SCHOOLS CHEMICAL CLEANOUT CAMPAIGN
LESSONS LEARNED REPORT

Prepared for
The United States Environmental Protection Agency
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Schools Chemical Cleanout Campaign (SC3)

United States Environmental Protection Agency, Region III and the Pennsylvania Department of Environmental Protection

Executive Summary

The Schools Chemical Cleanout Campaign (SC3) is a program designed with the objective of raising national awareness of the potential dangers posed by mishandled chemicals in schools. The Environmental Protection Agency (EPA), Region III, developed a pilot project to help promote this campaign in Pennsylvania schools. Ten schools were selected to participate in this pilot project.

Among the notable findings were:

- Over 5,600 lb of chemicals were removed from ten Pennsylvania Schools;
- Most schools had not designated a Chemical Coordinator;
- Many schools had not developed a Chemical Management Plan;
- Most schools did not have appropriate safety equipment needed to respond to chemical spills;
- Many schools possessed large quantities of expired chemicals;
- Many chemicals were not stored properly; which increased the potential for future problems.

Notable recommendations include:

- Schools should keep a detailed inventory of all chemicals stored on school property;
- Care should be taken to purchase the minimal amount of chemicals needed; and
- All chemicals should be stored pursuant to manufacturers specifications and following safe handling practices.

The recommendations contained in this report also detail how schools can go about conducting a chemical cleanout campaign by providing practical advice on identifying and selecting qualified chemical cleanout contractors.

EPA Region III's Schools Chemical Cleanout Campaign Demonstration Project

The Schools Chemical Cleanout Campaign (SC3) is a new program within the United States Environmental Protection Agency (EPA) created to build a network of federal agencies, state agencies, teachers' associations, school administrator organizations, chemical suppliers, and industry leaders. The objective of the campaign is to raise national awareness of the potential dangers posed by mishandled chemicals in schools. The SC3 program is designed to facilitate chemical cleanouts of outdated, unknown, or unneeded amounts of dangerous or inappropriate chemicals. The program is also designed to prevent future problems with mishandled chemicals by promoting chemical handling policies that encourage responsible

Examples of expired chemicals removed

management practices. These policies aim to minimize exposure to students and staff, thus improving the learning environment and reducing school days lost. The ultimate goal of the campaign is to prevent damage to human health and the environment such as that caused by school chemical incidents reported nationally in recent years.

The SC3 Program is a component of the Priority and Toxic Chemical Reduction focus area, one of the four EPA focus areas within the Resource Conservation Challenge (RCC). The RCC is a national effort to conserve natural resources and energy by managing materials more efficiently. In the interest of providing outreach resources to Pennsylvania schools, EPA Region III funded a SC3 demonstration project designed to disseminate, through an education and outreach campaign, the lessons learned from chemical cleanouts performed at Pennsylvania schools. EPA Region III, in conjunction with the Pennsylvania Department of Environmental Protection (PA DEP), initiated the demonstration project in January 2008 when applications were disseminated to all Pennsylvania schools. Interested schools completed and submitted an application package which included a preliminary chemical inventory listing. These applications were reviewed and assessed for need, and schools were selected to participate in the demonstration project. Schools were selected from counties across the commonwealth and an effort was made to select at least one school from each of the six PA DEP Regions. One school was selected from each of the following counties: Allegheny, Bucks, Dauphin, Erie, Franklin, Lehigh, McKean, Monroe, Montgomery, and Westmoreland.

Ultimately, ten schools were selected to participate in the program and chemical cleanouts were conducted with the assistance of government contractors who oversaw and performed lab packing activities at the schools during the summer of 2008. In total, more than 5,600 lb of materials were removed from these schools. This quantity was based on completed hazardous waste manifests for each of the ten schools. The table below summarizes the chemical waste categories and approximate quantities of chemicals removed from the schools.

Summary of Wastes Removed from the 10 Pennsylvania Schools - One School Per County*

School Location (County)	Flammable Liquids (lb)	Flammable Solids (lb)	Corrosive Liquids (lb)	Toxic Liquids (lb)	Toxic Solids (lb)	Mercury Compounds (lb)	Other** (lb)	Total Weight (Approx.)
Allegheny	35	5	71	25	17	-	171	**324**
Bucks***	136	2	19	221	-	2	538	**918**
Dauphin	300	3	127	25	18	7	73	**553**
Erie	41	-	12	7	-	2	90	**152**
Franklin	83	1	150	58	43	18	29	**382**
Lehigh	15	-	-	25	3	2	21	**66**
McKean	12	-	22	12	2	1	54	**103**
Monroe	41	11	60	162	16	8	196	**494**
Montgomery	-	-	80	132	-	2	1,800	**2,014**
Westmoreland	80	31	109	90	17	5	351	**683**
Totals	**743**	**53**	**650**	**757**	**116**	**47**	**3,323**	**5,689**

*One school in each of the 10 counties listed participated in the chemical cleanouts. The school names have been withheld from this report.
**Includes materials not categorized by the lab packing technicians as one of the preceding hazardous waste categories. These items included materials such as waste paint, compressed gases, and non-Department of Transportation and EPA Regulated wastes.
*** Cleanout also included six 55-gallon drums of flammable liquids, corrosive liquids, and toxic liquids (not included in estimated weights).

The quantities are approximate and based on observations made during the lab packing activities. The following sections of the report discuss the lessons learned during the SC3 demonstration project and are designed to provide Pennsylvania schools with information to assist them in properly managing the chemicals stored and used at their facilities, as well as to provide recommendations on conducting chemical cleanouts of their own.

Chemical Management Plans

Observations made during the cleanouts revealed that most schools did not have a designated Chemical Coordinator. This meant that chemicals were more likely to be stored in various locations throughout the schools and in various quantities. It also appeared that the teaching staff and the building maintenance staff did not always effectively coordinate or communicate chemical needs when determining the types and quantities of chemicals that needed to be ordered for the school. This lack of coordination contributed to the storage of excess quantities of chemicals. In addition, it was also observed that some schools did not maintain an up-to-date copy of Material Safety Data Sheets (MSDS) for all of the chemicals stored at the school.

Example: One school was in possession of two 55-gallon drums containing cleaning solution which had been stored for several years in the basement of the school but had never been used due to its relatively unknown and remote location. Storage of the drums in the basement also affected the integrity of the drums as well as their contents. Therefore, the result was that the cleaning solution required disposal. Proper storage and coordination amongst the staff would have insured that the cleaning solution was stored in a safe manner where it could have been utilized as intended.

Recommendations

1. Designate a Chemical Coordinator

If possible, one person per school, or per school district, if appropriate, should be designated as the Chemical Coordinator whose function is to manage all chemicals at the school or within the school district. The Chemical Coordinator's duties should include purchasing and oversight of chemicals (including chemicals utilized for maintenance and custodial purposes); maintaining and updating the chemical inventory; and ordering safety supplies related to the safe handling of chemicals. The Chemical Coordinator should communicate effectively with all departments within the school that utilize chemicals in order to minimize the amounts of chemicals needed to be ordered each year, and to insure an accurate inventory of stored chemicals is maintained.

The Chemical Coordinator should also maintain a central inventory of all MSDS's for chemicals stored at the school. In addition, a duplicate set should be maintained in each laboratory. MSDS's are chemical summaries that provide the proper procedures for handling, storing, and disposing of chemical substances. The Chemical Coordinator should keep apprised of any appropriate information regarding chemicals in the school's inventory that may render the chemicals unsafe for use (e.g., expiration date passed; damaged storage containers; chemicals classified as carcinogens, and endocrine disruptors). A copy of a sample MSDS is provided as Exhibit 1.

2. Conduct a Chemical Inventory of Existing Chemicals and Establish a Chemical Tracking System

The first step after designating a Chemical Coordinator should be to conduct a thorough inventory of all chemicals presently located in the school. It is recommended that a copy of the completed chemical inventory be supplied to local emergency responders (i.e., the local fire department).

Schools should consult with local authorities for specific requirements.

Attached as Exhibit 2 is a copy of the chemical inventories compiled by the ten Pennsylvania schools selected to participate in the demonstration project as part of their application package. Each inventory varies greatly in terms of the variety of chemicals listed. Some schools had inventories which included chemicals that were decades old.

A useful guidance document is available from the State of Florida's SC3 website and is entitled *Guidelines for Conducting a Chemical Inventory*. This reference guide provides practical advice on conducting thorough and safe chemical inventories.

The completed inventory should act as a chemical tracking system that tracks chemicals from the time they are purchased up to the time that they are used and disposed. Attached as Exhibit 3 is a copy of the chemical inventory form used for the demonstration project, which can be used as a component of a school's chemical inventory tracking system. This form was developed from EPA's SC3 website.

3. Evaluate the Condition of the Chemicals Stored at the School

All chemicals must be properly labeled with the contents of the container and a coded chemical safety label. Attached as Exhibit 4 is a copy of a standard chemical safety label. An October 2006 guide prepared by the U.S. Consumer Safety Product Commission, the Department of Health and Human Services, Center for Disease and Prevention (CDC) and the National Institute for Occupation Safety and Health (NIOSH) entitled School Chemistry Laboratory Safety Guide, contains useful labeling guidelines, such as:

- Any unlabeled, expired, or unknown chemicals must be disposed of immediately using the appropriate procedure (see below for proper disposal guidelines);
- MSDS's should be available for each chemical stored at the school; and
- In the event that the MSDS sheet can not be located for a particular chemical, a copy should be obtained from the vendor. In the event that the vendor is not available, most MSDS sheets can be procured from an on-line source. Two free websites that routinely stock a diverse chemical library of MSDS's are MSDS Solutions and MSDSSEARCH, which is recommended by NIOSH.

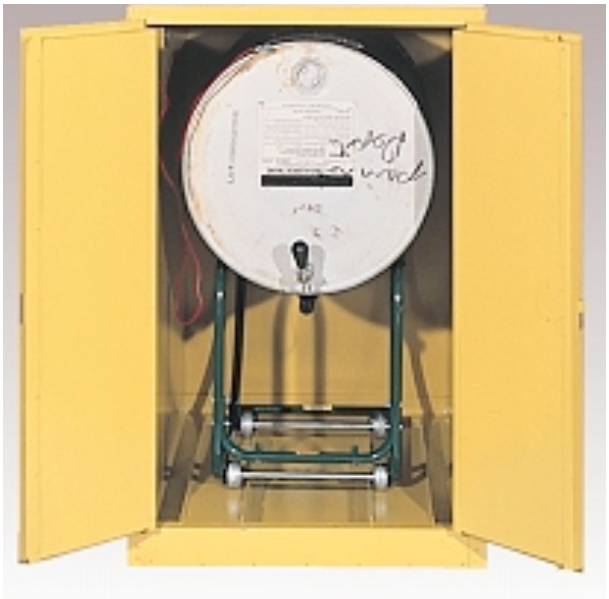
4. Identify a Central Storage Location or Storage Locations

The Chemical Coordinator should become familiar with all current chemical storage locations and determine if they are safe and appropriate for continued use. Examples of safe and appropriate storage locations include:

- Locked, chemical resistant, cabinets should be utilized to store all chemicals. Only compatible chemicals (i.e., acids with acids, bases with bases) should be stored within the same cabinet. Examples of acceptable chemical storage cabinets are shown below:

Examples of Acceptable Chemical Storage Cabinets
Used with permission from Eagle Manufacturing Company

- If necessary, a secondary secure location can be selected for storage of oversized containers of chemicals that will not fit into a standard chemical cabinet. An example is presented below:



Example of Acceptable Oversized Chemical Storage Cabinet.
Used with permission from Eagle Manufacturing Company

- All chemicals and chemical cabinets should be located in areas that are not subject to extreme changes in temperature, have proper adequate ventilation and are in low-traffic areas.

5. Develop and Maintain a Safety and Spill Plan and Have Response Equipment Readily Available

Functioning safety equipment, such as fire extinguishers, spill kits, eye wash kits, chemical showers, should be available and clearly marked. Safety equipment should be compatible with the chemicals stored on-site.

Chemical Coordinator Duties

The most effective way to ensure that chemicals are handled and stored properly is to designate a Chemical Coordinator whose function is to oversee all aspects of chemical management. The Chemical Coordinator should:

- Prepare a chemical tracking system that contains a listing of each chemical stored in the school.
- Oversee the purchase of all chemicals. This includes verifying that a stockpile of this chemical does not already exist. Care should be taken to order the minimal quantity required.
- Verify that the appropriate chemical storage receptacles, ventilation, Personal Protective Equipment (PPE), and spill equipment are present for chemicals being purchased.
- Manage and update the MSDS library as necessary. An MSDS should be present where chemicals are stored and readily accessible for every chemical stored and used at each facility.
- Determine if a less toxic alternative to a hazardous or toxic chemical is available in the market.
- Review the appropriate storage, use and disposal procedures with all faculty and provide updates as necessary.
- Coordinate the transportation and disposal of all chemical wastes.

Chemical Handling

Many schools possessed chemicals that were stored in damaged or leaking containers. Many of the chemicals stored had become unstable, forming crystals or becoming solid. Depending upon the substance, this can potentially increase the risk of an adverse reaction, explosion, or increase the likelihood of contaminating surrounding areas.

Example of a leaking container

Example: Two of the ten schools that participated in the demonstration project required explosives specialists to be brought in to safely re-package, remove, and dispose unstable ethyl ether. Had the two school cleanouts not occurred, explosions could have occurred at these two schools.

Recommendations

1. Only Properly Trained Personnel Should Have Access to Chemicals Within the School

Extensive training or education is not required to safely handle most chemicals, but basic training is strongly recommended. Personnel should be trained and able to:

- Review and understand the associated chemical label and any additional literature provided by the vendor;
- Review and understand the information provided in the applicable MSDS; and
- Identify the location of, and be able to utilize all applicable safety equipment in the event of a spill.

2. Utilize the Appropriate Level of PPE

When handling chemicals, at a minimum:

- MSDS sheets should be utilized to determine the appropriate level and type of PPE needed when handling each chemical;
- PPE generally can consist of gloves, eye protection (safety goggles or face shields), and lab coats or aprons;
- The appropriate quantity and type of PPE must be available to and used by students and faculty participating in school or maintenance activities; and
- Utilize a sign-off sheet that school personnel must prepare and sign prior to utilizing any chemicals. This sign-off sheet can be as simple as a form that lists the chemical to be utilized and states that personnel have reviewed and are familiar with the MSDS sheet and all relevant information regarding use of said chemical and will utilize all appropriate safety procedures.

Prior to the use of any chemicals in the classroom, it is suggested that an informational sheet describing the types of chemicals to be used in the classroom be prepared. This information should be distributed to all students that will be participating in science experiments or other school activities. This informational sheet should require review and signature by a parent or guardian authorizing the student to participate in said activities and a comment section to be completed by the parent or guardian if they are concerned that the chemicals to be utilized may adversely affect their child's health or aggravate a pre-existing health condition. Any children that may be adversely affected by contact with chemicals to be utilized during an activity could then be assigned an alternative activity.

3. Schedule Custodial or Maintenance Activities and Any Chemical Removal Activities During Off-Hours

It is suggested that any custodial or maintenance activities involving the handling and use of chemicals be scheduled to take place during off-hours when students are not in the building and the risk of student exposure has been eliminated. However, it should be noted that the custodial staff should review the applicable MSDS and utilize the appropriate PPE needed to safely perform their activities.

All chemical removal activities (e.g., lab packing, transportation, disposal activities) should be scheduled to take place during off-hours when students and staff are not in the building. Again, this will help reduce the risk of student and staff exposure and illness due to chemical fumes.

4. Utilize Chemicals that are Properly Labeled and Stored

Only chemicals that have been properly labeled and stored should be utilized for any school or custodial or maintenance activities. Chemical containers that are missing labels, leaking, bulging, cracked or appear to have changed in appearance (formed a solid, formed multi-phases, formed crystals, etc.) should not be utilized for any school or maintenance activity as the contents may be unstable. These items should be disposed as soon as possible in a safe and legal manner.

Standard Operating Procedures (SOPs) for Chemical Handling and Storage

1. Prior to the purchase of any chemicals, review the chemical inventory list to ensure that a quantity of said chemical is not already in stock.

2. Review the associated MSDS, which provides information regarding health hazards, the appropriate level of PPE required during the use of this chemical, recommended spill equipment, storage guidelines, and disposal restrictions.

3. All chemicals must be stored in locked chemical storage cabinets that are located in an area that is adequately ventilated. These cabinets are comprised of chemical and heat resistant materials. A copy of all chemical MSDS's should be kept in a binder next to the accompanying chemical cabinet.

4. Only store compatible chemicals (acids with acids, bases with bases) within the same chemical storage cabinet. Failure to do so can cause unsafe conditions within the chemical storage cabinet.

5. An adequately stocked spill kit should be stored in a conspicuous location. Standard spill kit contents include absorbent materials (spill pads, quick-dri, absorbent boom), neutralizing agents, and storage bags for placement of spill clean-up materials. Spill kits can be purchased from many safety supply vendors.

6. The use of any chemicals should occur in an area that has adequate ventilation and with the use of the proper PPE.

7. Review the proper protocol to be followed, including PPE, potential health hazards and proper disposal requirements with potential users. Verify that potential users understand all protocol to be followed.

8. Return unused chemicals immediately to the designated chemical storage cabinet after each use.

9. Periodically inspect the chemicals stored within the chemical storage cabinets to verify that all containers are in good condition and have not expired.

Chemical Minimization Plans

During the removal and disposal process it was noted that many of the schools possessed large quantities of mercury laden items (e.g., thermometers, lamps, barometers) computer batteries, obsolete cleaning compounds in bulk storage containers, and pesticides. A portion of these items were most likely accumulated because departments did not communicate when ordering the chemicals or the disposal costs were prohibitive. A Chemical Minimization Plan is designed to reduce the stockpiling of chemical products and to provide guidance on replacing hazardous chemicals with more inert substitutes.

Example: One school had two large bottles of naphthalene, two bottles of potassium chloride, several bottles of methyl red and 15 mercury thermometers in storage that required disposal. Due to the various dangerous characteristics of the chemicals found, such as the flammability of

Methyl red, which can be harmful if inhaled, swallowed, or exposed to skin
Two large containers of naphthalene, a highly flammable chemical

naphthalene and the toxicity of potassium chloride and mercury, the prompt removal and disposal of such chemicals is necessary to ensure the safety of school occupants and to avoid environmental contamination. In addition, if the school had ordered smaller quantities of the above chemicals, disposal costs would be reduced since less chemicals would be on-hand that require disposal.

Mercury containing thermometers collected for disposal

Recommendations

1. Draft and Implement a Chemical Minimization Plan

In order to generate an effective Chemical Minimization Plan, a complete chemical inventory must be performed. This will prevent the possibility of purchasing chemicals that are already in-house. The goal of a Chemical Minimization Plan is to identify, minimize quantities, eliminate, or substitute chemicals that are problematic with respect to toxicity, regulatory status and volume.

2. Avoid Purchasing Chemicals in Bulk

Even though vendors offer price incentives when buying in bulk, in most cases a large quantity of the product is not needed and goes unused. This leads to issues with safe storage of bulk materials and in most cases, paying for disposal of unused quantities at a later date. What seems like a bargain at the time of purchase is actually more expensive after the cost of disposal is added in with the cost of the purchase price. An effort needs to be made to determine and order the smallest quantities possible of all chemicals that are needed to perform tasks.

In addition, schedule chemical deliveries to occur during off-hours. Ideally, waste transportation and disposal activities should occur before the start of the school year.

3. Utilize Vendors that Offer Eco-Friendly or Less Toxic Products

An attempt should be made to utilize vendors that offer eco-friendly or less toxic products. These products normally do not pose the health and disposal hazards associated with traditional chemicals and in most cases can be disposed in an easier and less expensive manner.

EPA has provided resources for schools to utilize when looking for less-toxic cleaning alternatives. The document is entitled: SC3: Protecting Students and Staff with Green Cleaning.

4. Discontinue the Use of Mercury Laden Materials

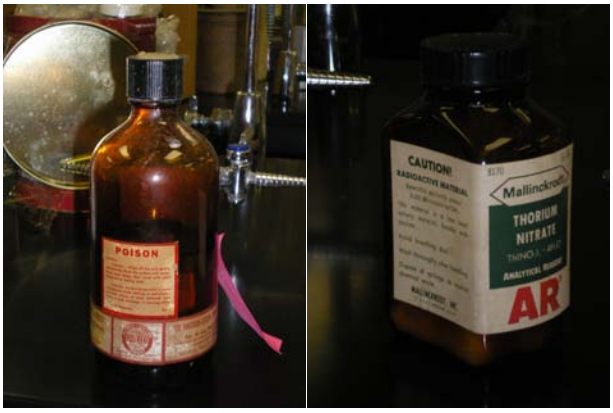
The use of mercury thermometers and other mercury laden materials in schools should be banned because mercury and mercury vapors are hazardous and can cause health problems. Schools should determine if a viable, inert replacement for mercury is available. Some suitable replacements for mercury containing equipment is listed in the table below.

Mercury Laden Material	Mercury-Free Substitute
Mercury Thermometers	Digital or Alcohol Thermometers
Mercury Barometers	Digital Pressure Sensors or Aneroid

When the use of mercury is unavoidable, such as in fluorescent light bulbs, care must be taken when removing, storing, and disposing these materials. Consult EPA's Mercury-Containing Light Bulb (Lamp) Recycling website for more information. These items, as well as other equipment such as batteries, or mercury containing thermostats, are classified and regulated by PA DEP as Universal Waste. The details of the requirements for Universal Waste can be found in the Code of Federal Regulations Title 40, Protection of the Environment, Part 273; Pennsylvania regulations can be found at Pennsylvania Title 25 Chapter 266b. PA DEP has prepared a series of fact sheets related to the proper disposal of these items for small quantity handlers of Universal Waste (see Exhibit 5). A small quantity handler is defined as not accumulating more than 5,000 kg (11,203 lb) of any universal waste at any one time.

5. Comply with RCRA Requirements

Every effort should be made to minimize the quantity of hazardous waste generated at the school and within the school district. Schools that meet the criteria as hazardous waste generators are subject to specific disposal, handling, and storage procedures. In most cases, with the proper planning, a school can avoid becoming a hazardous waste generator.



Two examples of chemicals that should be removed from schools. A radioactive chemical and a poison reagent

EPA has established three categories for hazardous waste generators based upon the quantity of hazardous waste generated per month. The regulations regarding hazardous waste can be found in the Code of Federal Regulations Title 40, Protection of the Environment, Part 261. Pennsylvania has incorporated the federal regulations by reference, see Pennsylvania Title 25, Chapter 261a.

PA DEP has also issued Fact Sheets detailing these categories and how individuals can determine what requirements apply to them. Attached as Exhibit 6 is

a copy of the requirements for Conditionally Exempt Small Quantity and Small Quantity Generators.

Following below is a general summary of these regulations.

- Conditionally Exempt Small Quantity Generators (CESQG)

  CESQG's generate no more than 100 kg (220 lb) of hazardous waste and no more than one kilogram (2.2 lb) of acutely hazardous waste in one calendar month.

  A CESQG can store 1,000 kg (2,200 lb) of hazardous waste but no more than one kilogram (2.2 lb) of acutely hazardous waste or 100 kg (220 lb) of acutely hazardous waste residue.

  The CESQG must complete a hazardous waste determination on all solid waste generated and must comply with storage limits.

  The CESQG must ensure that all hazardous waste is properly transported off-site to a treatment, storage or disposal facility (TSDF) permitted to accept hazardous waste, or to a recycler or permitted municipal or industrial landfill.

- Small Quantity Generators (SQG)

  Generate between 100 and 1,000 kg (220 and 2,200 lb) of hazardous waste per month and no more than one kilogram (2.2 lb) of acutely hazardous waste.

  A SQG can store up to 6,000 kg (13,200 lb) of hazardous waste but can not store more than one kg of acutely hazardous waste.

Note: Most schools qualify as CESQGs or SQGs

Large Quantity Generators (LQG)

Generate over 1,000 kg of hazardous waste or over one kg of acutely hazardous waste per calendar month.

LQGs have the largest regulatory burden including, for example, yearly reporting requirements, biennial reporting to EPA, and preparation of a hazardous waste contingency plan. In addition, all waste must be shipped off-site for disposal within 90 days of generation. And the generator must obtain a permanent EPA waste generator identification tracking number.

Management and disposal of laboratory wastes in containers are usually regulated under RCRA regulations. Typical waste streams include used chemicals, residues from experiments, spill cleanup, expired and off-specification chemicals.

As mentioned above, and as detailed in Exhibit 6, it is the school's responsibility to make the determination whether hazardous waste regulations apply.

School science laboratories typically have sinks and drains that are connected to a publicly owned treatment works (POTW). Discharges to a POTW are under the authority of the CWA and the school must determine (normally by contacting the local POTW) whether or not specific chemicals can be disposed of via sink drains. In some cases, chemical label containers will also provide disposal recommendations.

If a school utilizes a septic tank system, no chemicals should be discharged to the drain as a septic system can leach its contents to the surrounding groundwater.

Chemical Removals

It was noted, that in most cases, the preliminary chemical inventory drafted by most schools varied significantly from the actual quantity of chemicals presented for disposal during the actual scheduled chemical removal event.

Recommendations

1. Develop a Detailed and Accurate Chemical Inventory

A detailed and accurate preliminary chemical inventory will be necessary for identifying potential chemical cleanout contractors as it will provide sufficient information to the contractor to ensure that price quotations are accurate.

2. Review the Chemical Inventory with School Personnel

Review the Preliminary Chemical Inventory with all school personnel that use chemicals (science teachers, art teachers, maintenance personnel, etc.). This will assist in identifying surplus, outdated, or unneeded chemicals for disposal.

School personnel coordinate with lab packing contractors

3. Identify Chemicals for Removal

Develop a complete listing of all chemicals identified for removal. This listing should include a detailed description of the chemical name, quantity, current location of storage, and any other relevant information that would be useful to a potential removal contractor.

Chemical Cleanout Contractors

Selection of a chemical cleanout contractor to perform a chemical removal can result in a variety of options and prices for a school district to choose from. Proposed bids often vary greatly in the cost and services to be provided.

Example: For the SC3 demonstration project, requests for proposals were sent to licensed Pennsylvania contractors in good standing. Four of these contractors submitted bids for consideration. The prices quoted for these services ranged from a low bid of $50,000 to a high bid of $90,000 for all ten schools.

If the school's chemical inventory system is inaccurate, both regarding quantities and types of chemicals, prices are likely to increase once cleanout activities commence. For the demonstration project, preliminary inventories were conducted by each school's staff. This information was transmitted to the potential lab packing contractors for preparation of their bids. Commencement of the cleanout activities at all ten schools resulted in the discovery of additional chemicals on the day of the cleanout which also caused price increases for the cleanouts. In addition, the discovery of highly volatile hazardous substances (e.g., ethyl ether based materials) dramatically increased the cost of cleanouts because specialized personnel were required to deactivate, package, and remove the substance.

On average, the amount of increased costs averaged approximately 32 percent per school. The smallest increase was a four percent increase over the contractor's initial bid because the inventory was accurate with few exceptions; the largest price increase was a 71 percent increase due to an inaccurate inventory plus the discovery of ethyl ether, a highly volatile substance which necessitated a bomb deactivation team be brought in to properly dispose of the substance.

Recommendations

1. Utilize the Three-Bid System When Obtaining Prices for All Chemical Removal Activities

Prices for transportation and disposal from at least three vendors should be obtained prior to selection. Provide a copy of the Preliminary Chemical Inventory to all qualified vendors so that they can use the information to develop a detailed cost proposal and work plan.

2. All Vendors Should Meet the Specific Qualifications Required to Conduct Business in the School District

Most school districts require vendors to possess specific qualifications in order to conduct business or be considered as a bidder for services in the district. These qualifications vary, but generally include requirements for liability insurance, bonding, and letters of reference prior to being approved.

Lab packing contractors load vehicle with packaged chemicals

EPA's SC3 website recommends that qualified vendors provide proof of the following types of coverage: Contractor's Pollution Insurance; General Liability Policy; Contractor's Liability; Automobile Policy; Professional Errors and Omissions Liability; Workers Compensation Insurance; Transportation Pollution Liability; Pollution Legal Liability Insurance; Environmental Impairment Liability; and Indemnification. A copy of a Certificate of Insurance used in the demonstration project is attached as Exhibit 7.

EPA's SC3 website also recommends that qualified vendors' employees should be adequately trained, for example, all chemical technicians should have completed 40-Hour Health and Safety Training complying with 29 CFR 1910.120(e)(3)(i), and that all truck drivers also be appropriately trained as stipulated by United States Department of Transportation (US DOT) standards for Hazardous Material Transporters 49 CFR 177 and 49 CFR 383.

Finally, the SC3 website also recommends that all vendors should be required to submit a detailed compliance history of all citations for the previous five years, including: US DOT, EPA, OSHA and treatment, storage, or disposal facility (TSDF) compliance histories.

In addition to the items listed above, schools should make sure that the vendor selected meets all of the criteria necessary in the school district to conduct business. Consult PA DEP's Waste Generation and Disposal Information website to review licensed hazardous waste transporters.

The selected contractor will fill out Hazardous Waste Manifests for all of the chemical wastes that will be removed from the school. A sample Hazardous Waste Manifest is provided as Exhibit 8. Note, the proper authorized school official should sign the manifests rather than individual teachers.

Follow-Up Training and Standard Operating Procedures

Chemical handling procedures are regularly updated as more information regarding hazards becomes available. The best way to disseminate this information to the faculty at the respective schools is to provide refresher training. In addition, developing and adhering to Standard Operating Procedures (SOPs) that encompass all aspects of chemical handling will enhance safety.

Examples of Situations that Could Benefit from Standard Operating Procedures (SOPs) and Training:

a. SOPs: Situations often exist in which the school will contain a room full of chemicals that are not linked to any laboratory activity in the science curriculum. Standard Operating Procedures could be developed in which the school outlined the planned laboratory activities prior to the school year, listed the chemicals needed, along with an accurate assessment of the amount of each chemical needed for each activity, and when the chemical would be needed.

b. Training: Teachers may not fully understand the health hazards and risks associated with having possession of chemicals such as phosphorous, thorium nitrate, Robert reagent, and arsenic in schools and classrooms. Training on the dangerous characteristics of these chemicals would enable the teachers to know which chemicals possess a particular characteristic: thorium nitrate (radioactive); phosphorous (corrosive to eyes-can cause blindness, harmful if inhaled).

Recommendations

1. Provide Initial and Refresher Trainings to Any Staff that will Handle Chemicals

Regulations and safety procedures regarding chemical handling and disposal change frequently as new information or techniques are adopted. Refresher training classes should be available to the Chemical Coordinator and others annually. Written records should be maintained to document that personnel have completed refresher courses annually.

2. Utilize Qualified Personnel to Provide Trainings

Many qualified personnel may exist within the school's community that can provide follow-up training free of charge or at minimal cost. In addition, many organizations, including NIOSH, offer free training materials and updates to schools.

3. Develop and Adhere to Standard Operating Procedures (SOPs) that Encompass All Aspects of Safe Chemical Handling

The best way to ensure that faculty and students utilize appropriate protocol when handling chemicals is to develop a set of SOPs. The SOPs can be developed based upon the School Chemical Checklists and Recommendations contained within this report, along with the referenced materials identified. The SOPs can be drafted to incorporate school district-wide procedures and then customized to accommodate specific schools as necessary. SOPs should be numbered, dated and stored in a safe but accessible location. SOPs should be reviewed annually and updated as necessary. All faculty and students that are involved in chemical handling should be required to read any applicable SOPs, receive the appropriate level of training on SOPs, and provide their signature on a sign-off sheet indicating their intent to comply with the measures set forth in the referenced SOPs.

Conclusion

Schools can greatly improve their health and safety environments by adapting and adhering to the recommendations contained in this report. These recommendations are designed to assist schools in effectively managing their chemical inventories and to minimize the purchase of hazardous chemicals. This will result in reduced risk of exposure from mishandled chemicals, which will improve the school environment and benefit both faculty and students. By making a minimal investment in time and costs for proper school chemical management Pennsylvania schools can prevent far greater losses from human injury, property damage, and environmental damage that have occurred due to school chemical incidents throughout the nation. The lessons learned from the SC3 pilot project, as contained in this report, will assist educators and school administrators in developing preventative mechanisms that will ensure the proper safe management of chemicals in all schools throughout the Commonwealth of Pennsylvania.

School Chemical Management Checklists

Assess the Need for Any Chemicals Procured Prior to Purchase

Answer the following questions for your school: Yes No

- Is this chemical somewhere else within the school or the school district that could be used? ☐ ☐
- Is there a less toxic substitute for the chemical that I intend to use? ☐ ☐
- Can I order a small quantity of this chemical to minimize waste and surplus? ☐ ☐
- Will my purchase of this chemical potentially change my school's waste generator status (e.g., from CESQG to SQG)? ☐ ☐
- Do the ends justify the means – is the benefit derived from the purchase of this chemical greater than the possible hazards from use of chemical and cost of proper disposal? ☐ ☐
- Do I know how to properly dispose of waste from this chemical?

Properly Utilize and Store All Chemicals Purchased

- Can I safely store this chemical in my school? ☐ ☐
- Do I know how to safely use this chemical in my classroom? ☐ ☐
- Do I and my students have the proper safety equipment (gloves, glasses, spill kit)? ☐ ☐
- Do I have an MSDS for this chemical? ☐ ☐
- Has this chemical been added to the school's chemical inventory list? ☐ ☐
- Do I have the proper ventilation in my classroom to utilize this chemical? ☐ ☐

Properly Dispose of All Chemical Waste

Take the following actions for your school:

- Review MSDS sheet and chemical label for any disposal restrictions. ☐
- Work with the school administration to obtain subcontractors (environmental consultants, transportation and disposal service providers) that have the appropriate liability insurance, expertise and qualifications to safely and legally dispose of chemical waste. ☐
- Identify and contact the appropriate school representative responsible for signing all waste manifests and coordinate transportation and disposal activities accordingly.* ☐

**Note: All waste being transported and disposed of must be accompanied by a signed waste manifest. The signing party is considered the generator or an agent of the generator and is assuming responsibility and liability for the waste. Most schools have a designee such as the district superintendent, purchasing agent or the facility manager that have signing authority and should sign the waste manifest. School faculty must not sign any waste manifests unless they have been designated as the authorized party on behalf of the school.*

Summary of Recommendations

Chemical Management Plans

Recommendations

1. Designate a Chemical Coordinator.

2. Conduct a Chemical Inventory of Existing Chemicals and Establish a Chemical Tracking System.

3. Evaluate the Condition of the Chemicals Stored at the School.

4. Identify a Central Storage Location or Storage Locations.

5. Develop and Maintain a Safety and Spill Plan and Response Equipment.

Chemical Handling

Recommendations

1. Only Properly Trained Personnel Should Have Access to Chemicals Within the School.

2. Utilize the Appropriate Level of Personal Protective Equipment (PPE).

3. Schedule Custodial or Maintenance Activities and Any Chemical Removal Activities During Off Hours.

4. Utilize Chemicals that are Properly Labeled and Stored.

Chemical Minimization Plan

Recommendations

1. Draft and Implement a Chemical Minimization Plan.

2. Avoid Purchasing Chemicals in Bulk.

3. Utilize Vendors that Offer Eco-Friendly or Less Toxic Products.

4. Discontinue the Use of Mercury Laden Materials.

5. Comply with RCRA Requirements.

Chemical Removals

Recommendations

1. Develop a Detailed and Accurate Chemical Inventory.

2. Review the Chemical Inventory with School Personnel.

3. Identify Chemicals for Removal.

Chemical Cleanout Contractors

Recommendations

1. Utilize the Three-Bid System When Obtaining Prices for All Chemical Removal Activities.

2. All Vendors Should Meet the Specific Qualifications Required in the School District to Conduct Business in the School District.

Follow-Up Training and Standards Operating Procedures

Recommendations

1. Provide Initial and Refresher Trainings to Any Staff that will Handle Chemicals.

2. Utilize Qualified Personnel to Provide Initial Training.

3. Develop and Adhere to Standard Operating Procedures (SOPs) that Encompass All Aspects of Safe Chemical Handling.

Helpful SC3 Resources

Following below is a list of resources cited in this document that may assist you in conducting a chemical cleanout at your school.

Florida's SC3 Website
Provides information on how to conduct a chemical inventory.

EPA's SC3 Website
EPA's central website for SC3 resources. Includes a SC3 Tool Kit as well as other useful school resources.

School Chemistry Laboratory Safety Guide
NIOSH guide including useful information on chemical labeling.
MSDS Online and MSDS Solutions
Material Safety Data Sheet Resources

EPA's Green Cleaning Website

EPA's Mercury-Containing Light Bulb (Lamp) Recycling Website

EPA Federal Regulations

Universal Waste (40 CFR Part 273)

Hazardous Waste (40 CFR Part 261)

Pennsylvania Regulations

Universal Waste (Title 25 Chapter 266b)

Hazardous Waste (Title 25, Chapter 261a)

PA DEP's Waste Generation and Disposal Information website to review licensed hazardous waste transporters.

US DOT Regulations

40-Hour Health and Safety Training (29 CFR 1910.120(e)(3)(i))

Hazardous Material Transporters 49 CFR 177 and 49 CFR 383

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