
# The Complete Guide to LABORATORY SAFETY

## Fifth Edition

Dan Scungio, MT(ASCP), SLS, CQA (ASQ)

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*The Complete Guide to Laboratory Safety, Fifth Edition* is published by HCPro, a Simplify Compliance brand.



ISBN: 978-1-64535-006-4
CGLS5



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# About the Author

## Dan Scungio, MT(ASCP), SLS, CQA (ASQ)

**Dan Scungio, MT(ASCP), SLS, CQA (ASQ),** has over 25 years of experience as a certified medical laboratory scientist, over 10 of which were spent in the management of clinical labs, anatomical pathology labs, and collections sites. For the last 11 years he has served as the laboratory safety officer for Sentara Healthcare, a multihospital system in Virginia and North Carolina. In that role, he oversees the safety program for over 15 laboratories and multiple collection sites. He has a bachelor's degree in medical technology from the State University of New York (SUNY) at Buffalo in Amherst and Buffalo, New York.

As a laboratory safety consultant, Dan has provided laboratory safety education, presentations, training, and on-site safety consulting locally, nationally, and internationally under the title of Dan the Lab Safety Man, Inc.™ Dan has authored several laboratory safety articles and supplies new information regularly through virtual training opportunities and in the blog on his website *www.danthelabsafetyman.com.*

# Acknowledgments

This is the fifth edition of this book, but the original was written by Terry Jo Gile, known to many in the laboratory industry as the Safety Lady®. Over 10 years ago, Terry Jo saw something in me that made her decide to become my mentor and eventually my friend. Terry Jo, I can't thank you enough for opening up to me your business, your home, and an endless bounty of opportunities. I am forever grateful, and I hope I am able to honor your legacy always.

There are many other individuals who were behind the scenes but made the writing and production of the book possible.  I express my sincere gratitude to the following:

To my wife, Terri Scungio, who spends countless hours supporting me behind the scenes through love, sacrifice, encouragement, and by doing much of the hardest work of business ownership. Thank you for your constant support, love, and guidance.

To Sara Scungio, my daughter, who worked hard in this family business, and has made me one proud father because of her accomplishments and support. Thank you for your love, work, ideas, and sacrifices.

To Dennis Ernst, my friend and brother in the business. Thank you always for your caring friendship, advice, support, and generosity. Your light truly shines always.

To my colleague Dennis Adams, of DenLine Uniforms in Quincy, Illinois, who reviewed the chapter on personal protective equipment and provided much-needed insight.

To the wonderful people at HCPro:

Jay Kumar, Associate Product Manager

Brian T. Ward, Associate Content Specialist

AnnMarie Lemoine, Team Lead, Creative Layout

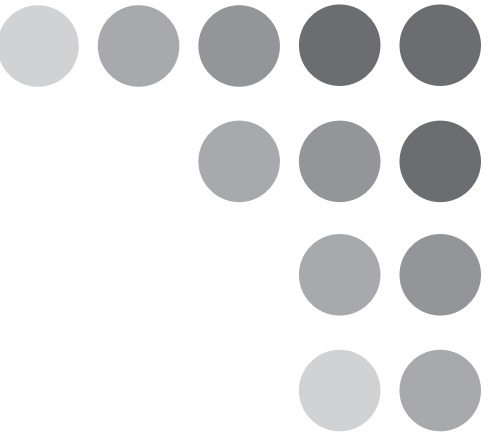
Matt Sharpe, Senior Manager, Creative Layout

…and to my friends, family, and colleagues along the way for their encouragement and inspiration to continue our crusade to help create safety-savvy laboratories everywhere!

Daniel J. Scungio, MT(ASCP), SLS, CQA (ASQ)
Williamsburg, VA

*August 2019*



# Preface

So many times people tell us they have not been following the safety rules in the laboratory and they have never been injured or suffered an exposure. The response should always be, "So were you smart, or were you lucky?" If you work in the lab setting, an inherently dangerous place, safety should be at the top of the list every day.

I am honored to provide you with the fifth edition of the *Complete Guide to Laboratory Safety*. It has been five years since the fourth edition and 17 years since the first edition. Changes in safety regulations and practices occur regularly, and it is important to stay current with the best safety practices. The content for this fifth edition will reflect the same quality and thoroughness you have come to know in the previous editions, with a focus on regulations and compliance. However, the following have been added:

- New case studies and safety-savvy tips in each chapter to bring out the important points
- Safety FAQs that provide real-world questions and answers, and clarifications
- News and trends that pertain to the subject matter
- Safety best practices that may not always be clearly interpreted from the regulations
- References and applicable citations and standards from The Joint Commission (TJC), the Centers for Disease Control and Prevention (CDC), the Occupational Safety and Health Administration (OSHA), the International Air Transport Administration (IATA), and the International Organization for Standardization (ISO)
- An updated list of the College of American Pathologists (CAP)'s checklist questions on laboratory safety and where the corresponding information can be found in the book
- A summary that includes instructions on how to use the information from each chapter as training material, including learning objectives, suggestions for interactive presentations, and reinforcement activities
- An updated safety audit checklist
- Lots of tables and figures, and more tools that will make your job easier

This book is all about results—informing you about the current lab safety issues, demonstrating how the regulations play out in reality, and keeping you in the loop and in compliance. The book summarizes the best practices for your safety program and provides operational details. You will learn the day-to-day safety routines that must be a part of every employee's work schedule so that they are done properly and completely—and, ideally, without a second thought—every single time.

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*August 2019*

CHAPTER 1

# The Law and Science of Laboratory Safety

As chemical waste was generated in each laboratory department, it was stored in containers in that area. As the waste accumulated, the staff in each lab department then moved all of its chemical waste to a large cabinet near the exit door of the main lab. Flammable waste was also stored there. At the end of each month, staff would place waste containers on transport carts and wheel it to the hazardous materials storage shed outside behind the hospital. There it would be picked up each month by a contracted hazardous waste vendor.

One day in December, John was pushing a full cart of waste through the rear parking lot to the shed. Because of icy conditions, the cart of waste tipped over and many containers spilled and leaked into the parking lot drain. John tried to stop the containers from falling, but when he reached down, he fell and was splashed in the face with mixed chemical waste.

John had to be treated for chemical exposure to the eyes and for a broken wrist which kept him out of work for several weeks. The injury had to be reported to OSHA. The Environmental Protection Agency (EPA) also came to investigate the incident because of the accidental spill into the wastewater drain. They cited the laboratory for improper waste practices, and the hospital was fined.

Lessons learned from this experience:

- Always store hazardous waste at or near the point of its generation until it is moved to a Central Accumulation Area.
- Larger amounts of flammable waste should be stored inside of a flammable storage cabinet.

The Joint Commission covers a broad spectrum of requirements, but many include appropriate employee safety considerations, such as tepid water for eyewash stations and appropriate personal protective equipment for lab employees. There are a number of survey preparation tools offered by The Joint Commission, including a *Comprehensive Accreditation Manual for Laboratory and Point-of-Care Testing* that is updated annually.

## Other Federal Laws

A number of other federal regulatory agencies issue and enforce regulations that affect labs, as listed in Figure 1.1. In addition, a number of other government organizations and industry groups publish regulations and guidelines that affect laboratory safety, as listed in Figure 1.2.

**Figure 1.1 Federal regulations affecting labs**

| Regulatory agency | Website | Lab activities affected |
|---|---|---|
| **Department of Transportation (DOT)**<br>Enforces regulations it issues about transporting all types of hazardous materials. | *www.dot.gov* | Transport of lab specimens |
| **Environmental Protection Agency (EPA)**<br>Enforces regulations under the Clean Air Act, the Resource Conservation and Recovery Act, and other environmental statutes. | *www.epa.gov* | • Ventilation<br>• Air contamination<br>• Disposal of hazardous waste |
| **Department of Labor (DOL)**<br>Enforces regulations under the Americans With Disabilities Act (ADA), Fair Labor Standards Act, and other federal labor laws. The Bureau of Labor Statistics is a division of the DOL that compiles and publishes employment data. | *www.dol.gov*<br><br>*www.ada.gov*<br>• (for compliance information about the ADA)<br><br>*www.bls.gov*<br>• (for employment and pay data) | • Lab design<br>• Ergonomics<br>• Human resources, payroll, and benefits |
| **Food and Drug Administration (FDA)**<br>Approves new medicines and medical devices for safe use. | *www.fda.gov* | Toxicology<br>Transfusion medicine<br>Apheresis |

Having the tasks in order and the proper attitude toward safety is important, but do not forget that lab operations may be affected by the actions of management. For example, if your staff in the phlebotomy area routinely have a high volume of draws (management issue) and are grumpy with the patients (attitude), they may be less likely to care about an overflowing sharps container (safety).


### Be a safety leader

As a leader and a lab safety professional, you might think some of the lab safety regulations don't apply to you. Do you wear lab-inappropriate clothing such as capri pants or open-toed shoes because you spend most of your time in the office? Do you put on a lab coat when you are reviewing paperwork in the lab? Your staff is watching you, and if you are leading the safety program, it is important that you also lead by example. Even if you are the lab manager or director, and the safety administrative duties belong to someone else, how you dress and act when you are in the lab has an effect on everyone. To make a difference in your lab safety culture, show the staff you care about safety: correct issues when you notice them, provide up-to-date safety equipment, and very importantly, be a safety role model. With persistence, it is possible for one person to make a difference in the safety culture without the support of leadership, but it is a much easier task when the safety program has the backing of lab leadership.

## The importance of safety precautions

Some laboratorians include special safety precautions in every procedure. According to Lucia M. Berte, MA, MT(ASCP), SBB, DLM, an expert in quality and safety management in laboratories, special precautions refer to safety measures taken in addition to the universal requirements for wearing a lab coat or gown and gloves. Berte recommends placing the information in two places in the procedures: "First, a list of special safety equipment should still appear near the beginning of the procedure so that the reader can locate and collect any required items before starting. Second, embed the safety instructions in the step of the procedure where the reader needs to know this information." For example:

| Step | Action |
|---|---|
| 5 | Remove the samples for the -80°C freezer. Note: Wear elbow-length freezer gloves when reaching into the -80°C freezer. |

Presenting safety information this way provides two important benefits:

- It specifies that readers use the correct safety precaution at the correct time
- It ensures that important information in the safety manual is used in the actual work environment

**Figure 2.3** **Safety recordkeeping requirements (cont.)**

| Record | Retention | Reference |
|---|---|---|
| Sharps injury log<br>• Type and brand of device in each exposure<br>• Department or area where exposure occurred<br>• How each incident occurred | Five years | OSHA Form 300<br>• Chapter 9 |
| Occupational illness, injury, and adverse incident<br>• Medical treatment beyond first aid<br>• Restricted work activity or job transfer<br>• Days away from work<br>• Loss of consciousness<br>• Death | Five years following the end of the year to which they relate | OSHA Form 300<br>• Chapter 2 |
| Risk assessment/safety checklist | Until replaced by a more recent checklist | OSHA, International Organization for Standardization (ISO), College of American Pathologists<br>• Downloads web page: *www.hcpro.com/downloads/13729* |
| Accident and incident investigations | Five years | OSHA, The Joint Commission, ISO<br>• Chapter 2 |
| Injury and illness trend analysis | Five years | OSHA, The Joint Commission<br>• Chapter 2 |
| Hazardous waste disposal reports<br>• Waste disposal<br>• Inspections<br>• Abatement actions | Indefinitely | OSHA, The Joint Commission, Environmental Protection Agency<br>• Chapter 7 |
| Medical records<br>• Medical exam results<br>• Hepatitis B vaccination record<br>• Exposure written opinion<br>• Health complaints | Length of employment, plus 30 years | OSHA<br>• Chapters 7 and 8 |

| Figure 3.1 | Tuberculosis questionnaire |
|---|---|
| Do you have a cough that has lasted longer than three weeks? | ❑ Yes ❑ No ❑ Unsure |
| Do you cough up sputum, phlegm, mucus, or blood? | ❑ Yes ❑ No ❑ Unsure |
| Have you had fever or chills? | ❑ Yes ❑ No ❑ Unsure |
| Do you have night sweats? | ❑ Yes ❑ No ❑ Unsure |
| Have you lost weight without dieting? | ❑ Yes ❑ No ❑ Unsure |
| Have you been feeling very tired? | ❑ Yes ❑ No ❑ Unsure |
| Have you ever had a positive TB skin test? | ❑ Yes ❑ No ❑ Unsure |
| Have you ever had an abnormal chest x-ray? | ❑ Yes ❑ No ❑ Unsure |
| Have you ever been told you had TB? | ❑ Yes ❑ No ❑ Unsure |
| Have you ever had close contact with someone who had TB? | ❑ Yes ❑ No ❑ Unsure |

## Hand hygiene

Hand hygiene is the single most important activity to prevent the spread of infection in the workplace. The CDC's *Guideline for Hand Hygiene* states that, although plain soap can remove loosely adherent transient flora on the skin, there remains the potential for contamination with Gram-negative bacilli. Alcohols effectively reduce bacterial counts of Gram-positive and Gram-negative bacteria, including multidrug-resistant pathogens (e.g., MRSA and VRE) on the hands. Alcohol-based products are more effective for standard hand washing than are antimicrobial soaps. However, soap and water should always be used when hands are visibly soiled.

Laboratory workers must wash their hands immediately after contact with blood, body fluids, or other contaminating materials, even if they have been wearing gloves. Employees must wash hands with soap and tepid water for a minimum of 15 (preferably 30) seconds before thoroughly rinsing and drying them. They must do so between patient contacts regardless of whether gloves have been contaminated. Not sure how long 15 seconds is? A fun and easy-to-remember trick is to silently sing "Happy Birthday." One verse takes about 15 seconds.

Hands should be washed:

- After accidental contact with blood, body fluids, and contaminated materials
- After removing gloves
- Before and after using the toilet
- Before leaving the laboratory

CHAPTER 5

# Safety in Laboratory Design

Janet was the manager in a large hospital laboratory, and she was tasked with designing a separate lab space for the emergency department. As a young, ambitious manager, Janet decided to tackle the design project alone, so she did not include the lab safety officer or other clinical specialists in the process.

When the new lab was complete, Janet contacted the clinical specialists to help install instrumentation, and she asked the LSO to perform a safety walk-through. As the team entered the new space, they noted a few issues. There was insufficient power for the chemistry analyzer. There was no eye wash station installed, and the counters were too high for staff to use. A staff break room was built into the area, but it was not separated from the lab proper.

Janet had to create an action plan and present it to the hospital administration. The changes to the laboratory would cost thousands of dollars.

Lessons learned from this experience:

- Make sure you are included in any laboratory design projects, even if you have to make a special request to be part of the design team.
- Review plans for each phase of a lab design or reconstruction, and look for obvious safety issues. Review elevation drawings also.
- Fight for what you know is right, even if it means researching the best product at the best price.

The purpose of this chapter is to summarize the optimal physical conditions for lab work, the legal requirements or best practices for where safety equipment should be located, and the key safety considerations to keep in mind when designing an all-new laboratory. This chapter uses safety standards issued by the International Organization for Standardization (ISO) 15190 and the Occupational Safety and Health Administration (OSHA), and the Environmental Protection Agency (EPA) rules in addition to guidelines issued by accreditation agencies such

| Figure 5.2 | Examples of noise levels |
|---|---|
| Whisper | 20 dB(A) |
| Library reading room | 40 dB(A) |
| Average home | 50 dB(A) |
| Conversation between two people in a lab | 60 dB(A) |
| Dishwasher | 65 dB(A) |
| Vacuum cleaner | 75 dB(A) |
| Alarm clock | 80 dB(A) |
| Power mower | 105 dB(A) |
| Rock concert | 105 dB(A) or higher |
| Car horn | 120 dB(A) |
| Jet engine | 140 dB(A) |

The noise level of most laboratories is between 60 dB(A) and 80 dB(A). A noise level that exceeds 90 dB(A) over an eight-hour working day can damage hearing. To check noise levels in your laboratory, use a noise meter, which can be purchased in any lab safety catalog or borrowed from your facility's engineering department. A noise dosimeter can measure the amount of noise an employee receives over a given period. A sound-level meter measures the average noise levels in a particular place. Either device can be used to determine the sound level in decibels, as well as the duration and distribution of exposure during a typical workday.

If the average noise level is between 80 dB(A) and 100 dB(A), the laboratory must provide earplugs at no cost to employees; however, earplug use is optional. If noise level exceeds 100 dB(A), earplugs are mandatory. If earplugs are necessary in the workplace, make sure that they fit properly and that they are kept clean. Properly fitted earplugs can cut noise levels by up to 20 dB(A). Disposable earplugs are usually made of waxed cotton or acoustical fibers; they are used once and then thrown away. Semi-disposable plugs are made of foam material and can be used for about a week.

According to the National Institute for Occupational Safety and Health, soft foam earplugs should be used as follows:

1. Wash your hands before attempting to insert the earplugs.

2. Roll the earplug into a small, thin "snake" with your fingers. You can use one or both hands.

**Figure 7.2**

## Hazard Communication Standard pictograms

As of June 1, 2015, the Hazard Communication Standard (HCS) will require pictograms on labels to alert users of the chemical hazards to which they may be exposed. Each pictogram consists of a symbol on a white background framed within a red border and represents a distinct hazard(s). The pictogram on the label is determined by the chemical hazard classification.

### HCS Pictograms and Hazards

| | | |
|---|---|---|
| Health Hazard<br>  <br>• Carcinogen<br>• Mutagenicity<br>• Reproductive Toxicity<br>• Respiratory Sensitizer<br>• Target Organ Toxicity<br>• Aspiration Toxicity | Flame<br>  <br>• Flammables<br>• Pyrophorics<br>• Self-Heating<br>• Emits Flammable Gas<br>• Self-Reactives<br>• Organic Peroxides | Exclamation Mark<br>  <br>• Irritant (skin and eye)<br>• Skin Sensitizer<br>• Acute Toxicity<br>• Narcotic Effects<br>• Respiratory Tract Irritant<br>• Hazardous to Ozone Layer (Non-Mandatory) |
| Gas Cylinder<br>  <br>• Gases Under Pressure | Corrosion<br>  <br>• Skin Corrosion/Burns<br>• Eye Damage<br>• Corrosive to Metals | Exploding Bomb<br>  <br>• Explosives<br>• Self-Reactives<br>• Organic Peroxides |
| Flame Over Circle<br>  <br>• Oxidizers | Environment (Non-Mandatory)<br>  <br>• Aquatic Toxicity | Skull and Crossbones<br>  <br>• Acute Toxicity (fatal or toxic) |

For more information:
U.S. Department of Labor
*www.osha.gov* (800) 321-OSHA (6742)
OSHA 3491-02 2012

OSHA® Occupational Safety and Health Administration

CHAPTER 8

# Bloodborne Pathogens

Maureen was often late to work, so she already felt like she was in trouble with the manager. She did not report what she considered to be a minor injury that occurred during the night shift. She cut her finger when she picked up broken glass as she was cleaning the hematology counter. She wore gloves, and the cut was small, so Maureen felt it was just better not to report it. One month later, Maureen went to her doctor for symptoms of bruising and fatigue. She was diagnosed with hepatitis C, but she couldn't prove it happened at work, and the worker compensation office denied her claim to cover the necessary healthcare.

Lessons learned from this experience:

- Never pick up broken glass in the lab with hands, even if gloved. Always use an implement or tool to do the job.
- Report every lab injury or exposure as soon as possible, no matter how minor it may seem.
- Promote a culture of incident reporting and transparency—this leads to an overall better safety culture.

The Occupational Safety and Health Administration's (OSHA) Bloodborne Pathogens standard, published at 29 *CFR* 1910.1030, is built around the concept of universal precautions (now typically referred to as "standard precautions")—an approach that requires workers to handle all blood, body fluids, and tissue as if it is known to be infected with HIV, hepatitis B virus (HBV), hepatitis C virus (HBC) or other potentially infectious material (OPIM). The OSHA rule also incorporates the concepts of "engineering controls" and "work practice controls"—modifications to tools and work processes that minimize workers' risk of exposure. This chapter explains OSHA requirements for:

- Engineering controls
- Work practice controls

## Safety best practices FAQ

What to do with requisitions that are contaminated with blood or body fluids

***Q: What should we do when requisitions become contaminated with blood or body fluids?***

***A:*** Check with infection prevention and control in your facility to see how they want such situations handled. Some infection preventionists feel if the blood or body fluid is dried, then you can handle contaminated requisitions the same way as regular requisitions by wearing gloves and a lab coat. However, some feel that even dried blood can harbor an infection for some time. Whatever the decision (remember—it may be dictated by state law), put it in your policy and follow it.

You should blot wet requisitions with a paper towel to absorb the gross blood and then place them in some type of plastic covering or bag. Hopefully, this doesn't occur often. If it does, you need to look at the process to see what the real issue is and make the appropriate corrections.

*Source: OSHA Healthcare Advisor.*

## Signs and Labels

Post signs bearing the biohazard symbol and legend at each entrance to the work area. Figure 8.3 is a sample warning sign. The words "authorized personnel only" may also be used (with or without the biohazard symbol).

**Figure 8.3** **Biohazard warning entrance sign**

## Safety best practices: Bloodborne Pathogen training

OSHA's written Bloodborne Pathogen standard requires that all employees are trained regarding exposure control in the laboratory when they are first hired and annually thereafter. Many organizations provide this annual training using computer-based training (CBT) programs. While this method can work for some safety education, the BBP standard specifically states that BBP training must include an "opportunity for interactive questions and answers with the person conducting the training session." That may mean you need to provide live training every year for your staff unless you can find another way to offer that opportunity for questions using that computer-based training. OSHA Inspectors have been known to look closely at training on bloodborne pathogens, so make sure all aspects of the training requirements are followed.

## Interactive Presentation Materials

- Show safety needles, lab coats, and other PPE and demonstrate how to use them

## Reinforcement Activities

- Have staff demonstrate cleaning up a biohazard spill using proper supplies

## Resources

The following are the College of American Pathologists' checklist questions that relate to this chapter:

- GEN.74000—Bloodborne Pathogens
- GEN.74100—PPE Provision and Usage
- GEN.74200—PPE instruction
- GEN.74250—Hand cleaning
- GEN.74300—Manual Manipulation of Needles
- GEN.74400—Eating/Mouth Pipetting
- GEN.74600—Spill Handling
- GEN.74700—Hepatitis B Vaccinations
- GEN.74800—Viral Exposure
- GEN.74900—Tuberculosis Exposure Plan
- GEN.74400—Eating/Mouth Pipetting

CHAPTER 11

# Fire Safety

A frayed electrical cord sent out sparks near a small waste basket in the lab starting a small fire near the chemistry analyzer. Crystal and Johnny both retrieved fire extinguishers to put out the fire. They activated their extinguisher at the same time and the force of the two blasts sprayed the fire onto a nearby counter, and the fire began to spread. They decided it was time to evacuate the laboratory. They walked outside the front door but could not locate any of their co-workers. They did not know if anyone had alerted the fire department.

Lessons learned from this experience:

- Make sure staff are trained in proper fire response, and that drills are conducted.
- Use RACE and PASS (or your own facility's acronyms) to train staff how to respond to a fire and how to use a fire extinguisher.
- Make sure all staff are trained in fire extinguisher use.
- Never use two fire extinguishers at the same time to put out a small fire.
- Ensure staff know the location of the designated evacuation meeting location so they will know all have safely evacuated.

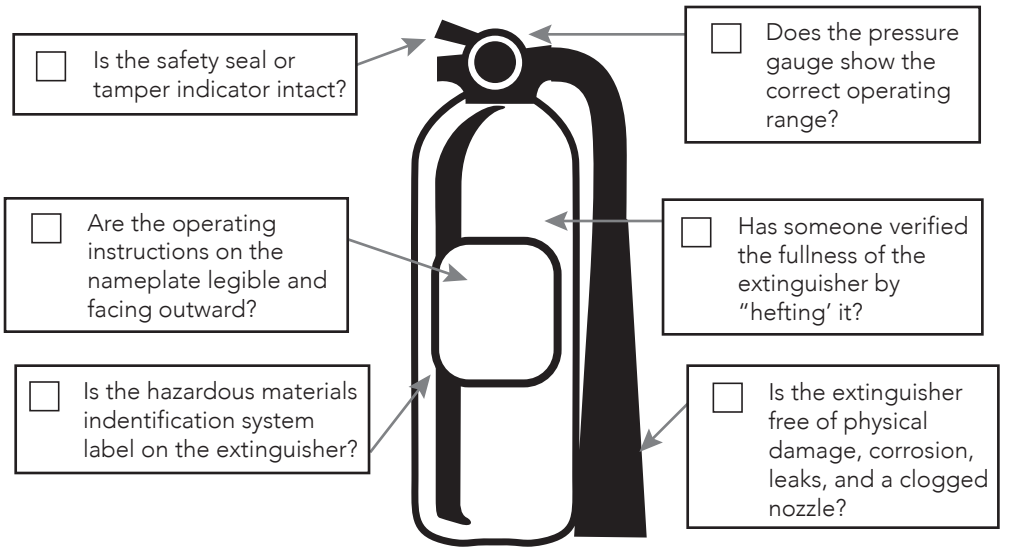
According to the National Fire Protection Association's NFPA 10, fires are classified into five types based on the material burning. Different types of extinguishers are used for different types of fires:

- Class A fires involve ordinary solid combustible materials such as paper, wood, or cloth. Extinguish Class A fires with water or an all-purpose dry chemical extinguisher. Class A fires may smolder for a long time, so it is important to drown them thoroughly.

**Figure 11.1**

## Sample fire extinguisher quick-check diagram

This diagram can help staff understand the steps behind a monthly quick check of a portable fire extinguisher:




Other questions to consider during a quick check include the following:

- Is the extinguisher in its designated location?
- Is access to the extinguisher unobstructed?
- Is the extinguisher clearly visible?
- For wheeled extinguishers, has someone checked the conditions of the tires, wheels, carriage, hose, and nozzle?

Source: *NFPA 10,* Portable Fire Extinguishers. *Adapted with permission*

# Legal Standards for Fire Safety

Fire safety requirements are imposed by a variety of government agencies and private organizations, including the following:

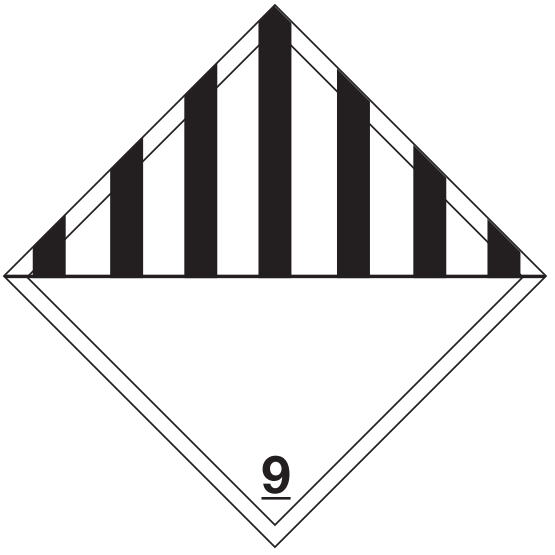
## OSHA

OSHA imposes standards (Subpart L—29 *Code of Federal Regulations* [*CFR*] 1910.155 to 1910.165) requiring employers to take fire protection precautions. Employers should be certain that all materials are stored, handled, and stacked with due respect for their fire-hazard

**Figure 15.5**

**Class 9 Miscellaneous label for dry ice**




Each section of the shipper's declaration must be filled out appropriately. If you are not sure how to do this, contact your carrier (e.g., FedEx, UPS) for exact instructions. The carrier can refuse to accept the shipment if the paperwork is not filled out correctly. The following are tips for filling out the declaration:

- In the "Shipper" box, be sure to include the shipper's phone number that is answered by a person 24/7.
- In the "Consignee" box, be sure to include the recipient's name, full address, and phone number that is answered by a person 24/7.
- Under "Transport Details," cross off "Cargo aircraft only" because you cannot be sure it will ship strictly as cargo. The "passenger and cargo aircraft" box will apply regardless of how the shipment is sent.
- Under "Airport of Departure," list the city and state from which the shipment is being sent.
- Cross out the shipment type you are not going to use (usually "radioactive").
- If you are shipping from the United States, the "Additional Handling Information" should say, "In case of emergency, contact the Centers for Disease Control and Prevention at 800-232-4636."
- Be sure the printed name and the signature on the shipping document is the same individual who actually prepares the package for shipment.

# Chemical Hygiene

General precautions for handling all laboratory chemicals are in place to include minimizing exposure. The following procedures are used when working with chemicals.

## Accidents and spills

- Eye contact: Promptly flush eyes with water for a prolonged period (15 minutes) and seek medical attention.
- Ingestion: Encourage the victim to drink large amounts of water or as indicated on the SDS.
- Skin contact: Promptly flush the affected area with water and remove any contaminated clothing; use a safety shower when contact is extensive. If symptoms persist after washing, seek medical attention.
- Cleanup: Promptly clean up spills, using appropriate protective apparel and equipment and proper disposal.
- Avoid unnecessary exposure to chemicals.
- Do not smell or taste chemicals. Any apparatus that may discharge toxic chemicals (vacuum pumps, distillation columns, etc.) should be vented into local exhaust devices.
- Inspect gloves and test glove boxes before use.
- Do not allow release of toxic substances in cold rooms and warm rooms, which have contained recirculated atmospheres.
- Use only those chemicals for which the quality of the available ventilation system is appropriate.
- Eating, drinking, smoking, gum chewing, or application of cosmetics or lip balm or manipulating contact lenses in areas where laboratory chemicals are present is prohibited. Wash hands before conducting these activities.
- Storing, handling, or consuming food or beverages in storage areas, refrigerators, glassware, or utensils that are also used for laboratory operations is prohibited.
- Handle and store laboratory glassware with care to avoid damage; do not use damaged glassware. Use extra care with Dewar flasks and other evacuated glass apparatus; shield or wrap them to contain chemicals and fragments should implosion occur. Use equipment only for its designed purpose.
- Wash areas of exposed skin well before leaving the laboratory.
- Avoid practical jokes or other behavior that might confuse, startle, or distract another worker.

# Chapter 13: Safe Use of Compressed Gases

### Objectives

- List the four basic rules for handling compressed gas cylinders
- Discuss the method to check gas cylinders for leaks
- Describe the necessary labeling for empty cylinders

### Case study

Darryl saw the low CO2 level alarm on the microbiology incubator and went to change the tank in the nearby storage room. The valve cover seemed stuck on the replacement tank and Darryl was unable to remove it with his hands. He found a hammer and began to hit the valve cover to loosen it. The force of the blows damaged the main valve underneath, and gas quickly started to escape from the tank. Darryl quickly began having trouble breathing, and since he still could not remove the valve cover, he left the storage room.

Lessons learned from this experience:

- Never use a hammer or insert a tool to open a valve cap on a tank of compressed gas.
- Call a vendor for assistance if a valve cap cannot be removed.
- Do not attempt to close a venting cylinder—contact the maintenance department or the vendor for assistance immediately.
- Move away from venting cylinders quickly as they can become deadly projectiles.

## Interactive presentation materials

Review liquid nitrogen safety procedures and have staff choose the proper PPE for handling LN2 and dry ice.

## Reinforcement activities

Have staff demonstrate changing gas tanks if they are responsible for that task.

APPENDIX E

# CAP Checklist Summary

The following table lists all of the College of American Pathologists' (CAP) requirements that relate to laboratory safety from the Laboratory General Checklist as of 9/17/19. The table identifies the question in numerical order, the title of the requirement, and where it is discussed in this book.

| CAP requirement | Title | Chapter location |
|---|---|---|
| GEN.20374 | National/Federal/State/Local Regulations | 9 |
| GEN.40511 | Specimen Tracking/Labeling | 15 |
| GEN.40512 | Infectious Material Packing/Shipping | 15 |
| GEN.40515 | Transport Personnel Training | 15 |
| GEN.40530 | Specimen Tracking | 15 |
| GEN.40535 | Specimen Transport QM | 15 |
| GEN.40545 | Newborn Screening Specimen Tracking | 15 |
| GEN.43946 | Data Preservation/Destructive Event | 10 |
| GEN.59980 | Restricted Laboratory Access | 5 |
| GEN.60000 | Adequate Space (adequate space) | 5 |
| GEN.60100 | Adequate Space (staff work areas) | 5 |
| GEN.60150 | Adequate Space (technical space needs) | 5 |
| GEN.60250 | Working Environment | 5 |
| GEN.61300 | Climate Control | 5 |
| GEN.61350 | Direct Sunlight | 5 |
| GEN.61400 | Halloway Obstructions | 11 |
| GEN.61500 | Environment Maintenance (clean lab space) | 5 |

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