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Procedure for handling chemical spillages

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1 Scope

This procedure is to inform and instruct staff, students and visitors of the actions to take in the discovery of, or involvement in, a chemical spillage. All University controlled areas of OCDEM are covered by this procedure.

This procedure does not cover radioactive spillages or leaking gases.

It is the responsibility of Laboratory Managers to ensure compliance with this procedure.

2 Spill response and clean up procedure

A spillage kit suitable for the types of chemicals being handled as well as suitable personal protective equipment (PPE) must be available in laboratory areas.

Laboratory F40 houses a cabinet containing spill kits and supplies; see Appendix 1 for contents.

It is the responsibility of the individual who caused the spill to clean up promptly if the spill is minor; if the spill is greater than 2.5 litres, or greater than 500ml if hazardous, help may be required to clean up and the Departmental Safety Officer (DSO) must be alerted.

Material Safety Data Sheets should be available for all reagents as a source of information; risk assessments must include action to take in the event of a spill.

The following are general guidelines to be followed after a spill:

- Isolate area of chemical spillage and evacuate the area, if necessary.
- Attend to any persons who might have been contaminated; contaminated clothing must be removed and the skin flushed with water for at least ten minutes. Clothing must be laundered prior to re-use.
- Wear adequate full protective clothing, i.e. white coat, gloves, eye/face protection.
- Control the spillage if possible. For large spills use absorbent socks to surround the spill and absorbent pillows to soak up as much of the spill as possible.
- Ensure area is well ventilated and extinguish any sources of ignition.
- For large (> 2.5 litres), unidentified spills, or spills of hazardous materials (>500 mls) notify the DSO immediately and seek advice from the University Safety Office if required. If the DSO is unavailable the Group Laboratory Manager must supervise the clean up.
- Protect floor drains or other means of environmental release. Absorbents can be placed around the drains.
- Use the VWR Chemical Spill X Treatment kit (VWR code 121-0006), spillage absorption granules or appropriate chemicals to clean up the spill; power sorb sheets, absorbent pillows or socks (as appropriate for the size of the spill) and oil sorbent sheets are also available.
All of the above can be found in the 'Spill Kit' cabinet located in lab F40 along with a mercury spillage box.
- All areas must be thoroughly cleaned with detergent and water after the spill has been cleaned up.
- Radioactive spills are dealt with in 'OCDEM Local Rules for Laboratory Work with Radioactive Materials'.

2.1 Using the VWR chemical spill X treatment kit

Identify chemical

Acid
Caustic
Solvent

Select reagent

Spill-X-A for acid spills
Spill-X-C for caustic spills
Spill-X-S for solvent spills

Encircle spill perimeter by pouring agent from bottle.

Cover spill by applying agent inward at the recommended rate (see Appendix 2 Merck/BDH Spill-X protocol 16/11/95).

Mix agent thoroughly into spill using 'REMCO' scraper.

Wait for 5 mins until any reaction stops and mixture cools.

If spill was acid or base, check pH of residue using pH strips provided. If spill was solvent, make sure it is fully absorbed into dry powder.

Label disposable bag (provided) with date, name of chemical spilled and treatment, and place treated spill residue into bag.

Consult the DSO for disposal route of the residue.

2.2 Using other spill treatment method

Strong acids

Neutralise by sprinkling sodium carbonate onto the spill or absorb with Spillage Absorption granules. If the acid has been neutralised with sodium carbonate, in most cases, depending on the acid, the resulting salt can be swept up, placed in a strong plastic bag or plastic jar and disposed of into an orange bag; check with the DSO before disposal. If spillage absorption granules have been used the granules should be swept up and placed in a plastic jar or old reagent bottle, labelled with the contents, volume and concentration, along with the date and your name. This must then be stored in an appropriate area until disposal via the Safety Office; inform the DSO.

Strong alkalis

Mop up with, 'Power Sorb' sheets or Spillage Absorption granules. The residue must be placed in a plastic jar or old reagent bottle, labelled with the contents, volume and concentration, along with the date and your name. This must then be stored in an appropriate area until disposal via the Safety Office; inform the DSO.

Volatile Solvent spills

Soak up the spill with either 'Power Sorb' sheets or Spillage Absorption granules. Sheets must be placed in a fume cupboard inside a mesh basket with a lid and granules must be placed in a fume cupboard in a beaker or glass tray. When the solvent has completely evaporated the remaining sheets or granules can be placed in an orange bag for disposal, ensure granules are placed in a secondary vessel first.

Oil spills

Soak up oils or oily solvents with the specific sorbent sheets made for oils (they are white and clearly labelled). Place the sheets in a bag for disposal via the Safety Office; inform the DSO.

Biological spills

Spills of blood, tissue and body fluids are dealt with in OCDEM SOP S4: Disinfection in containment Level 2 areas.

Spills of Radioactive Material

Spills of radioactive substances are dealt with in 'OCDEM Local Rules for Laboratory Work with Radioactive Materials'.

Chemical powder spills

Always consult the material safety data sheets (MSDS) for hazard information and the arrangements for handling a significant spill. If the chemical is not harmful then the powder should be swept up using a moistened towel to minimise the generation of dusts, and disposed of via the clinical waste stream. If the chemical is harmful mop up with a moistened towel as above and place in a sealed container; consult the MSDS for information on disposal. If the chemical can be disposed of through the clinical waste system it can be placed in an orange bag in the sealed container. If the hazardous waste cannot be disposed of by this route consult the DSO who will arrange disposal through the University Safety Office.

Mercury spills

Use the contents of the mercury spillage box or alternatively sprinkle with zinc powder, sweep up and collect in a suitable container. If there is only a small amount it can be placed in the yellow sharps container. A large spill will have to be disposed of via the University system - see the 2014 update of S5/11 "Waste Disposal" for more comprehensive instructions.

Small spills are usually from mercury thermometers. Mercury thermometers must be replaced with alcohol thermometers.

Spills in Centrifuges

Biological spills are dealt with in SOP S4: Disinfection.

Radioactive spills are dealt with in 'Local Rules for Laboratory Work with Radioactive Materials'.

For chemical spills in the centrifuge except organic solvents:

Remove the bucket to the nearest sink and treat the spill according to the chemical as mentioned above.

The contents of the bucket must then be wrapped well in paper and then transferred to a rigid jar or bottle. Be very careful if there are glass or sharp plastic fragments in the bucket. Disposal is either through the clinical waste stream or the Safety Office depending on the chemical.

Soak the bucket in mild detergent for 10 minutes, then rinse well with tap water followed by de-ionised water. Wipe the rotor and drum with mild detergent in water, and then wipe off the detergent with clean water.

Organic solvent spills in the centrifuge:

Remove the bucket to the nearest fume cupboard and tip as much of the contents as possible into a large glass beaker.

Leave the beaker in the fume cupboard until the solvent has evaporated.

Let the residue solvent in the bucket also evaporate in the fume cupboard, when dry, wash out well with mild detergent and water and then rinse well with clean water.

When the beaker is dry, tip the contents into a sharps bin and rinse the beaker with water before placing in the washing up system.

Be very careful if there are glass or sharp plastic fragments.
Wipe the rotor and drum with mild detergent in water, and then wipe off the detergent with clean water.

Disposal of hazardous chemicals

Contact the DSO who will arrange disposal with the University Safety Office – as per University Policy Statement S5 11 'Waste Disposal'.

For large spillages, record date, chemical spillage, area of laboratory and disposal reagent used in accident book. This should be countersigned by one of the DSO before sending the form to University Safety Office

Document approved and accepted by OCDEM Safety Advisory Committee 1st December 2014.

I have read and understood this SOP and agree to abide by the regulations therein.

Signed: (Staff Member) Date:

Please copy the signed form and return to your supervisor or the DSO who will ensure it is placed in your personnel file.

Appendix 1

Contents of Spill Cupboard

BDH Chemical Spill Kit

Oil sorbent pads

PowerSorb absorbent sheets

Absorbent pillows

Spill kit containing: absorbent sheets, absorbent socks, waste bag and ties

Spillage absorption granules

Plastic aprons and over sleeves

Mercury spill kit

Zinc powder

Sodium carbonate

Appendix 2

Instructions from the BDH Chemical Spill Kit

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SELECT AGENT

for acid spills...



for caustic spills...



for solvent spills...



for formaldehyde spills...



Your SPILL TREATMENT KIT contains spill control agents specially formulated to treat particular classes and sizes of chemical spills. Kits are available packaged with either SPILL-X-A agent, SPILL-X-C agent, SPILL-X-S agent, SPILL-X-FP agent or in certain combinations (see back page of Guide for combinations available). Using this Guide, evaluate agent suitability for spill size and type. **Do not use any agent on substances other than those listed for that agent in the Chemical Spill Treatment Ratio Table** (next page). Upon deciding to proceed with spill clean-up, be sure to wear all required personal protective equipment.

4

TREAT SPILL



encircle, cover with agent



mix agent into spill

⚠ CAUTION

Remove sources of ignition if spilled material is flammable.

Discard safety seal from inside agent bottle cap. Begin spill treatment by pouring agent around spill to encircle and dike its perimeter. Taking care to avoid splashing, continue to apply agent evenly onto spill. Using scraper provided, carefully mix agent into spill for the most complete reaction. If spill was corrosive, any neutralization reaction will subside after a few minutes leaving a paste-like residue. If spill was a formaldehyde solution, complete solidification may not occur. For dilute solutions, see Formaldehyde Treatment Ratio Table for solidification information. If spill was a solvent, agent adsorption is indicated by the disappearance of free liquid.

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RESTORE AREA



disposition and clean-up



label, proper disposal

SPILL-X-A and SPILL-X-C agents work as acid/base neutralizers respectively. Test representative samples of spill residue for final pH (see Page 5). Add more agent if necessary. SPILL-X-S agent adheres (adsorbs) solvent onto a carbonaceous matrix. Final spill residue should be dry and powdery. SPILL-X-FP agent polymerizes formaldehyde, but **may not** solidify waste. Use SPILL-X-S agent to solidify any remaining liquid. Record spill type, treatment (e.g., “neutralized acid/base, pH = ___”, “adsorbed solvent: name”) and disposition (i.e., recommended disposal method) onto label of bag(s) provided. After treatment reaction cools, use scraper and pan to pick up residue and place into labeled bag. Rinse and decontaminate utensils, area. Residue disposal must follow your company guidelines and meet local, state and federal regulations.

HOW TO USE THIS TABLE ...

The type and size of the chemical spill determines the choice and amount of SPILL-X agent to use. The following is a list of chemicals which have been tested with the appropriate SPILL-X agent. Additional chemicals are being tested. If you have a chemical which does not appear on the list, call EM Science at 1-800-222-0342 to see if testing has been performed.

CHEMICAL SPILL TREATMENT RATIOS

After identifying the chemical spilled, find its name (and concentration if applicable) on a list below. **If it is not on a list, do not use this kit on the spill.** Each list gives the amount of spilled chemical that can be treated with the contents of one SPILL-X agent container. Use multiple containers for larger spills.

ACID SPILLS

If an acid spill of the type below, one 2.5 lb. (1.13 kg) SPILL-X-A agent container will treat the following amount of spilled acid:

Acid		Amount	
		Neutralized/Solidified Pints	(liters)
Acetic	99%	2.40	(1.14)
Adipic	10%	1.96	(0.93)
Acrylic	99%	1.96	(0.93)
Butyric	99%	1.96	(0.93)
Chlorosulfonic	99%	1.57	(0.74)
Cyanoacetic	50%	1.96	(0.93)
Formic	90%	1.96	(0.93)
Hydriodic	50%	1.96	(0.93)
Hydrochloric	37%	2.12	(1.0)
Hydrofluoric	49%	1.96	(0.93)
Methacrylic	98%	1.96	(0.93)
Nitric	70%	4.42	(2.08)
Propionic	99%	1.96	(0.93)
Perchloric	70%	2.35	(1.11)
Phosphoric	85%	2.42	(1.14)
Sulfuric	93%	2.28	(1.08)

CAUSTIC SPILLS

If a caustic spill of the type below, one 2.0 lb. (0.90 kg) SPILL-X-C agent container will treat the following amount of spilled caustic:

Caustic		Amount	
		Neutralized/Solidified Pints	(liters)
Ammonium Hydroxide	29%	2.80	(1.32)
Aniline		0.61	(0.29)
Diethanolamine		0.71	(0.34)
Diethylamine		0.75	(0.35)
Diethylenetriamine		0.75	(0.35)
Dimethylformamide		0.53	(0.25)
Ethylenediamine		0.70	(0.33)
Morpholine		0.75	(0.35)
Potassium Hydroxide	45%	1.84	(0.87)
Pyridine		0.72	(0.34)
Sodium Hydroxide	50%	1.15	(0.54)

FORMALDEHYDE SPILLS

If a formaldehyde spill of the concentration below, one 1.85 Lb. (0.84 kg) SPILL-X-FP agent container will treat the following amount of spilled formaldehyde:

Formaldehyde Concentration (WT%)	Amount Polymerized	
	Pints	(liters)
37	1.54	0.73
30	1.92	0.91
20	2.96	1.40
15	3.99	1.89
10	6.11	2.89
4 (10% V/V)	15.49	7.33

Actual amount polymerized and solidified may vary according to application. For solution strengths of less than 15 wt. %, it may be necessary to solidify any remaining liquid with SPILL-X-S agent.

SOLVENT SPILLS

If a solvent spill of the type below, one 1.0 lb. (0.45 kg) SPILL-X-S agent container will treat the following amount of spilled solvent:

Solvent	Amount Adsorbed	
	Pints	(liters)
Flammable:		
Acetone	1.60	0.76
Acrylonitrile	1.20	0.57
Avgas 100	1.20	0.57
Benzene	1.06	0.50
Butylacetate	1.04	0.49
Butylether	0.96	0.45
Butyraldehyde	1.04	0.49
Carbon Disulfide	0.88	0.42
Cumene	1.04	0.49
Cyclohexane	0.96	0.45
Decane	1.04	0.49
1,2-Dichloroethane	0.72	0.34
Diethylamine	1.20	0.57
1-Diethylamino-2-Propanol	1.20	0.57
N,N-Diethylethanamine	0.80	0.39
Dimethylformamide	0.64	0.30
Ethanol	0.96	0.45
Ethylenediamine	0.96	0.45
Ethylene-Glycoldimethylether	1.04	0.49
Fuel Oil #2	0.96	0.45
Gasoline (50-100 Octane)	0.96	0.45
Gasoline (100-130 Octane)	1.36	0.64
Gasoline, Unleaded	1.36	0.64
Heptane	1.28	0.61
Hexane	0.96	0.45
Isopropylalcohol	1.44	0.68
Isopropylamine	1.20	0.57
Jet A-1 Avtur	0.88	0.42
Methanol	0.96	0.45
Methyl Ethyl Ketone	1.60	0.76
Methylisobutylketone	1.52	0.72
Morpholine	0.96	0.45
Nonane	1.04	0.49
Octane	0.80	0.39
Pentane	0.88	0.42
Petroleum Ether	1.60	0.76
Pyridine	1.60	0.76
Styrene	1.04	0.49
Toluene	0.96	0.45
Triethylamine	0.96	0.45
Vinyl Acetate	1.44	0.68
Xylene, O-	1.20	0.57
Xylene, P-	0.96	0.45

SOLVENT SPILLS (Continued)

Solvent	Amount Adsorbed	
	Pints	(liters)
Nonflammable:		
1-Amino-2-Propanol	0.96	0.45
Aniline	0.88	0.42
2-Butoxyethanol	0.80	0.39
Carbon Tetrachloride	0.88	0.42
Chloroform	1.04	0.49
Diethanolamine	1.20	0.57
Diethyleneglycol		
Dimethylether	0.88	0.42
Diethylene Triamine	1.20	0.57
Ethanolamine	0.88	0.42
5-Ethyl-2-Methylpyridine	0.88	0.42
Toluene Diisocyanate	0.88	0.42
1,1,1-Trichloroethane	0.64	0.30
1,1,2-Trichloroethane	1.92	0.91
Triethylene Tetramine	1.20	0.57

DISPOSITION OF TREATED SPILL RESIDUE ...

A spilled chemical may be 'hazardous' because it contains an RCRA listed waste or because it possesses one or more 'hazardous characteristics' as defined by the U.S. Environmental Protection Agency. SPILL-X-A and SPILL-X-C agents are formulated to treat only the hazardous characteristic of corrosivity. SPILL-X-S agent, because it adsorbs solvents and their vapors, can help reduce vapor evolution and therefore flammability. SPILL-X-FP agent chemically reacts with formaldehyde to yield the polymer polyoxoilyn. SPILL-X-FP agent reduces the formaldehyde vapors because the chemical bonds formed do not allow the release of reacted formaldehyde. Chemical spills treated with the appropriate SPILL-X agent may still possess additional properties which are 'hazardous' as characterized by the EPA. For example, chromic acid spills can cause chemical burns on contact to skin and eyes because of their corrosive characteristic. Using SPILL-X-A agent, it is possible to eliminate this corrosivity characteristic. However, since in this case the spill residue contains chromate salts (an RCRA listed waste) the residue must still be disposed of as a hazardous waste. Final disposition of all spill waste residue must be in consideration of the presence of any remaining hazardous characteristic.

SPILL-X-A and SPILL-X-C agents are acid/base neutralizers respectively; formulated to address the hazardous characteristic of 'corrosivity.' Neutralization reaction efficiency can be measured using conventional pH measuring procedures.

MEASURING pH

Personal protective equipment must be worn during this procedure.

1. Place about 10 cc of a representative sample of spill residue in a 150 ml beaker.
2. Slowly add distilled water until mixture volume reaches 100 ml. Stir contents for about 3 minutes (**Note:** severe foaming and high heat generation is a sign of incomplete spill neutralization).
3. Using a pH meter or pH test strips (provided), test solution pH. The U.S. EPA criteria for solid, noncorrosive acid or caustic waste requires a pH from 2.0 to 12.5. If the pH is unacceptable, mix more of the appropriate SPILL-X agent into spill and retest for pH. Repeat this procedure as necessary until spill residue pH is acceptable.
4. Record final pH onto Chemical Spill Waste disposal bag (provided) along with other pertinent information. Indicate on the bag what the final disposition of the waste should be. Dispose of following company, local, state and federal guidelines.

ADSORPTION

SPILL-X-S agent is a proprietary carbonaceous substrate designed to adsorb spills of many common solvents. Adsorption does not chemically alter the substance being adsorbed. However, some physical properties (e.g., flashpoint) can be modified by the adsorptive process. Proper adsorption condenses the solvent and its vapors onto the SPILL-X-S agent substrate allowing spill residue to be simply swept-up, minimizing the amount of spill waste residue for transport to final disposal or incineration site. Furthermore, adsorption can help limit solvent vaporization, reducing workplace contamination and flammability hazards.

POLYMERIZATION REACTIONS

SPILL-X-FP agent is a urea-based agent designed to chemically react with formaldehyde solutions. The end product of a treated formaldehyde spill is the polymer polyoxymethylene. The reaction rate is affected by the spill temperature and the formaldehyde concentration.

Review History

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