

SAFETY AUDIT/ INSPECTION MANUAL



**A Publication of the American Chemical Society
Committee on Chemical Safety**

Copyright © 2000
Washington, DC
All rights reserved.

PREFACE

Audits and inspections play ever-increasing roles in our workplaces. The ACS Joint Board Council Committee for Chemical Safety produced this manual in response to numerous requests. In addition to being available in print, this manual is the first to be published by the committee on the Web site of the American Chemical Society.

The Committee for Chemical Safety is pleased to introduce this manual and thanks the subcommittee that produced it. The subcommittee includes the chair, Stephen Sichak, Sr., and members Ann M. Norberg, Russell W. Phifer, Diane G. Schmidt, and Eileen B. Segal.

We welcome all comments. Please direct them to the Committee for Chemical Safety, American Chemical Society, 1155 Sixteenth Street, NW, Washington, DC 20036.

Henry C. Ramsey
Chair, ACS Committee on Chemical Safety
1998-1999

DISCLAIMER

The materials contained in this manual have been compiled from sources believed to be reliable and to represent the best guidelines and procedures for conducting a thorough safety audit and inspection in the workplace. This manual is intended to serve only as a starting point for managers and employees in their task of establishing good safety practices. The manual does not purport to specify any minimal legal standards or to represent any specific policy of the American Chemical Society. No warranty, guarantee, or representation is made by the American Chemical Society as to the accuracy or sufficiency of the information contained herein, and the Society assumes no responsibility in connection therewith. This manual is intended to provide workplace managers with basic guidelines for conducting safety inspections. Therefore, it cannot be assumed that all necessary checklists, guidelines, and precautionary measures are contained in this document and that other or additional information or safety measures may not be required or implemented. Users of this manual should consult pertinent local, state, and federal laws and legal counsel before initiating any safety audit or inspection program and be especially well informed about any compliance issues with respect to the handling of any hazardous chemical substances in laboratories.

TABLE OF CONTENTS

INTRODUCTION	vi
1. SAFETY AUDITS	1
1.1 ADMINISTRATIVE CONCEPTS	1
Assignment of Responsibility.....	2
Emergency Preparedness.....	2
Employee Awareness, Acceptance of Responsibility, and Participation.....	2
Identification, Control, and Monitoring of Potential Hazards.....	2
Management Leadership.....	4
Maintenance of Safe Working Conditions.....	4
Medical and First Aid Systems.....	5
Safety, Health, and Environmental Record Keeping and Statistics.....	5
Safety Organization and Administration.....	5
Safety Policy, Programs, and Activities.....	5
Safety Rules, Regulations, and Procedures.....	5
Safety Training and Education.....	6
1.2 PHYSICAL CONCEPTS	6
Compliance.....	6
Identification of Exposure.....	6
Safeguarding Exposures.....	7
Protection and Guarding.....	7
Safety Organization.....	7
Environmental Controls.....	8
1.3 PROTECTING YOUR AUDITS	9
2. SAFETY INSPECTIONS	10
Inspection Teams.....	10
Effective Safety Observation.....	11
Starting the Inspection.....	11
Inspection Team Obligations.....	12
Inspection Procedures.....	12

Technical Problems.....	12
Chemically Related Inspections.....	12
Specialized Inspections.....	13
Health Surveys	13
Overhead Inspections.....	13
Condemning Equipment.....	13
Taking Notes	14
Making the Report.....	14
Handling Recommendations.....	15

3. SAFETY INSPECTION CHECKLIST	16
Animal Handling and Biohazards.....	16
Building Conditions	17
Carcinogens	18
Compressed Gas Cylinders	19
Cryogenic Safety	20
Electrical	20
Emergency Evacuation and Equipment	22
Employer Posting.....	23
Environmental Protection.....	23
Fire Inspection/Fire Protection.....	24
Hand and Power Tools	26
Housekeeping	26
Laboratory Hazard Analysis	27
Ladders.....	29
Lasers	29
Lockout/Tagout Procedures.....	30
Machinery and Guarding	30
Personal Protective Equipment	31
Radiation Protection	32
Signs and Tags	33
Waste Accumulation.....	33
Working Environment.....	33
4. APPENDIX	35
Federal Laws and Regulations Affecting Laboratories.....	35

INTRODUCTION

What is a safety audit? What is a safety inspection? Although the words *audit* and *inspection* are frequently used interchangeably, they are *not* the same.

Broadly defined, an audit is a systematic review of operations and practices to ensure that relevant requirements are met. Traditionally, the term *audit* is associated with principles of accounting. Because of this, many people perceive a safety audit as an Internal Revenue Service (IRS) procedure or a financial accounting procedure. Indeed, the safety audit may apply similar methodologies used in financial audits to mitigate safety risks within any facility or operation. A sound business enterprise must check its safety practices as carefully as its accounting records. The debits of possible loss or injury situations should balance against the credits of adequate safeguards. Audits are not inspections. Audits evaluate all aspects of the program with special emphasis on the quality as well as the quantity of safety and health activities at every level. The basic goal of an audit is to verify that health and safety activities comply with institutional policies and federal, state, and local regulations.

The Committee on Chemical Safety is well aware of the possible negative perception of the word *audit*. Once you understand its meaning as used in this document, you may, at your discretion, replace it with alternatives. Examples of alternative terms include safety survey, safety consultation, safety assessment, field observation, field assessment, or operational survey. Throughout this manual, the concept of *environment, health, and safety* is intended, but for the sake of simplicity, *safety* is used. No matter what term(s) you use, you should assign significant importance to the assessment of safety practices in the workplace.

Inspection, on the other hand, is defined as that monitoring function conducted in an organization to locate and report existing and potential hazards that could cause accidents in the workplace. Legally, the Occupational Safety and Health Administration (OSHA) or the Environmental Protection Agency (EPA) conducts inspections. What we are discussing are *surveys*, not *inspections*. Safety surveys frequently reveal potential causes of accidents and, thus, provide an opportunity to take corrective action before an injury occurs. Surveys are conducted at the line or operating levels; audits, on the other hand, are a managerial or corporate activity. Safety surveys are effective ways of preventing accidents.

You should take corrective action as soon as possible to abate all hazards found during an inspection. If the hazard presents an imminent danger to employees, you must take corrective action immediately. If you must delay corrective action for nonimminent hazards, you should document the reason for the delay and the estimated date of correction. When the corrective action has been completed, you should document the action date.



1. SAFETY AUDITS

Safety audits are report cards on the success of safety and health programs, environmental programs, and process safety management. Like financial and IRS audits, safety audits are structured evaluations on performance and compliance. A safety audit is a structured, methodical assessment and evaluation of how workplace activities affect safety and health. It reveals how an organization is doing in maintaining a safe and healthy environment. Its goal is to ensure a safe and healthy workplace by striving to eliminate unsafe practices and hazards that lead to injuries and accidents.

An audit consists of two parts: gathering data about a program and evaluating the data. The audited program must comply with a variety of regulations and guidelines: federal environmental, safety, and health regulations; local and state requirements; and internal institutional performance requirements. Governmental controls may include laws that cover environmental management, right-to-know issues, or process safety management.

An audit should identify the strengths as well as the weaknesses of a program. It should reveal to management and the employees where and how they could and should make improvements. On-site audits require three main actions. First, arrange interviews with facility personnel who have key roles in developing or implementing safety management systems. Next, review documentation that defines safety system records or verifies completion of critical tasks. These tasks may include emergency preparedness; hazard identification, control, and monitoring; and safety education and training. Last, conduct field assessment of the facility or equipment. Here, the assessment might include verification of implementation of safety practices. For example, are only certified welders performing hot work (welding)? Does he or she have hot work permits?

Audit data, obtained by reviewing written records and procedures, interviewing personnel, and personal observation, are collected from both an administrative area and a management or operational area, which controls the physical environment. Audit of the administrative area includes a review of how well or how poorly management has implemented the program. Audit of the operational areas, whereby management controls the physical environment, includes assessing the surroundings and external conditions that influence the daily operation of the organization.

1.1 ADMINISTRATIVE CONCEPTS

In its broadest terms, an audit includes all or some of the administrative concepts described in this section. Some of these concepts are provided to establish a “Framework for Evaluating Safety.” The following information provides a framework for developing evaluation criteria. It should not be used as a checklist, which can be limiting.

Assignment of Responsibility

- Are department heads, supervisors, and staff assigned safety responsibilities as a policy or procedure, and is the policy communicated to all levels?
- Is there a clear line of responsibility?
- Who is responsible for coordinating the compliance program?
- What steps has the organization taken to comply with OSHA and other regulations?
- Is the safety staff competent and qualified?
- Is safety responsibility monitored?

Emergency Preparedness

- Does the employer have an emergency action plan? Is it tested by drills?
- Do personnel receive training on the proper way to report emergencies and summon help?
- Does the organization have an emergency response procedure, including backup systems for controlling spills and releases and evacuating personnel?
- Are procedures in place for reentry and cleanup?



EYE WASH

Employee Awareness, Acceptance of Responsibility, and Participation

- Is there active participation in a safety and health committee?
- Are the engineering and administrative controls effective?
- Is there an effective personal protective equipment program?
 - What type of equipment is used?
 - What is the rationale for use?
 - What are the maintenance procedures?
 - Is equipment available to and used by all employees?
 - Is mandated training performed?
- Is there safety publicity (newsletters, bulletins, etc.)?
- Discipline:
 - Are violators of safety rules disciplined?
 - Are supervisors setting a good example?
 - Is the safety and health performance effective?

Identification, Control, and Monitoring of Potential Hazards

- Is top management aware of all health and physical safety risks in the workplace?
- Hazardous substance control program:
 - Is one in use?
 - Are all substances identified?
 - Are employees aware of the risks?
- Are procedures in place to inform and educate employees about all health and physical safety risks? Does this procedure include informing employees about the potential hazards of nonroutine tasks and educating contract employees about potential hazards on-site? Do employees receive testing to ensure that they understand what they learned?

- Does the employer provide written information and training procedures?
- Does the employer document information and training session outcomes? Do employees sign attendance sheets and state in writing that they understood the material presented? Does it document who was trained, when they were trained, and whether they successfully completed the training? What procedure is in place to coordinate documentation of training materials? Are the training logs entered into a database? How are the original sign-in sheets stored? Are they easy to retrieve?
- Is a knowledgeable person assigned responsibility to determine the presence and use of hazardous materials?
- Is a list of all hazardous substances available?
- Have suppliers provided material safety data sheets (MSDSs) covering hazards and precautions for all chemicals?
- Are these MSDSs available to all employees on request?
- Is every nonexempt container of hazardous chemicals in the workplace appropriately labeled?
 - The hazard communication standard generally applies only to those chemicals (including elements, compounds, and mixtures) to which employees are exposed in the workplace under normal conditions or in a foreseeable emergency.
 - Hazardous wastes regulated by the U.S. Environmental Protection Agency (EPA), chemicals produced and used only in a laboratory, and items for personal consumption are exempt.
 - Piping and containers into which an employee transfers hazardous chemicals for use during that workshift are exempt from the labeling requirement.
- How does the safety coordinator find out when a new chemical is introduced into the workplace? How does the safety coordinator ensure that unused chemicals are disposed? For every known health hazard, does a definite control plan exist that covers
 - periodic monitoring of the hazard?
 - continued maintenance and monitoring of employee exposure records?
 - periodic physical examinations for employees in exposure areas?

Is strict enforcement of rules governing provision, care, and use of personal protective equipment followed in all cases?

- Is a list of symptoms and antidotes for toxic substances circulated and posted where necessary?
- Are known health exposures studied to eliminate or reduce exposures through process or design changes or engineering controls? How are such studies conducted? How are the results communicated?
- Do employees understand and comply with OSHA standards or safe practices recommended by manufacturers or other agencies?
- Have certified industrial hygienists evaluated the operations?
- What actions are taken regarding recommendations made by industrial hygienists? What actions still remain to be taken?

- Are safety rules and approved signs relating to health hazards posted in areas where hazards are present?
- What is the procedure to confirm that supervisors and employees exposed to potential health and safety hazards understand the nature of the risks, the preventive measures, and related safety rules?
- What evidence is there in the workplace that the hazards are known and adequate controls are in place and working?
- Are appropriate safety devices available? Is personal protective equipment (PPE) provided and used properly?
- Is PPE in conformance with appropriate standards such as NIOSH (National Institute for Occupational Safety and Health) or ANSI (American National Standards Institute)?

Management Leadership

Fundamentally, all safety work must proceed from the proper motivation of management. The effectiveness of any program increases or diminishes according to the degree of support and encouragement that management displays.

- Is there a written safety policy/program?
- Is employee participation solicited?
- Is management setting a good safety example?
- Is off-the-job safety a management concern?
- Is there a systematic review of safety performance?
- Do safety issues flow down from management or up to management?
- To whom in top management does the chief safety coordinator report?
- Are adequate funds made available to
 - support the safety program?
 - correct unsafe conditions?
 - support training and other educational activities?
- Are new employees indoctrinated with safety and health training by management's edict? Are they then tested to ascertain that the safety and health training is inculcated?

Maintenance of Safe Working Conditions

- Is there proper maintenance of good housekeeping conditions in the workplace? Are equipment and materials organized and adequate? Are work areas and the exterior of the plant clean?
- Workplace inspection program:
 - What is the frequency of inspections?
 - Who performs them?
 - Is a record maintained?
 - Is there a preventive maintenance program?
- Are the inspection team personnel trained?
- Are the engineering and/or administrative control programs routinely evaluated?



Medical and First Aid Systems

- Does the employer have an emergency action plan?
- Does the employer have first aid and medical treatment available for emergency response?
- Are adequate first aid and emergency facilities available?
- How is adequacy determined?
- Does the employer have access to a consulting physician?
- Is the consulting physician certified in occupational health practices?
- Is the program under the supervision of a physician certified in occupational medicine? Does the program regularly review and monitor illnesses?
- Is there a program that regularly reviews and monitors medical exam records? Is the program under the supervision of a certified physician?

Safety, Health, and Environmental Record Keeping and Statistics

- Is the record keeping responsibility assigned and implemented?
- Is the OSHA 200 log up-to-date?
- Are facilities and equipment inspection records kept?
- Are environmental monitoring records (for noise, dust, heat, radiation, etc.) kept?
- Are training records kept?
- Are medical records complete?
- Are accidents and occupational illnesses evaluated? Are policies and procedures changed as necessary?

Safety Organization and Administration

- Is there a clear line of responsibility?
- Is there a budget for time and expenses for a safety program?
- Is the safety staff competent?
- Is safety responsibility being monitored?

Safety Policy, Program, and Activities

- Has the safety policy been issued and communicated?
- Is there a safety committee? How is membership determined? How frequently do members meet, and what are the topics of the meetings?
- Are the minutes of the meetings recorded?
- What type of safety program does the facility have? Who is in charge of the program?
- Are adequate funds made available to support the safety program, correct unsafe conditions, and support training and other educational activities?

Safety Rules, Regulations, and Procedures

- Who is responsible for knowledge and maintenance of an up-to-date file on applicable federal, state, and local laws, regulations, and ordinances?
- Are these laws, regulations, and ordinances communicated to all key personnel?
- Who ensures compliance?

- Are institutional and departmental safety rules issued and communicated to all employees?
- How is it ensured that these safety rules will be followed?
- Are types of personal protective equipment and the rationale for use communicated to all employees? Who maintains personal protective equipment? How is it ensured that the maintenance is performed in a timely manner?

Safety Training and Education

- Employee safety education and job safety training:
 - What is the frequency of the meetings?
 - What topics are covered?
 - Which types of jobs require safety training?
- Supervisor safety training:
 - What types of training are required?
 - What subjects need to be covered?
 - What is the frequency of the meetings?
 - Is attendance mandatory and/or recorded?

1.2 PHYSICAL CONCEPTS

Maintenance is an essential element of safe working conditions. A safe and healthy place to work is the foundation on which every successful safety program is built. To provide such a workplace requires control of the physical environment—the surroundings and external conditions that influence the daily operation of the establishment, including the possibility of injury to employees. Control of the physical environment is management’s responsibility. The organization and administration of every safety program require that management makes a complete and competent effort to provide a safe workplace.

The importance of a safe physical environment cannot be overemphasized. Physical concepts to be considered include the topics described in the following section.

Compliance

- Is there compliance with federal, state, and local laws, regulations, and ordinances?
- Who has been assigned responsibility for coordinating the compliance program?
- What steps has the company taken to comply with OSHA and other regulations?
- Have priorities been established regarding corrections of known OSHA and other violations?
- Is the safety program thoroughly documented, and will it be useful to help demonstrate a positive safety attitude?

Identification of Exposures

- Are known health exposures studied to eliminate or reduce them in the future through process or design changes or engineering controls?

- How are such studies conducted, and how are the results communicated?
- Are all containers of hazardous materials properly labeled?
- Are there knowledge of and compliance with OSHA standards or safe practices recommended by manufacturers or other agencies?

Safeguarding Exposures

- Is there evidence in the workplace that hazards are known and adequate controls are being implemented?
- Are appropriate safety devices and PPE provided and used properly?
- Is PPE in conformance with appropriate standards such as NIOSH and ANSI?
- Are defective tools, equipment, and/or materials recalled, repaired and/or replaced?

Protection and Guarding

- Are all accessible belt and chain drives well guarded to prevent personal contact?
- Are all machines, fans, and foot switches guarded as required?
- Are all accessible hot surfaces guarded to prevent thermal burns?
- Are the guards in proper position on the bench grinder, and is the tool rest clearance properly set?
- Are guards in place on paper cutters?
- Are pump couplings guarded to prevent splashes?
- Are vacuum desiccators and other glass apparatus being used under a vacuum properly guarded, coated, or taped?
- Are all areas where special PPE must be worn (goggles, face shields, special footwear, hard hats, respirators, gloves, and body protection) clearly marked?
- Is the special PPE in good condition (sanitized, etc.) and readily available?
- Where compressed air is supplied, do all hoses and fittings comply with the service requirements, and is the pressure properly reduced at the point of use?



Safety Organization

- Are all safety activities coordinated by one individual? If not, how are safety activities coordinated?
- Does the safety coordinator report directly to top management?
- Does the coordinator have direct access to all levels of operating management?
- Does the coordinator provide progress, accident analyses, status of recommendations, and other reports to management regularly?
- Does the coordinator make specific recommendations for management's action?
- What are the time commitments of the coordinator in relation to the following items:

- What percentage of time is spent on safety?
 - What percentage of time is spent on other duties?
 - Are accident statistics posted for review by all employees?
 - Is information on specific accidents, their causes and corrective actions, ever publicized?
 - Are any awards given for good accident records, and are such awards given wide publicity?
- Has management established a safety suggestion system? Are employees encouraged to make suggestions or complaints on safety matters? Are they rewarded for making such suggestions?

Environmental Controls

- Is the workplace free of odors that may indicate unhealthy conditions?
- Is there adequate control of noise level while work is under way?
- Is the workplace reasonably clean and free of debris, spilled materials, dirt, etc.?
- Is lighting and illumination satisfactory in all areas?
- Are rules pertaining to food and drink in the workplace being followed?
- Are guidelines for restraining long hair when operating a machine posted and followed?
- Are guidelines regulating loose sleeves and dangling jewelry while operating a machine followed?
- Are “no smoking” rules followed?
- Are there at least two persons present in all work areas where workers are not permitted to work alone?
- If employees climb up off the floor, are they using an approved ladder or portable platform?
- Are razor blades, knives, and other sharp tools of the proper type for their intended use? Are they used and stored in accordance with suitable guidelines?
- Are all tools in good repair?
- Are all required caution and warning signs posted?
- Are wastes deposited in the proper containers?



1.3 PROTECTING YOUR AUDITS

- Is an audit a protected internal document?
- How much information is available to the public?
- What does the public have a right to know?
- What does the government have a right to know?
- Does the government have the right to view audit reports?
- Can regulatory agencies use information found in these reports?

Currently, both the U.S. Department of Justice and the EPA have policies stating that they will not review audit reports during every investigation but still reserve the right to do so. OSHA, on the other hand, has taken the position that it may use voluntary audit results obtained during an inspection of a facility. It may use the results not only to determine if violations have occurred but as a potential basis for alleging that violations were committed willfully. This position is especially true in those cases in which it is evident that the employer was aware of hazards but did nothing to resolve the exposure.



2. SAFETY INSPECTIONS

Safety inspections are a basic tool for establishing and maintaining safe conditions and discovering unsafe practices in the workplace. Systematic inspections are practical ways to identify and correct unsafe equipment, conditions, processes, and work practices. If unsafe conditions and practices are found to exist, prompt corrective actions are initiated. They are an excellent way to prevent accidents from occurring and to safeguard employees. An additional benefit occurring from inspections is that they give employees an opportunity to point out deficiencies in their area that may otherwise go unnoticed and uncorrected. Safety inspections are conducted primarily not to find out how many things are wrong, but rather, to determine if things are satisfactory. Their secondary purpose is to discover conditions that, when corrected, will bring the facility up to accepted and approved standards and/or regulations. As a consequence, the inspected facilities should become safer and more healthful places to work.

First-line supervisors, individual employees, maintenance employees, as well as inspection teams, all function as workplace inspectors. The first-line supervisor is one of the most important inspectors in the entire organization. He or she is more important to safety than is the safety inspection team. The supervisor is the key person because he or she is in constant contact with employees and is thoroughly familiar with all the safety risks that may develop in the department. Supervisors should be on the alert at all times to discover and correct unsafe conditions and practices. Employees, if they are on the alert, also can be of great value in preventing accidents. Employees should be encouraged to inspect the workplace every day and to report any hazardous conditions to their supervisor. Employees who are safety conscious will look continuously for conditions that may cause injury to themselves or others.

Maintenance employees, in particular, should be safety conscious. When maintenance employees are working in various departments and observe safety risks that should be corrected, they can avert hazards by reporting risks to the supervisor of the department. Management should alert its employees that maintenance people are a great help in locating and correcting hazardous conditions.

Inspection Teams

Safety inspection teams bring a fresh view to an old familiar scene and usually catch details overlooked by people too close to the scene. It's essential, however, for inspection teams to understand that their job really is a helpful and constructive one. Many unsafe and unhealthy conditions are transparent because they've always been a part of the scene. They are hardly noticeable.

Ideally, a safety professional is on the inspection team to spearhead the inspection. This person has a key role during safety inspections because he or

she is responsible for coordinating the inspection. Additionally, the safety professional has an obligation to teach by first-hand contact with the use of on-the-spot examples. Safety professionals, of course, should know thoroughly all safety and health rules and policies. They should also be familiar with OSHA standards, state laws and regulations, and municipal ordinances affecting the safety and health of workers. The fire protection requirements that are applicable should also be known. Frequently, codes, federal and state laws, and regulations set up minimum requirements only. It may be necessary to exceed those requirements to comply with organizational policy and perhaps even to secure maximum safety.

A fire protection representative and an industrial hygienist are others who should be part of the inspection team. Volunteers, of course, are there to learn more about accident prevention and safeguards that make the workplace safer and more healthful for all employees.

Effective Safety Observation

There are several factors necessary for effective safety observation. The inspection team must:

- **Be selective.** An inspection team might look over the department first for safety and second for improvement of operations.
- **Know what to look for.** The more a team knows about a job and a worker's responsibilities, the more effectively the team members can observe.
- **Practice observing.** The more often a person looks with the conscious intention to observe, the more they will see at each fresh look. Like all skills, observation improves with practice.
- **Keep an open mind.** One way to increase open-mindedness is not to pre-judge facts. Team inspectors must accept facts, no matter what conclusion they may find. Each inspector must keep an open mind at least until all the facts are in.
- **Do not be satisfied with first impressions.** A clean shop or a careful routine may still contain hidden hazards.
- **Guard against habit and familiarity.** Asking the questions what, where, who, how, when, and (especially) why often will help uncover the real meaning of the situation.
- **Record observations systematically.** Date all notes. Include space for comments on actions taken and on results of the actions taken.
- **Use a checklist.** A systematic check for litter, obstructions, handling of flammables, condition of fire-fighting equipment, and so on, can help uncover tangible problems to correct. But never rely exclusively on a checklist!



Starting the Inspection

There are three basic steps for conducting an inspection:

1. Contact the department head and solicit his or her help.
2. Observe all conditions for compliance with established standards (use checklist).
3. Observe all operations for any unsafe acts or violations of safety rules.

Step 1. Before an inspection is started in any department, the inspection team leader should first contact the person responsible for the safety of workers and for correcting whatever unsafe conditions exist. It is good practice, therefore, for the designated representative to accompany the inspection team while inspecting his or her department.

Steps 2 and 3. Inspections should be systematic and thorough. No location that may contain a hazard should be overlooked.

Inspection Team Obligations

Inspection team members should wear the protective equipment required in the areas they enter. Hard hats, safety glasses or goggles, and safety shoes are examples of protective equipment that may be needed. It is essential that inspection team members practice what they preach.

Under no circumstances should the inspection team or its members interfere with the work of employees or with the condition of the department, except in the case of an immediate threat to life or limb.

Inspection Procedures

Inspection procedures vary considerably. The group that makes inspections should give equal consideration to accident, fire, and environmental health exposures; storage of incompatibles; explosives; and other hazard situations.

Cut paperwork for the inspection team to a minimum. Checklists are useful for helping the inspection team cover details. Because checklists have limited scopes, do not solely rely on them in general inspections. Refer to Section 3, Safety Inspection Checklist, for a detailed discussion on areas to include.

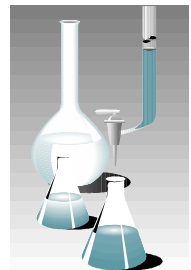
Technical Problems

The inspection team should not attempt to handle technical problems that are best analyzed by trained observers or special testing methods. It should, however, be able to recognize the need for expert assistance when the possibility of danger exists, such as exposure to dusts, fumes, gases, vapors, or noise, which calls for scientific testing methods to measure the hazards and determine remedies.

Chemically Related Inspections

When chemicals are used, it is important that the handling measures up to exact standards. Otherwise, they may cause fires or other accidents. The safety inspection team should work in close cooperation with the chemist to ensure that unsafe conditions generated by improperly stored chemicals do not exist.

Also, where toxic and corrosive substances are present, such as dusts, gases, vapors, and liquids, the safety professional or inspection team members should take special training. They must ensure that they are familiar with the hazardous properties of these substances and with the methods of control. For such problems, consult a chemist, if needed. Ensure that all MSDSs are readily available and understood.



Specialized Inspections

Recognize that a person qualified for general types of inspection work may not be qualified to make inspections of a special type. For example, pressure equipment (e.g., boilers, autoclaves, digesters, and air receivers) and materials-handling equipment (e.g., cranes, hoists, elevators, chains, and slings), often are among the most hazardous pieces of equipment used in industry. The inspection and testing of such equipment requires engineering knowledge and training. In such cases, at least two members of the inspection team should be competent to understand the hidden physical risks involved and to pass judgment on the equipment.

Health Surveys

Wherever there is a suspected health hazard, conduct a special inspection to determine the extent of the risk and the precautions or mechanical safeguarding needed to provide and maintain healthy conditions. Follow up to these inspections usually requires air sampling for the presence of toxic fumes, gases, and dusts, testing of materials for toxic properties, or testing of ventilation and exhaust systems for proper operation.

Overhead Inspections

Special inspections for overhead hazards are very important in the control of accident causes. Hazardous conditions often exist because of loose objects that may fall from building structures, cranes, roofs, and other overhead locations.

Overhead inspections frequently disclose the need for repairs to skylights, windows, cranes, roofs, and other installations that affect the safety not only of employees but also of the physical plant itself. Inspections are necessary to determine that all reasonable safeguards are in place and that safe practices are observed.

Low piping lines, especially in basement areas, may require labeling on other signage to advise personnel of these hazards.



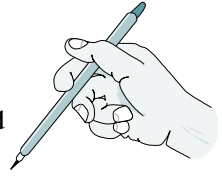
Condemning Equipment

Establish a practical system for taking certain materials and equipment out of service because of unsafe conditions. Use special danger tags to prevent the use of equipment or materials that have become unsafe.

However, use such systems only under the strictest supervision. When using danger tags, always obtain the signatures of those persons who are authorized to condemn equipment. Only persons who place tags can remove tags, and only when they are satisfied that the hazardous condition is eliminated. Do not place any equipment or materials out of service without notifying the person in authority in the affected department. A shutdown to avoid what seems like a possible hazard might interrupt work at great expense without actually affording any protection. Consequently, exercise authority to condemn equipment with a great deal of care.

Taking Notes

Take notes at the time you discover unsafe conditions and practices to form the basis of a complete report for later preparation. The inspection team secretary should not depend on memory to write notes after leaving the particular department or returning to the office.



It is important to secure all the information needed to describe the hazardous conditions found. Give the exact location in the department, other necessary data, and suggestions for correcting the condition to make a complete report.

The safety team should not record numerous trivial items. A long list should not ordinarily result from a regularly inspected facility. If follow-up safety work is neglected, however, expect a long list.

If the supervisor accompanies the inspection team, discuss each recommendation to inform the supervisor of all recommendations. Otherwise, the inspection team should contact the supervisor and go over the list of recommendations before leaving the department. In this manner, you can reach an agreement based on the relative importance of the recommendations.

Making the Report

Correct most unsafe conditions expeditiously. If the inspection team immediately communicates to the occupants the defects that need correction, you expedite remediation. Also, this helps to communicate that the inspection is done to eliminate hazards—not to “catch someone in the act.”

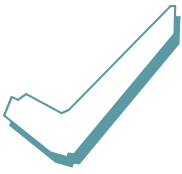
- A clearly written report must follow every inspection. Inspection reports are usually of two types:
 - **The Emergency Report** is made without delay whenever immediate corrective action is necessary.
 - **The Routine Report** covers those observations of unsatisfactory (nonemergency) conditions that require correction.
- The following descriptive details should identify and distinguish each report:
 - name of department or area inspected (boundaries or location, if needed)
 - date and time of the inspection
 - date of the report
 - names of individuals to whom the report was given

This information provides a record and reference. When the supervisor fully understands what is required, he or she can make corrections in a short time. Sometimes, the supervisor does not carry out his or her promise to correct the hazard; therefore, it is advisable to include all items in the written report.

- “Bad housekeeping” is often listed in a report, but it means nothing unless details are given. Instead of merely reporting “bad housekeeping,” list specific examples:
 - empty pallets left in the aisles
 - scrap from machines in piles on the floor around the machines
 - a ladder lying across empty stock boxes
 - slippery spots on the floor from oil leaks
- Generally, the head of the department or area where the inspection is made receive inspection reports. Also give copies of the reports to
 - safety management
 - to the person to whom the department head reports
 - the inspection team members

Handling Recommendations

List recommendations in the order in which they were discovered or grouped by the department according to the individual responsible for their compliance. Where possible, set a definite time limit for compliance for each recommendation, or group them according to their importance and mark them “urgent,” “important,” or “desirable.” All recommendations should be completed before the next general inspection. Recommendations approved by the management should become a part of the facility’s improvement or maintenance program.



3. SAFETY INSPECTION CHECKLIST

This checklist serves as a guide for safety inspections. Although not detailed enough to deal with each and every unsafe condition, it does address common concerns and minimum standards. The success of a well-planned inspection depends on knowing where to look and for what to look. This section discusses possible areas of concern that may be included in an inspection.

Animal Handling and Biohazards

- In animal-handling facilities, are the required personal hygiene and decontamination procedures followed?
- Do the records show that personnel are immunized and tested as required?
- Are all required items of personal protective equipment available, including sterile gowns, suitable gloves, scrub suits, surgical masks, caps, and capes?
- If animal facilities include restricted areas, are these areas well marked and are personnel complying with the restrictions?
- In biohazard areas, are all entrances properly posted, and are entry restrictions followed?
- Is the biohazard immunization program implemented as required?
- Are service personnel properly protected and instructed concerning biohazards?
- Are special rules on food, smoking materials, protective clothing, and decontamination followed?
- Are personnel instructed on the necessity to report immediately any release or event that might cause exposure to biohazard agents?
- Are biological hazard tags used to signify the potential or actual presence of a biohazard and to identify items contaminated with hazardous agents?
- Do workers recognize the biohazard symbol?
- Do workers understand the “universal precautions” concept?
- Do workers know that wastes need not be infectious to be considered “medical waste”? Are infectious wastes decontaminated before disposal?
- Are medical/biohazardous wastes double-contained in biohazard bags and disposed of within seven days?
- Do workers know how to decontaminate counters, spilled materials, equipment, etc.?
- Are sharps (Pasteur pipettes, needles, blades, etc.) stored in approved, labeled containers?
- Are all sharps disposed of in sharp containers? If the sharps are contaminated with hazardous chemicals and/or radioactive substances, are the containers properly labeled and the real contents declared?

Building Conditions

Inspect aisles, ceilings, driveways, exits, floors, platforms, ramps, stairs, walkways, walls, loading and shipping docks, and grounds.

- Are floors and platform gratings smooth, level, and free of bumps, nails, holes, splinters, and loose boards?
- Are there safeguards against slippery floors, especially where floors may become wet during work?
- Are working areas, passageways, storerooms, and service rooms in a clean, orderly, and sanitary condition?
- Are permanent aisles and passageways marked?
- Are walkways, aisles, and corridors wide enough for persons to move and to pass each other freely? Are they free of tripping hazards?
- Have obstructions such as hoses, cables, paper, furniture, extension cords, equipment, containers, books, boxes, and other items that restrict or block free movement in aisles, walkways, or on stairs been eliminated?
- Is lighting and illumination satisfactory in all areas, including stairs? Factors to be considered include type, intensity, controls, conditions, location, glare and shadow control, and emergency systems.
- Are portable lights or light fixtures mounted at heights below seven feet fitted with protective guards?
- Do all facilities' exits have adequate and reliable illumination?
- Are walkways and stairs free of valve handles, pipelines, or other protruding equipment that could present a bump hazard to personnel?
- Are platforms, balconies, and mezzanines fitted with proper guards? Are openings around process equipment guarded with rails and toe boards? Are openings around process equipment through which tools could drop sufficiently guarded?
- Are all ladders in good repair? Does an ongoing ladder inspection and maintenance program exist?
- Is the working space crowded and/or cluttered?
- Are cabinets and shelves securely fastened to the wall?
- Are storage shelves sturdy enough to support the items stored?
- Are the tops of cabinets free of stored items that might be heavy or sharp enough to cause injury if they fell?
- Are materials piled too high or insecurely?
- Are heavy objects confined to the lower shelves? Are glass containers stored off the floor or in protective outer containers?
- Is a minimum of 18 inches (46 centimeters) clearance provided between the top of stored materials and the elevation of the fire sprinkler heads?
- Are there burrs or sharp edges on furniture or equipment?
- Is there a chance of bumping into or striking an object?
- Are there open drawers or sharp and/or protruding objects?
- Is there an eyewash, a safety shower, and a fire extinguisher in the vicinity of each work area where required?
- Are the eyewash and safety showers tested regularly? Are dates on tags current?

- Loading and shipping docks get severe use from trucks and heavy traffic. Are bumpers present to prevent damage from tail ends of trucks?
- Carefully inspect the grounds of the facility, including parking lots, roadways, and sidewalks, for
 - breaks
 - cracks
 - holes
 - tripping and falling hazards
- Are all worksites, restrooms, and washrooms clean, orderly, and in a sanitary condition?
- Are all floor holes into which persons can accidentally walk guarded?
- Are ceiling panels, overhead light fixtures, and other overhead objects properly secured?
- Is equipment properly secured if is capable of causing a hazard when knocked over?
- Are steps on stairs and stairways designed or provided with a surface that renders them slip-resistant?
- Are handrails standard on all stairways that have four or more stairs?
- Are risers on stairs uniform from top to bottom?
- Do stairs angle no more than 50 and less than 30 degrees?
- Are spiral stairways prohibited except where it is not practical to provide a conventional stairway?
- Are permanent aisles and walkways appropriately marked?
- Are aisles and passageways kept clear and free of tripping hazards?
- Are wet surfaces covered with nonslip materials?

Carcinogens

- Do entrances to regulated areas have signs with the legend, “Cancer Suspect Agent”?
- Are containers of carcinogens prominently labeled “Cancer Suspect Agent”?
- Do employees who work in regulated areas receive training for working with carcinogens?
- Are all carcinogens labeled? Are wastes containing carcinogens labeled as such?
- Have supervisors assessed the feasibility of substituting less hazardous substances and/or reducing quantities used?
- Have supervisors recorded the names of workers potentially exposed to carcinogens?
- When carcinogens are handled, are all of the following considered?
 - use of “Designated Areas”
 - waste removal procedures
 - use of contaminated devices
 - decontamination procedures
- Do regulated areas have a negative pressure with respect to nonregulated areas?
- Are employees required to wash hands, face, forearms, and neck on every exit from a regulated area and to shower at the end of the day?
- Are employees provided with clean, full-body protective clothing before entering regulated areas?

- Do employees remove protective clothing when leaving regulated areas? At the end of the day, do they place the clothing in an impervious container for decontamination or disposal?
- Are all asbestos scrap, waste, debris and other products containing asbestos fibers appropriately labeled?
 - “Caution”
 - “Contains Asbestos Fibers”
 - “Avoid Creating Dust”
 - “Breathing Asbestos Dust May Cause Serious Bodily Harm”
- Are fume hoods designated for carcinogens use labeled?
- Are decontamination and clean-up procedures written for all carcinogens disposed as hazardous waste?
- Do workers know that many solvents, such as chloroform, benzene, formaldehyde, methylene chloride, and perchloroethylene, are on OSHA’s “Select Carcinogen” list?
- Is exposure to the following carcinogens or suspected carcinogens limited?

■ 2-acetylaminofluorene	■ 3,3'-dichlorobenzidine and its salts
■ acrylonitrile	■ 4-dimethylaminoazobenzene
■ 4-aminodiphenyl	■ ethylene oxide
■ asbestos	■ ethyleneimine
■ benzene	■ formaldehyde
■ benzidine	■ inorganic arsenic
■ bis(chloromethyl)ether	■ methyl chloromethyl ether
■ butadiene	■ methylene chloride
■ cadmium	■ methylene dianiline
■ coke oven emissions	■ α -naphthylamine
■ 1,2-dibromo-3-chloropropane	■ β -naphthylamine
■ nitrobiphenyl	■ β -propiolactone
■ nitrosodimethylamine	■ vinyl chloride

Compressed Gas Cylinders

- Are all gas cylinders supported according to requirements?
- Are all cylinders stored away from excessive heat?
- Are two-stage regulators used wherever required?
- Are all cylinders marked clearly to identify the type of gas contained?
- Are compressed gas cylinders stored in areas free of fire or obstruction hazards? Are the following avoided?

■ electric arcs	■ high-temperature lines
■ elevators	■ intense radiant heat
■ flame impingement	■ stairs
■ gangways	
- Are gas cylinders stored in a vertical, valve-end up position to prevent them from creating a hazard by tipping, falling, or rolling? Are they secured with chains or other devices fastened to a wall rack or other substantial structure?
- Do compressed gas cylinders have appropriate pressure relief devices?

- Are fuel gases in storage properly segregated (minimum separation of 20 feet) from oxygen or by a five-foot-high noncombustible partition having a fire resistance rating of at least one hour?
- Are regulators removed and valve-protection caps put in place before cylinders are moved?
- Are cylinder valves closed off before moving cylinders, when the cylinder is empty, and at the completion of each job? Before removing a regulator, is the valve closed and is gas released from the regulator?
- Are cylinders transported only with hand dollies and with the cylinders secured in a manner to prevent them from creating a hazard by tipping, falling, or rolling?

Cryogenic Safety

- Are cryogenic tanks and dewars labeled or marked to identify contents?
- Are MSDSs available for the materials used?
- Do personnel handling cryogenic materials wear appropriate clothing, loose fitting gloves, and eye/face protection?
- Are cold metal components/piping that could damage tissue either insulated or guarded to protect personnel?
- Are insulated dewars used to store and transport liquid nitrogen and other cryogenic materials protected by pressure relief devices?
- Are closed cryogenic gas systems provided with appropriate gauges, relief devices, and venting systems?
- Is each section of the system that can be valved off (including the fill line) protected by a pressure relief valve?
- Are all pressure relief devices thermally isolated from the cryogenic material by at least eight inches of stainless steel tubing?
- Are cryogenic systems located so that vent gases cannot accumulate to reduce the oxygen content in the air to 19.5 percent or less?

Electrical

- Every year, an average of 1,000 persons are fatally shocked by accidents involving less than 600 volts. Common electrical equipment includes

- | | |
|-----------------------------|--------------------|
| ■ breakers | ■ junctions |
| ■ circuits | ■ motors |
| ■ extensions | ■ special fixtures |
| ■ fuses | ■ switchboards |
| ■ ground fault interrupters | ■ switches |
| ■ grounding and bonding | ■ tools |
| ■ insulation | |

- Are all flexible power cords in good condition, for example, free of patches, frayed areas, and other failures of the outer covering? Are extension cords
 - equipped with proper cord plugs?
 - positioned so they do not create trip hazards?



- not used in place of permanent wiring?
 - equipped with grounding conductors?
- Is the area free of situations in which power cords are used contrary to the code? For example:
 - excessively long runs
 - passing through walls, windows, or doors
 - passing between levels
 - drop cords for light in storage areas
 - a substitute for permanent wiring
- Do electrical cords and wires exhibit damage?
- Is the practice of stringing cords or wiring on pipes, conduits, nails, or hooks or across ceiling avoided? Is the practice of running flexible cords and cables through holes in walls, ceilings, or floors avoided?
- Are daisy chains of extension cords and power strips avoided?
- Are power strips approved and labeled with the UL symbol?
- Is temporary wiring tagged to show the expiration date of the temporary period?
- Are all switches and breaker boxes marked clearly in accordance with established guidelines?
- Is the space adjacent to and below all sprinkler heads free of electrical wiring, electric lamps, and other electrical devices?
- Is the outer metal casing of each immersion bath properly grounded?
- Are there defective wiring, switches, and fuses?
- Is there ungrounded equipment?
- Electrical installations should conform to the National Electrical Code NFPA 70, ANSI C1:

All new electrical installations and all new utilizations installed after March 15, 1972, and all replacement, modifications, and repairs on equipment installed before this date should meet the National Electrical Code NFPA 70, ANSI C1.
- Is there defective or unfused electrical equipment?
- Where flammable liquids, gases, or combustible dusts are present and the National Electrical Code requires explosion-proof wiring, fixtures, and equipment, did a certified electrician make the installation, as required by the code?
- Where electrical bonding and grounding connections are present to prevent ignition by static discharge while handling flammable substances, are the connections well made? Are they tested electrically?
- Are metal measuring tapes, ropes, handlines, or similar devices with metallic thread woven into the fabric prohibited where they could come in contact with energized parts of equipment or circuit conductors?
- Is the use of metal ladders prohibited in areas where the ladder or the person using the ladder could come into contact with energized parts of equipment, fixtures, or circuit conductors?
- Are portable electrical tools and equipment grounded or of the double-insulated type?

- Are electrical appliances (vacuum cleaners, polishers, vending machines, etc.) grounded and/or used with a ground fault circuit interrupter (GFCI)?
- Are GFCIs for 120-volt 15- and 20-amp receptacles installed in wet or damp areas and in receptacles within six feet of sinks or fume hood sinks?
- Are electrical equipment, cords, and connectors maintained in good condition free from damaged insulation, loose connections, exposed terminals, or loose wires?
- Are all unused openings (including conduit knockouts) in electrical enclosures and fittings closed with appropriate covers, plugs, or plates?
- Are all electrical raceways and enclosures securely fastened in place?
- Are exposed terminals guarded adequately (e.g., Plexiglas shields, metal barriers, and locked enclosures)?
- Are receptacles and outlets in good condition (not loose or broken)?
- Are multiple plug adapters prohibited?
- Are electrical outlets of the approved 3-wire (grounded) type?
- Are electrical panels and breakers properly labeled? Are all disconnecting switches and circuit breakers labeled to indicate their use or equipment served?
- Is sufficient access and working space provided and maintained about all electrical equipment to permit ready and safe operations and maintenance? Is there a 30-inch-wide and 3-foot-deep clearance maintained around control switches, circuit breakers, and electrical panels?
- Are obsolete or disconnected plugs, wiring, or other installations properly removed?
- Are space heaters provided with a tip-over switch?
- Does adequate lighting exist for all workspaces about energized electrical equipment?
- Are cable trays properly grounded, not overfilled, and used only for their designated purpose, for example, not for water lines?
- Is all electrical equipment adequately protected from damage?
- Is all electrical equipment free from recognized hazards and used in accordance with its design and listing?
- If emergency lighting units are connected by cord and plug, are cords no more than 3 feet long?
- Are pilot lights installed on all electrical heaters that might be left energized by accident?
- Are combustible materials kept well clear of electrical resistance heaters?
- Are 3-wire cord plugs undamaged (no tape), with no removed grounding pins?
- Are warning signs posted where employees, other than qualified employees, might come into contact with live parts?
- Are adequate warning signs posted at all major access points to equipment?

Emergency Evacuation and Equipment

- Are there sufficient exits for leaving in case of fire or other emergency, with alternate escape means provided?

- Are exit doors unlocked and unobstructed, and is there an unobstructed path leading to a safe outside area in each case?
- Are exits and nonexits clearly marked?
- Do exits have a proper fire resistance rating? Are they protected by an approved self-closing fire door?
- Is emergency lighting provided in critical areas? Is it in working order?
- Is the established test schedule for emergency lights followed and documented?
- Is the building evacuation drill schedule followed and documented?
- Are personnel instructed on the proper way to report emergencies and summon help?
- Is the layout of work in each room set up to prevent personnel from being trapped by fire?
- If handicapped persons work at the site, is an adequate plan for emergency egress in use? Is it recorded?
- Is the plan implemented, and is training conducted?
- Are first aid kits available wherever required?
- Is the inspection program on first aid kits followed and documented?
- Are sufficient personnel trained in first aid wherever first aid kits are located?
- If a particular area requires other emergency equipment, record the equipment and area. Is it present, is it inspected, and are the personnel trained in its use?

Employer Posting

- Are hazard warning signs and tags in place where there are immediate dangers or potential hazards?
- Are caution and information signs in place where there are potential hazards or where special instructions are needed?
- Where employees are potentially exposed to any toxic substance or harmful physical agents, is appropriate information concerning employee access to medical and exposure records and MSDSs posted or otherwise readily available to affected employees?
- Is the OSHA poster “Safety and Health Protection on the Job” displayed in a prominent location?
- Are signs concerning exiting from buildings, room capabilities, floor loading, exposures to X-ray, microwave, or other harmful radiation or substances posted where appropriate?
- Are emergency telephone numbers posted and readily accessible in case of an emergency?
- Are building and trailer identification numbers posted on the exterior? Are room numbers readily visible?
- Does employer post OSHA 200 log every February as required?



Environmental Protection

The inspection team may identify situations that relate to environmental protection.

- Are hazardous chemicals dumped down laboratory sinks?
- Are drums, tanks, or containers of chemical or waste materials leaking?
- Does water in ditches or ponds have an unusual color, odor, or oil sheen?
- Are containers of chemicals properly stored? Are lab wastes of all kinds packaged and/or segregated in a manner consistent with established practice and with due regard for the service personnel?
- Are hazardous chemicals improperly stored?
- Is “Satellite Accumulation Area” practiced? If so, is the facility in compliance?
- Are there spills of petroleum products or other chemicals on the soil, paved areas, or rooftops?
- Are odors, smoke, or fumes coming from equipment, stacks, or buildings?
- Are PCB transformers leaking, or are combustible materials stored near transformers?
- Are wastes deposited in the proper containers?
- Are waste containers properly labeled?
- Is mercury emptied out of apparatuses that are not in active use, and is mercury handled with reasonable care to prevent spillage? If mercury-containing items such as thermometers or manometers are present, are they leaking?



Fire Inspection/Fire Protection

One of the greatest hazards is fire. Ensure that a rigid system is in place for inspection of all types of fire protective equipment, situations, and procedures:

- | | |
|----------------------------|-------------------------------------|
| ■ alarms | ■ fire doors |
| ■ assigned personnel | ■ separation of flammable materials |
| ■ dangerous operations | ■ smoking rules |
| ■ exits | ■ sprinklers |
| ■ explosion-proof fixtures | ■ waste disposal |
| ■ extinguishers | |
- Are fire detection equipment, smoke alarms, sprinkler systems, and lighted exit signs in good operating condition?
 - Are fire alarms and smoke/fire sensors adequate?
 - Is adequate fire-fighting equipment available? Is it of the proper size and type (A, B, C, or D)?
 - Are defective, unchecked fire extinguishers present? Are fire extinguishers inspected and serviced in accordance with an established schedule?
 - Are portable fire extinguishers kept fully charged, operable, and stored in a designated place at all times when not in use?
 - Are fire extinguishers identified and readily accessible along normal paths of travel?
 - Are extinguishers obstructed or obscured from view?
 - Are extinguishers installed on hangers or breakers, mounted correctly in cabinets or on shelves, and located the correct distance from the floor?
 - Do personnel in each work area receive fire extinguisher training and information annually?

- Are “No Smoking” signs posted in all areas where required?
- Are extinguishers in cabinets, wall recesses, or on shelves placed with the instructions facing outward?
- Are exit doorways, corridors, stairs, walkways, and aisles kept free of obstructions and combustible materials?
- Are sprinklers able to provide full coverage? Are they periodically inspected and tested?
- Are they functional and unobstructed? In other words, are the heads and pipes kept free of decorations, wire, and other materials?
- Are fire control sprinkler heads kept clean?
- Is proper clearance from extinguisher, hose racks, system valves, and hydrant or sprinkler connection maintained?
- Are work aisles maintained at a minimum 24-inch width and other aisles at a minimum 36-inch width?
- Are combustible scrap, debris, and waste materials (oily rags, etc.) stored in covered metal receptacles and removed from the worksite properly?
- Are Class 1A flammable liquids stored in metal containers with a maximum capacity of 1 gallon or in safety containers with a maximum capacity of 2 gallons?
- Are other flammable and combustible liquids stored in containers (metal or safety cans) with a maximum capacity of 5 gallons?
- Are amounts of flammable and combustible liquids greater than 10 gallons stored in an approved flammable liquid cabinet, storage room, or storage area?
- Are heat-producing appliances located at least 18 inches from combustible material?
- Are walls and ceilings properly maintained, with no holes?
- Are exit doors and gates maintained to open without a key, tool, or special effort?
- Are self-closing doors maintained in closed positions?
- Do exit signs contain the word “EXIT” in lettering at least 6 inches high, with the strokes of the lettering at least 3/4-inch wide? Do the signs and exits adequately illuminate?
- Are only approved containers and portable tanks used for storage of flammable and combustible materials?
- Are containers of materials and sizes specified by OSHA and the U.S. Department of Transportation?
- Is storage of flammables limited to use required for maintenance and operation? Are flammables kept in closed metal containers, storage cabinets, or an approved inside storage room?
- If flammable liquids must be kept cool, are they stored only in explosion-proof or cold rooms? Are they clearly labeled either “Explosion-proof” or “Nonexplosion-proof”?
- Is each safety can clearly labeled, does it have a flame arrestor screen, and does it close well enough to be leak-tight?

- Are the lids of all safety cans, including waste solvent cans, kept closed except while making transfers?
- Is the storage of flammable liquids in glass restricted to containers no larger than 1 liter? (If not, explain.)
- If 1-gallon glass containers are permitted in specific instances, are they being kept in fire-resistant storage cabinets and otherwise safeguarded as required?
- Do storage cabinets contain more than 60 gallons (240 liters) of flammable liquids or 120 gallons (480 liters) of combustible liquids?
- Are flammable liquids dispensed into containers where nozzle and container are electrically connected?
- Are flammable liquids transferred by means of air pressure?
- Are places for transferring combustible liquids provided with spill drainage and proper ventilation?
- Is adequate precaution taken to prevent ignition of flammable vapors?
- When flammable or combustible liquids are used, are provisions provided for safe disposal of leakage or spills?

Hand and Power Tools

Areas to be inspected include storage, use of tool cribs, repair, maintenance, testing, grounding, use, and handling.

- Are razor blades, knives, and other sharp tools of the proper type used and stored in accordance with the guidelines?
- Are all tools in good repair?
- Is there use of improper/defective tools?



Housekeeping

Check the general housekeeping throughout the facility to see if it is satisfactory.

- Are cords of coffeepots, hot plates, electric fans, etc., arranged safely to prevent electrical overload?
- Are papers and other light combustibles kept away from hot plates and coffeepots?
- Is there proper storage of flammable liquids?
- Are papers, books, and materials on cabinets stored neatly and safely?
- Is the retained computer paper neatly stored in metal cabinets or shelves?
- Are papers, books, and materials reachable from the ground? If not, is there a step stool provided?
- Are free-standing, open metal shelving units stable? Are they secured to the wall?
- Are glass-front bookcases banded together if stacked more than four units high?
- Are file cabinet drawers kept closed when not in use?
- Are bottles stored on shelves at or below eye level?
- Are shelves too crowded?
- Is shelving strong enough to bear the load safely?
- Are sufficient containers available for broken glass or other special trash?
- Are materials stored in a secure and orderly manner?
- Are guards in place on paper cutters?

Laboratory Hazard Analysis



- Are the required items of personal protective equipment available? For example:
 - body protection
 - eye protection
 - face protection
 - foot protection
 - hand and arm protection
 - head protection
- Is personal protective equipment easily accessible, maintained in a sanitary condition, ready for use, and stored in an orderly manner?
- Are “Eye Hazard Areas” marked?
- Are safety glasses available for visitors in eye hazard areas?
- Are hazardous areas adequately designated?
- Are employees prohibited from eating, drinking, or smoking in areas where potentially hazardous chemicals are handled?
- Are eye wash fountains and safety showers readily accessible, clearly marked, properly maintained, and inspected and tagged? Are identification signs present and clear?
- Are storage regulations and guidelines for unusually hazardous chemicals adhered to? For example:
 - biohazards
 - carcinogens
 - corrosives
 - limited retention items
 - narcotics
 - oxidizers
 - radioactive materials
 - toxic materials
- Are adequate labels present to prevent food or beverages from being stored in laboratory or consumer refrigerators or cabinets used for chemical storage?
- Is a complete and up-to-date chemical inventory available?
- If a potential health hazard in an operation involving chemicals occurs, is an industrial hygienist or environmental health specialist requested to evaluate the operation?
- Do employees notify their supervisor when they experience adverse health effects while handling chemicals?
- Are containers with flammable or toxic chemicals tightly closed and covered when not in use?
- Are materials that give off toxic, asphyxiant, suffocating, or anesthetic vapors stored in remote or isolated locations when not in use?
- Are solvents stored in and dispensed from approved containers? (Gravity flow containers are prohibited for inside use.)
- Are the contents of chemical piping systems clearly marked?
- Are all accessible hot surfaces guarded to prevent thermal burns?
- Is pressure or vacuum equipment properly shielded?
- Are all areas requiring special protective equipment, such as goggles, face shields, and special footwear, clearly marked?
- Are all piping systems labeled?
- Are waste chemicals properly stored and labeled?
- Are there improperly stored hazardous chemicals?
- Are materials stored in unlabeled containers?

- Is spilled mercury visible?
- Are incompatible chemicals stored separately?
- Are chemicals stored in approved containers with, if necessary, secondary containment?
- Are all chemical containers, such as bottles, vats, and storage tanks, labeled properly to identify their contents and hazard?
- Are all glass bottles holding liquids filled to leave about 10 percent space for expansion?
- Are hazardous substances handled in properly designed and exhausted hoods?
- Are fume hoods inspected and tested? Does the sash operate properly?
- Are required notices posted regarding hood air velocity, sash position, or restrictions on use of the hood?
- Is there sufficient unobstructed space (6 inches) to allow free movement of air into each hood and through the hood to the rear discharge slots?
- Are vacuum pumps set on drip pans to collect leaking oil?
- If hoods are equipped with pilot lights, flow indicators, or indicator/alarms, are these devices in working order?
- Has the performance of each local exhaust ventilation point (e.g., hood) been checked within the last 12 months?
- Has the performance of the biosafety/laminar flow cabinet where hazardous materials are handled been certified within the last 12 months?
- Is the lab under negative pressure relative to the corridor?
- Are solvents stored in and dispensed from approved containers?
- Are dates displayed on all chemicals where dating is required, and are all such items within the guideline retention period?
- Are diethyl ether cans dated when opened and are they kept no longer than six months after initial opening?
- Are MSDSs readily available for all chemicals present?
- Are piping systems and valves to lab benches in good repair?
- Are ion gauges guarded?
- Are ultraviolet hazard areas labeled?
- Is equipment that produces ultraviolet radiation shielded properly?
- Are the contents of drawers and cabinets reasonably neat and well organized, with attention given to preventing the breakage of glass?
- Is all glassware free of cracks, sharp edges, and other defects?
- Is there improper handling of glassware?
- Is potable water supplied for drinking, washing, etc.?
- Is PPE used?
- Is there a disregard of safety rules?
- Is there ignorance of safety rules?
- Are standard operating procedures established for responding to chemical spills?
- Are standard operating procedures followed when cleaning up chemical spills?
- Are supplies (spill kits) readily accessible? Do researchers know where they are?

- Where corrosive liquids are handled frequently in open containers or are drawn from storage vessels or pipelines, are adequate means available to neutralize or dispose of spills or overflows properly and safely?
- Are hazardous liquids such as solvents stored and dispensed where they cannot accidentally spill into drains (e.g., floor or sink drains)?

Ladders

- Are only approved ladders or step stools in use?
- Are all ladders in good condition, are joints between steps and side rails tight, and are all hardware and fittings securely attached and movable parts operating freely?
- Are the rungs of ladders uniformly spaced at 12 inches center to center?
- Do ladders more than 20 feet long have cages?

Lasers

- Are laser warning signs in place on the laser as well as at entrances to the controlled area? [29 CFR 1926.54(d) ANSI Z136.1-1986 Sec.4.7]
- Are only authorized personnel using the laser(s)?
- Have all of the personnel using the laser(s) had a baseline medical examination if required?
- Have all personnel who operate the laser(s) received the required training?
- Is there a written, up-to-date operating procedure supplied by the manufacturer available for each laser?
- Do all operators have a copy of the current operating procedures for each laser?
- Are appropriate protective eyewear available for each laser and for all personnel in the area (when required)?
- Is the protective eyewear marked with the optical density and the wavelength they will protect against?
- Is protective eyewear checked for pitting, crazing, and cracking?
- Are all necessary enclosures for the beam path in place?
- Are all of the nonfunctional specular reflecting surfaces near the path of the beam guarded or painted flat black?
- Are the doors to rooms containing Class IV lasers interlocked to prevent personnel from entering the room when the laser is in operation?
- Are all safety interlocks in place and functioning in accordance with operating procedures?
- Is the laser turned off when not in use?
- Is the ventilation sufficient to remove vaporized metals and/or decomposition products from laser-cutting or drilling installations?
- Are laser operations isolated from nonlaser operations?
- Are all electrical cables in good shape?
- Is the layout of auxiliary equipment such as meters and instruments made to minimize the hazards to the operators(s)?
- Are only mechanical or electronic means used to detect the beam during alignment procedures?

- Are the appropriate types of fire extinguishers readily available?
- Are combustible and flammable materials kept to a minimum in approved containers and placed so they will not be accidentally exposed to high-power laser beams?
- Are there additional hazards such as ultraviolet radiation, accidental firing or misfiring, ignition potentials, etc.?

Lockout/Tagout Procedures

- Does the department identify machinery or equipment that requires lockout/tagout procedures?
- Are approved locks and tags used?
- Is a qualified person(s) designated in the department to delegate lockout/tagout authority, and is training provided to authorized individuals?
- Are procedures in place for machinery or equipment that requires specific lockout/tagout procedures?
- Are lockout/tagout procedures in accordance with specified guidelines?
- Are lockout tags affixed properly to all defective equipment or otherwise secured against use?
- Is all machinery or equipment capable of movement required to be de-energized or disengaged and locked-out during cleaning, servicing, adjusting, or setting up operations, whenever required?
- Can the control circuit be disconnected and locked out?

Machinery and Guarding

- Is there a regular program of safety inspection of machinery and equipment?
- Is all mechanical equipment inspected before initial use?
- Are safeguards designed to prevent the operator from having any part of his or her body in the danger zone during the operating cycle?
- If machinery requiring restraint of long hair, ties, badges on chains, loose sleeves, etc., is present, are guidelines followed?
- Does machine guarding, such as barrier guards and two-hand tripping devices, protect employees in the machine area from hazards created by the point of operation, ongoing nip points, rotating parts, flying chips, and sparks?
- Are machine guards secured and arranged so that they do not create an accident hazard in themselves?
- Are power and operating control switches within easy reach of the operator while at the regular work position? (No need to reach over cutter to make adjustments.)
- Are there unguarded moving parts?
- Are all accessible belt and chain drives well guarded to prevent personal contact?
- Are all machines, fans, and foot switches guarded as required?
- Are guards in proper position on bench grinders? Is the tool rest clearance properly set?

- Are all emergency stop buttons colored red?
- Is the belt drive system totally enclosed to provide protection for the front, back, top, and sides?
- Are all pulleys, belts, gears, shafts, and moving parts that are within 7 feet of the floor or working level guarded?
- Are hand-fed/self-fed circular rip saws equipped with nonkickback features to oppose the tendency of the saw to throw the work back toward the operator?
- Is sufficient clearance provided around and between machines to allow for safe operations, set up and servicing, material handling, and waste removal?
- Are switches, including foot-operated switches, guarded or arranged to prevent accidental actuation by personnel or falling objects?
- Are splashguards mounted on machines that use coolant to prevent the coolant from reaching employees?
- Are machines designed for a fixed location securely anchored to prevent walking or moving?
- When special hand tools place and remove material, do they permit easy handling of material without the operator placing a hand in the danger zone?
- Are lockout/tagout procedures used for shutting down machinery before removing safeguards?
- Are all required caution and warning signs posted?
- When supplying compressed air, do all hoses and fittings comply with the service requirements, and is the pressure properly reduced at the point of use?
- Do employees avoid using compressed air at greater than 30 psi for cleaning purposes?
- When using compressed air for cleaning, do employees wear personal protective equipment and ensure that chip guarding is in place?
- Do employees wear required safety glasses when they air guns or nozzles are used?
- Is it strictly prohibited to direct compressed air toward a person?
- Are all areas requiring special protective equipment, such as goggles, face shields, and special footwear, clearly marked?

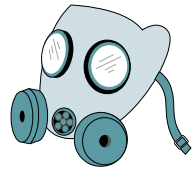
Personal Protective Equipment

- Are “Eye Hazard Areas” marked?
- Do eye and face protectors provide adequate protection against hazards?
- Are safety glasses available for visitors in eye hazard areas?
- Are approved safety glasses required to be worn at all times in areas where there is a risk of eye injury?
- Are employees who need corrective lenses (glasses or contacts) in working environments having harmful exposures required to wear only approved safety glasses or protective goggles or use other medically approved precautionary procedures?
- Is personal protective equipment accessible, maintained in a sanitary condition, ready for use, and stored in an orderly manner?



FOOT PROTECTION

- Are protective gloves, aprons, shields, or other means provided against cuts, corrosive liquids, and chemicals?
- Are hard hats provided and worn where danger of falling objects exists?
- Are hard hats inspected periodically for damage to the shell and suspension system?
- Is appropriate foot protection required where there is risk of foot injuries from hot, corrosive, or poisonous substances, falling objects, and crushing or penetrating actions?
- Are approved respirators provided where engineering controls are not available or feasible and their use required?
- Are respirators used in accordance with instructions? Is training provided?
- Are respirator users medically approved?
- Is a written operating procedure for selection and use of respirators provided?
- Are respirators selected on the basis of the hazard present?
- Is a respirator assigned to an individual for his or her exclusive use?
- Are respirators regularly cleaned and disinfected?
- Are respirators stored in a convenient, clean, and sanitary location?
- Are respirators stored properly in plastic ziplock storage bags without filters/cartridges attached to prevent contamination?
- Are standard procedures established for respirator use, including emergency and routine uses?
- Are employees assigned to tasks requiring respirators only when they are able to perform the work and properly operate the equipment?



Radiation Protection

- Have employees received appropriate radiation protection training? Have they demonstrated competence, and is the training documented?
- Is egress monitoring (such as hand and foot counters or portable survey instruments) used in radioisotope work areas?
- Are radioactive contamination surveys of radioisotope areas performed and documented?
- Are radioisotope work areas clearly posted and/or delineated?
- Are personal radiation exposure devices (film badges, dosimeters, etc.) worn in areas where they are required?
- Are radiation meters (including X-ray monitors and neutron detectors) installed where required?
- Is radioactive waste properly bagged, characterized, and tagged? Is liquid radioactive waste characterized and stored properly (e.g., not in plastic bottles)?
- Are radioactive waste containers properly identified?
- Are radioactive sources stored properly? Are they in approved lockers or cabinets?



- Are bioassay monitoring and/or access control procedures followed for casual visitors to radioisotope work areas?
- Are fail-safe interlocks at radiation-generating devices tested for proper operation?
- Are lab coats and other items that are taken from controlled areas to uncontrolled areas surveyed properly by users?
- Are all furniture and/or equipment items (including gas cylinders) going from controlled areas to reclamation (salvage) surveyed for radiation and tagged?

Signs and Tags

DANGER signs should be used only where immediate hazards exist.

CAUTION signs should be used to warn of potential hazards or unsafe practices.

SAFETY INSTRUCTION signs should be used where there is a need for general information and suggestions relative to safety measures.

Wording on signs must meet OSHA regulations.

Signs must be compliant:

- **DANGER signs** must be red, black, and white and meet ANSI Z53.1.
- **CAUTION signs** should have a yellow background and the panel must have black and yellow letters.
- **Radiation warning signs** must have a background that is yellow; the panel must be magenta with yellow letters; the symbol must be magenta; and background letters must be black.
- **Safety instruction signs and warning notices** must be white; the panel must be green with white letters; and background lettering must be black.



Waste Accumulation

- Is there secondary containment for all liquid hazardous wastes?
- Are “Hazardous Waste” labels completely filled out?
- Are waste containers compatible with the stored waste and readily visible?
- Are waste containers tightly covered/sealed?
- Are incompatible wastes stored separately from each other?
- Are halogenated waste solvents stored separately from other wastes?
- Are liquid flammable wastes stored in approved FLAMMABLE cans?
- Are “Satellite Accumulation Procedures” in place and compliant?

Working Environment

- Are all work areas, including passageways, storerooms, and service rooms, clean, orderly, and sanitary?
- Are floors of all work areas clean and dry to the extent possible?
- Are cleaning and sweeping done in a manner that minimizes air contamination and, to the extent possible, conducted outside of working hours?

- Are receptacles for solid or liquid waste easy to clean, maintained in sanitary condition, equipped with a tight-fitting cover, and free of leaks?
- Are all wastes removed without creating a nuisance or health menace and as often as necessary?
- Are work areas and other rooms constructed, equipped, and maintained to prevent the entrance or harborage of rodents, insects, and other vermin?
- Are receptacles for recycled paper of noncombustible construction?
- Is the area free of odors that may indicate an unhealthy condition?
- Is there adequate control of noise level while work is under way?
- Is the area reasonably clean and free of debris, spilled materials, dirt, etc.?
- If instruments or materials are present that generate or use radiation, is a leak survey schedule established, and do the survey results show the absence of leaks?
- Are rules pertaining to food, drink, and application of cosmetics in the laboratories followed?

4. APPENDIX

Federal Laws and Regulations Affecting Laboratories

Law/Regulation	Citation	Purpose	Comments
Occupational Safety and Health Act (OSHA)	29 USC 651 et seq.	Worker protection	
Occupational Exposure to Hazardous Chemicals in Laboratories (Laboratory Standard)	29 CFR 1910.1450	Laboratory worker protection from chemical use	
Hazard Communication Standard	29 CFR 1910.1200	General worker protection from chemical use	
Occupational Exposure to Bloodborne Pathogens	29 CFR 1910.1030	Worker protection from exposure to bloodborne pathogens	
Air Contaminants	29 CFR 1910.1000-1050	Standards for exposure to hazardous chemicals	
Hazardous Waste Operations and Emergency Response (HAZWOPER)	29 CFR 1910.120 and 40 CFR 311	Worker protection during hazardous waste cleanup	Applies to state and local government employees not covered by OSHA
Hazardous Materials	29 CFR 1910.101-111	Protection against hazards of compressed gases, flammable and combustible liquids, explosives, anhydrous ammonia	See also Uniform Fire Code (UFC) and National Fire Protection Association (NFPA) standards
Personal Protective Equipment	29 CFR 1910.132-138	Head, hand, foot, eye, face, and respiratory tract protection	See also American National Standards Institute (ANSI) standards
Medical Services and First Aid	29 CFR 1910.151	Provision of medical services, first aid equipment, and facilities for quick drenching and flushing of eyes	
Control of Hazardous Energy (Lockout/Tagout)	29 CFR 1910.147	Worker protection from electrical and other stored energy hazards	
Machinery and Machine Guarding	29 CFR 1910.211-219	Worker protection from mechanical hazards	

Law/Regulation	Citation	Purpose	Comments
Ionizing Radiation	29 CFR 1910.96	Worker protection from radiation	See also Atomic Energy Act
General Duty Clause	29 USC 654 5(a) and (b)	Assurance of workplace free from recognized hazards that are causing or likely to cause serious physical harm	
Resource Conservation and Recovery Act (RCRA)	42 USC 6901 et seq.	Protection of human health and environment	
Hazardous Waste Management	40 CFR 360-272	“Cradle-to-grave” control of chemical waste	
Underground Storage Tanks	40 CFR 280	Protection against groundwater and soil contamination	
Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)	42 USC 9601 et seq.	Remediation of past chemical disposal sites and assignment of liability	Also known as “Superfund” law
Superfund Amendments and Reauthorization Act (SARA)	42 USC 9601 et seq. 42 USC 11000 et seq.	Planning for emergencies and reporting of hazardous materials	Title III also known as Community Right-to-Know Act
National Contingency Plan	40 CFR 300-302	Cleanup requirements for spills and disposal sites	
Emergency Planning and Notification	40 CFR 355	Requirements for reporting of extremely hazardous materials and unplanned releases	Applies to all chemical users
Hazardous Chemical Reporting: Community Right-to-Know Act (SARA 311-312)	40 CFR 370	Requirement for reporting of hazardous chemicals in use	Exempts hazardous chemicals used in research laboratories (states may vary)
Toxic Chemical Release Reporting (SARA 313)	40 CFR 372	Requirements for reporting of chemical releases	Applies only to manufacturing facilities (states may vary)
Toxic Substances Control Act (TSCA)	15 USC 2601 et seq.	Protection of human health and the environment by requiring testing and necessary restrictions on use of certain chemical substances	Collection and development of information on chemicals

Law/Regulation	Citation	Purpose	Comments
Reporting and Recordkeeping Requirements	40 CFR 704	One provision exempts users of small quantities solely for research and development (R&D)	Must follow R&D exemption requirements
Significant Adverse Reaction	40 CFR 717	Record of new allegation that chemical substance or mixture caused significant adverse effect for health or the environment	TSCA 8(c)
Premanufacture Notification (PMN)	40 CFR 720	Premanufacture notification (PMN) for chemical not on TSCA Inventory	Requires notification of EPA before manufacture or import of new chemical substance
Technically Qualified Individual (TQI)	40 CFR 720.3(ee)	Definition of technically qualified individual (TQI) by background, understanding of risks, responsibilities, and legal requirements	Follow TQI requirements with R&D
TSCA Exemption for Research and Development (R&D)	40 CFR 720.36	Exemption for R&D from PMN if chemical substance not on TSCA Inventory is manufactured or imported only in small quantities solely for R&D	Follow R&D exemption requirements including labeling and MSDS information
Polychlorinated Biphenyls (PCBs)	40 CFR 761	Prohibitions against PCBs in manufacturing, processing, distribution in commerce, and use prohibitions	Permits certain limited laboratory use of PCBs
Clean Air Act (CAA)	42 USC 7401 et seq.	Protection of air quality and human health	
Clean Air Act Amendments of 1990 (CAAA)	42 USC 7409 et seq.	Expansion of air quality protection	Requires development of specific rules for laboratories
National Emission Standards for Hazardous Air Pollutants (NESHAP)	40 CFR 70	Control of air pollutant emissions	
Montreal Protocol: Protection of Stratospheric Ozone	40 CFR 82	Control of emission of ozone-depleting compounds	Severely limits use of certain chlorofluorocarbons

Law/Regulation	Citation	Purpose	Comments
Federal Water Pollution Control Act (FWPCA)	33 USC 1251 et seq.	Improvement and protection of water quality	
Criteria and Standards for the National Pollutant Discharge Elimination System (NPDES)	40 CFR 125	Control of discharged to public waters	
General Pretreatment Regulations for Existing and New Sources of Pollution	40 CFR 403	Control of discharge of pollutants to public treatment works	Implemented by local sewer authorities
Hazardous Materials Transportation Act (HMTA)	49 USC 1801 et seq.	Control of movement of hazardous materials	
Hazardous Material Regulations	49 CFR 100-199	Regulation of packaging, labeling, placarding, and transporting	
Hazardous Materials Training Requirements	49 CFR 172.700-704	Assurance of training for all persons involved in transportation of hazardous materials	Also known as HM126F
Atomic Energy Act (AEA)	42 USC 2073 et seq.	Establish standards for protection against radiation hazards	See also OSHA, Ionizing Radiation
Energy Reorganization Act (ERA)	42 USC 5841 et seq.		
Standards for Protection Against Radiation; Licenses	10 CFR 20 10 CFR 30-35	Establish exposure limits and license conditions	Rules promulgated by Nuclear Regulatory Commission
National Environmental Policy Act (NEPA)	42 USC 4321 et seq.	Ensure consideration of all environmental effects	
Requirements of the Council on Environmental Quality	40 CFR 6 and 1506	Indicate requirements for Environmental Impact Statement (EIS)	

Source: Reprinted with permission from *Prudent Practices in the Laboratory: Handling and Disposal of Chemicals*.

Copyright © 1995 by the National Academy of Sciences. Courtesy of the National Academy Press, Washington, DC.

For the latest information, check the appropriate Web sites, for example:
Occupational Safety & Health Administration, www.osha.gov
U.S. Environmental Protection Agency, www.epa.gov