



Lab Safety

Spectrum

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UW - Madison Safety Department Chemical and Radiation Protection
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Custodians

Does it sometimes seem that you explain a situation with a custodian before you go home, but when you come back the next day it is as if you never told anyone? We have had a few incidents involving custodians which were perplexing. For example, a lab spilled about 2 pounds of mercury on a Friday afternoon. Safety personnel responded and decided to leave the spill until Monday. They told the custodian about the spill, put a note on the door saying "Mercury spill, do not enter" and left. Next thing you know, UW Police and Madison Fire Department respond. Another time a lab spills a little P-32, they clean it up but decide to block off that space with plexiglas. They tell the custodian what they have done and the custodian seems satisfied. A few days later Safety is asked by the Assistant Director of Physical Plant whether we knew about the spill, was the area safe, etc.

There are several issues here. First, let's look at why the custodian does not seem to understand even after being shown the situation. While you may see only a single custodian, there are usually several custodians who visit your lab. One may only do trash. One may do the floors, etc. When you tell "the custodian" you are actually only telling ONE custodian.

While that person may be completely comfortable with your situation, the next one into your room is presented with an "emergency" they are unprepared to respond to and call their supervisor who is equally unaware of the issue. I talked to a Physical Plant supervisor, who suggested a solution is to notify the custodial supervisor of the incident and residual contamination. The supervisor will thus NOT be surprised by a call regarding a spill and can react appropriately.

Second. What are custodians' responsibilities? They are only responsible for tasks assigned by their supervisor. Each lab has personnel who have been properly trained to handle any situation that may arise. Custodians are "untrained" in chemical, radiation, and biological safety. They are custodians. Do not ask them to pick up after you. Sometimes they may even want to help, but remember they may not understand the hazards and later, if they experience a completely unrelated reaction, they may link the two and file a workman's compensation claim citing your lab, or spread a rumor about what happened to them in your lab.

(Continued on Page 2)



Third. You should report all spills, even those you have cleaned up, to the Safety Department. The UW has certain County, State, and Federal reporting requirements. We keep a file of spills and incidents which are made available when we are inspected. We could also discuss the spill with you and notify the Custodial Supervisor if there is anything which custodians may spot and report. Call Larry Walls at 3-3082 to learn who your off-hours Custodial contact is.

Gas Cylinders

Let's review a few of the basics. I attended a Safety Committee meeting for a department on campus. They more or less used us as a sounding board. One of the questions concerned the requirement that persons transporting gas cylinders via the elevator assure (1) that they do not ride in the elevator with the cylinder and (2) that they insure no one gets on the elevator while it is carrying a gas cylinder. My response, "Really?" Gas cylinders can be dangerous. Some of the dangers include: decompression (and high pressure release), atmospheric displacement, explosion and fire, toxicity, heavy lifting, and cryocooling (see table).

Decompression. Gas cylinders contain gas under pressure. Opening the high-pressure valve without a regulator can launch the cylinder like a rocket ship. Consider a large (200 lb) helium cylinder fully pressurized with 3 lb of helium. If the gas were to be released rapidly through the valve stem, the cylinder, if unrestrained, could reach a velocity of 66 mph, enough energy to penetrate lab walls. To prevent this type of accident, always restrain cylinders with appropriate chains or brackets, transport them in cylinder carts, keep them capped at all times unless in use, immediately return any cylinder found to be damaged or that has a stuck valve, never try to vent a damaged cylinder.

Atmospheric displacement. Even if a cylinder is restrained, the sudden release of more than 6 m³ (220 ft³) of unbreathable gas in a laboratory will reduce the level of oxygen dramatically and present a real suffocation hazard (e.g., a 10 x 12 x 8 foot room = 960 ft³), this volume would displace 25% of the room air (an instrument room is even smaller); Liquefied gases expand as much as 1000-fold and can present a greater hazard. When breathed in any significant concentration, CO₂ **(Continued on Page 3)**

Hazard classes for common laboratory gases					
	Decompression	Flammability	Asphyxiation	Toxicity	Cryohazard
Acetylene	✓	✓	✓	✓	
Air	✓				
Argon	✓		✓		✓*
CO ₂	✓		✓	✓	✓*
Chemical reagents (i.e., reactive gases)	✓	✓	✓	✓	
Helium	✓		✓		✓*
Hydrogen	✓	✓	✓		✓*
Nitrogen	✓		✓		✓*
Oxygen	✓	✓†			✓*
Propane	✓	✓	✓		

* Liquefied gas. † Accelerates combustion.



can cause immediate unconsciousness followed by death. Consider the venting of a large tank to be a major emergency. Leave the area immediately, prevent others from entering, call 911. Don't try to reenter a hazardous area to assist someone else without the proper breathing equipment.

Explosion and fire hazard. If a hydrogen cylinder vents into a lab in an uncontrolled manner, leave the area immediately, close the doors, pull the fire alarm to evacuate the building and call 911. Hydrogen has a flammable concentration in air of 4%, so a vented cylinder can easily create an explosive concentration. The same response applies to other flammable gases. If a gas fire starts and the gas leak cannot be stopped, don't try to extinguish the flame. Unburned gas can accumulate and explode. Some gases (e.g., hydrogen) can burn with an invisible flame. In a fire, high-pressure gas cylinders can rupture explosively. Even though tanks have a thermal fuse which is designed to melt and release the cylinder contents more safely, the valve may have been damaged. Call 911 for all fire emergencies.

Toxicity. Some gases can present significant health hazards and disposal problems. If even a small leak of a toxic gas is detected, leave the area and call 911. Trained and equipped personnel will move the leaking cylinder to a safe place.

Each type of gas has a Material Safety Data Sheet (MSDS) which should be on hand to inform the worker of a gas's hazards before they handle it. Toxic gases should be stored properly; never store them above floor level nor with unprotected valves. If you find a hazardous or unknown chemical in gaseous, liquid, or solid form, call Safety for evaluation and removal.

Cryocooling. Liquefied gases can cause immediate frost burns on exposed skin and some (e.g., liquid nitrogen) can embrittle objects, including fingers. Connecting tubing should be insulated or shielded to prevent accidental contact. Wear appropriate protective wear (e.g., thermal gloves, eyewear, skin-covering). Our web site has more information about cryogenic liquids.

Heavy lifting. Never attempt to lift a cylinder that weighs more than about 26 lbs. Heavy cylinders should be on the floor restrained to a bench or wall. Move cylinders with a cylinder cart. Make sure cap is in place. Do not roll a cylinder on its bottom edge, it could injure fingers and toes and the cylinder may fall. Never place a cylinder on its side and roll it; the sidewalls are the thinnest part of a cylinder and are not designed to support any weight. Liquid gas cylinders weigh much more when full than other gas cylinders. Wear protective clothing, eyewear, gloves, and shoes when manipulating large cylinders.

EPA & NRC Inspection Results

The UW receives inspections from Federal and State agencies at least annually. This past spring we received an inspection from the Nuclear Regulatory Commission and the Environmental Protection Agency.

The EPA inspection focuses on hazardous chemicals that are "waste." They went into a lab and "the inspector observed a brown glass 1-gallon bottle ... that was utilized for accumulation of waste acetone and water. The labeling was not clear on the bottle." Labeling is important for safety. Sure, you know what is in the bottle and normally you empty it into your lab's solvent carboy (as appropriate). However, things can come up and you may leave the lab unexpectedly. Label your containers to protect all persons from unintended exposure to hazardous chemicals. In this instance, the bottle had been used repeatedly by the lab and the label had become unreadable. Remember, label all the containers you use to hold chemicals and periodically verify that the labels are readable.

The NRC inspector visited several labs and use areas. While there were no radioactive issues identified, when walking through one lab the inspector noticed that a gas cylinder was not chained as required by OSHA (Occupational Safety and Health Administration). He noted this in his out-briefing with the Chancellor and informed him that he would be passing the information on to OSHA. He stated that the Federal Government requires its inspectors to notify sister agencies if they see "unsafe" situations involving that agency. The idea is that safety is not just radiation or biological or chemical, but safety concerns all aspects of hazardous material use.



Dosimetry Billing

The dosimeter provider has been working to get the system to function smoothly. They have informed us that they will soon begin charging for lost dosimeters. The fee will be \$36 for a whole body or collar dosimeter and \$18 for a ring dosimeter. Tell all of your people of the proper care of dosimeters. Make sure all badges turned in have name and part number. The part number is a 5-digit number which is used to identify the person instead of the Social Security Number. If the tag is worn, write the information on a piece of paper and tape it to the badge. If the badge has no name, the radiation dose can not be assigned and you will be billed for whomever's badge was not returned. To keep from losing your badge, you should leave it in the building in a low background area (i.e., your desk drawer, your locker) when you leave the lab. Do not take it home with you. Notify Safety (dosimetry@fpm.wisc.edu) if you lose your dosimeter. You will be charged anyway, but we can get you another dosimeter in a few days.

Training

Chemical Safety training class begins at 9:30 on the same day as the Radiation Safety Training class which begins at 12:30. The schedule from 1 September through 30 December (all classes are held at Union South): September 4, 9, 16, 23; October 2, 10, 18, 24; November 6, 12, 18, 26; and December 5, 9, 19. Additionally, the schedule is flipped twice in September and the Radiation class is held at 8 AM with the Chemical class held at 1:30. The dates when the Radiation class is in the morning (and the chemical class in the afternoon) are September 6 and 13. No sign-up is needed, just show up. A quiz is used to document training. Booklets for either class can be picked up at our annex which is room 62, Biochemistry. Find a complete listing at our web site:

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