Laboratory Emergency Planning

Emergency Pre-Plan

Each laboratory should have an emergency plan that all personnel working in the lab should be familiar with. The emergency plan will be coordinated with Environmental Health, Safety, and Risk Management (EHSRM) and should include:

1. Post laboratory spill procedures (https://www.angelo.edu/live/files/18839-laboratory-spill-procedures)
2. An inventory that includes the quantities and locations of all flammable, pyrophoric, oxidizing, toxic, corrosive, reactive, radioactive materials, nonionizing radiation, biological materials, and compressed and liquefied gases. The inventory is currently kept online in Quartzy which is backed up monthly.
3. A list of personnel who are designated and trained to respond to chemical, biological, and radiological spills. Refer to Appendix 1 for guidance regarding response planning.
4. A list of responsible personnel who are designated and trained to be the liaison for fire department and other emergency responders.
5. Action to be taken by laboratory personnel upon activation of a fire alarm. This should include instructions to turn off flames and other ignition sources, close the fume hood sash, close all hazardous materials containers, and turn off all electrical equipment. All personnel are required to exit the facility when the fire alarm is activated.
6. Location of emergency equipment in the laboratory and/or building (spill kit(s), fire extinguishers, AED, fire blankets emergency eyewash, shower, and first aid kit).
7. Procedures for extinguishing clothing fires (stop, drop & roll, cover face with hands and use fire blanket, do not use fire extinguisher), emergency shower and eyewash and spill kits.
8. Primary and secondary evacuation routes and the closest emergency exits to the outside of the facility.
9. Meeting point outside of the building to account for all laboratory personnel.
10. Instructions not to reenter the building until qualified emergency responders provide notification (i.e., all clear) that it is safe to return.

Spill Control Equipment

All laboratory buildings must have spill control equipment (see appendix 4). Commercial spill kits can be purchased or the necessary components assembled in the lab. All laboratory staff must know where the spill control equipment is kept and be instructed on how to use it. Cleanup materials must be sufficient to contain the hazard type and volume of materials being used in the laboratory. The spill control equipment must be regularly checked by laboratory staff and restocked after use.

1. Basic Equipment
   a. Spill Warning Sign (Appendix 3)
   b. First Aid kit recommendations
      (1) General Contents: bandages, compresses, tape, gloves, antiseptic and burn treatments.

(2) Hydrofluoric Acid use requires “antidote” gel (calcium gluconate) in the lab. Train all HF users and periodically check expiration date.

c. Absorbent pads, vermiculite, and/or kitty litter.
d. Plastic dust pan, scoop, and broom.
e. Plastic bags; applicable hazardous waste labels.

2. Material Specific Spill Control Equipment (see Appendix 2 for more detailed information):
   a. Flammable Solvents
   b. Mercury
   c. Hydrofluoric Acid
   d. Acid/Base
   e. Formaldehyde
   f. Osmium Tetroxide
   g. Blood/Body Fluid
   h. Radioactive Material Decontamination

3. Personal Protective Equipment
   a. Gloves: gloves must be appropriate for the hazardous material that is being cleaned up.
   b. Goggles: eye protection must be appropriate for the hazardous material that is being cleaned up. Chemical splash goggles must be worn for chemical spills. A face shield may be needed and must be worn over goggles.
   c. Respirator: only staff who have been medically cleared, fit tested, and annually trained on the use and limitations of the respiratory protection equipment, may wear a respirator. The respirator must be selected for the hazard and potential exposure of the spilled hazardous material. All respiratory protection use must be coordinated with EHSRM.

Determination of Major vs. Minor Spill

To determine whether a spill is major (emergency response with clean up by outside staff) or minor (incidental release with clean up by lab staff), (1) the hazard(s) posed by the spilled chemical and (2) the spill's potential impact need to be known. Both these factors, in large part, are determined by the spill's size.

1. The following information will help determine whether it is a minor spill:
   a. Type of chemical(s) spilled – other hazards (biological or radioactive)?
   b. amount,
   c. Hazardous characteristics – is it a solid, powder, liquid or gas?
      Is it flammable, corrosive or toxic?
   d. Specific location – facility and room number,
   e. Proper method for cleaning up the spill,
   f. Personal protective equipment available, and
   g. Training received by lab personnel.

A chemical spill is not a health risk if it has a low toxicity (especially if it is not volatile or a dust), is not highly corrosive, and is not a strong oxidizer. Such spills may be considered "minor" only if physical damage or environmental factors are absent.

If the spilled chemical's toxicity is unknown, treat the spill like a potential human health hazard by avoiding exposure and seeking outside assistance.

2. Factors that may magnify a spill's impact and require emergency response (major spill) are:
    a. The possibility that hazardous vapors or dusts might enter the facility's ventilation system and be distributed to other areas;
    b. The possibility that spilled liquids might flow into other areas, thus expanding the threat of harm, such as reaching ignition sources, exposing other people, damaging delicate equipment;
    c. The presence of incompatible chemicals;
    d. The proximity of classrooms or offices containing people who could be harmed by the spill's consequences; and
    e. Spills in sinks that might be connected to other sinks through the plumbing system.

3. Major Spills are defined by the following criterion:
    a. The response comes from outside the immediate release area.
    b. The release requires evacuation of employees in the area.
    c. The release poses, or has the potential to pose, conditions that are immediately dangerous to life and health (IDLH).
    d. The release poses a serious threat of fire or explosion (exceeds or has the potential to exceed the lower explosive limit or lower flammable limit).
    e. The release requires immediate attention because of imminent danger.
    f. The release may cause high levels of exposure to toxic substances.
    g. There is uncertainty that the employee in the work area can handle the severity of the hazard with the PPE and equipment that has been provided ant the exposure limit could easily be exceeded.
    h. The situation is unclear, or data are lacking on important factors. The properties of hazardous substances, such as toxicity, volatility, flammability, explosiveness, corrosiveness, etc. as well as the particular circumstances of the release itself, such as quantity, confined space considerations, ventilation, etc. must be known and understood prior to response.

In addition to potential fire and explosion hazards, strong corrosives and oxidizers typically fall under the property damage category. A large-quantity release that threatens the environment is not a minor spill, but requires the attention of trained responders. If any hazards are present that would damage property or the environment, treat the spill as “large” or “major” and contact University Police at 325-942-2071.

4. Minor Spills are defined by the following criterion:
    a. Less than 1-gallon spill of a low toxicity or non-flammable chemical or a material that has any NFPA/HMIS rating of 1 or 2;
    b. A spill involving less than 20 cc/ml of a particularly hazardous chemical (carcinogen, reproductive hazard or acutely toxic), or chemical with any NFPA/HMIS rating or 3 or 4;
    c. Blood and/or body fluids; or
    d. Any amount of chemical material with all NFPA/HMIS ratings of 0.

NFPA Rating	Health Hazard (BLUE)	Fire Hazard (RED)	Instability (Reactivity) Hazard (YELLOW)
0	Normal	Will not burn	Stable
1	Slightly Hazardous	Flash Point above 200 F	Unstable if heated
2	Hazardous	Flash Point below 200 F	Violent chemical change
3	Extreme Danger	Flash Point below 100 F	Shock & heat may detonate
4	Deadly	Flash Point below 73 F	May detonate

Biohazard Spills in the Laboratory

1. Employee Contamination
   a. If the skin becomes contaminated with blood or other potentially infectious materials, wash the area thoroughly with soap and water.
   b. If blood or other potentially infectious material is splashed into the eyes, immediately use the eyewash station, and flush continuously for at least 15 minutes.
   c. Remove contaminated clothing and shoes immediately. Place the contaminated items in a plastic bag and label the bag.
   d. Report the spill to the lab supervisor, and seek medical attention.
   e. File an incident report with your department. Specific OSHA paperwork is required for bloodborne pathogens exposure. See Operating Policy 34.22, Bloodborne Pathogen Protection Program, for specific information.

2. Clean Up
   a. Wear appropriate personal protective equipment (PPE) to clean up the spill. At a minimum, this includes gloves, protective eyewear and a mask, or a face shield. Depending on the size and type of spill, impervious gowns, protective foot coverings, or respirators may be needed.
   b. Pick up any broken glass with tongs or other mechanical device. Do not use your hands. Dispose of glass in an appropriate container (e.g. heavy cardboard box which is taped shut and marked “BROKEN GLASS” prior to disposal).
   c. Place absorbent towels over the spill, making sure not to spread the liquid.
   d. Carefully pour a dilute bleach solution (1:10) or other EPA registered tuberculocidal agent over the absorbent towels. Let remain for 10 minutes in order to disinfect the spill.
   e. Carefully pick up the absorbent towels, and place into a plastic bag. Wash the contaminated area again with the bleach other disinfectant. Rinse the area with water.
   f. All PPE, towels, and other items that became contaminated must be disposed of as regulated medical waste. Please coordinate disposal with EHSRM.
   g. Wash hands and any other exposed skin with soap and water before leaving the work area.

3. Spills or Breakage in a Centrifuge
   a. Turn off the centrifuge, and allow it to come to a full stop before opening the cover.
   b. Wear the appropriate PPE to clean the spill.
   c. Remove any broken glass with tongs, and clean the spill as outlined above.

4. Spills in a Biological Safety Cabinet or Laminar Flow Hood

a. Do not shut off the ventilation. The cabinet should be left running to prevent the escape of contaminants. If there is a UV light, leave it on.
b. Wear the appropriate PPE. If the material is infectious, a respirator may be needed.
c. Use a diluted bleach solution (1:10) or an EPA registered tuberculocidal agent to disinfect the cabinet. Wipe the walls, work surfaces, and equipment with the disinfectant. Use sufficient amount of the disinfectant to ensure that the drain pans and catch basins below the work surface get disinfected. Lift the front exhaust grill and tray and wipe all surfaces. Let the disinfectant stand for 10 minutes. Wipe the catch basin and drain the disinfectant into a container. Wipe the area with water.
d. This procedure will not disinfect the filters, blowers, air ducts, or other interior parts of the cabinet. If the cabinet needs to be sterilized, contact EHSRM for additional information.

Chemical Spills

1. Employee Contamination
   a. Call UPD at 942-2071 to report the spill and request assistance from EHSRM.
   b. Assist victim with appropriate first aid and move to fresh air.
      (1) DO NOT become contaminated by the chemical as you give first aid.
      (2) DO NOT try to neutralize any chemical.
      (3) DO NOT disturb a blister or remove dead skin from a chemical burn.
      (4) DO NOT apply household remedy such as an ointment or salve to a chemical burn.
   c. If the skin becomes contaminated with hazardous materials, wash the affected area thoroughly with copious amounts of water. If available, use the Emergency Shower for at least 15 minutes.
   d. If hazardous material is splashed into the eyes, immediately use the eyewash station, and flush for at least 15 minutes.
   e. Remove contaminated clothing, including shoes, immediately. Place the contaminated clothing in a plastic bag and label the bag.
   f. Report the spill to the lab supervisor and seek medical attention.
   g. File an incident report with your department (https://www.angelo.edu/administrative-support/environmental-health-safety-and-risk-management/accidents-and-incidents.php).

2. Small Chemical Spill Clean Up – Incidental Spill
   a. These spills can be cleaned up by trained laboratory personnel.
      Examples:
      (1) Less than 1-gallon spill of a low toxicity or non-flammable chemical or a material that has any NFPA/HMIS rating of 1 or 2;
      (2) A spill involving less than 20 cc/ml of a particularly hazardous chemical (carcinogen, reproductive hazard, or acutely toxic), or chemical with NFPA/HMIS rating of 3 or 4;
      (3) Blood and/or body fluids
      (4) Any amount of chemical material with all NFPA/HMIS ratings of 0
   b. Notify fellow workers in vicinity of spill.
   c. Secure area by restricting access and posting signs.
   d. Wear the appropriate personal protective equipment (PPE) to clean up the spill. At a minimum, this includes gloves and protective eyewear (chemical splash goggles).

Depending on the size and type of spill, protective clothing (lab coat and apron), and protective foot coverings may be needed. If high splash potential exists, also wear a face shield over the chemical splash goggles.

e. Shutdown equipment:
   (1) Close doors and shut HVAC vents (coordinate with Facilities Management), if possible.
   (2) Close all chemical containers.
   (3) Close fume hood sash (leave fume hood ON).
   (4) Turn off heating devices.
   (5) Stop any reactions in progress.
   (6) If flammable material spills, turn off sources of heat and ignition in entire lab.
f. Gather and review safety information on spilled chemical. Review chemical's Safety Data Sheet (SDS) for a hazard assessment and other pertinent information. Important information to know before beginning clean up includes:
   (1) Flammability: Flash Point and Vapor Pressure
   (2) Toxicity: PEL, TLV
   (3) Corrosiveness: pH
g. Locate an appropriate spill kit (see appendix 4).
h. Pick up any broken glass with tongs, dust pan and broom, or some other mechanical device. Dispose of glass in an appropriate container (e.g. heavy cardboard box which is taped shut and marked "BROKEN GLASS" prior to disposal).
i. Confine and contain spill. Place absorbent material over the spill, making sure not to spread the liquid. Protect drains – do not allow any spilled material to enter drains.
   (1) Liquid Spills:
      - Cover spill material with absorbent. Work from outside to center of spill to avoid spreading liquid.
   (2) Flammable Solvents:
      - Immediately turn off any open flames, heating devices, instrument or machine near the spill that could spark and cause solvent vapors to ignite and flash back.
      - Use plastic scoops and dust pan to clean up absorbent material.
   (3) Acids (except HF)
      - It is not necessary to neutralize an incidental spill. Use absorbent material.
      - Decontaminate area after removal of absorbent. Check pH if possible.
   (4) Powder Spills:
      - Do not dry sweep material. This will cause powder to become airborne and spread. Thoroughly wet material with water (or appropriate material) first.
   (5) Alkali Metals
      - Smother with dry sand. Avoid contact with water.
      - Do not dry sweep material.
   (6) Mercury
      - Cover with mercury decontaminating powder.
      - Do not dry sweep material. Use aspirator bulb or wet paper towels to collect mercury beads.
      - Use a flashlight to detect mercury beads that may have spread.
   (7) Gas Leak

- Turn off gas cylinder if possible.
- If gas is toxic, corrosive or flammable, evacuate area and call University Police at 325-942-2071.

j. Clean up spill using a scoop or other suitable item and place material in appropriate disposal container.
k. Decontaminate spill surface with mild detergent and water, as appropriate. Carefully remove PPE, place non-reusable items in disposal container and thoroughly wash hands.
l. Dispose of all contaminated material in a plastic bag. Label the bag with the name of the hazardous material. Complete a hazardous waste label and affix label to container. Contact EHSRM for disposal.
m. Investigate cause of spill and review with EHSRM. Document spill, response and follow-up with staff. The incident report must include the following:
    (1) Type of emergency
    (2) Name of material spilled, including pH, strength, concentration, etc.
    (3) Area of spill and estimate of volume
    (4) Remediation performed
    (5) Any follow-up that may be necessary
    (6) Contact person
    (7) Names of people who may have been exposed to substance
n. Replenish spill kit.

3. Large Chemical Spill Clean Up – Emergency Response See Hazardous Chemical Storage & Spill Contingency Plan (https://www.angelo.edu/live/files/21596-hazardous-chemical-storage-and-spill-contingency)

    a. These spills must be cleaned up by a Hazardous Materials Emergency Response Team. DO NOT ATTEMPT TO CLEAN A MAJOR SPILL!
    Examples:
    (1) The release requires evacuation of employees in the area.
    (2) The release poses, or has the potential to pose, conditions that are immediately dangerous to life and health (IDLH).
    (3) The release poses a serious threat of fire or explosion (exceeds or has the potential to exceed the lower explosive limit or lower flammable limit).
    (4) The release requires immediate attention because of imminent danger.
    (5) The release may cause high levels of exposure to toxic substances.
    (6) There is uncertainty that the employee in the work area can handle the severity of the hazard with the PPE and equipment that has been provided ant the exposure limit could easily be exceeded.
    (7) The situation is unclear, or data are lacking on important factors. The properties of hazardous substances, such as toxicity, volatility, flammability, explosiveness, corrosiveness, etc. as well as the particular circumstances of the release itself, such as quantity, confined space considerations, ventilation, etc. must be known and understood prior to response.
    (8) In addition to potential fire and explosion hazards, strong corrosives and oxidizers typically fall under the property damage category. A large-quantity release that

threatens the environment is not a minor spill, but requires the attention of trained responders. If any hazards are present that would damage property or the environment, treat the spill as “large” or “major.”

b. Evacuate the area and close all doors. Notify others not to enter the area. Post signs.
c. If possible, put absorbent material around the spill to prevent it from spreading, particularly into drains or under cabinets.
d. Call University Police at 942-2071 and give details of spill including specific location, chemical, quantity, and if anyone is injured.
e. During the evacuation, If possible, shutdown equipment:
   (1) Close doors and shut HVAC vents if possible.
   (2) Close all chemical containers.
   (3) Close fume hood sash (leave fume hood ON).
   (4) Turn off heating devices.
   (5) Stop any reactions in progress.
   (6) If flammable material spills, turn off sources of heat and ignition in entire lab.
f. For spills of highly hazardous material or present a fire hazard, activate the fire alarm by pulling the nearest fire alarm pull station.
g. Inform the Hazardous Materials Response Team the location, the name of the material that spilled and the approximate quantity of spilled material. Staff knowledgeable about the spill should provide responders with all pertinent information and the SDS.
h. Do not reenter the area until advised by EHSRM that it is safe to do so.
i. Investigate cause of spill. Document spill, response, and follow-up with staff and contact EHSRM. The incident report must include the following:
   (1) Type of emergency,
   (2) Name of material spilled, including pH, strength, concentration, etc.,
   (3) Area of spill and estimate of volume,
   (4) Remediation performed,
   (5) Any follow-up that may be necessary,
   (6) Contact person, and
   (7) Names of people who may have been exposed to substance.

Radioactive Materials Spills

Radioactive material spills are chemical spills with the added radioactivity hazard and perhaps a biological hazard. Spill response must include all procedures. If it is determined that the spill meets the definition of an incidental chemical release, the radioactive material spill must then be assessed to be a “minor” or “major” spill. The activity level (in uCi) and the isotope involved determine the level of spill response (incidental response vs. emergency response).

Hazard	**Activity Level**	**Isotope** *(Example)*
Low	Above 1 mCi, treat as a Major Spill	H-3, F-18, Zn-69
Medium	Above 100 uCi, treat as a Major Spill	C-14, P-32, S-35, Cl-36, Cr-51, Fe-55, Cu-64, Zn-65, Ag-111, Cd-109, Tl-201, U-135
High	Above 10 uCi, treat as a Major Spill	Na-22, Sr-90, Cs-137

A major spill will be remediated by Radiation Safety Officer in coordination with EHSRM. Below this Activity Level, treat as a minor spill with lab staff following clean-up procedures listed below.

1. Spill Procedure When Airborne Contamination is Possible
    a. Evacuate the laboratory immediately and warn others in the vicinity.
    b. Before leaving the area, remove shoes if contaminated and do not touch anything.
    c. Where possible, adjust ventilation to prevent spread of airborne contamination.
    d. Close and lock the doors or isolate area and prevent entrance.
    e. Perform a personal survey of all areas of the body. Remove any contaminated clothing, shoes, lab coat, etc.
    f. If skin contamination is discovered, see Personal Decontamination section (below).
    g. Contact University Police at 942-2071 and request EHSRM and Radiation Safety Officer.

2. Spill Procedure When Contamination is not Airborne
    a. Immediately contact University Police at 942-2071 and request EHSRM and Radiation Safety Officer.
    b. Do not track contamination around the laboratory. Call out for help; do not go for help if possible.
    c. Isolate contaminated area and notify others not to enter.
    d. Localize the spill. Place absorbent material on a liquid spill.
    e. Survey the area for extent of contamination.
    f. If spilled materials have dried, lightly wet down the area where the spill occurred with water. Be careful not to spread contamination.
    g. Monitor all persons involved in the clean-up.
    h. Perform a personal survey of all areas of the body. Remove any contaminated clothing, shoes, lab coat etc. See Personal Decontamination section (below).
    i. Check shoes before leaving the area of a cleaned-up spill.
    j. Do not allow anyone to resume work in the area until Radiation Safety Officer has made a final survey and given approval for reoccupy the area.

3. Personal Decontamination
    a. Perform personal survey of all areas of the body.
    b. Remove contaminated clothing.
    c. If skin contamination is discovered, use luke-warm soapy water and wash for 2-3 minutes. It is important to not allow any radioactive material to enter your skin which can cause internal contamination. Use mild soap (e.g., Dove or Ivory), gentle washing and copious amounts of water.
    d. Be especially thorough in flushing out wounds.
    e. If thorough washing does not remove contamination from the body, consult Radiation Safety Officer.
    f. Isolate contaminated items and hold for Radiation Safety Officer.

Water Loss

Supervisors and workers are required to anticipate the consequences of loss of water to the laboratory where employee safety may be impacted. The emergency eyewashes and showers

will not operate and therefore will not provide protection in the event of a hazardous material contamination. Water cooling systems for equipment (i.e., distillation apparatus) will not work.

Secure all hazardous experiments and make sure that any experiments in progress are stabilized and discontinued until water service is returned to normal.

If the water loss occurs during off hours, check all laboratories that may be running overnight experiments. Contact the persons involved so they can secure their hazardous experiments.

Power Failures

Supervisors and workers are required to anticipate the consequences of an electric power interruption where employee safety may be impacted. Laboratory operations can pose a significant risk to building occupants during an extended power failure. Lab personnel must take appropriate actions to safeguard systems and operations.

1. Before a power outage occurs:
    a. Make a list of equipment that must be reset or restarted. Keep instructions for doing so in a nearby place. Equipment that operates unattended should be programmed to shut down safely during a power failure and to NOT restart automatically when power returns.
    b. Make a list of critical equipment that should be on emergency power. Check regularly that this equipment is plugged into the emergency power supply (if available). Consider purchasing a UPS unit for computers or other similar equipment.
    c. Identify a source of dry ice or liquid nitrogen for use during an extended power outage. Have a safety plan for using the cryogenic material and cryo-gloves and face shield.
    d. Do not store flammables in domestic refrigerators at any time. This is an even greater hazard during a power outage because vapor concentration may increase as temperature increases, creating an explosive atmosphere inside of a unit where sparking is imminent when the power returns.
    e. Leave at least one flashlight in each area for use during a power outage. Use the type that is continuously recharged or keep fresh batteries with the flashlight.

2. While the power is off:
    a. Secure all hazardous experiments. Make sure that any experiments in progress are stabilized and discontinued.
    b. Securely cap all chemical containers, extinguish all flames, close gas valves, store cultures, and secure radioactive materials.
    c. Completely close the sash of all fume hoods.
    d. Power off all equipment so it does not reenergize when power is restored.
    e. Close all interior lab doors to reduce spread of hazardous vapors and fire risks.
    f. Check any equipment on emergency power. It may take up to 30 seconds for the emergency power to kick in. Items not permanently connected to emergency power outlets should not be connected during a power interruption.
    g. Exit the lab and lock exterior lab doors.
    h. Evacuate the building and follow established departmental specific directives and supervisor guidance regarding alternate work locations.

i. If the power loss occurs during off hours, check all laboratories that may be running overnight experiments. Contact the persons involved so that they can properly secure their hazardous experiments.
j. Coordinate the use of temporary emergency power with Facilities Management. Do NOT bring in electric generators to operate equipment.

3. After power is restored:
   Reset/restart and check equipment to ensure it is functioning properly. In particular, check to ensure airflow of fume hoods has been restored. If fume hoods do not automatically re-start, call Facilities Management at 942-2355 to request an emergency work order. Keep the sashes closed and do not use the hood until sure the exhaust system is working.

Severe Weather

Laboratory equipment, materials and research can be protected from loss during severe weather events, by taking appropriate precautions that will minimize the impact of dangerous conditions (e.g. wind, tornado, ice, etc.) and loss of services (e.g. electric power, heat, air conditioning, water, etc.). Prepare a lab contingency plan, including the items noted below, that meets your specific needs. This plan should be shared with your department for inclusion in the facility Emergency Action Plan.

The Laboratory Severe Weather Plan should be implemented to protect personnel, equipment, and laboratory facilities whenever a severe weather event threatens laboratory operations, or when directed by the university's emergency notification system. Remember, you must take responsibility to protect the laboratory and research.

Laboratory Shutdown Procedures

1. Shutdown experiments that could be affected by loss of electricity, water, or other services.
2. Close the sash on all chemical fume hoods in the event that ventilation is lost.
3. Remove all infectious materials from bio-safety cabinets, and autoclave, disinfect, or safely store them as appropriate.
4. Ensure that all chemical, radioactive and hazardous waste containers are properly covered and sealed.
5. Ensure that all gas valves are closed. If able, shut off gas to area.
6. Turn off all appliances, computers, hot plates, ovens and other equipment.
7. Review storage of perishable items. Consolidate valuable items within storage units that have backup systems or store items in duplicate locations as appropriate. Review safety precautions for the use of alternate cooling methods (e.g. liquid nitrogen, dry ice, etc.), if used (see Power Failures section above).
8. Ensure that water reactive chemicals are in sealed containers and stored in areas that are unlikely to become wet.
9. Check that all gas cylinders are secured. Remove regulators and use caps.
10. Elevate equipment, materials, supplies, chemicals, and electrical wires (off of the floor), particularly in lower elevations that are prone to flooding.
11. Update lab emergency contact numbers. Ensure that they are properly posted on lab doors and provided to your department.
12. Secure lab notebooks and backup critical data on computers.

13. Close all doors, including cabinets, storage areas, offices and utility chase-ways. Lock all exterior lab doors before leaving.

Appendix 1: Guide for Chemical Spill Response Planning in Laboratories
All spills are different and this guide does not provide definitive guidance for how to handle every specific incident.

Planning
Planning must be done in advance, not after a spill occurs. A professional response to spills, from planning to properly using cleanup equipment, will reduce the eventual costs (in injury, damages, expense, pollution, and liability).

Spill Prevention Methods
Laboratory spills can occur while transporting or storing chemicals or during experiments. A spill prevention program for storage areas should include the following:

- containers stored by hazard class
- properly designed area with sturdy shelves and larger containers stored closer to the floor;
- containers are not stored above eye level and shelves have lips to reduce tipping/breakage;
- regular inspections of the integrity of containers.

To minimize spills during transport, a laboratory should integrate the following:

- carts, where appropriate,
- safety containers,
- rubberized buckets,
- straps to secure containers, and
- properly train workers.

For the transfer of liquids from one container to another, the risk of spills can be reduced by

- paying careful attention to the size of containers to avoid overfilling;
- using pumps or other mechanical devices rather than pouring directly into a container;
- providing spill containment to capture any leaks; and
- bonding and grounding containers when flammable liquids are involved.

In addition to chemical spills, water damage can be caused by loose connections, breaks in lines, or flooding. Appropriate planning, including use of security clamps or other devices to prevent loosening of connections or automatic shut-off devices, can reduce the likelihood of flooding. Planning should include the protection of instruments and storing chemicals and supplies in a manner to prevent being harmed by water.

While considerable attention is given to potential spills or leaks of liquids, laboratories using gases should also develop spill prevention plans for these materials. Consider safety concerns related to securing and capping tanks and other gas containers. Additionally, frequent checks of valves and tubing to prevent leaks into drains or fume hoods.

Finally, ensure personnel are trained and prepared to properly respond to spills. They should know the location of spill kits and the emergency response procedures and required actions.

Appendix 2: Chemical Specific Response

The following contains specific guidance for cleaning up common chemical spills and examples of recommended materials to use. Other cleanup kits and resources are available and may also be used to remediate spills of hazardous substances.

Spill-X Spill Control Agents are available for a number of different applications and packages, including Spill-X-A for Acid spills, Spill-X-C for Caustic spills, Spill-X-S for Solvent spills and Spill-X-FP for spills of formaldehyde. Each bottle can treat up to a 0.5-gallon spill which is equivalent to approximately a 15 - 20 ft.2 spill. The exact spill area which can be properly treated is a function of the acid, caustic, and solvent type, as well as the concentration. Use to solidify and reduce vapor release from solvent or formaldehyde spills. Neutralize and solidify acid or caustic spills. Properly treated spills greatly reduce the costs of spill handling, transport, and waste disposal. Fisher Product 17-987-144A 1.

Acids/ Bases

Spill-X-A for Acid Spills is effective on spills of mineral and organic acids and will neutralize and solidify acids. It is red in color to differentiate it from other spill control agents. Spill-X-C for Caustic Spills will neutralize and solidify caustics. It is tan in color to differentiate it from other spill control agents.

Flammable Solvents

Spill-X-S for Solvent/Fuel spills reduces evaporative losses by adsorption and when topped off with and additional layer of Spill-X-S agent elevates the flashpoint above 140 degrees Fahrenheit of most organic solvents. It is black in color to differentiate it from other spill control agents.

Formaldehyde

Spill-X-FP® Formaldehyde Polymerizer Rapidly treats formaldehyde spills and reduces the amount of vapors. It reacts with aqueous formaldehyde to form a polynoxylin polymer. Urea-based. Lab Safety Supply Co. Product # 9894

Mercury

500gm Hg Absorb™ Powder to amalgamate mercury droplets, scoop to pick up amalgam, four 250gm Hg Absorb Jars for absorption of tiny droplets, Indicator to identify additional mercury that may have been missed and 1-1/2 lb. Mercury vapor Adsorbent for inaccessible spill areas. Also includes protective glasses, gloves and two disposal bags. Lab Safety Supply Co. Product # 20876

Appendix 3: Spill Caution Sign

Appendix 4: Spill Response Kit Locations

Location	19"x15" Pads	Absorbent Pillows	4ft. Absorbent Socks	10ft. Absorbent Socks	12ft. Jumbo Socks	Neoprene over Latex Gloves (pair)	Latex Gloves (pair)	Safety Glasses (pair)	Mask(s) - N 95	Waste Bag(s)	Absorbent Litter	Mercury Kit(s)
Cavness 011A - Kit #2 (30 Gal.)	25	2	8			1	3	2	5	2		1
Cavness 212- Kit #5	25		6			1	3	2	3	1		
Science III 206 - Kit #3 (20 Gal.)	20		2			1	3	1	5	1		
MIR Center - Kit #4 (20 Gal.)	15		3	1		1	3	2	3	1		
MIR Barn - (20 Gal.)	28	6	6				1	1		1		
Hunter Strain Engineering 108	12	2		3			1	1		3		
Hazmat Storage Kit #1 (White barrel containter located in Hazmat Cage)	60 pads & 56 Napkin	8	8	10						20 (Jumbo w/ZipTi		
Mobile Unit - Blue 30 gallon barrel containing -	84	8	2		2					Pull from Kit #1	2 shovels	
Chemical Storage 307 - Outside Central Plant	42		6		2	1		1				
Vincent R06 Geo Sample Room	**2 Gallons of HF Acid**	**2 Hazmat Boot Covers**	**2 Acid Resistant Aprons**		2	**1 pair of Acid Resistant Gloves**		1		1	**1 Yellow Tape**	
Vincent - 244 - Carry Case	10		2			1			2-Face Shiel	1		