
The Waste-Paper

“Waste is a terrible thing to mind”

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D.E.P. Inspection...

As many of you are aware, the New Jersey Department of Environmental Protection (NJ DEP) conducted an inspection of hazardous waste activities for part of our campus (Moffett Site) a little over one month ago. The areas covered by the inspection included several laboratory and Facilities buildings including Carl Icahn, Lewis Thomas, Schultz, and Moffett laboratories, the Energy Plant, MacMillan Building, Guyot and Jadwin Halls. There had not been a NJ DEP chemical waste inspection of Moffett since December 2005.

No fines were issued related to the areas and practices reviewed during the one-day inspection. The inspector was pleased with the chemical waste program as a whole and was impressed with the level of compliance witnessed. It is worth noting that although the three recent DEP inspections of the hazardous waste program have gone very well, it is crucial that we continue our vigilance and keep in good standing with our local regulators.

Indeed, since we have a history of no serious problems, the DEP has minimized the length of time spent on inspections of Princeton. This is due to the hard work of many, including the chemical users in the laboratories and maintenance areas and the individuals responsible for the waste storage areas at each of the three waste collection points (Frick, E-Quad, and Moffett sites).

The DEP generally conducts inspections of our main campus sites every few years. E-Quad (SEAS, Bowen Hall) was last inspected in March 2008. The Frick site (Frick, Hoyt, 185 Nassau St. and Green Hall) was last inspected in February 2007.

All of us in EHS extend our heartfelt congratulations and gratitude to all who were involved in the most recent inspection. Please keep up the excellent efforts and your commitment to high environmental standards.



Happy Earth Day

“Only when the last tree has died and the last river been poisoned and the last fish been caught will we realize we cannot eat money.”

These words, attributed to a Cree Indian proverb, remind us of the importance of our individual role in environmental stewardship.

There are many opportunities to reduce Princeton University’s “environmental footprint” - even in the laboratory or other chemical use areas. Everyone is encouraged to observe the following:

- Recycle glassware, scrap metal, paper and plastic
- Avoid using organic solvents for cleaning; when necessary, use the least amount possible
- Try quaternary ammonium compounds or ultrasonicators as more environmentally friendly alternatives to solvent rinsing
- Use non-mercury thermometers, manometers, etc.
- Use Energy Star-rated equipment
- Use oil-less diaphragm pumps instead of those that require oil or a constant water flow
- Use the least toxic chemicals possible
- Use chilled water loops rather than domestic water for cooling
- Don’t order more chemicals than you need (just-in-time ordering)
- Turn off equipment when not in use
- Keep fume hood sashes closed when no hands-on work is underway to minimize heating/cooling load
- Offer unused, unopened chemicals to other labs.
- Reduce the scale of your experiments (microscale)
- Seal containers of volatile chemicals to avoid product waste through evaporation and minimize air pollution
- Purchase gases in returnable, refillable cylinders
- Use low-mercury, compact fluorescent lamps instead of incandescent bulbs

For more ideas, see the EHS Pollution Prevention website at <http://web.princeton.edu/sites/ehs/chemwaste/p2labs.htm>.

What Happens When I Mix These?

The violent rupture of a hazardous waste container caused the temporary closure of a Princeton University lab recently. *Research was delayed for several days* as the lab cleaned up the debris and chemical contamination. Fortunately, no one was injured as the lab was unoccupied at the time of the blast.

The root cause of the container rupture was ultimately determined to be the combination of concentrated nitric and sulfuric acids. It is likely that after mixing, the heat released as the acids mixed caused excessive pressure build-up in the container and thereby ruptured it. The force from the rupture broke another bottle of chemical waste nearby. Researchers had been sorting through and disposing of dozens of superfluous and expired chemicals. They combined the acids into a single container to reduce the overall number of waste containers. This practice is recommended for compatible materials, such as most flammable organic solvents. However, the compatibility of all materials must be considered very carefully before comingling.

The addition of small amounts of incompatible materials with seemingly benign effects is another common scenario that can lead to disaster. "I'm only making a couple of milliliters of this waste, why bother make a whole new waste container?" Small amounts of incompatible materials may be enough to catalyze reactions or create powerful byproducts that are very hazardous in small quantities.



Figure 1. Nitric acid was collected in a methanol container. The reaction caused the container to burst into tiny pieces strewn throughout the lab. Several nearby containers broke. The lab was closed for two days for cleanup.

Typical material hazards that are incompatible include:

- Oxidizers with flammable/combustible organic solvents and reagents
- Acids with bases/caustics
- Organic acids with inorganic acids
- Water-reactives with hygroscopic/hydrophilic reagents
- Cyanide or sulfide salts with acids
- Bleach mixed with acid or ammonia



*Please bring waste down to your
Collection site on
Wednesday, April 29th
Waste Pickup will be Thursday,
April 30, 2009.*

When incompatible materials react in a sealed container and create pressure, they can rupture the bottle with enough force to break other nearby containers of chemicals, crack fumehood sashes, and send glass shrapnel flying with enough force to cause injury to researchers in the area.

So what do you do if you have 500 1-ml ampoules of reagent to dispose? Do you need to waste (no pun intended) three hours opening each one and emptying it into a one quart bottle? No! Save some time and put those ampoules directly into a bottle, box or even a Ziploc bag. Label it immediately and bring it to the hazardous waste room during the normal drop-off time. Done! Not only does this save time, but it minimizes the hazardous materials handling and prevents hazardous side reactions of degraded or incompatible reagents.

For more information on chemical incompatibilities, research material safety data sheets (MSDS), the National Research Council's *Prudent Practices In The Laboratory*, the *Rapid Guide to Chemical Incompatibilities*, or visit the Laboratory Safety Manual (<http://web.princeton.edu/sites/ehs/labsafetymanual/sec7a.htm#storage>) or this helpful chart at <http://www.c-f-c.com/charts/chemchart.htm>.

Do you have any questions or ideas about how to manage your waste safely and effectively? Contact Jim Boehlert at 8-7882 or Boehlert@princeton.edu to get and give information and ideas for efficient waste collection.

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