Science ASSIST Information Sheet

Spill Kits

Expert answer 20th March 2023

Introduction

This information sheet is an updated review of the answers to the following questions, and replaces the previously published Q&As:

- What is a spill kit situation?
- Years 7–12. I have a Spill Kit in place at work (stored in the prep room) which is kept in a smaller (i.e., 1/2 size) than standard-size wheelie bin. What would Assist suggest the contents/quantities of a Spill Kit be? I have 5 labs and a prep room all under the same roof (no steps). Should I have more than one? Note: each lab has a bucket of sand.

In Brief

Due to the broad range of hazardous materials present and a range of different circumstances surrounding spills in school settings, a blanket statement about quantities of spill kits and clean-up procedures is difficult to make. All staff who use hazardous materials should be trained in their use, be aware of the hazards and implement strategies to control and manage the risks. Prevention is always better than cure.

Spill kits should be present in all workplaces that store and use hazardous materials, including chemical and biohazards. The type of spill kit used should reflect the type of hazards present in the laboratory, e.g., a chemical spill kit for a laboratory storing and using chemicals, and/or a biohazard spill kit for laboratory handling microbiological, human or animal fluids. A commercial kit or a self-assembled kit is sufficient.[1]

All hazardous substance spills should be cleared immediately, either by direct action or by contacting relevant authorities.

When to use a spill kit

Ascertaining when a spill requires clean-up with a spill kit can be determined by the risk that the hazardous substance carries, the location and the size of the spill.

- An example of a minor spill may be 5mL of concentrated sulfuric acid. In this example, the risks associated with this concentrated acid are high, however it is only a small volume that could be easily neutralised and contained.
- A major spill may involve a substance that is an immediate fire hazard or a large volume of a hazardous chemical that is not contained and may represent a high risk to the health of staff or students.

Emergency response procedures

Emergency response should be in consultation with the specific and current Safety Data Sheet section 6 “Accidental Release Measures”. Risks to teachers, students and laboratory technicians should be considered before any action to clean up a spill is taken. Consider if you are competent and confident to act in response to the hazard, or whether the safer option is to evacuate the building and call the fire brigade for assistance.

Major spills should be immediately referred to trained emergency personnel. Remove ignition sources and evacuate the building. It is helpful if the substance has been identified.

Minor spills, depending on the substances, may be treated as follows:

- Notify laboratory personnel and people in surrounding areas.
- Evacuate and isolate the immediate area.
- If flammable liquid has been spilt, remove ignition sources and isolate power to the laboratory with the emergency switch. Evacuate if required.
- Establish ventilation – open windows and doors.
- If possible, positively identify the substance spilt. Check the labelling on the bottle identifying the chemical and its hazards. Look for hazard signal words and hazard statements and if possible, consult the safety data sheet.
- Locate the spill kit.
- Choose appropriate PPE (goggles, face shield, chemical resistant gloves, lab coat, apron).
- Contain the spill using a spill absorbent material such as Vermiculite or sand as a barrier.
  Note: There are also commercial products available such as chemical absorbent pillows, either in pillow or long snake shapes, which can be used to contain spills.

Different types of spills will require different treatment

Acid and base spills should be neutralized prior to clean up. Acids should be covered with sodium carbonate or sodium bicarbonate until the reaction ceases to fizz. Spilt bases should be neutralised with vinegar, boric acid or sodium bisulphite. Liberally sprinkle the neutraliser over the spill, starting at the perimeter and continue towards the centre. Leave for 1-5 minutes. Ensure the area is ventilated by opening the windows. Turn on exhaust fans.

Flammable spills should be covered with commercial spill absorbent material, chemical absorbent pads or paper towel to soak up the spill. These items should be then left to completely evaporate in a fume cupboard or a secure area outdoors away from all sources of ignition. Wash chemical absorbent pad or paper towel in water before disposal.

Mercury spills Queensland department of education have information in Section 4: chemicals in their List of prohibited and high risk chemicals,[2] which categorises mercury as high risk with uncertain or unpredictable risk levels. Mercury may still be found in some schools, usually in thermometers. Science ASSIST recommends disposing of any mercury before it spills, by contacting your regional waste disposal company.

Mercury spills can be contained by either;

- using commercial mercury spill kits that use absorbent sponges to pick up the globules for storage in an airtight container,
- or by obtaining a decontaminant powder that reacts with the mercury to prevent the formation of a vapour.

More information on how to clean up a mercury spill can be found on the following websites:
Victorian department of health: Mercury spills and safe clean up [3]
Safe Work SA: Mercury [4]

Biological spills

- Cover with 1% Sodium hypochlorite (bleach) or hospital grade disinfectant for 20-30 minutes.
- Cover the spill with Vermiculite (or similar product) or sand to soak up liquid from the spill.
- Sweep solid material into a plastic dust pan and place in a sealed container.
- Wet mop spill area. Be sure to decontaminate the broom and dustpan.
- Put all contaminated items (gloves, clothing, etc.) into a sealed container or plastic bag. Ensure that all materials are disposed of correctly and seek further advice if necessary.
- Disposal of toxic substances may need to be arranged through a commercial waste disposal company.

Once the spill is contained.

- Return spill kit to storage location and arrange for used contents to be replaced.
- Report the spill to the head teacher and/or the school Work Health and Safety Officer.
- Staff and students should not be allowed into the area of the spillage, nor should the notice be removed until all of the spilt substance is cleaned up and odours dissipated.

Location and number of spill kits

The number of spill kits is determined by the site and the use of the site. Science ASSIST is unable to give a precise number of emergency spill kits required, as we are not familiar with your science area. The location will depend on the user's ability to access the spill kit from any area chemicals are used. Your risk assessment should consider whether the location of one single spill kit would adequately service all of your science teaching areas. Where facilities are spread geographically across different floors or buildings, it is likely that multiple spill kits would then be needed. It is important to remember that the closer a spill kit is to an area where chemicals are used, the quicker a spill can be contained.

In a school science setting, rooms may be eliminated because chemicals are not used there, for example, a dedicated Physics room.

Contents of spill kits

The contents of your spill kit will be determined by a local risk assessment and will depend on the type of chemicals, the quantities that are stored there, how they are used and their location. ASSIST recommends that your spill kits include the **capacity** to respond to both the **range** of chemicals that are stored and might be spilled, and the quantity that might be spilled. If the contents of a spill kit are used, then the items used from the kit need to be replaced immediately.

Quantities and range of hazardous chemicals stored

In most school science situations, the largest single chemical containers are 2.5 litres, so a spill response would need to be prepared to deal with a spill of at least this size. This would include the neutralisation of acids or alkalis, and absorption with pads, pillows or snakes using an absorption medium such as attapulgite, vermiculite or polyacrylamide.

As your spill kit may be required at any time and as there may be a delay in purchasing replacement items, it would be good policy to have a second spill kit available, or extra quantities of neutralising agents and pads in case the spill kit is fully used up in one incident.

While it is desirable to neutralise spills of substances such as acids and alkalis, please consider the quantities of neutralising chemicals required for this purpose. For larger spills, complete neutralisation may not be realistic and the use of absorbent media including pillows may be more practical. For example, for a large spill of a 2.5 litre container of concentrated acid, your spill kit may need several kilograms of sodium hydrogen carbonate. Similarly, you would need a large volume of vinegar to neutralise a large spill of concentrated sodium hydroxide solution.

Highly absorbent polymers such as polyacrylamide are able to absorb and hold many times their own mass of liquid. These are the materials that are used in nappies/diapers and they are more effective than earlier absorption agents. Pillows and sausages of these materials are available as relatively inexpensive spill control measures.

Suggested list of spill kit items

PPE

Eye protection	Wrap around type that fit over prescription glasses
Nitrile gloves	Chemical resistant
Apron or lab coat	Disposable options available
Face mask	Useful protection when sweeping dusts/powders and when handling neutralising agent powders

Other items

Dustpan and brush	For sweeping up spilt powders.
Tongs	To pick up contaminated materials, e.g., fragments of broken containers.
Plastic bags, heavy duty	To contain absorbed spills and biological waste.
Signage	For example - Do not enter: Chemical spill clean-up in progress.

Absorbent materials, pads and pillows

	Select as appropriate from the following range of options
Vermiculite	Silicate material that can absorb up to 10 times its weight of water. Good for aqueous spills, less effective for oil-based spills.
Attapulgite (“kitty litter”)	Silicate (clay) mineral that is an excellent absorption agent. Useful for oil-based spills
Commercial chemical absorbent pads and pillows.	Available in various sizes and shapes: pads, pillows, snakes.
Super-absorbent polymers	Polymers with cross-linking to form gels that can absorb many times their weight of aqueous solutions. The material in disposable diapers.
Sand	Useful to contain a spill.

Neutralising Agents

Small spills of aqueous solutions of acids or alkalis should be neutralised before flushing down the drain. It is not necessary to neutralise the spill to exactly pH 7; neutralisation to a pH within the range pH 6–8 is acceptable as trade waste by water authorities in Australia. The pH can be measured with pH test strips or universal indicator solution.

Larger spills can first be contained with dry sand or vermiculite to prevent the spill spreading before treatment with a neutralising agent.

Neutralisation of concentrated acids or bases generates heat and fumes; ensure good ventilation and PPE. In the case that good ventilation is not possible, a risk assessment might determine that it is safer to absorb the concentrated solution and store the material for collection by a waste disposal contractor.

Spills of concentrated nitric acid should not be contained/absorbed with organic materials such as paper towel or fabric as fire may result.

Acid spills

The use of carbonates and hydrogen carbonates to neutralise acids will produce effervescence and carbon dioxide. When sufficient neutralising agent has been applied, the end of effervescence indicates that the acid has been neutralised.

Sodium carbonate	Also called washing soda, a supermarket item.
Sodium hydrogen carbonate	Also called sodium bicarbonate, bicarbonate of soda, baking soda. This may be difficult to source in large pack sizes.
Calcium carbonate	Can be a chemical powder, or as marble chips. If using marble chips, the reaction time will be longer due to the much smaller surface area to volume ratio.

Alkali spills

Vinegar	Good for small aqueous or powdered spills. Because of its dilution, vinegar is not effective in treating large spills as the quantity required is too great.
Citric acid, Boric acid, Sodium hydrogen sulfate	As solids, these are much more effective in neutralising a large alkaline spill. They should be sprinkled on the spill after it has been contained, starting from the outside and working toward the centre. We recommend having one of these reagents in your spill kit.

Biohazard spills

Sodium hypochlorite (bleach) solution	Use this to treat hazards such as animal tissues and fluids, and microorganisms. Absorb the treated spill with vermiculite, and dispose of general waste. Also treat exposed surfaces.

Organic spills

Vermiculite	Absorb with vermiculite and place the material in a sealed, labelled container for collection by a licenced waste disposal contractor. Small spills of volatile organic liquids (< 100 mL) may be evaporated in a fume cupboard.

Recommendations

Science ASSIST recommends the following strategies to prevent or minimise the severity of spills in school science laboratories:

- Complete risk assessments of all procedures before purchasing, using or storing chemicals to ensure risks are known and adequate emergency response mechanisms are in place.
- Ensure that students only use the lowest concentration possible of chemical solutions.
- Minimise the volumes of chemical solutions and salts – aliquot minimal amounts for classroom use.
- Ensure that students are provided with equipment to minimise the risk of spills e.g., funnels, dispensers.
- Minimise unnecessary movement of students in laboratories while practical sessions are in progress.
- Replace the lids of containers as soon as possible after use.
- Use well fitting, viable lids on containers.
- Use spill containment procedures and equipment such as bottle carriers.
- Do not store chemicals on the floor.

After an incident, immediately replenish stock of spill kit, review procedures and effectiveness of the emergency plan, and document for WH&S reporting as per your school procedure. The references listed below have some very good guidance material.

In order to reduce the likelihood of a large spill, it is recommended that minimal quantities of chemicals are used in the teaching areas and that Winchester carriers are used when transporting 2.5 L bottles of concentrated acids.

Many schools use mini wheelie bins as spill kits. They are often brightly coloured and easily noticed. They should be labelled accordingly and their storage location should be signed. Being on wheels and easily movable reduces manual handling issues. It is also a good idea to have your Personal Protective Equipment (PPE) stored at the top, so when responding to a spill you can easily access the PPE to protect yourself before attending to the spill.

Additional Information

Department of Education and Training Victoria, has produced a guidance sheet on Chemical spill management with suggestions for kit contents listed. Guidance Sheet 4: Chemical Spill Management, Department of Education and Training Victoria
website, see https://www.education.vic.gov.au/hrweb/Documents/OHS/guid4chemspill.docx

References

[1] Storemasta website (2023, March 15), '*When to use a spill kit…and why do you need one?',* retrieved from https://blog.storemasta.com.au/what-is-a-spill-kit

[2] Queensland department of education website, (2023, March 1), '*Schools officers: Section 4 – chemicals: Prohibited and high risk chemicals list',* retrieved from https://education.qld.gov.au/initiatives-and-strategies/health-and-wellbeing/workplaces/safety/managing/school-officers

[3] Victorian department of health website (2021, December 3), '*Mercury spills and safe clean p',* retrieved from https://www.health.vic.gov.au/environmental-health/mercury-spills-and-safe-clean-up

[4] Worksafe SA website, (2020, June 24), '*Mercury',* retrieved from https://www.safework.sa.gov.au/workplaces/chemicals-substances-and-explosives/mercury

[5] Department of Education and Training Victoria website, (2020, October 22), '*Guidance Sheet 4: Chemical Spill Management'*, retrieved from https://www.education.vic.gov.au/hrweb/Documents/OHS/guid4chemspill.docx ,(website, https://www.education.vic.gov.au/hrweb/safetyhw/Pages/chemicalmgt.aspx)

Safe Work Australia website, (2022, June), '*Fact Sheet – Emergency Plans*,' retrieved from https://www.safeworkaustralia.gov.au/doc/emergency-plans-fact-sheet , , (from website) https://www.safeworkaustralia.gov.au/search?search=emergency+plan

University of Melbourne website, (2019, April), '*Health and safety – Spill management requirements',* retrieved from https://safety.unimelb.edu.au/hazard-topics/spills

University of Queensland website, (2022, January 20), '*2.70.09 Chemical Spill and Response Guidelines',* retrieved from https://ppl.app.uq.edu.au/content/2.70.09-chemical-spill-and-response

University of Wollongong website, (2015, December), '*Chemical Spill Management Guidelines',* retrieved from https://www.uow.edu.au/about/services/safe-at-work/safety-topics/chemical-management/

Science ASSIST website, (2023, February 27), '*Mercury spills',* retrieved from https://assist.asta.edu.au/question/2706/mercury-spills

New Pig website, (accessed 2023, March), *'PIG® HazMat Chemical Absorbent Pillow',* retrieved from https://www.newpig.com/pig-hazmat-chemical-absorbent-pillow/p/HR7015