from the federal or state environmental protection agency or related agency to provide additional information about how the incident is treated or can be prevented in the future.

Working with the media in advance of any emergency incident will help to facilitate that positive, reassuring messages will be disseminated about how the school responded to the incident and a plan for preventing or mitigating future chemical incidents. Through advance planning, the media will understand the procedures for talking with students or staff, visiting the site of the chemical incidents and obtaining reliable and current information.

### **Conclusion**

Integrating a chemical management plan into a district or school emergency management plan will help to avoid disruptions in the school environment due to spills or other emergency incidents and safeguard the health and safety of staff, students and the community. Conducting training on the plan will increase staff, student and community awareness about the correct management of chemicals used in schools as part of the curriculum or maintenance.



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For information about the Emergency Response and Crisis Management grant program, contact Tara Hill ([tara.hill@ed.gov](mailto:tara.hill@ed.gov)), Michelle Sinkgraven ([michelle.sinkgraven@ed.gov](mailto:michelle.sinkgraven@ed.gov)) or Sara Strizzi ([sara.strizzi@ed.gov](mailto:sara.strizzi@ed.gov)).

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