

Laboratory Safety Guidelines: 40 Steps to a Safer Laboratory

"Laboratory Safety Guidelines" were written while I worked for the Dow Chemical Company in an attempt to share with schools, colleges, and universities what I was learning about lab safety.

In 1976, Dow sent copies to 2,000 colleges and university chemistry departments and received requests for 250,000 reprints!

In 1986, I assisted Dow with a revision of the guidelines. Dow sent this version to 10,000 high school chemistry teachers. Since then, over two million copies have been distributed and reprinted in various forms.

Most recently, I revised the guidelines in 1997 for Fisher Scientific to make a "Laboratory Safety Yardstick... How does your lab safety program measure up?" Five thousand copies were printed in the first edition.

The Laboratory Safety Workshop offers these suggestions for improving laboratory safety because we believe that having an understanding of inherent hazards and learning how to be safe should be an integral and important part of science education, work, and life.

Steps Requiring Minimal Expense

1. Have a written health, safety and environmental affairs (HS&E) policy statement.
2. Organize a departmental HS&E committee of employees, management, faculty, staff and students which will meet regularly to discuss HS&E issues.
3. Develop an HS&E orientation for all new employees and students.
4. Encourage employees and students to care about their health and safety and that of others.
5. Involve every employee and student in some aspect of the safety program and give each specific responsibilities.
6. Provide incentives to employees and students for safety performance.
7. Require all employees to read the appropriate safety manual. Require students to read the institution's laboratory safety rules. Have both groups sign a statement that they have done so, understand the contents, and agree to follow the procedures and practices. Keep these statements on file in the department office.
8. Conduct periodic, unannounced laboratory inspections to identify and correct hazardous conditions and unsafe practices. Involve students and employees in simulated OSHA inspections.
9. Make learning how to be safe an integral and important part of science education, your work, and your life.
10. Schedule regular departmental safety meetings for all students and employees to discuss the results of inspections and aspects of laboratory safety.
11. Require every prelab/pre-experiment discussion to include consideration of the health and safety aspects.
12. Forbid working alone in any laboratory and working without prior knowledge of a staff member.
13. Don't allow experiments to run unattended unless they are failsafe.
14. When conducting experiments with hazards or potential hazards, ask yourself these questions:
 - What are the hazards?
 - What are the worst possible things that could go wrong?
 - How will I deal with them?
 - What are the prudent practices, protective facilities and equipment necessary to minimize the risk of exposure to the hazards?
15. Require that all accidents (incidents) be reported, evaluated by the departmental safety committee, and discussed at departmental safety meetings.
16. Extend the safety program beyond the laboratory to the automobile and the home.

17. Allow only minimum amounts of flammable liquids in each laboratory.
18. Forbid smoking, eating and drinking in the laboratory.
19. Do not allow food to be stored in chemical refrigerators.
20. Develop plans and conduct drills for dealing with emergencies such as fire, explosion, poisoning, chemical spill or vapor release, electric shock, bleeding and personal contamination.
21. Display the phone numbers of the fire department, police department, and local ambulance either on or immediately next to every phone.
22. Store acids and bases separately. Store fuels and oxidizers separately.
23. Maintain a chemical inventory to avoid purchasing unnecessary quantities of chemicals.
24. Use warning signs to designate particular hazards.
25. Require good housekeeping practices in all work areas.
26. Develop specific work practices for individual experiments, such as those that should be conducted only in a ventilated hood or involve particularly hazardous chemicals. When possible most hazardous experiments should be done in a hood.

Steps Requiring Moderate Expense

27. Allocate a portion of the departmental budget to safety.
28. Require the use of appropriate eye protection at all times -- in a laboratories and areas where chemicals are transported.
29. Provide adequate supplies of personal protective equipment -- safety glasses, goggles, face shields, gloves, lab coats, and bench top shields.
30. Provide fire extinguishers, safety showers, eye wash fountains, first aid kits, fire blankets and fume hoods in each laboratory and test or check monthly.
31. Maintain a centrally located departmental safety library:
 - "Safety in Academic Chemistry Laboratories" American Chemical Society, 1155 16th St., N.W., Washington, DC 20036
 - "Fire Protection Guide on Hazardous Materials" National Fire Protection Association, Batterymarch Park, Quincy, MA 02269
 - "Manual of Safety and Health Hazards in the School Science Laboratory"
 - "Safety in the School Science Laboratory"
 - "School Science Laboratories: A guide to some Hazardous Substances" Council of State Science Supervisors, Route 2, Box 637, Lancaster VA 22503
 - "Handbook of Laboratory Safety", 4th edition, CRC Press, 2000 Corporate Boulevard, N.W., Boca Raton, FL 33431
 - "Prudent Practices in the Laboratory: Handling and Disposal of Hazardous Chemicals", 2nd Edition, 1995
 - "Biosafety in the Laboratory", National Academy Press, 2101 Constitution Avenue, N.W., Washington, DC 20418
 - "Safety in School Science Labs", Clair Wood, 1994, Kaufman & Associates, 192 Worcester Road, Natick, MA 01760
 - "The Laboratory Safety Pocket Guide", 1996, Genium Publisher, 1 Genium Plaza, Schenectady, NY
 - "Learning By Accident", volume 1, 1997, The Laboratory Safety Workshop, Natick, MA 01760
(All of these books are available from The Laboratory Safety Workshop.)
32. Provide guards on all vacuum pumps and secure all compressed gas cylinders.
33. Provide an appropriate supply of first aid equipment and instruction on its proper use.
34. Remove all electrical connections from inside chemical refrigerators and require magnetic closures.

35. Require grounded plugs on all electrical equipment and install ground fault interupters (GFI's) where appropriate.
 36. Label all chemicals to show the name of the material, the nature and degree of hazard, the appropriate precautions, and the name of the person responsible for the container.
 37. Develop a program for dating stored chemicals and for recertifying or discarding them after predetermined maximum periods of storage.
 38. Develop a system for the legal, safe and ecologically acceptable disposal of chemical wastes.
 39. Provide fireproof cabinets for storage of flammable chemicals.
 40. Provide secure, adequately spaced, well ventilated storage of chemicals.
- The Laboratory Safety Guidelines are available as a [2'x3' poster](#) and in an [expanded version](#) which discusses each of the 40 suggestions.*

The Laboratory Safety Institute

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