HEALTHCARE HAZARD CONTROL AND SAFETY MANAGEMENT

Second Edition
HEALTHCARE
HAZARD CONTROL AND
SAFETY MANAGEMENT

Second Edition

JAMES T. TWEEDY, M.S., CHCM, CHSP
DEDICATION

With a father's heart of love, I dedicate this book to the memory of my precious daughter, Elizabeth Cheryl Tweedy, who in her brief nineteen years touched the lives of so many for time and eternity. She taught all who knew her the true meaning of the words "love" and "friendship."

I have come to realize that the completeness of one's life cannot be measured in length of years but in the way in which we choose to live the time allotted us.

So I Pray
by
Elizabeth Cheryl Tweedy
18 January 1977–26 June 1996

In a world where sorry is so common place
That undeniable pain is evident on every face
We are guided by theory
Led by a blackened light
And virtues are just a concept
Of a long forgotten time

Where happiness is misunderstood
And confusion reigns supreme
I look around and tremble
As I think of what it means

But I know who I am in You …
Called out and commissioned by Christ
To go unto all the nations
And make the sacrifice

So I pray …

Let me love with your love
Let me shine with your light
Let me care with your compassion, Lord
In this world black as night
Let me trust with all my heart
Let me speak only the truth
Let me teach so they might understand
What it means to know you

So I pray …

Send me Lord today
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preface</td>
<td>xiii</td>
</tr>
<tr>
<td>Acknowledgments</td>
<td>xv</td>
</tr>
<tr>
<td>The Author</td>
<td>xvii</td>
</tr>
<tr>
<td>1 Introduction to Healthcare Hazard Control</td>
<td>1</td>
</tr>
<tr>
<td>A. Introduction</td>
<td>1</td>
</tr>
<tr>
<td>B. Healthcare Employment Growth</td>
<td>1</td>
</tr>
<tr>
<td>C. Joint Commission on Accreditation of Healthcare Organizations</td>
<td>3</td>
</tr>
<tr>
<td>D. American Osteopathic Association</td>
<td>6</td>
</tr>
<tr>
<td>E. Canadian Council on Health Services Accreditation</td>
<td>7</td>
</tr>
<tr>
<td>F. Commission on Accreditation of Rehabilitation Facilities</td>
<td>8</td>
</tr>
<tr>
<td>G. College of American Pathologists Laboratory Accreditation Program</td>
<td>9</td>
</tr>
<tr>
<td>H. Institute of Medicine</td>
<td>10</td>
</tr>
<tr>
<td>I. American Health Care Association</td>
<td>11</td>
</tr>
<tr>
<td>J. American Hospital Association</td>
<td>11</td>
</tr>
<tr>
<td>K. Association of Occupational Health Professionals</td>
<td>12</td>
</tr>
<tr>
<td>L. Service Employees International Union</td>
<td>13</td>
</tr>
<tr>
<td>M. ECRI</td>
<td>13</td>
</tr>
<tr>
<td>Summary</td>
<td>13</td>
</tr>
<tr>
<td>For Review and Discussion</td>
<td>14</td>
</tr>
<tr>
<td>2 Healthcare Safety Management</td>
<td>15</td>
</tr>
<tr>
<td>A. Introduction to Safety Management</td>
<td>15</td>
</tr>
<tr>
<td>B. Management Efficiencies and Safety</td>
<td>16</td>
</tr>
<tr>
<td>C. Safety Leadership</td>
<td>22</td>
</tr>
<tr>
<td>D. Human Behaviors</td>
<td>25</td>
</tr>
<tr>
<td>E. Safety Cultures and Systems</td>
<td>27</td>
</tr>
<tr>
<td>F. Information Management</td>
<td>30</td>
</tr>
<tr>
<td>G. Risk Management</td>
<td>31</td>
</tr>
<tr>
<td>H. Quality Improvement</td>
<td>33</td>
</tr>
<tr>
<td>I. Employee Health</td>
<td>34</td>
</tr>
<tr>
<td>J. Worker’s Compensation Program Management</td>
<td>39</td>
</tr>
<tr>
<td>K. Chemical Dependency and Substance Abuse</td>
<td>42</td>
</tr>
<tr>
<td>L. Materials and Purchasing Management</td>
<td>45</td>
</tr>
<tr>
<td>M. Human Resources Management</td>
<td>45</td>
</tr>
<tr>
<td>N. Security Management</td>
<td>46</td>
</tr>
<tr>
<td>Summary</td>
<td>49</td>
</tr>
<tr>
<td>For Review and Discussion</td>
<td>50</td>
</tr>
</tbody>
</table>
# Table of Contents

L. Terrorism and Weapons of Mass Destruction 164
M. Decontamination Activities (Weapons of Mass Destruction) 170
N. Introduction to Fire Safety Management 173
O. Life Safety Code® 174
P. Healthcare Facility Fire Safety Management 178
Q. Fire Prevention Activities 180
R. Interim Life Safety 184
S. Fire Confinement 184
T. Egress 186
U. Portable Fire Extinguishers 188
V. NFPA 99 (Healthcare Facilities) 191
W. Electrical Equipment Installations 191
X. Flammable/Combustible Materials 192
Y. Surgical Fires 194
Summary 197
For Review and Discussion 198

6 General and Physical Plant Safety.........................................................................199
A. Introduction 199
B. Office Safety 200
C. Ergonomics 203
D. Slip, Trip, and Fall Prevention 210
E. Plant Operations Safety 211
F. Tool Safety 216
G. Machinery Safety and Guarding 219
H. Compressed Air 220
I. Safety Signs and Color Schemes 221
J. Welding Safety 222
K. Electrical Safety 224
L. Painting Operations 228
M. Lockout/Tagout (29 CFR 1910.147) 230
N. Permit-Required Confined Spaces (29 CFR 1910.146) 234
O. OSHA Noise Standard (29 CFR 1910.95) 239
P. Utilities Management 242
Q. Plumbing Operations and Safety 246
R. Boiler and Heating Systems 248
S. Refrigeration and Air-Conditioning Maintenance 250
T. Ventilation 252
U. Indoor Air Quality 256
V. Mold in the Workplace 260
W. Vehicle and Forklift Safety 263
X. OSHA Helicopter Standards (29 CFR 1910.183) 267
Y. Landscape/Grounds Maintenance 267
Z. Construction Safety (29 CFR 1926) 269
Summary 273
For Review and Discussion 273

7 Managing Hazardous Materials ..................................................................................275
A. Introduction 275
B. Hazardous Materials Exposure Risks 276
C. Emergency Shower and Eyewash Stations
   (OSHA Requirements 29 CFR 1910.151) 281
# Support Department Safety

A. Introduction

B. Environmental services

C. Laundry Safety

D. Food Service Department Safety

E. Facility Security Management

F. Radiology and Nuclear Medicine

G. Nonionizing Radiation

H. Laboratory Safety

I. Central Sterile Supply

J. Pharmacy Safety

K. Medical Equipment Management

L. OSHA HAZWOPER Training for Support Personnel

For Review and Discussion

# Glossary

# Appendices

Appendix A. Acronyms

Appendix B1. Accident Investigation Report


Appendix C1. Key OSHA Bloodborne Pathogens Compliance Issues

Appendix C2. Sample OSHA Bloodborne Pathogens Standard Exposure Control Plan

Appendix C3. OSHA Bloodborne Pathogens Training Requirements and Sample Education Plan

Appendix C4. Barrier Precautions for Exposure to Blood or Body Fluids

Appendix D. OSHA Standards for Selected Areas or Departments

Appendix E. OSHA Hospital Health Hazards

Appendix F. OSHA Multi-Employer Citation Policy

Appendix G1. Germicide Effectiveness

Appendix G2. Leadership Tips for Healthcare Environmental Services Professionals

Appendix H. OSHA HAZWOPER (29 CFR 1910.120) Training Requirements

Appendix I. Model Laboratory Chemical Hygiene Plan


Appendix J2. Model Hazard Communication Program

Appendix K. Overview of NFPA 1600, Managing Emergencies

Appendix L. Worker Safety Perception Survey

Appendix M. Safety Evaluation Profile (SEP)

Appendix N. OSHA General Industry Training Requirements for Healthcare

Appendix O. Key OSHA Compliance Issues for Dental/Medical Offices

Appendix P. Healthcare Resources for Emergency Management

Appendix Q. Back Injury Prevention Workplace Evaluation Tools

Appendix R. Patient and Resident Moving Guidelines

Appendix S. Partial List of NFPA Standards Relevant To Healthcare

Appendix T. Overview of DOT-Regulated Medical Waste Standards

Appendix U. CDC Hand Hygiene Recommendations Chart
Appendix V. Sample Permit-Required Confined Space Program Elements 643
Appendix W. Patient Safety Plan Development Considerations 651
Appendix X. Sample Construction Infection Control Program Elements 654
Appendix Y. OSHA Recording of Work-Related Injuries and Illnesses 658
Appendix Z. Key OSHA Compliance Standards for Funeral Homes 662

13 Safety Checklists ........................................................................................................665

14 Agency Listings .........................................................................................................753
   Alphabetical Listing 753
   Website Quick Reference 757
   Selected Disaster Resource Information 762

15 Bibliography .............................................................................................................763

Index ................................................................................................................................771
The first edition began almost 10 years ago as a joint project to develop a study manual for those preparing for the Certified Healthcare Safety Professional (CHSP) examination. As the project progressed, a decision was made by the author and the Board of Certified Health Safety Management to publish the information as a hardcover book.

This second edition follows the same format as the original text but has been completely revised. The author has attempted to produce a single-volume resource that addresses every major area of healthcare safety. The book is broad in scope and focuses on the importance of safety in our nation's hospitals and nursing homes. However, much of the information has application to other healthcare organizations, including ambulatory surgery centers, long-term-care facilities, laboratories, and primary health clinics. The author places a strong emphasis on identifying, analyzing, and controlling healthcare-related hazards and unsafe behaviors.

The text is written in an easy-to-use format that includes tables, lists, and bulleted paragraphs. Each of the main chapters contains a short summary and review exercises. The author feels strongly that the revised text would be an appropriate text for college or university courses in curriculums such as safety, nursing, healthcare administration, and public health. Much of the text even has application to safety curriculums outside of the healthcare arena. The revised and expanded text also includes dozens of appendices containing safety management plans, a glossary of healthcare safety terms, and healthcare-specific safety checklists.

The author acknowledges that many of the hazards found in healthcare organizations cannot be comprehensively addressed in a text of this type. Readers are encouraged to refer to other texts and government publications that address specific healthcare safety topics. Voluntary compliance organizations such as the Joint Commission on Accreditation of Healthcare Organizations (JCAHO) and the National Fire Protection Association (NFPA) also publish safety material specifically for healthcare applications.

This book is presented with the sincere hope that it will continue to help those working in healthcare-related positions. The author trusts it will provide both the seasoned professional and the newcomer to the field with an accurate overview of healthcare safety information and resources. The text also was prepared to serve as a primary study resource for candidates seeking to earn the CHSP designation.
I would like to thank Mr. Harold M. Gordon, Executive Director of the Board of Certified Hazard Control Management, for his personal encouragement during the preparation of this revised text. His years of commitment to improving safety through the use of sound management techniques are highly commendable. I have learned much from Harold over the years and value our friendship greatly. Many of the hazard control concepts in this second edition are based on his publication, *A Management Approach to Hazard Control*.

I would like to thank Michelle F. Bradley, for preparing many of the tables and checklists that appear in the text. Her dedication made my job of revising the text much easier.

I would also like to give a special acknowledgment and thanks to Jolean Pederson, CHSP, for providing information for many of the checklists found in Chapter 13. Jolean currently serves as Public Health & Safety Coordinator, Office of Safety and Environmental Health, North Dakota State University, Fargo.

Most of all I would like to thank my wife, Marlene, and my son, Aaron, for their love and support. This second edition is also dedicated to the memory of my daughter, Cheryl. Please turn to the dedication page to read her poem, *So I Pray*. 
James T. Tweedy, an experienced safety consultant, risk manager, and educator founded TLC Services, Inc. The Birmingham, Alabama area healthcare performance, safety consulting, and training company specializes in conducting Certified Healthcare Safety Professional (CHSP) and Certified Hazard Control Manager (CHCM) review and preparatory seminars. TLC Services also presents performance based educational program such as: (1) Team Root Causes Analysis, (2) A Simplified Approach To Failure Mode Analysis, (3) Cleaning Healthcare Facilities To Achieve Safety & Health, (4) Safety Culture Development, (5) Safety For Leaders and Managers, (6) Solving Organizational Problems, (7) Learning To Write In The Active Voice, (8) Healthcare Safety Regulatory Update Programs, and (9) Advanced Safety Management Techniques. TLC Services also provides safety services to general industry organizations.

Mr. Tweedy is founder of Healthcare SafeScan. This unique healthcare newsletter provides readers with news articles, editorials, and best practice suggestions in each monthly issue. Topics include safety, risk, compliance, training, recalls, and quality improvement. He also serves as the Director of SAFTRAC, an organization that certifies and documents continuing education credits for personnel holding the Certified Quality & Risk Management Specialist in Long Term Care (CQRMS-LTC) designation.

Mr. Tweedy holds a Master of Science Degree in Safety Management from Central Missouri State University and a Bachelor of Science Degree in Liberal Arts from the University of the State of New York. He is a Certified Healthcare Safety Professional (CHSP), a Certified Hazard Control Manager (CHCM), a professional member of the American Society of Safety Engineers (ASSE), and a member of the American Society For Healthcare Engineering (ASHE).

You can contact Mr. Tweedy by mail at P.O. Box 213, Helena, AL 35080. He can be contacted by phone at (205) 621-0464, or on the web at: www.certsafenow.com
A. INTRODUCTION

This revised text presents a proactive approach to safety management and leadership. The author places an emphasis on preventing accidents, injuries, and other adverse organizational events. Senior healthcare leaders must learn to promote safety as an organizational value. Safety impacts both the overt and covert cultures of the organization, and the safety culture of healthcare organizations must be recognizable by those served. Healthcare organizations seeking to maintain revenues, minimize losses, serve their communities, and meet regulatory/accreditation requirements need effective safety programs. The Joint Commission continues to promote safety-related issues and is partnering with the Occupational Safety and Health Commission (OSHA) to increase education and knowledge. OSHA recently added hospitals to the targeted inspection list, which already included nursing homes. Safety issues found in healthcare organizations of today include such areas as patient safety, medication safety, laser hazards, latex allergies, chemical exposures, biological hazards, workplace violence, and community safety issues. The increased emphasis on topics such as emergency management, indoor air quality, and patient safety indicates that safety will remain a key focus of healthcare organizations. Controlling hazards, managing risks, and maintaining proactive safety management programs will continue to challenge senior leadership. Effective healthcare hazard control management continues to be overlooked despite the number of workers employed in healthcare-related occupations. Advances in medical technology and clinical treatment techniques expose workers to a variety of occupational hazards that still must be controlled (see Table 1.1 and Table 1.2).

B. HEALTHCARE EMPLOYMENT GROWTH

Need for Improved Safety Performance — The discipline of healthcare safety serves a growing numbers of workers. Health care remains one of the fastest growing sectors of the U.S. economy. Senior leadership must ensure that qualified personnel fill the safety-related positions within their organizations. Many healthcare facilities still do not view healthcare safety as vital to organizational success. The number of workers, patients, and residents continues to increase but the number of healthcare safety professionals to serve
Healthcare Hazard Control and Safety Management

this population does not. As the largest industry in 2002, health services provided 12.9 million jobs (12.5 million jobs for wage and salary workers and about 382,000 jobs for the self-employed). Out of 20 occupations projected to grow the fastest, 10 are concentrated in health services. About 16% of all new wage and salary jobs created between 2002 and 2012 will be in health services — 3.5 million jobs, which is more than in any other industry (see Table 1.3). The majority of jobs require less than 4 years of college education, but health diagnosing and treating practitioners are among the most educated workers.

Combining medical technology and the human touch, the health services industry administers care around the clock, responding to the needs of millions of people — from newborns to the critically ill. About 518,000 establishments make up the health services industry; all vary greatly in terms of size, staffing patterns, and organizational structures (see Table 1.4 and Table 1.5). Three fourths of all health services establishments are offices of physicians, dentists, or other health practitioners. Although hospitals constitute only 2% of all health services establishments, they employ 41% of all workers. In the rapidly changing health

### TABLE 1.1 Health Services Industries (All Categories): Top 10 OSHA Citations for 2002

<table>
<thead>
<tr>
<th>Citation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bloodborne Pathogens (1910.1030)</td>
</tr>
<tr>
<td>Hazard Communication (1910.1200)</td>
</tr>
<tr>
<td>Electrical, Wiring Methods, Components, and Equipment (1910.305)</td>
</tr>
<tr>
<td>Medical Services and First Aid (1910.151; includes eyewash and drenching facilities)</td>
</tr>
<tr>
<td>Electrical Systems Design, General Requirements (1910.303)</td>
</tr>
<tr>
<td>Personal Protective Equipment, General Requirements (1910.303)</td>
</tr>
<tr>
<td>Control of Hazardous Energy, Lockout/Tagout (1910.147)</td>
</tr>
<tr>
<td>Respiratory Protection (1910.134)</td>
</tr>
<tr>
<td>Means of Egress, General (1910.37)</td>
</tr>
<tr>
<td>Machines, General Requirements (1910.212)</td>
</tr>
</tbody>
</table>

### TABLE 1.2 OSHA Comparative Incidence Rates for 2002

<table>
<thead>
<tr>
<th>Industry</th>
<th>Recordable Events</th>
<th>Days Away for Restricted Job Transfer</th>
<th>Days Away from Job</th>
</tr>
</thead>
<tbody>
<tr>
<td>Private industry</td>
<td>5.3</td>
<td>2.8</td>
<td>1.6</td>
</tr>
<tr>
<td>Construction</td>
<td>7.1</td>
<td>3.8</td>
<td>2.8</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>7.2</td>
<td>4.1</td>
<td>1.7</td>
</tr>
<tr>
<td>Ship building</td>
<td>14.6</td>
<td>8.1</td>
<td>3.4</td>
</tr>
<tr>
<td>Hotels and lodging</td>
<td>6.6</td>
<td>3.4</td>
<td>1.8</td>
</tr>
<tr>
<td>Health services</td>
<td>7.4</td>
<td>3.4</td>
<td>2.0</td>
</tr>
<tr>
<td>Hospitals</td>
<td>9.7</td>
<td>4.1</td>
<td>2.3</td>
</tr>
<tr>
<td>Nursing facilities</td>
<td>12.6</td>
<td>7.6</td>
<td>4.1</td>
</tr>
</tbody>
</table>

*Note: Incidence rates are per 100 employees. Source: U.S. Bureau of Labor Statistics data (www.osha.gov.oshstats/work/html).*
services industry, technological advances have made many new procedures and methods of diagnosis and treatment possible. Clinical developments such as organ transplants, less invasive surgical techniques, skin grafts, and gene therapy for the treatment of cancer continue to increase longevity and improve the quality of life of many Americans. Advances in medical technology also have improved the survival rates of trauma victims and the severely ill, who need extensive care from therapists and social workers, among other support personnel.

C. JOINT COMMISSION ON ACCREDITATION OF HEALTHCARE ORGANIZATIONS

A number of accrediting and voluntary organizations publish standards impacting the operation of healthcare facilities. This chapter provides a brief overview of many of the

### TABLE 1.3 Healthcare Employment (Selected Categories)

<table>
<thead>
<tr>
<th>Category</th>
<th>Employment Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Home health aides</td>
<td>569,670</td>
</tr>
<tr>
<td>Nursing aides</td>
<td>1,329,310</td>
</tr>
<tr>
<td>Medical assistants</td>
<td>361,960</td>
</tr>
<tr>
<td>Dental assistants</td>
<td>268,220</td>
</tr>
<tr>
<td>Psychiatric aides</td>
<td>56,260</td>
</tr>
<tr>
<td>Registered nurses</td>
<td>2,239,530</td>
</tr>
<tr>
<td>Occupational health and safety</td>
<td>39,060</td>
</tr>
<tr>
<td>Dental hygienists</td>
<td>148,530</td>
</tr>
</tbody>
</table>


### TABLE 1.4 Projected Employment Increases in Health Care from 2000 to 2010

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Increase</th>
<th>Percentage of Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dental assistants</td>
<td>88,875</td>
<td>29.5</td>
</tr>
<tr>
<td>Health technicians</td>
<td>50,190</td>
<td>23.9</td>
</tr>
<tr>
<td>Licensed practical/vocational nurses</td>
<td>103,776</td>
<td>18.8</td>
</tr>
<tr>
<td>Medical assistants</td>
<td>179,998</td>
<td>59.8</td>
</tr>
<tr>
<td>Medical and clinical lab technicians</td>
<td>22,869</td>
<td>18.9</td>
</tr>
<tr>
<td>Physicians and surgeons</td>
<td>127,602</td>
<td>27.8</td>
</tr>
<tr>
<td>Radiologic technicians</td>
<td>37,365</td>
<td>23.5</td>
</tr>
<tr>
<td>Registered nurses</td>
<td>448,822</td>
<td>25.3</td>
</tr>
</tbody>
</table>

Healthcare Hazard Control and Safety Management

organizations, including several professional groups such as the American Hospital Association and the American Health Care Association. The most well known of the accrediting bodies, the Joint Commission on Accreditation of Healthcare Organizations (JCAHO), impacts the operations of most hospitals and a good number of other healthcare organizations, including nursing homes and surgery centers. The Joint Commission is an independent, not-for-profit organization, established more than 50 years ago. JCAHO is governed by a board that includes physicians, nurses, and consumers. The mission of the Joint Commission is to continuously improve the safety and quality of care provided to the public through the provision of healthcare accreditation. JCAHO sets the standards by which healthcare quality is measured in the United States and around the world. JCAHO evaluates the quality and safety of care for nearly 16,000 healthcare organizations. To maintain and earn accreditation, organizations must have an extensive on-site review by a team of JCAHO healthcare professionals at least once every 3 years. The purpose of the review is to evaluate the organization’s performance in areas that affect the care of patients. Accreditation may then be awarded based on how well the organizations met JCAHO standards.

Environment of Care® Standards — The newly reformatted Environment of Care® standards, performance elements, and scoring guidelines became effective on January 1, 2004. Organizations must provide a safe, functional, supportive, and effective environment for patients, staff, visitors, and contractors. An effective safety management program provides guidance to achieve quality patient care, good outcomes, and continuous improvement of patient safety. Some key environment and care requirements include:

- Long-range and continuous planning by organizational leaders to ensure that space requirements, proper equipment, and necessary resources remain available to support services offered
- Planning and designing of the environment consistent with the organizational mission to support proper care considering the patient’s physical condition/health, cultural background, age, and cognitive abilities

### TABLE 1.5 Employment in Health Services in 2002 and Projected Increase from 2002 to 2012

<table>
<thead>
<tr>
<th>Segment</th>
<th>2002 Estimate</th>
<th>Projected Increase by 2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>All industries</td>
<td>132,279,000</td>
<td>16.3</td>
</tr>
<tr>
<td>Health services</td>
<td>12,524,000</td>
<td>28.0</td>
</tr>
<tr>
<td>Hospitals</td>
<td>5,148,00</td>
<td>12.8</td>
</tr>
<tr>
<td>Nursing facilities</td>
<td>2,743,000</td>
<td>34.3</td>
</tr>
<tr>
<td>Physicians’ offices</td>
<td>1,983,000</td>
<td>38.8</td>
</tr>
<tr>
<td>Dentists’ offices</td>
<td>726,00</td>
<td>30.9</td>
</tr>
<tr>
<td>Home health care</td>
<td>675,00</td>
<td>55.8</td>
</tr>
<tr>
<td>Other health practitioners</td>
<td>482,00</td>
<td>48.8</td>
</tr>
<tr>
<td>Ambulatory health services</td>
<td>184,00</td>
<td>47.5</td>
</tr>
<tr>
<td>Medical laboratories</td>
<td>174,00</td>
<td>37.6</td>
</tr>
</tbody>
</table>

Introduction to Healthcare Hazard Control

- Educating staff on the role of environment in safely, sensitively, and effectively supporting patient care
- Educating staff on physical requirements and processes for monitoring, maintaining, and reporting on the organization’s environment of care
- Developing standards to measure staff and organizational performance in managing and improving the environment of care
- Implementing plans to create and manage the hospital’s environment of care
- Establishing an effective information collection and evaluation system (ICES) to continuously measure, assess, and improve the environment of care

Management Programs — Environment and care standards do not prescribe any particular safety-related structure. The standards do not address the type of safety committee, specific individual to be named as safety officer, or the specific requirements for designing or planning activities. An organization with multiple sites may develop separate management plans for each location or choose to use a single comprehensive set of plans. The organization must address specific risks and unique conditions at each site. The seven written management programs cover:

- Safety Management
- Security Management
- Hazardous Materials and Waste Management
- Emergency Management
- Fire Safety
- Medical Equipment Management
- Utilities Management

Managing a Safe and Risk-Free Environment — Organizations manage safety risks associated with providing services for patients. Their programs must address the performance of daily activities by staff and maintenance of the physical environment. Each organization must identify risks and implement processes to minimize adverse impacts on buildings, grounds, equipment, occupants, and internal physical safety systems. Such procedures would include the following tasks:

- Develop a written plan to address management of the care environment.
- Designate a person(s) to coordinate safety functions.
- Identify a person(s) to intervene when events threaten life, health, or property.
- Review general safety policies as often as necessary, but at least every 3 years.
- Respond to product safety recalls by taking appropriate actions.
- Ensure proper maintenance of all facility grounds and equipment.
- Conduct periodic environmental tours to assess the effectiveness of the safety program.
- Assess staff knowledge behaviors during periodic environmental tours.
- Identify new or altered tasks that could pose risks in construction areas.
- Evaluate areas with changes in services to identify improvement opportunities.
- Conduct environmental tours to identify deficiencies and unsafe practices.
- Conduct such tours at least every 6 months in all patient areas.
- Conduct tours at least annually in nonpatient areas.

Patient Safety Efforts — The Joint Commission is committed to improving safety for patients. This commitment is stated in the JCAHO mission statement: The mission of the Joint Commission on Accreditation of Healthcare Organizations is to continuously improve the safety and quality of care provided to the public through the provision of healthcare
accreditation and related services that support performance improvement in healthcare organizations. Accreditation is a risk-reduction activity, and compliance with standards is intended to reduce the risk of medical mistakes.

**JCAHO Quality Reports** — The Joint Commission has a long-standing commitment to providing to the public meaningful information about the comparative performance of accredited organizations. JCAHO began publishing organization-specific Performance Reports in 1994. As part of the its mission, JCAHO began publishing an enhanced version of Performance Reports (called Quality Reports) in July of 2004. The new Quality Report provides consumers with relevant and useful information about the quality and safety of JCAHO-accredited organizations. The Quality Report provides summary information about the quality and safety of care provided by accredited organizations. Quality Reports are created at the organization level and are designed to provide national and state information that can be compared against locally accredited organizations. The online Quality Reports, available on the JCAHO website in the Quality Check section (www.jcaho.org/quality), include interactive links to information that will help consumers better understand how to use and interpret the information presented.

D. AMERICAN OSTEOPATHIC ASSOCIATION

The American Osteopathic Association healthcare accreditation program received deemed status by the Centers for Medicare and Medicaid Services (CMS) to accredit critical access hospitals in 2001. The accreditation program initiated surveys of healthcare facilities under Medicare in 1966. The accreditation application process includes an on-site administrative review of corporate policies, including an assessment of financial and human resources. Other areas of review include a comparison of the accreditation standards for critical access hospitals to the standards of current Medicare requirements. When the review is completed, CMS determines if the osteopathic facility meets or exceeds the requirements for deeming authority. The association represents more than 47,000 osteopathic physicians, promotes public health, encourages scientific research, and serves as the primary certifying body for osteopath doctors. The association serves as the accrediting agency for all osteopathic medical schools and healthcare facilities, including acute-care hospitals. The osteopathic accreditation program was implemented in 1945 to survey hospitals each year. This enabled the association to ensure that osteopathic students received their training through rotating internships and residencies in facilities that provided a high quality of patient care. The association also has deeming authority to accredit laboratories within accredited hospitals under the Clinical Laboratory Improvement Amendments (CLIA) of 1988. The association has also developed accreditation requirements for ambulatory care, surgery, mental health, substance abuse, and physical rehabilitation medicine facilities. The laboratory accreditation program is a recognized alternative to accreditation by the College of American Pathologists (CAP) or JCAHO. Healthcare facilities seeking accreditation from the association’s accrediting program must comply with all the requirements identified by the association.

Completed applications must include the following documents:

1. Governing body bylaws
2. Medical staff bylaws, rules and regulations, credentialing manual
3. Master staffing plan for nursing
4. Facility floor plan (on 8-1/2 × 11 paper only)
5. Copy of the latest Life Safety Code Inspection by a local or state agency
E. CANADIAN COUNCIL ON HEALTH SERVICES ACCREDITATION

The Council operates as a national nonprofit and independent organization. Its mission is to help health services organizations assess and improve their quality of care. The Council promotes excellence in health care and the effective use of resources to improve the delivery of health services. The Canadian Council on Health Services Accreditation operates a two-part accreditation process. The first part involves self-assessment against national standards. Key areas include patient care, delivery of service, information management, human resources management, facility governance, and management of the environment. Surveyors from outside the organization conduct another survey and use the same national standards to validate the self-assessment survey. This survey uses external and objective reviewers. Surveyors meet with board members, administrative staff, physicians, caregivers, human resources people, information management specialists, patients, and family members. The focus of these meetings is on the experiences, perceptions, and expectations of these people. A written report that summarizes the survey findings focuses on the organization's strengths and weaknesses. Surveyors make recommendations to help the organization improve weak areas and maintain those that are performing well. Surveyors come from organizations similar to those they survey. Surveyors participate in ongoing education and evaluation programs to upgrade their skills and knowledge base.

The Council's accreditation program covers the following services or programs:

- Acute care
- Acquired brain injury
- Assisted reproductive technology
- Canadian Forces Health Services (being finalized)
- Cancer care
- Community health
- Correctional Service of Canada health services (being finalized)
- First Nations and Inuit addictions services
- First Nations and Inuit community health services
- Health systems
- Home care
- Long-term care
- Mental health
- Rehabilitation

Continuous quality improvement team members from each facility perform the self-assessment. The team focuses on the grounds, building systems, equipment, environment, and personnel. Membership on the environmental teams could include, but is not limited to, members from administration, nursing, housekeeping, food services, laboratory, occupational health and safety, engineering, infection control, and imaging. The environmental team must address five primary concerns during the self-assessment, before the accreditation survey team arrives:
• **Managing physical resources** — The organization must provide evidence supporting the safe, efficient, and effective use of facilities, equipment, supplies, and medical devices. Areas addressed include preventative/routine maintenance, storage, utilities, and energy conservation. Other areas assessed include upgrading of equipment and systems, waste generation and disposal, and health and safety, as well as adherence to regulations, standards, and codes. The team also evaluates the use of space, quality of training on equipment use, and maintenance of a comfortable environment for staff and patients.

• **Anticipating and preventing adverse outcomes** — The survey team focuses on infection control and the identification of potential safety hazards, including the proper recording of incidents. The environmental team must evaluate the handling, storage, and disposal of all infectious material. Other areas of concern include food handling, personal hygiene, cleanliness of the physical setting, proper ventilation, design structure, proper climate control, and indoor air quality.

• **Disaster planning and execution** — The survey team evaluates the planning and execution of disaster procedures, including coordination with community and area agencies. During the accreditation survey, the survey team evaluates the facility on actions taken to reduce fire risks and assesses the storage of flammable materials and compliance with fire codes. The assessment focuses on the inspection, testing, and maintenance of all fire-detection and extinguishing systems. Fire safety training is also evaluated.

• **Minimizing impact on the environment** — The survey team assesses an organization on its efforts to improve the health of the environment. The evaluation considers processes to reduce, reuse, and recycle generated waste. Other areas addressed include the proper handling and disposal of biomedical waste, conservation of water and energy, use of green products and practices, and limiting power plant emissions. Facilities are expected to reduce or eliminate incineration, minimize noise, and work together with local, provincial, and federal environmental agencies to improve or maintain the environment.

• **Evaluating services and processes to identify improvement** — Each facility being assessed must have methods to evaluate their various services and processes. The evaluation considers outcome indicators to identify need for improvement. The assessment process focuses on measuring the services provided by the facility. Performance and outcome indicators are tools that can assist the healthcare facility in measuring its performance. The environmental team may evaluate indicators such as needle sticks, noise complaints, equipment failures, patient falls due to environmental reasons, organizational acquired infection rates, reprocessing supplies, purchase orders, and fire incidents.

### F. COMMISSION ON ACCREDITATION OF REHABILITATION FACILITIES

The Commission on Accreditation of Rehabilitation Facilities (CARF) serves as an independent, not-for-profit accrediting body. CARF provides accreditation in the human services field and focuses on the areas of rehabilitation, employment, child and family, and aging services. CARF accredits providers of the following specific services:

- Adult day services
- Assisted living
- Behavioral health
- Comprehensive blind rehabilitation services
CARF considers accreditation to be a partnership with the service provider. The survey is a consultative process rather than an inspection. The survey team works with the provider to improve service resources and outcomes. CARF standards are developed and revised through a series of leadership panels, national advisory committees, focus groups, and field reviews. The standards development process provides opportunities for persons receiving services and other stakeholders to be actively involved in developing CARF standards. The types of accreditation include:

- **Three-Year Accreditation:** The highest level of accreditation awarded to a service provider is the Three-Year Accreditation, which reflects substantial fulfillment of the CARF standards.

- **One-Year Accreditation:** The One-Year Accreditation indicates that the provider has been deficient with regard to conformance to the CARF standards, yet there is evidence of the provider’s capability and commitment to correct the deficiencies or make progress toward their correction.

- **Provisional Accreditation:** A provider still functioning at the level of a One-Year Accreditation on the following year’s survey visit will receive a survey outcome of Provisional Accreditation. A Provisional Accreditation is for a period of one year. The provider must be functioning at the level of a Three-Year Accreditation on the following year’s survey visit, or it will receive a survey outcome of Non-Accreditation.

- **Non-Accreditation:** This status indicates that the provider has major deficiencies in several areas of the standards, and serious questions have been raised with regard to the benefits, health, welfare, or safety of those served; the provider has failed over time to bring itself into substantial conformance to the CARF standards; or the provider has failed to meet one or more of the other accreditation conditions.

Surveyors are peers in the field who are employed by organizations that have CARF accreditation or who have substantial experience in the types of programs and services that are accredited by CARF. The goal is to recruit and train only the most highly qualified professionals to conduct surveys. The surveyor plays a critical role in the overall accountability of CARF’s survey process. CARF surveyors are committed to the principle that accreditation is essential to ensuring that organizations offer services that demonstrate value to the persons served. They are trained to consult and to share their knowledge. In 1999, CARF published a standards manual for accreditation of adult daycare services. The following year, they published an assisted-living standards manual. By launching accreditation opportunities in these areas, CARF moved beyond its initial market arena into the rehabilitation field. Since then, CARF has developed accreditation for other human services that are not associated with rehabilitation — for example, workforce development services and the administration of one-stop career centers.

**G. COLLEGE OF AMERICAN PATHOLOGISTS LABORATORY ACCREDITATION PROGRAM**

The College serves as the principal organization of board-certified pathologists and represents the interests of patients, pathologists, and the public by fostering excellence in the practice of pathology and laboratory medicine. Located in the Chicago area, the College is the world’s
largest association composed exclusively of pathologists and is widely considered to be the leader in providing quality improvement programs to laboratories around the world. CAP programs and products include resources designed specifically for pathologists and laboratory professionals.

**Accreditation Program** — An accredited laboratory is one that has been inspected by a private, not-for-profit accrediting organization that has been approved by the Centers for Medicare and Medicaid Services (CMS) and whose requirements have been deemed as equivalent to or more stringent than the regulatory requirements of CMS. An approved accrediting organization can inspect a laboratory in lieu of CMS. The goal of the CAP Laboratory Accreditation Program is to improve the quality of clinical laboratory services through voluntary participation, professional peer review, education, and compliance with established performance standards. Upon successful completion of the inspection process, the laboratory is awarded CAP accreditation and becomes part of an exclusive group of more than 6000 laboratories worldwide that have met the highest standards of excellence. Only CAP utilizes working and experienced laboratory professionals in a peer-review inspection process. This approach provides a laboratory with inspectors who bring first-hand knowledge of the most current laboratory techniques and processes. The College serves the broadest patient population by accommodating the full spectrum of laboratory disciplines under one accreditation process. No other accreditation program provides such a comprehensive offering. Participants are able to maintain laboratory standards by participating in the only program designed and maintained by laboratory experts. An accredited laboratory helps ensure that the facility meets federal requirements. The CAP has CMS authority to accredit all CLIA specialties and subspecialties and has been recognized by the JCAHO as an equivalent program in Joint Commission accredited institutions. Such rigorous requirements help ensure the highest quality of patient care. CAP accreditation indicates that a laboratory has met the highest standards of practice, and the process itself focuses the entire laboratory team on quality patient care.

**Accreditation Cycle**

- The laboratory submits an Application Request Form with a deposit.
- CAP sends an application and checklists to the laboratory.
- The laboratory completes and returns the application and reviews the checklists.
- CAP receives and evaluates the application.
- CAP assigns an inspection team.
- The laboratory and CAP set up a mutually acceptable date for the inspection.
- A team of inspectors arrives on the designated date.
- The team conducts a thorough inspection using the checklists as guides.
- The team conducts a summation conference with the laboratory staff to review findings.
- The inspectors leave a copy of the final Summation Report.
- The laboratory corrects any deficiencies and provides documentation for CAP.
- The laboratory is accredited for a 2-year cycle but conducts a self-inspection at the 1-year mark.

**H. INSTITUTE OF MEDICINE**

The mission of the Institute of Medicine (IOM) is to serve as an adviser to the nation with the goal of improving the health of the population. As an independent, scientific adviser, the Institute of Medicine strives to provide advice that is unbiased, based on evidence, and
grounded in science. The mission of the Institute of Medicine embraces the health of people everywhere. Part of the National Academies, the IOM advises on matters of biomedical science, medicine, and health. It is a nonprofit organization that provides a vital service by working outside the framework of government to give policymakers, professionals, and leaders in every sector of society scientifically informed analyses and independent guidance, as well as evidence-based and authoritative information and advice concerning health and science. Committees of volunteer scientists serve without compensation. Each report produced by a committee goes through a review and evaluation process. The work of the Institute centers principally on committee reports or studies on subjects ranging from quality of medical care to medical errors. The Institute maintains a close working relationship with the National Institutes of Health (NIH). The majority of the studies and other activities are requested and funded by the federal government. Other studies are initiated by private industry, foundations, state and local governments, and the Institute itself. The Institute’s primary objective is to improve decision making by identifying and synthesizing evidence.

I. AMERICAN HEALTH CARE ASSOCIATION

The American Health Care Association (AHCA) operates as a nonprofit federation of affiliated state health organizations, together representing nearly 12,000 nonprofit and for-profit assisted-living and nursing facilities as well as facilities providing services to the developmentally disabled and subacute care for more than 1.5 million elderly and disabled individuals nationally. It represents the long-term-care community to the nation at large — to government officials, business leaders, and the general public. It also serves as a force for change within the long-term-care field, providing information, education, and administrative tools that enhance quality at every level. At its Washington, D.C., headquarters, the association maintains legislative, regulatory, and public affairs staffs, as well as a member services staff, all of which work both internally and externally to promote the interests of government and the general public, as well as member providers. The ultimate focus is on providing quality care to the nation’s frail, elderly, and disabled who are served by the long-term-care professionals comprising the membership of the Association. These providers believe that the individuals whom they serve are entitled to a supportive environment in which professional and compassionate care is delivered. Reflecting this belief, the Association is committed to developing necessary and reasonable public policies that balance economic and regulatory principles in support of quality care and improving the quality of life. The Association is dedicated to professionalism and ethical behavior among all who provide long-term care.

J. AMERICAN HOSPITAL ASSOCIATION

The American Hospital Association (AHA) is a national organization that represents and serves all types of hospitals and healthcare networks and their patients and communities. Close to 5000 hospitals, healthcare systems, networks, other providers of care, and 37,000 individual members comprise the AHA. Through its representation and advocacy activities, AHA ensures that members’ perspectives and needs are heard and addressed in national health policy development, legislative and regulatory debates, and judicial matters. The Association’s advocacy efforts target the legislative and executive branches of government and include legislative and regulatory arenas. Founded in 1898, the AHA provides education for healthcare leaders and is a source of information on healthcare issues and trends.
American Society of Healthcare Engineering — The American Society of Healthcare Engineering (ASHE), an AHA-affiliated organization, has almost 6000 members worldwide. ASHE promotes healthcare safety, emergency preparedness, healthcare engineering, and security issues and takes a leading role in providing members information about regulatory codes and standards. ASHE promotes healthcare education through professional development seminars and conferences. The monthly publication of technical documents keeps members informed on the latest changes and developments related to healthcare engineering and facility management. The Society’s more than 100 publications and innovative software programs help members meet new challenges. The Society provides advice on a number of operational concerns, including:

- Facilities management
- Plant design and engineering
- Building maintenance and support services
- Environmental and waste management
- Safety and security
- Clinical engineering

American Society of Healthcare Risk Management — Established in 1980, the American Society of Healthcare Risk Management (ASHRM) is a personal membership group of the American Hospital Association that has more than 4400 members representing health care, insurance, law, and other related professions. Its mission is to advance safe and trusted patient-centered healthcare delivery. The society promotes effective and innovative risk-management strategies and professional leadership through education, recognition, advocacy, publications, networking, and interactions with leading healthcare organizations and government agencies. The society initiatives focus on developing and implementing safe and effective patient care practices, preservation of financial resources, and maintenance of safe working environments.

American Society of Healthcare Environmental Services — The premier healthcare association representing over 1650 environmental services, housekeeping, and textile care professionals, the American Society of Healthcare Environmental Services (ASHES) is the largest healthcare environmental services organization in the world. ASHES is the personal membership association of choice for healthcare environmental services and textile care professionals and is the recognized resource and catalyst for the general and regulatory communities. ASHES strives to exceed its members’ expectations by providing strong leadership and progressive thinking in the face of a changing healthcare field. ASHES is becoming a leading educator as well as an effective listener and communicator that values member input and recognizes members for their contributions. ASHES provides:

- Educational programs and materials to increase knowledge and enhance skills
- Leadership that is accessible and responsible to the needs of its members
- Opportunities to network with peers on a national level
- Recognition for personal and professional achievements
- Collaboration with the AHA and other organizations on public policy and advocacy issues relating to environmental services

K. ASSOCIATION OF OCCUPATIONAL HEALTH PROFESSIONALS

The Association of Occupational Health Professionals (AOHP) works to define employee health issues and serve as a leading advocate for occupational health professionals serving in healthcare organizations. The board uses monthly conference calls to coordinate positions
Introduction to Healthcare Hazard Control

on hot topics and strategic initiatives. The association participates in governmental affairs and meets with OSHA, the National Institute for Occupational Safety and Health (NIOSH), and congressional representatives to address Association positions. The Association sponsors an annual national conference where members meet to share, network, and attend professional education sessions. OSHA and the Association recently entered into an alliance to promote worker health and safety in healthcare workshops.

L. SERVICE EMPLOYEES INTERNATIONAL UNION

With 1.6 million members, the Service Employees International Union (SEIU) is the largest and fastest growing union within the American Federation of Labor–Congress of Industrial Organizations (AFL–CIO). It is the nation’s largest healthcare union, representing more than 755,000 healthcare workers, including more than 100,000 nurses and 20,000 doctors. The labor group is also the largest union of nursing-home workers (more than 130,000). SEIU members are using their strength to raise staffing and quality care standards in the healthcare industry. The union also supports legislation and standards aimed at improving safety and staffing in healthcare facilities. Understaffing in hospitals, nursing homes, and other healthcare facilities drives down the quality of care and drives healthcare workers away from the profession. On its website, the union provides its members and the public with access to current news and valuable safety information on a number of healthcare hazards.

M. ECRI

A nonprofit health services research agency, ECRI (formerly the Emergency Care Research Institute) works to improve the safety, quality, and cost-effectiveness of health care. It is widely recognized as one of the world’s leading independent organizations committed to advancing the quality of health care. The agency focuses on healthcare technology, risk, quality, and environmental management. The agency provides information services and technical assistance to more than 5000 hospitals, healthcare organizations, ministries of health, government and planning agencies, voluntary sector organizations, associations, and accrediting agencies around the world. ECRI maintains more than 30 databases, publications, information systems, and technical assistance services which set the standard for the healthcare community. The agency provides alerts related to technology hazards and publishes the results of medical product or technology assessments. ECRI provides expert advice on technology acquisitions, staffing, hazardous materials management, and clinical practice guidelines/standards. It developed the Center for Healthcare Environmental Management (CHEM) in 1990. CHEM, an international membership organization, provides continuing education and professional accreditation for healthcare occupational safety and environmental managers. The agency now plays a major role in healthcare policy and research, including clinical guideline development. ECRI maintains close working relationships with the European Union, the U.S. Food and Drug Administration, the Pan American Health Organization, the World Health Organization, and healthcare organizations worldwide.

SUMMARY

This brief introductory chapter provided an overview of the changing healthcare industry and addressed employment growth projections to make the point of how necessary effective safety programs are. As the healthcare environment changes, new hazards will emerge
and effective hazard control will continue to be necessary. This changing face of healthcare safety provided much of the motivation for this second edition. This chapter also noted some of the organizations helping to promote the importance of safety improvement in the healthcare and medical communities. Senior leaders must learn to view and manage healthcare safety issues using a systems approach. To do this properly, senior leaders must understand that healthcare organizations must address the following essential system components: employee safety, patient safety, visitor safety, contractor safety, construction safety, and even community safety.

FOR REVIEW AND DISCUSSION

1. Why is a proactive approach to safety vital to the success of safety programs in healthcare environments?

2. Who should promote safety as an organizational priority within the organization? Why?

3. Why do you think that safety has just recently become a priority in some healthcare and medical organizations?

4. How can an effective safety program contribute to the success of any healthcare organization?

5. What is the most well-known accrediting body serving the healthcare industry? Briefly describe its mission and sphere of influence.

6. What agency in Canada helps hospital access and improves the quality of care? Explain the two-part accreditation process.

7. List five types of service providers accredited by the Commission on Accreditation of Rehabilitation Facilities.

8. The College of American Pathologists (CAP) conducts accreditation visits to what healthcare segment? Why is accreditation so vital for this segment?

9. Describe the primary mission of the Institute of Medicine (IOM).

10. What organization exists to represent the nation’s long-term-care industry?

11. Explain the roles of the following organizations:
    a. American Hospital Association
    b. American Society of Healthcare Engineering
    c. American Society of Healthcare Risk Management
    d. American Society of Healthcare Environmental Services

12. How can organized labor truly improve the safety of healthcare workers?

13. Explain the mission of ECRI.
CHAPTER 2

HEALTHCARE SAFETY MANAGEMENT

A. INTRODUCTION TO SAFETY MANAGEMENT

Healthcare safety continues to develop and has emerged as a distinct discipline. Many healthcare organizations realize that preventing or avoiding losses improves the bottom line, but controlling hazards, managing risks, and maintaining proactive safety programs are essential activities still overlooked by many top healthcare leaders. A well-organized safety program plays a vital role in meeting the challenges of providing effective patient care and other services within a safe environment. Integrating safety into the care environment using a systems approach remains the most proven method for achieving these desired results. Challenges facing organizations include:

- Making safety an integral part of job performance
- Understanding accidents and their relationship to cost, time, and performance factors
- Educating all personnel on basic safety management concepts and principles
- Increasing involvement of staff and departments in the safety program
- Establishing a functional safety committee that can make a difference
- Implementing an effective system of information collection and evaluation
- Conducting safety-related causation analyses
- Applying system safety techniques to the safety program
- Establishing quality safety orientation, training, and education sessions
- Focusing on unsafe behaviors as well as hazard control

Safety Management Principles — Accidents, injuries, and loss events occur as a result of management deficiencies and reveal the existence of managerial and leadership problems. The following actions should be taken to minimize the likelihood of accidents:

- Correct the causal factors to make better use of human and material resources.
- Understand that placing blame never addresses real safety problems.
- Use analysis to help pinpoint system problems.
- Improve safety throughout the organization by integrating safety programs into all functions within the organization.
- Improve organizational performance and the bottom line.
- Determine ways to reduce the costs of accidents, insurance, equipment, hiring, and training.
- Bolster worker morale and promote good public relations.
B. MANAGEMENT EFFICIENCIES AND SAFETY

- Management deficiencies and inefficiencies lead to errors of omission and commission.
- Management deficiencies set the stage for accident events.
- Most accidents result in work interruptions and the loss of someone’s time.
- Good management eliminates the causes of accidents; poor management generates accidents.
- The occurrence of accidents has a domino effect on the entire organization.

Safety Program Fundamentals — Top management must demonstrate a total commitment to the organization’s safety and health program. An effective program considers maintaining worker safety and health to be a fundamental responsibility of the organization:

- **Workplace analysis** — Management must ensure that effective workplace hazard surveys are conducted. Hazard information must be accurately analyzed to better permit the organization to anticipate and prevent accidents.
- **Accident prevention and hazard control** — Organizations should stress accident prevention and safe work practices to all employees. Actions should be taken to control hazards through the design of work areas or the job task itself. When it is not feasible to eliminate hazardous conditions, the organization must implement measures to protect individuals from unsafe conditions or unhealthy exposures.
- **Employee training** — Training is the key to success. The nature of the training depends on the type, size, and complexity of the organization. Training is also based on potential hazards, risks, or exposures present.

Coordinating Safety — Coordinating hazard control and safety activities that address behaviors can be difficult for a number of reasons. Coordination cannot take place unless the cultural and communication aspects of the organization are understood. The coordinating function of management is the vehicle to change behaviors and expectations. Results occur when the culture is understood, communication is effective, and coordination takes place. Management commitment provides the motivating force for organizing and controlling safety-related programs. A clearly stated worksite policy regarding safety and working conditions demonstrates the priority management has placed on safety in relation to other organizational values.

Policy Statements — Good policy statements express a belief or philosophy. Many organizations make the mistake of attempting to implement policies that conflict with the leadership philosophy of the organization. Never attempt to establish a policy unless the philosophy of the organization has been clearly defined by senior leaders. An understood philosophy regarding safety provides the foundation for an organizational policy statement, and a good policy statement provides direction for meeting established safety goals or objectives. Senior leadership must approve the safety policy statement. (See Table 2.1.)

Healthcare Safety Environments — The environment of a healthcare organization consists of buildings, equipment, and people. A number of elements can positively influence patient outcomes, satisfaction, and improve patient safety. Proper design and management of the physical environment contribute to creating a safe and comfortable environment of care that helps support and maintain patient dignity, promotes interaction, reduces stress, and encourages family participation in the care process.
Basic Healthcare Environment Considerations — (See Table 2.2.)

- Proper lighting (natural and artificial sources)
- Privacy (including visual and auditory)
- Appropriate use of space that considers the clinical philosophy of care
- Security of person, property, and valuables
- Orientation and access to nature and the outside
- Color schemes that enhance care
- Efficient layouts that promote effective operations and staff procedures
- Reduction and control of environmental hazards and risks
- Sustaining an environment sensitive to patient comfort and social interaction
- Developing an environment that minimizes unnecessary environmental stress
TABLE 2.3  Safety Director Responsibilities

Advise senior leadership and the safety committee.
Use good communication and human relations skills to achieve safety goals.
Help develop, implement, and maintain safety management plans.
Provide assistance in developing safety polices for various hazards.
Seek ways to promote safety awareness throughout the organization.
Serve as a consultant to all organizational leaders and department heads.
Oversee the facility inspection, hazard survey, and environmental tour programs.
 Assist with the development and evaluation of safety-related training programs.
Supervise accident investigation and hazard analysis programs.
Ensure compliance with safety and fire regulatory standards and codes.
Participate in organizational root-cause analysis sessions as necessary.
Facilitate root-cause analysis sessions that address safety issues.
Attend professional education sessions to stay current with healthcare safety procedures.
Achieve safety-related certifications (e.g., CHSP, CHCM, CHEM).
Promote a decentralized approach to safety by promoting departmental safety programs.
Coordinate safety, accreditation, and compliance issues.
Communicate safety issues with the risk management, infection control, engineering, facility management, security, employee health, materials management, human resources, and quality improvement functions.

Senior Leadership Responsibilities

- Publish a safety policy that expresses commitment to the program.
- Establish realistic safety program goals and expectations.
- Provide the resources necessary to ensure achievement of these goals.
- Communicate the importance of the program to staff members.
- Assign responsibilities and authority as necessary to carry out the plan.
- Hold organizational members accountable for safety goals and objectives.
- Emphasize the importance of using a systems approach to solve safety problems.
- Personally communicate safety at every opportunity.
- Establish an off-the-job safety and health program.
- Require that a safety-related topic is to be discussed at all meetings or training sessions.
- Implement an effective education program for all third-shift workers.
- Encourage key department managers to personalize the safety message.
- Promote safety as a proactive endeavor that pays off by improving the system.

Supervisor Safety Responsibilities — (See Table 2.3.)

- Analyze work areas to identify unrecognized potential hazards.
- Maintain personal protective equipment and ensure its proper use.
- Provide job training on potential occupational hazards.
- Be sure that workers know the protective measures to follow.
- Reinforce employee training through continual performance feedback.
- Enforce compliance with safety rules and practices.
- Complete accident reports and conduct initial investigations.
- Conduct periodic safety inspections.
Worker Involvement — Senior leaders, department heads, and supervisors should encourage worker involvement by:

- Appointing employees to positions in the safety program
- Placing hourly workers on a safety committee
- Requiring workers to report accidents and injuries immediately
- Providing quick responses to concerns about safety
- Assessing and correcting problems and hazardous conditions
- Training and educating workers on a recurring basis
- Promoting safety on a continuous basis

Successful Safety Programs — Safety programs developed to fit the needs of an organizational can succeed if properly managed. There are several reasons why safety programs produce results for an organization. Successful safety programs:

- Stress results-oriented activities based on defined goals.
- Investigate and analyze causal factors that result in loss.
- Develop a management action plan in addition to publishing policies.
- Establish measurement criteria to assess program effectiveness.
- Publish contingency plans to deal with potential problems.

Written Program Considerations

- Implement a program structure that best serves the organization.
- Ensure that the program utilizes a systems approach that integrates safety.
- Assign responsibilities and delegate authority to a qualified safety officer or director.
- Establish lines of communication within the safety management function.
- Develop comprehensive orientation, training, and education programs.
- Specifically address patient, worker, visitor, and community safety objectives.
- Stress accident prevention and worker’s compensation cost containment.
- Develop effective reporting, hazard identification, and investigation procedures.
- Establish specific written coordination requirements for the following functions:
  - Safety management
  - Risk management
  - Employee health
  - Security
  - Emergency management
  - Infection control
  - Quality improvement

Developing or Revising a Written Safety Program

1. Assessment:
   - Review statistics, claims, trends, and severity/frequency rates.
   - Evaluate effectiveness and scope of current loss-control practices.
   - Talk with workers to reveal their feelings, perceptions, and reactions.
   - Identify any other problem areas that impact loss-control efforts.

2. Organizational safety policy statement:
   - Be sure that a philosophy has been defined before publishing any safety policy statement.
   - Obtain approval to issue the policy statement from the highest level in the organization.
   - Write the policy statement using simple language that communicates to everyone involved.
• State objectives in broad terms in the statement, as details will be provided in the written safety program.
• Communicate long-range applications of the policy.
• Understand that an effective safety policy statement promotes integrated and decentralized actions while at the same time it gives organizational leaders the right to act.
• Do not allow the written safety program to conflict with the policy statement.

3. Assigning authority and responsibilities:
• Find the authority for implementing a safety program in the codes, regulations, and organizational policy.
• Appoint a safety officer, director, or coordinator to lead the program.
• Assign responsibilities and delegate authority to ensure program success.
• Publicize management’s commitment to the program.
• Ensure that all employees understand their responsibilities.

4. Establishing documentation and training procedures:
• Determine recordkeeping requirements for injury and accident reports.
• Obtain all required regulations, publications, and standards.
• Publish written safety policies, job procedures, and safety regulations.
• Establish documentation requirements for all employee training sessions.
• Develop concise and complete job descriptions for all employees.

5. Developing evaluation guidelines:
• Determine how frequently to evaluate the program for effectiveness.
• Involve department heads by requiring periodic self-inspections.
• Advise departments that safety officers will evaluate each department on a regular basis.

6. Establishing a safety committee or process team to oversee the safety management program:
• Take a proactive role to promote and oversee safety activities.
• Be given the authority to cross departmental boundaries.
• Take all actions necessary to accomplish program objectives.
• Be structured to meet the needs of the organization.

Safety Committees — The Joint Commission does not require a specific type of safety committee but does require a safety management process to help develop, implement, evaluate, and resolve safety matters (see Table 2.4). Committees or other processes must have representatives from administration, clinical, and support departments. Other suggestions include the following:

• Make recommendations related to program improvement or revision.
• Report safety-related activities to upper-level management on a regular basis.
• Maintain documentation of actions and results of the management process.
• Develop a process of coordination between various departments.

Safety Planning — The Joint Commission requires the development of a safety management plan that will provide a physical environment free of hazards. The plan must address ways to manage staff activities and reduce the risk of injuries at all campus facilities, as well as:

• Outline activities that will reduce the risk of human injury.
• Ensure the safety of grounds, facilities, and equipment.
• Provide readily identified and accessible emergency service areas.
• Establish a risk assessment program to evaluate safety.
• Provide for the appointment of a qualified safety officer.
TABLE 2.4 Reasons for Ineffective Safety Programs

Safety efforts focus on activities instead of behavioral elements.
Safety problems and issues are not addressed using a systems approach.
Senior leadership fails to define the organizational safety philosophy.
Organization focuses primarily on compliance and accreditation issues.
Physicians in many situations do not participate in safety efforts and become an obstacle.
Safety education and training programs focus too much on simply documenting attendance.
Performance- and objective-based training and education are rarely provided.
Competition is allowed to exist among safety program elements (e.g., patient vs. worker safety).
Leaders fail to address or deal with turf kings and queens.
Lack of good coordination results in poor “buy-in” by organizational leaders.
Senior leadership does not communicate goals and objectives to all levels.
Effective accident investigation techniques are not implemented.
Root-cause analysis methods are used only for patient safety, not all safety events.
Facility believes a “one-size-fits-all” safety program approach will work.

- Establish accident investigation procedures.
- Require departments to develop safety programs.
- Require safety training, orientation, and education of all employees.
- Require an annual evaluation of program effectiveness.
- Examine safety issues raised by clinical departments.
- Provide ongoing hazard surveillance programs.
- Identify persons to intervene when conditions threaten life or health.
- Develop plans to promote worker safety.
- Address the organization’s smoking plan.
- Require semiannual environmental tours in patient areas and annually in other areas.

Safety Committee Reports — A general report should be compiled after each safety committee or process management meeting. Circulate these reports to applicable departments and members of top management. Examples of performance topics include:

- Safety deficiencies reported during the period
- Summary of causal factors that contributed to accidents
- Emergency preparedness drills, critiques, and plan activations
- Status of the hazardous materials and waste management programs
- Data on important issues, costly trends, or hazards
- Evaluation information on safety program effectiveness
- Summary of trends, problem areas, or accomplishments

Safety-Related Definitions

- **Hazard** — A condition or practice with potential for loss under certain circumstances.
- **Hazard control** — The practice of identifying, evaluating, and controlling hazards to prevent or mitigate harm or damage to people, property, or the environment.
- **Industrial hygiene** — The art devoted to the anticipation, recognition, evaluation, and control of environmental factors or stressors found in the workplace. The
Environmental factors addressed by industrial hygiene personnel include physical, ergonomic, biological, and chemical hazards.

- **Risk** — The chance that loss will occur under certain conditions.
- **Safety** — Human actions taken to control, reduce, or prevent accidental loss.

## Function of Management

- **Planning** — Actions taken to predetermine the best course of action.
- **Organizing** — Arranging work or tasks to be performed in the most efficient manner.
- **Directing** — Providing the necessary guidance to others during job accomplishment.
- **Controlling** — Measuring performance of work by monitoring outcomes.
- **Coordinating** — Communicating to interested parties to obtain input and agreement.
- **Evaluating** — Assessing program effectiveness for the purpose of improving it.
- **Leading** — Creating an atmosphere and purpose that encourage people to succeed.
- **Line organization** — Creating a hierarchy with a chain of command.
- **Span of control** — The number of workers a person can effectively supervise.
- **Unity of command** — Workers being responsible to one supervisor or leader.

## Safety Management and Related Definitions

- **Management by exception** — A decision made by a manager that was reached by reviewing only pertinent information instead of reviewing all available information.
- **Management by objective** — A manager and subordinates agree on a predetermined course of action or objective.
- **Bureaucratic organizational theory** — A line organization that creates a hierarchy with a chain of command.
- **Human needs** — Physiological, safety, social acceptance, self esteem, and self-actualization.
- **Cost–benefit analysis** — A safety evaluation of a situation that focuses on the comparative benefits of an expenditure (not necessarily a dollar-for-dollar comparison).
- **Overt culture** — Formal, expected, published, visible, or anticipated culture.
- **Covert culture** — Informal or hidden culture that exists in every organization.
- **Culture of trust** — A culture where workers have a voice and choice (participate).
- **Turf kings and queens** — Managers who view only their issues as being important.
- **Thinking outside the box** — Tapping the creativity, expertise, and insights of people.

## C. SAFETY LEADERSHIP

Top healthcare leaders should provide the framework for planning, directing, coordinating, providing, and improving care, treatment, and services to respond to community and patient needs and improve healthcare outcomes (see Table 2.5). Senior leadership must provide the foundation for an effective safety program by developing the organizational safety philosophy. It is not unusual for written safety policies of healthcare organizations to conflict with the leadership philosophy; for this reason, senior leaders must clearly define the safety philosophy before publishing any policies. Safety as an organizational value is a reflection of the worth placed on people. Accreditation organizations and compliance agencies do not give safety its value — people do. The science and practice of safety strive to prevent losses, including injuries, from occurring. Related disciplines, such as risk management and quality control, must support the organizational safety program. Risk managers attempt to reduce
the impact of an undesirable event, while quality programs seek to improve processes. The safety, risk, and quality functions must integrate their actions to address potential risks and hazards. Healthcare organizations permit and sometimes encourage each function or department to build its own “dynasty.” This results in turf leadership that makes it difficult to coordinate or communicate among departments. Keep in mind that:

• Safety performance requires planning, delegation, and accountability.
• Safety goals must be expressed in specific terms.
• Safety becomes a value when people are allowed to have a voice and participate.
• Safety leadership deals with motivating, inspiring, and rewarding success.

Goals of a True Leader

• Develop a safety philosophy for the organization.
• Plan and implement a comprehensive safety management program.
• Communicate clear safety goals and methods of achievement.
• Create an environment that allows the organization to meet these established goals.
• Establish a framework for supporting quality patient care and services.
• Focus on developing strategic operational plans.
• Develop clear lines of authority, responsibility, and accountability.
• Present safety as a value to be used as a reference point for management decisions.
• Develop the leadership skills of subordinate staff members.
• Provide direction and adequate staffing for maintenance of all care services.
• Implement processes to measure, assess, and improve all functional areas.
• Communicate expectations of all improvement processes.
• Require establishment of practice guidelines that focus on reducing variances.
• Stress the importance of using root-cause processes to discover causal factors.
• Promote safety at every opportunity.
• Present an off-the-job safety topic at every safety event.
• Train and educate second- and third-shift workers during their shifts.
• Provide special education on sleep deprivation for second- and third-shift workers.
• Focus on behavioral and organizational elements instead of on activities only.
• Never adopt a “one-size-fits-all” safety mentality.

Safety Teamwork
Merge skills and talents of a group into a single force:

• The group’s performance and knowledge are greater than any one person.
• The force of the group enables the team to work in harmony to achieve common goals.
• Teamwork fosters the development of positive attitudes.
• Teamwork focuses on improved safety-related behaviors.

Leading Safety Quick List

• Help people succeed by using effective communication techniques.
• Use good judgment but rely on common sense or intuition.
• Reward safe behaviors but correct unsafe acts.
• Show expectations by walking through the process step by step.
• Individualize training as much as possible and provide feedback to all team members.
• Give team members time to practice.

Leadership Qualities — Learn to focus on the process, not just the final product. Consider the following leadership qualities:

• Learn to educate instead of dictating.
• Use conditional statements that encourage creativity.
• Listen first before taking action and listen along the way.
• Promote safety by emphasizing worker ownership.
• Encourage choice to foster responsible actions.
• Establish expectations, not mandates.
• Be confident yet uncertain about the “how.”
• Look beyond the numbers to understand the people issues better.
• Try to understand the diversity of the organizational culture.

Improving Leadership

• Attempt to build strong teams that promote a common purpose.
• Help teams establish values by providing direction.
• Learn to communicate and coordinate a strategy for success for all team members.
• Sell new ideas but do not over-manage.
• Identify and help team members overcome barriers to success.
• Challenge followers by creating change in a nonconfrontational manner.
• Strive to continually learn and improve personal skills.
• Seek ways to make each process valuable to the team.
• Always keep the goal in view but learn to focus more on the team and the process.
• Most of all, learn to listen more and say less.

A leader must honestly assess both the overt and covert cultures existing in the organization; consider the following as other ways to truly improve leadership:

• Create a guiding coalition between team leaders and team members.
• Communicate in plain terms the values, practices, and expectations.
• Communicate the “what” and “why” of all changes of direction.
• Provide feedback to the team regarding the effectiveness of their participation.
• Share the truth with all team members.
• Provide others opportunities to lead.
• Help create new leaders by teaching, coaching, and educating.

**Concepts Leaders Must Understand**

- **Character** — The moral and ethical structure of individuals or groups.
- **Belief** — The mental act and habit of placing trust in someone or something.
- **Values** — A reflection of what we believe and things that have relative worth or importance.
- **Culture** — Socially accepted behaviors, beliefs, and traditions of a group.
- **Attitude** — A state of mind or feeling about something that is many times hidden.
- **Behavior** — The open manifestation of a person’s reactions in a given situation.

**Leadership Lessons for Employees**

- Participate in design review processes.
- Help select necessary safety equipment.
- Conduct safety meetings.
- Identify unsafe behaviors.
- Communicate safety lessons to co-workers.
- Act as safety observers.
- Serve on safety action teams.
- Draft safety suggestions.

**D. HUMAN BEHAVIORS**

A solid safety management process recognizes the role of human behaviors in preventing accidents and reducing losses. Failure to promote safety as an organizational value results in the absence of a safety culture. Management’s attitude toward safety is reflected by the time and resources dedicated to the program. Managers, supervisors, and hazard control personnel can no longer afford to ignore the need for safe human behaviors. Some experts estimate that in 85 to 95% of accidents unsafe human behaviors have been the key primary or contributing causal factors. Hazard control personnel and supervisors need to understand that unsafe behaviors must be corrected, just like unsafe conditions. Front-line supervisors must know how to correct unsafe behaviors.

**Attitudes and Organizational Culture** — A person’s attitude involves feelings that are hidden and many times based on perceived problems and misunderstandings. A supervisor can never change an attitude, but human behavior can be dealt with because it is visible and based on an expectation or standard. The overt or formal culture represents the way management believes the organization should operate; however, many managers do not realize that among the powerful forces that motivate their workers are the organization’s hidden culture and informal communication channels (i.e., grapevine). Organizational dynamics, not structure, have the most influence on performance, and they are based on the way people conduct themselves on a daily basis. Be aware that larger organizations experience more difficulty in communicating important information.
Human Relations and Safety

- Keep in mind that humans give safety its value.
- Implement ways for workers to make suggestions and report hazards.
- Develop ways to listen to the opinions and concerns of others.
- Remember that listening and communicating go a long way toward promoting effective hazard control.
- Never ignore the safety perceptions of others.
- Let workers know that safety is an important organization priority.
- Remember that coordination and communication pave the way to a safe environment.
- Use a systems approach to prevent accidents.
- Promote safety as the proper thing to do.
- Never suggest that safety is important only because of regulations, policies, or standards.
- Promote providing care with safety (never promote care and safety).
- Never use safety as an excuse to discipline.
- Correct unsafe behaviors by showing the proper way to perform a task.
- Provide positive feedback to those supporting safety efforts.

Dealing with Unsafe Behaviors — Working safely depends on a worker’s current needs and situation, as well as past experiences. Efforts to eliminate unsafe behavior must consider many variables, including work environment and job requirements. Supervisors must understand that the needs of people can link organizational goals to their individual goals. Workers often become frustrated when their goals cannot be achieved. Reactions to frustration can be disruptive to the safety, morale, and job performance of others. Understanding factors that contribute to unsafe job performance is key to changing safety-related behaviors (see Table 2.6). Consider taking the following actions:

- Provide frequent and effective training.
- Document unsafe behavior and poor attitudes.
- Provide a positive work environment.
- Recognize and reward satisfactory performance.
- Remove obstacles that prevent satisfactory performance.
- Look for smarter ways to do a job.
- Listen to the opinions and concerns of workers.

Establishing and Enforcing Safety Rules — Employers must publish all rules, policies, and regulations and communicate them so all employees know what is expected of them:

- Include safety policies and rules in the employee handbook.
- Provide a copy of the rules and regulations to each worker.
- Have employees sign a safe work agreement.
- Explain the rules and regulations in regular meetings.
- Post important rules and regulations in a visible location.
- Enforce safety and job rules fairly and firmly.
- Issue verbal warnings for the first or minor infractions.
- Provide a written warning for serious or repeated infractions.
- Ensure that workers understand the consequences of failing to follow procedures.
- Deal immediately with flagrant job violations.
Correcting Unsafe Behaviors

- Identify the unsafe act or behavior.
- State concern for the worker’s safety.
- Demonstrate the correct and safe way.
- Be sure the worker understands.
- Restate the concern for worker, staff, or patients.
- Follow up.

Correction Techniques

- State facts, not opinions, and use “I” statements instead of “they” statements.
- Be direct and to the point but be consistent in doing what you say.
- Reward good performance.

E. SAFETY CULTURES AND SYSTEMS

Healthcare leaders have begun to see the value of establishing safety cultures. Unfortunately, many organizations focus only on developing a patient safety culture without establishing a total safety culture. Many people incorrectly consider a healthcare organization to be a closed system. The management of a closed system depends on the reliability of subsystems and processes that make up the entity. Closed-system managers use predictability tools such as failure mode analysis, fault-tree analysis, and Boolean algebra to assess the reliability of critical systems or subsystems. Certainly, healthcare organizations can apply lessons learned
Healthcare Hazard Control and Safety Management

from the management of complex closed systems, such as the nuclear power, aviation, and space industries; however, healthcare leadership must understand that most healthcare facilities and organizations operate as open systems.

Understanding Open Systems — Healthcare organizations must be considered as open systems that contain many subsystems and even some closed systems, such as the pharmacy. Healthcare organizations have too many variables to apply closed-system methodologies to improve safety, but most root-cause analyses used in healthcare organizations today originated in closed systems. Healthcare organizations have even attempted to use failure-mode analysis to address employee problems. This author strongly encourages healthcare leaders to develop a total safety program that involves the entire organization. Such a program would lay the foundation for addressing safety subcultures in areas such as worker and patient safety. Healthcare leaders must learn to view the organization as a total system (see Table 2.7) and use a systems approach to solve safety-related problems.

Other Key Safety Culture Development Considerations

- Acknowledge that a problem exists and that safety can benefit the bottom line.
- Communicate top management’s commitment to a total safety culture.
- Establish critical controls by establishing standards or goals.
- Monitor deviations and correct performance.
- Include safety performance evaluations in all review instruments.

True Safety Cultures

- Each person assumes responsibility for safety, and safety is integrated into management processes.
- Off-the-job safety programs integrate safety with other training.
- Safety is viewed as an asset, not overhead.
- The focus is on processes, not activities.
- A recognizable culture exists from top to bottom, with leadership setting the example.
- Compliance is not a major concern, and the safety manager is a resource center.

Safety Values

- Right — Following safety procedures is the proper thing to do and benefits everyone.
- Part of the whole — Safety must be a value of the organization and viewed as necessary.
- Without end — Safety is a continuous process.
- People focused — Safety must focus on beliefs, values, morale, and culture.
- Leadership — Centers of influence must be present throughout the organization.
- Measurable — The yardstick must be visible and credible.
- Beneficial — Safety must be fully integrated so everyone is aware of the benefits.
- Not second rated — Safety is viewed as a profit center, not as overhead.
Empowerment — Safety success depends on safety leadership and teamwork.

Management role — Management provides the guidance and resources.

Tips for Keeping Good Employees

- Share the results of hard work and let them know they are a part of the team.
- Be open, honest, and direct with workers.
- Never hide bad news, and understand that apparently minor things can actually mean a lot.
- Learn to be a model, be real, and teach that continued growth is key to success.
- Let employees know their boundaries in clear terms and recognize that suspicion in normal.

Successful Workers

- Demonstrate satisfaction with their jobs.
- Perceive that senior management cares.
- View team leaders as supportive and considerate.
- Expect fair treatment and acknowledgment for jobs well done.
- Look for the opportunity to develop in their job.
- Are acknowledged for a job well done.

(See Table 2.8.)

Things Workers Should Know — Educate or train workers in job safety requirements by encouraging them to:

- Identify and report hazards in their work areas.
- Properly select and use personal protective equipment.
- Perform the task or job correctly by taking safety into consideration.
- Accept supervisory responsibility for correcting behaviors.
- Understand the importance of designing safety into everything.
- Use inspections, analyses, and controls to ensure hazard correction.
- Understand what safety is and what safety is not.
- Realize that safety is the right thing to do.

---

TABLE 2.8  Improving the Safety Culture

Never use orientation sessions to conduct performance-based safety training or education.
Conduct safety orientation topics during the morning.
Require supervisors to conduct and document job-related training.
Centralize all respirator fit-testing activities to ensure proper training.
Do not insist on a sign-in for training (documentation becomes more important than learning).
Have all workers document their training by completing, at a minimum, a ten-question quiz.
Train second- and third-shift workers on their shift.
Orient second- and third-shift workers on their shift.
Provide mandatory education for third-shift workers regarding stress and sleep deprivation.
Establish an off-the-job safety education program.
Address an off-the-job safety topic at every safety function or training session.
Safety Slogans Do Not Impact the Culture — Safety slogans may look good and sound cute but in reality do little to change or improve organizational safety cultures. In most situations, slogans:

- Do not address behaviors that impact the job.
- Become easy to say but difficult to accomplish.
- Drive safety to compete with other organizational activities.

Past Safety Culture Assumptions
- Safety officer or director solves all safety-related problems.
- Safety is viewed by senior management as a necessary expense.
- Safety training and education are most focused on documentation, not content.
- Safety department is totally responsible for all safety actions in the facility.
- Safety focuses only on work hazards, with minimum emphasis on unsafe behaviors.
- Safety is not integrated into work activities and job descriptions.

Current Safety Culture Assumptions
- Safety officer or director serves as a consultant, resource center, or educator.
- Safety is viewed as a way to increase revenue by decreasing losses.
- Safety training and education focus on learning objectives.
- Safety responsibilities are delegated to individual departments or units.
- Safety focuses on safe behaviors, safety cultures, and accident prevention.
- Safety is integrated into all functions, job descriptions, and job tasks.

F. INFORMATION MANAGEMENT

Good information management techniques must be applied, regardless of the technology used. Organizational leaders must ensure that roles and responsibilities are clearly defined, and staff members at all levels must be educated and trained on how to manage and use information. An effective information management program addresses the following aspects:

- Identification of the organization’s information needs
- Structural design of the information management system
- Definition and capture of data and information
- Data analysis and transformation of data into a usable form
- Transmission and reporting of information and data
- Assimilation and use of available information
- Timely and easy access to organizational information
- Accuracy of informational data
- Maintaining security while providing ease of access for users
- Collection processes that improve program efficiency
- Opportunities for collaboration and information sharing

Information Collection and Evaluation System — Organizations must develop an information collection and evaluation system (ICES) to collect and analyze information. An effective program permits the development of performance indicators for maintaining an effective environment of care. Organizations must also have an ongoing assessment process that allows for periodic review of all safety-related programs. The process should strive to analyze, manage, and resolve safety issues. Other objectives include:
• Provide timely access to organizational information.
• Ensure the accuracy of all collected information and data.
• Maintain security while providing access to authorized users.
• Design collection processes to help improve program efficiency.
• Provide for collaboration and information sharing among all departments.

G. RISK MANAGEMENT

The term “risk management” describes the function that attempts to control financial losses and liabilities of the healthcare organization. Most losses result from the activities of the resident-care departments. Healthcare risk managers normally focus on incidents involving patients or residents, as well as employees. This section covers many of the fundamentals of risk management and includes a look at obtaining, using, and managing risk information.

The risk management function should monitor initiatives, regulations, and standards that are being considered by a facility committee. Employee, visitor, and resident incidents or accidents should be analyzed and reported through the risk management function and reported quarterly to the safety committee. The safety committee should initiate measures to reduce the incidence of accidents and improve the safety function using information provided by those involved in risk management, infection control, and employee health. The safety committee should also review hygiene assessments, actions, and recommendations based on accident occurrences, work duty assessments, employee suggestions, and safety and infection control data. Some risk concerns include:

• Medical errors — The 2000 Institute of Medicine report on medical errors was the first volley in what has been years of follow-up reports, legislative initiatives, and regulatory scrutiny.
• Ergonomics — Healthcare organizations must place an emphasis on worker-related injuries and increased costs and liability exposures.
• Safer needle systems — Such risk exposures stem from complacency on the part of workers who believe that the design of the products being used will protect them. Failure to adhere to protocols can still result in injuries and liability exposure.

Patient-Related Risks — Healthcare risk managers are primarily concerned with resident issues. Among the most important are safety issues related to facilities, and risk managers should be very concerned with developing emergency and disaster planning activities. Understanding these issues will allow the risk manager to better focus risk financing efforts to ensure that losses are minimized should an emergency situation arise. Other risk concerns can vary by facility but could include issues related to contractors, volunteers, and even medical students.

Employee Risk Concerns — Some employee issues create concerns for the risk manager. The following are potentially serious issues:

• Discrimination claims based on recruitment, hiring, and promotion practices
• Americans with Disabilities Act (ADA) complaints
• Claims filed with the Equal Employment Opportunity Commission
• Worker's compensation disability actions
• Wrongful termination suits
• Occupational Safety and Health Administration (OSHA) violations
Pre-Loss Activities

- **Elimination** — Identify, minimize, and eliminate, if possible, activities or exposures that could result in the possibility of a loss.
- **Prevention** — These are activities that allow the organization to integrate knowledge and technical advances into an environment that protects humans.
- **Safety** — A conduct or behavior that is the last defense in stopping a loss.

Post-Loss Activities

- **Controls** — Policies and procedures implemented to minimize the severity of a loss.
- **Claims management** — Activities and decisions aimed at reducing or minimizing loss severity and enhancing recovery from loss events.
- **Funding** — The mechanisms in place to pay for losses incurred.

Monitoring Care Environments — Leadership appoints someone to monitor and respond to environment concerns. Responsibilities of this position include participating in hazard surveillance, incident reporting, and safety procedure development activities (see Table 2.9). This person also coordinates:

- Organization-wide collection of information about deficiencies and opportunities for improvement
- Collection and dissemination of other sources of information found in published hazard notices or recall reports
- Preparation of summaries of deficiencies, problems, failures, and user errors related to managing the environment of care
- Preparation of summaries on findings, recommendations, actions taken, and results of performance improvement (PI) activities

Monitoring Potential Risks

- Establish and implement processes for ongoing monitoring of actual or potential risks associated with the care environment and of management plans for safety, security, hazardous materials and waste, emergency management, fire safety, medical equipment, and utilities.
- Evaluate objectives, scope, performance, and effectiveness of management plans for the care environment at least annually.
- Integrate environment safety monitoring and response into the patient safety program.
- Report incidents involving patients to appropriate staff functions, including quality assessment and improvement.
- Share a summary of incidents with the person designated to coordinate safety management activities.

---

**TABLE 2.9  Tips for Improving Care Environments**

Establish procedures for monitoring environmental conditions in all care areas.
Develop effective reporting methods to address injuries to patients, staff, and visitors.
Identify, analyze, and correct all causal factors reported through reports or surveys.
Create mechanisms for encouraging all employees to report near-hit events.
Implement reporting procedures to document property damage incidents.
Ensure that occupational health personnel manage employee illnesses and injuries.
Develop reporting procedures to document all security incidents at the facility.
• Review incident reports and consider legal processes to be followed to preserve confidentiality.
• Ensure that opportunities to improve care, treatment, or services or prevent future incidents are not lost as a result of the legal process followed.

H. QUALITY IMPROVEMENT

Continuous Improvement — All functions of a healthcare organization should be systematic, objective, continuous, and integrated. Any quality management or process improvement should accomplish the following:

• Provide quality patient care, maintain accurate and complete clinical records, and ensure a safe environment for patients, visitors, and staff.
• Require all staff members to adhere to the highest professional standards.
• Establish a process to monitor, evaluate objectively, and improve the environment.
• Receive reports from quality assurance activities that relate to safety issues.
• Report issues relating to medical staff to the medical staff oversight committee.
• Coordinate quality assurance efforts with other departments, including safety.
• Require that quality assurance share information with risk management and infection control.

Improving the Care Environment

• Ensure that staff participates in implementing recommendations.
• Require that staff monitor the effectiveness of implementation of the recommendation.
• Report results through appropriate channels, including senior leaders.
• Report measurement results to the multidisciplinary improvement team.
• Report results, when appropriate, to those responsible for managing the patient safety program.

Quality and Safety Performance

• Identify external and internal customer needs.
• Develop a quality strategy.
• Base leadership commitment to the quality strategy on understanding and support.
• Develop a spirit of ownership.
• Encourage teamwork among key program players.
• Develop quality improvement teams to focus on specific problems.
• Promote a commitment to excellence among workers.
• Recognize employees contributing to the quality improvement program.
• Allow workers full participation in determining safety behaviors and correcting actions.
• Implement a quality improvement suggestion system.
• Track and respond to all complaints and use teams to focus on specific problems.
• Conduct comprehensive safety audits and assessments.
• Integrate quality principles into safety training sessions.
• View safety and the associated behaviors as norms.
• Ensure that organizational knowledge considers the principles of safe behavior.
• Implement an effective hazard information collection system.
• Base communication on observations, feedback, and freedom to speak.
• Remember that a strategic viewpoint is always proactive, not reactive.
I. EMPLOYEE HEALTH

The employee health function must work closely with safety, risk, facility engineering, and quality improvement personnel to ensure that the occupational health program is fully integrated into the safety culture of the organization. Occupational health professionals and healthcare safety professionals must coordinate and communicate issues on a continuous basis. Coordination of the safety and employee health functions can help ensure that healthcare workers receive the best training, education, and protection from hazards. The employee health function should promote the physical, mental, social, and environmental well-being of the entire healthcare staff. Program design and implementation should be undertaken after a careful evaluation of the activities required to ensure the health of all workers. A multidisciplinary approach to manage employee health, risks, and costs is necessary. Consider OSHA and health department compliance issues when designing the program. It is strongly recommended that the employee health program be an integral part of the environmental safety or risk management departments; however, very large organizations might create stand-alone departments to manage employee health programs and monitor health assessments. Some key objectives include:

- Establishing baseline data and identifying early changes in health status
- Evaluating the effects of potential worker exposures based on information from the worksite analysis and requirements of applicable OSHA or other standards
- Conducting employee preplacement evaluations, periodic, post-exposure, and exit assessments
- Developing policies and procedures for a health assessment in the event of the employee’s separation from the hospital
- Completing all necessary follow-up assessments or testing
- Overseeing treatment of any ongoing occupational illness or injury
- Assisting the safety and infection control departments with assessing needs for personal protective equipment and clothing as required by 29 CFR 1910.132
- Managing the organizational respiratory protection program (29 CFR 1910.134)
- Managing the OSHA bloodborne pathogens program (29 CFR 1910.1030)
- Maintaining a needlestick injury log, as required by the bloodborne exposure standard
- Managing or coordinating the hazardous chemical monitoring program (29 CFR, Subpart Z: formaldehyde, asbestos, ethylene oxide, benzene, waste anesthetic gases, lead, cadmium)
- Managing the latex allergy program
- Overseeing a hearing conservation program (29 CFR 1910.95)
- Assisting the radiology and nuclear medicine departments with monitoring of ionizing radiation (29 CFR 1910.1096)
- Monitoring and ensuring protection of all workers exposed to tuberculosis, including fit testing for respirators and following current Centers for Disease Control (CDC) guidelines

Occupational Health and Safety Policies — Occupational and environmental medicine physicians should play a key role in developing occupational health and safety policies consistent with OSHA, National Institute for Occupational Safety and Health (NIOSH), American Conference of Governmental Industrial Hygienists (ACGIH), Joint Commission on Accreditation of Healthcare Organizations (JCAHO), and other statutes. In addition, the policies developed should be regularly updated and consistent with current “best practices” in occupational and environmental medicine. All individuals responsible for the promulgation and enforcement of these policies, as well as those responsible for employee collective bargaining agreements, should be involved in policy development. The application of policies to different categories of employees and to nonemployees (students, contract employees,
emergency response personnel, volunteers, physicians) should also be considered in their development. Suggested and mandated occupational and safety policies are discussed in the following text.

**Typical Employee Health-Related Programs** — Some of these programs may be managed by other functions, such as safety, radiology, infection control, or laboratory:

- Bloodborne exposure control plan (29 CFR 1910.1030)
- Fitness for duty (local policies)
- Infectious diseases (CDC guidelines)
- Personal protective equipment (29 CFR 1910.132)
- Laser safety (OSHA General Duty clause; ANSI Z-136.1 and 136.3)
- Eye protection (29 CFR 1910.133)
- Lab safety (29 CFR 1910.1450)
- Smoking and tobacco products policy (JCAHO standards)
- Fire safety (NFPA 101; 29 CFR 1910.38; local and state codes)
- Tuberculosis policy (CDC guidelines; health department requirements)
- Immunizations (CDC guidelines; health department recommendations)
- Radiation safety (29 CFR 1910.1096)
- Reproductive hazards (OSHA and NIOSH recommendations)
- Confidentiality of medical records (Health Insurance Portability and Accountability Act [HIPAA] and OSHA standards)
- Hazard communication (29 CFR 1910.1200)
- Substance abuse (local policies)
- Work-related injuries (29 CFR 1904; state worker’s compensation statutes)
- Medical waste management and disposal (Environmental Protection Agency [EPA] laws; 29 CFR 1910.1200)
- Recordkeeping (29 CFR 1904)
- Hearing protection (29 CFR 1910.95)
- Work-related stress (NIOSH publications)
- Shift work and sleep deprivation (NIOSH guidelines)

**Program Administration** — Occupational and environmental medicine physicians should participate in, advise, or be involved in the analysis, contracting, and administration of health-benefit and managed-care plans. Policies and procedures should include:

- Thorough preplacement evaluation, including documentation of immunizations, tuberculosis testing, and orientation to communicable-disease work restrictions
- Periodic reevaluation to encourage preventive activity and use of personal protective equipment
- Periodic mandatory retraining in the use of personal protective equipment and universal precautions
- Periodic review of employee lists to ensure adequate numbers and training of employees for respiratory use
- Immunization review and update programs
- Ongoing tuberculosis testing requirements for employees, volunteers, students, and medical staff
- Care of personnel for work-related exposures and illnesses
- Monitoring exposures to infectious disease
- Maintenance of employee health records
- Providing educational sessions and literature encouraging work and personal hygiene
- Establishing work restriction programs for cases of communicable diseases
Managing Injuries and Illnesses — All work-related incidents of injury and exposure allegations should be reported immediately to employee health and safety personnel. A system should be in place to provide first aid and quickly evaluate work-related injury and illness according to OSHA reporting and recordkeeping guidelines. Each incident should trigger a safety evaluation to determine the mechanism of injury. Employee health should monitor, manage, or coordinate all worker’s compensation injuries. Employee health personnel should coordinate the care of all work-related injuries or illnesses and should report on the employee’s progress, the imposition of necessary work restrictions, and return-to-work evaluations with the treating physician. Most occupational health services refer cases of nonoccupational illness and injury to the employees’ personal physicians.

Duty Fitness Evaluations — Excessive absence, psychological problems, and potentially serious medical conditions, such as heart disease and multiple sclerosis, may impair employee performance and productivity. The occupational medicine physician should evaluate whether or not a medical condition is impacting work performance. The evaluation should focus on job-related issues and include a thorough job analysis. Confidentiality should be maintained, and all formal recommendations and reports should be limited to work-related matters (such as suggested work modifications). If the evaluation indicates no medical cause for performance problems, the employee is referred back to management for appropriate administrative action.

Physical Capacity Determination — The Americans with Disabilities Act (ADA) requires job descriptions for all positions requiring preplacement physical capacity determinations. Functional capacity evaluations may help in determining job placement and modifications. Essential job functions can determine the capability of a prospective employee to perform those functions with or without reasonable accommodations. Ideally, job-specific evaluations should be performed. The job examiner must know the physical demands and chemical hazards associated with the job of every potential employee being examined. Placement issues and accommodation needs are referred to the human resource function. Abnormal findings should be discussed with the new employee with appropriate follow-up suggestions. Physical limitations, work restrictions, and special protective measures should also be discussed with the new employee.

Job Assignments — Review job assignments periodically to identify new, outdated, and current hazards. This process encourages implementation of appropriate surveillance activities to determine the need for personal protective equipment. Taking periodic histories, performing physical exams, and the application of laboratory and testing procedures will vary depending upon job requirements, risk factors, hazards encountered, worker age, and concurrent medical problems. Employees returning from extended leave due to injuries, surgery, or certain infectious diseases should undergo return-to-work exams. Procedures should be in place to document, track, and analyze injury, illness, and surveillance data. Recordkeeping must comply with OSHA standards and applicable worker’s compensation and state administrative statutes. It is important to identify all employees exposed or potentially exposed to such job hazards as asbestos, ethylene oxide, formaldehyde, dangerous drugs, and anesthetic gases. OSHA may require monitoring or medical surveillance activities with regard to the possible health effects of exposure to nonregulated substances and possible toxicity. Possible overexposure to agents such as ionizing radiation, formaldehyde, and benzene may require medical surveillance. Ergonomic surveillance may also be indicated in some circumstances.

Preplacement Assessment — This assessment develops a baseline for medical surveillance and helps determine employee capability of performing essential job functions. The preplacement assessment may include the following:
• A medical history, including reproductive health history, if exposure to known or potential reproductive toxins is likely
• An occupational health history
• A review of immunization records
• Physical exam of systems pertinent to job performance
• Baseline medical surveillance, such as pulmonary function tests, if a respirator will be required, or audiometric testing, if noise exposure is a hazard

Periodic Assessment — The frequency of assessments will depend on the dose and type of the exposure as well as individual employee characteristics, such as age. Some OSHA regulations require a physical or medical evaluation for employees using certain kinds of personal protective equipment, such as respirators, or who are exposed to hazards such as ethylene oxide or formaldehyde. Assessments may include an update of the occupational and medical histories, biological monitoring, and medical surveillance.

Post-Exposure Assessment — Conduct a post-exposure assessment following any exposure incident. Determine the extent of exposure and develop measures to prevent recurrence. Implement policies for responding to exposure incidents. Establish procedures to provide for proper post-exposure evaluation and treatment following a needlestick injury.

Return-to-Work Assessment — Conduct an assessment for employees returning to work after injury or illness, and identify limitations to ensure that these employees do not pose a threat to themselves or the safety of others, including patients or other workers. Many organizations develop formal programs that address early return to work or transitional duty. Rehabilitation involves facilitating the employee’s recovery to a pre-injury or -illness state; occupational health should be informed of the rehabilitation of workers who have experienced illnesses or injuries regardless of whether they are work related or not.

Case Management — The goal of case management is to work with the employee to facilitate a complete and timely recovery. Case management health professionals know the insurance laws, medical care provided, and hospital policies.

Informed Consent — Workers should receive consent forms that explain the procedures to be done and their possible side effects. They should read, sign, and date these forms, which are then kept in the employee medical files. In addition,

• Employees have a right to refuse to participate in an occupational health program. Some facilities, however, have written policies that make participation a condition of employment.
• Employees have a right to privacy. This becomes an issue when someone other than the employee seeks access to the information generated through health assessment procedures.
• Employee personal health information is confidential and cannot be shared with management, supervisors, or coworkers without consent.
• Healthcare professionals can only reveal information about employee work restrictions and whatever information might be required to ensure the health of the affected employees and their coworkers.
• Finally, employees have a right to know the results of their health assessment and medical surveillance. These medical testing results should be provided directly and confidentially to individual workers.
Suggested Immunizations for Healthcare Workers

- Diseases for which immunization is strongly recommended include hepatitis B, measles, mumps, rubella, pneumonia, and influenza.
- Diseases for which immunization or prophylaxis may be indicated include typhoid, hepatitis A, pertussis, and meningococcal disease.
- Workers should be current on diphtheria and tetanus.
- Under special circumstances (such as workers employed in research and animal laboratories), rabies, Q fever, polio, and vaccinia vaccines, among others, may be appropriate.
- Needlestick injuries are a significant cause of healthcare worker injuries. Needles should not be recapped or broken before disposal. Puncture-resistant containers should not be filled to capacity. The hepatitis and human immunodeficiency virus (HIV) status of workers experiencing needlestick injuries should be determined, as well as that of the source (whenever possible); anonymous HIV testing for the worker and source is necessary. Recommendations and practices regarding bloodborne exposures change frequently, and policies should be reviewed and updated regularly.

Shift Work and Sleep Deprivation — Shift workers face a number of challenges at home and on the job (see Table 2.10). Education about how to better cope with shift work is almost nonexistent in most healthcare organizations. The healthcare system performs research on sleep disorders but does not apply that knowledge to its own workers. Shift workers fight hard to stay alert at night because the body wants to revert to its natural wake-sleep pattern. Shift workers get less sleep and poorer quality sleep than day workers:

- The human body follows a 24- to 25-hour rhythm referred to as the circadian clock. This internal clock regulates cycles in body temperature, hormones, heart rate, and other body functions.
- The desire to sleep is the strongest between the hours of midnight and 6:00 a.m. This internal clock is difficult to reset, and up to 20% of night workers fall asleep on the job. Most sleep occurs during the second half of the shift.
- According to a National Sleep Foundation poll, 65% of all people report that they do not get enough sleep. This translates into a greater number of health problems and impaired immune systems.
- The financial loss to business because of decreased productivity has been estimated at more than $18 billion each year. Also, workplace and vehicular accidents are higher for shift workers.
- Shift workers face special problems in trying to maintain family relationships, as family members do not always understand the needs of those working these shifts. Many shift workers hold down more than one job.
- Shift workers are candidates for stress-related problems, including family or relationship difficulties.
- Prescription sleep medications do not cure sleep deprivation. No evidence has been found that over-the-counter supplements such as melatonin help shift workers.
- Some studies have shown that a short nap (20 minutes) in the workplace can improve performance, alertness, and moods; however, less that 3% of employers permit napping.
- Driving home after a night shift can be risky due to the sleep deprivation. It is much better for these employees to take a short nap after the shift than to depend on a car radio or open windows to keep them awake.

For additional information, contact the National Sleep Foundation (www.sleepfoundation.org).
J. WORKER’S COMPENSATION PROGRAM MANAGEMENT

All states and U.S. territories have enacted statutes that protect and compensate workers injured on the job. Some laws are limited to physical injuries while others provide compensation only for specific injuries. Many state statutes protect employees from discharge or other retaliatory actions as a consequence of filing a worker’s compensation claim. Some employee health functions may provide medical services for worker’s compensation cases; first-aid guidelines should be developed and followed by all employees. Patient choices for treatment for work-related injuries can vary from state to state. It is important to carefully evaluate all incidents to ensure development of appropriate preventive measures, in addition to maintaining employee contact and communicating often with the affected employees. Regular reviews of cases remain crucial to the long-term health and well-being of employees. Worker’s compensation is viewed by many workers as a way to get fast and easy money, but good management helps minimize lost work days and control costs. Healthcare organizations must maintain an effective cost-containment program that includes hazard control programs, effective employer-employee communications, managed medical care, and effective claims-handling procedures.

### TABLE 2.10  Shift Work Suggestion for Healthcare Employers

**Employers should:**

- Remember that shift differential pay alone does not improve worker morale or performance.
- Provide special orientation sessions for new shift workers.
- Never schedule training after a work shift (a sin committed often).
- Conduct job training sessions before scheduled work shifts.
- Never schedule shift workers to attend training on their off days.
- Provide mandatory shift work education sessions for all shift workers.
- Provide handouts (with the latest research) on how to improve sleep patterns.
- Demonstrate appreciation for all shift workers on a regular basis.
- Encourage workers to share the information with their families.
- Provide flexible scheduling during a crisis and for special occasions.
- Encourage workers to communicate their feelings about their jobs with supervisors.
- Install bright lights in work areas wherever possible.
- Provide vending machines or other food services that offer healthy snacks.
- Never promote overtime among shift workers.
- Ensure that employees do not rotate shifts without sufficient breaks and time off.
- Considering developing a napping policy and provide friendly space to do so; short naps may be effective in improving worker alertness and productivity.
- Show concern about workers’ off-the-job activities such as traveling to and from work.
- Use healthcare professionals to help develop effective education programs.
- Encourage workers to seek medical assistance if needed.
- Encourage workers to report sleepiness when operating machines or equipment.
Purpose of Worker’s Compensation

- Provide adequate, equitable, prompt income and medical benefits to work-related injury victims or income to their dependents, regardless of fault.
- Provide a single remedy and reduce court delays, costs, and workloads arising out of personal injury litigation.
- Relieve public and private charities of financial drains incident to uncompensated industrial accidents.
- Reduce payments to lawyers and expert witnesses.
- Encourage maximum employer interest in safety and rehabilitation through an appropriate experience-rating mechanism.

Worker’s Compensation Coverage

- The injury or illness must have resulted from employment. In many states, injuries resulting from horseplay are not covered.
- The injury or illness must have occurred during employment periods considering time, place, and circumstances.

Types of Coverage

- **Employee benefits** — Worker’s compensation provides benefits to the injured worker including medical coverage and wages during periods of disability.
- **Employer protection** — Employers are protected from litigation based on work-related injury.

Worker’s Compensation Rates — The costs associated with providing coverage are paid by employers, who purchase commercial insurance, establish self-insurance programs, become members of a worker’s compensation self-insurance association fund, or participate in a state-controlled fund. Basic rates paid by employers are normally determined by the state or the National Council of Compensation Insurance (NCCI), an independent rating organization. Rates are based on a number of factors, with the state insurance department approving rates. Other factors considered include:

- The organization or fund quoting the coverage
- Standard industrial classification codes of the employer
- Payroll amount for the work force covered
- Experience rating

Experience Rating — Experience ratings are critical to large companies that can expect to pay for their losses in future premium projections. Controlling losses can result in a lower experience rating and lower premiums. Organizations such as NCCI use 3 years of payroll and loss data when calculating the rating. The most recent policy period or year is not used in the calculation. An experience rating of 1.0 is considered the average. An experience rating above 1.0 could result in an additional premium, while a rating below 1.0 could result in a premium discount.

Worker’s Compensation Cost Containment — Cost containment and employee welfare must be top concerns of company management. Injured employees are entitled to benefits, but companies do not have to tolerate false or fraudulent claims. A successful program will have a plan of action to ensure that each individual case is treated fairly and consistently. Cost-containment programs should provide for the following:
Healthcare Safety Management

- **Prevention activities** — Injury and accident prevention should be the main objective of any cost-containment program. Employers must be committed to establishing a comprehensive occupational safety and health program.

- **Timely reporting of injuries** — Employers must report work-related injuries on a “first report” within a specified time as determined by statute. The claims-handling agency normally reports for the employer to state agencies. Timely reporting can reduce costs and allow the claims adjuster to better manage the claim.

- **Effective claims management** — Timely and professional claims handling can be crucial in controlling costs. Worker's compensation cases must be managed and not just paid. Some companies are using managed care and preferred-provider networks to control medical costs.

- **Injury reporting** — Formal accident and injury reporting procedures should be in place that require prompt reporting by injured workers. Supervisors must ensure that the “first report” of injury is sent to the claims-adjusting agency immediately.

- **Establish medical treatment protocols** — Employers should develop medical treatment protocols and communicate them to all workers.

- **Accident investigations** — Each accident should be investigated immediately and corrective measures implemented.

**Worker’s Compensation Disability Categories**

- **Permanent total disability** — A permanent disability rating occurs when an injured employee is not capable of doing work of any type. Most states award a benefit equal to two thirds of the average wages within a low and high range. The amount is paid for life or for the maximum number of weeks allowed by law.

- **Temporary total disability** — This type of disability involves an employee who is unable to work for a temporary period of time but is expected to recover. Benefits normally begin after a brief waiting period, and payments are determined using the average wage. The payments are made for the period the worker is recovering.

- **Permanent partial disability** — Workers partially disabled by a permanent injury who are unable to perform their normal jobs can receive benefits according to a fixed schedule or be compensated to make up lost wages that can no longer be earned due to the disability.

- **Temporary partial disability** — A worker who is recovering from an injury but is still capable of performing a modified-duty job can receive a benefit that pays the difference between their previous and current jobs.

- **Death benefits** — These are sometimes referred to as survivor benefits and are paid to a spouse and dependent children. Many times partial benefits can be paid to other family members if the deceased did not have dependents.

- **Special injury funds** — Some states have established a secondary injury fund to help employers pay benefits to an employee with a pre-existing condition who is injured again, resulting in total disability. The current employer pays for the recent injury with the additional disability benefits coming from the subsequent injury fund.

**Early Return-to-Work Programs** — return-to-work programs should be structured to address both work-related and non-work-related injuries and illness. Because medical center operations involve dozens of different jobs, it is often possible to place affected workers in productive jobs outside their usual department on a temporary basis. In cases where suitable modified duty is not available, case management is essential to determine when appropriate modified duty or return to work is possible. Significant savings may be realized in both worker’s compensation and disability costs with a carefully management return to work program. Occupational health departments should closely track and analyze costs associated with work absence and modified duty.
Modified Duty or Limited Duty — The direct costs of an accident can be very high. Direct costs include compensation and medical treatment expenses. Many times the indirect costs are not calculated. A well-organized return-to-work or modified-duty program will not only save but also deter fraudulent claims by returning injured employees to work. Modified-duty jobs must be assigned according to the physical capabilities of the injured workers. Also,

- Treating physicians must evaluate injured workers to determine their specific physical limitations. Never place a worker in a modified-duty job based on the statement “Return to Light Duty.”
- Human resources should develop job descriptions expressed in physical capacity terms. Medical personnel can use these descriptions to evaluate an injured worker's return to work status.
- Workers returning with modified-duty status should be considered for part-time status or placement elsewhere in the company if they cannot return to their original departments. The worker’s supervisor must be involved in the placement process to reduce the chance of reinjury, and the worker must be thoroughly oriented in the new job and understand the modified-duty requirements.
- Some disadvantages of modified duty include the possibility of reinjury, designated work that may not be light duty, the risk of a poor match of skills with the job, and the unknown length of the modified-duty assignment.
- Some advantages of modified duty include a return to financial productivity, contributing while recovering from injury, and the relief of stress associated with being off work. A modified-duty job should be evaluated to determine whether or not it meets the physical capabilities of the individual.

K. CHEMICAL DEPENDENCY AND SUBSTANCE ABUSE

Employees at all levels of an organization have the potential to be affected by chemical dependency or substance abuse. Identification of abuse through pre-employment screening and for-cause drug testing should fall within the construct of established policy and procedures. Hospital employees found to be habituated or addicted to performance-impairing drugs (e.g., alcohol, narcotics, sedatives, depressants, stimulants) should be medically evaluated and referred to a qualified employee-assistance or treatment program. The employer and the employee should agree on a rehabilitation plan and random testing upon the employee’s return to work. Such employees should periodically meet with the employee health physician or employee-assistance program (EAP) representative for a period of up to 2 years following completion of the rehabilitation program. Depending on state regulations, affected professional personnel should be referred to the appropriate agency (e.g., impaired physician program, state medical or nursing board) for counseling and mandated restriction of access to scheduled drugs and drug documents.

Employee-Assistance Program — Trained personnel can help employees and their families deal with personal problems that can affect job performance, such as substance abuse, death, divorce, marriage, separation, and family trauma.

Drug-Free Workplace Act of 1988 — As its name implies, the Drug-Free Workplace Act of 1988 requires federal contractors and grantees to maintain a drug-free workplace. The act has limited applicability and does not apply to private workplaces unless government contracts of more than $25,000 are involved. The act does address specific activities that could help any facility concerned about substance abuse; for example:
• Publish a substance-abuse policy statement that notifies workers that the unlawful manufacture, distribution, possession, or use of a controlled substance is not allowed in the workplace.
• Inform employees that action will be taken against those violating this policy.
• Create a program to inform workers about the effects of drug abuse, the types of counseling available for those with a drug problem, the scope of the employee-assistance program, and the penalties for abusing drugs.

Types of Substance-Abuse Testing

• Pre-employment screening
• For-cause, upon reasonable suspicion by employer
• Post-accident
• Periodic screening based on preset intervals
• Random, where anyone can be tested without prior notice

Chain of Custody — "Chain of custody" refers to tracking and documenting the movement of a single specimen through the entire testing procedure. Each specimen is accompanied by a form that provides a written record and signatures of all who had access. Such a procedure ensures more accurate results and imparts integrity to the testing program. Nongovernmental hospitals with drug- or substance-abuse programs must ensure that their policies meet constitutional due-process requirements:

• Give workers and job applicants prior notice regarding any drug testing requirements.
• Obtaining written voluntary consent from the person prior to testing.
• Implement workplace testing of employees only on the basis of objective criteria or on reasonable suspicion of abuse.
• Maintain the “chain of custody” and have all specimens tested by independent laboratories.
• Have legal counsel review the organizational drug testing program and policy before implementing them and periodically thereafter.

Substance-Abuse Problems — Substance abuse can be a real problem in healthcare organizations. Easy access to drugs contributes to the problem. Alcohol is also a major drug that impacts the nation’s workplaces. Consider that:

• Substance abuse in any form disrupts many lives and costs employers an estimated $50 billion each year. It is no respecter of age, gender, profession, education, or social standing.
• It is believed that 25% of all workers deal with some type of medical or behavioral problem each day. Over 50% of these people have some kind of drug problem.
• Alcoholism is a treatable disease; many people seeking treatment are able to bring their problem under control and stay sober.
• Abuse of other drugs is an increasing problem; it is estimated that 65% of the work force have used drugs at some time.
• Over 20 million people have tried cocaine, and 5 million are regular users; 23 million people use marijuana on a regular basis.
• Some studies indicate that professional personnel such as nurses and physicians may fall prey to the chemical addiction of over-the-counter, prescription, or illegal drugs or substances.
Losses Attributed to Substance Abuse — Statistics regarding the incidence and costs of substance abuse highlight the need to promote a drug-free workplace:

- Measurable losses include absenteeism, overtime pay, tardiness, sick-leave abuse, health insurance claims, and disability payments.
- Hidden costs are tougher to realize but still cost employers a bundle. These costs include friction among workers, waste, damage to equipment, diverted supervisory time, and poor workplace decisions.
- Costly legal claims involve worker's compensation payments, employee complaints, disciplinary actions, security issues, and drug dealing on the job.

Supervisory Involvement — Supervisors play a key role in effective substance-abuse programs. Supervisors need training in knowing what to do and also what not to do. They are the ones who document worker behavior and are in a position to observe the signs of substance abuse, such as:

- Increased absenteeism
- Poor decision making
- Ineffectiveness on the job
- Poor production quantity or quality
- High accident rate
- Resentment by coworkers who have to pick up the slack
- Poor morale in the department

Handling a Suspected Substance Abuser — Supervisors must be thoroughly familiar with the facility’s policy regarding substance abuse. Normally, the employee-assistance program or the personnel department has established procedures to handle these situations. During a meeting with the employee, the supervisor should present documented information, address only work-related problems, and explain in detail and in writing what the employee must do to improve. If no improvement is noted, the supervisor should inform the employee that the facility would like to evaluate him or her. If the facility has a treatment program, the supervisor should advise the employee of the requirements that must be met to remain employed after treatment.

Documenting Performance — Supervisors must be objective and fair when documenting an employee’s performance. Performance files should contain the following information:

- Date and time of incident
- Who was involved
- What happened and where
- What caused the incident and results
- Witnesses

Profile of a Worker on Drugs

- Is late three times more often than other workers
- Uses three times more sick leave than others
- Is five times more likely to file a worker's compensation claim
- Is involved in accidents four times more often than other employees
L. MATERIALS AND PURCHASING MANAGEMENT

These important healthcare functions are often not addressed in healthcare safety publications; however, materials management and purchasing departments play important roles in the safety performance of the entire organization. Today’s healthcare organizations purchase supplies and equipment through a number of vendors, and many participate in group purchasing organizations. Often, the personnel working to procure goods and services at the best prices are not aware of or even consider safety specifications. Healthcare organizations must be sure that those purchasing or receiving consumable and durable goods consider safety during the process. Contracts for services also have major safety considerations. Senior managers and healthcare safety personnel must work to inform buyers and material managers of all safety-related specifications or requirements. Purchasing and materials management personnel should be encouraged to participate in safety committee activities. Receiving department personnel must learn to inspect all received goods and equipment to ensure that all safety requirements have been met. Some examples of safety-related goods involving such specifications include respirators, personal protective equipment, gloves, and floor-care products.

M. HUMAN RESOURCES MANAGEMENT

The human resources department also plays a key role in organizational safety performance. Healthcare organizations must learn to move away from the independent department mentality and learn to view safety as a value that transcends functions. Human resource managers can contribute to the safety function in a number of ways. A key element is in the area of worker’s compensation management. Many healthcare organizations place the worker’s compensation program under the auspices of the human resources. The worker’s compensation coordinator must communicate with employee health personnel and the safety department on a number of issues, including claims and losses. Many hospital and nursing home safety directors are unaware of the losses incurred due to work-related injuries and illnesses. Human resource managers must work closely with the safety and employee health functions to ensure that new employee orientation programs meet current safety education and training requirements. Many orientation sessions attempt to cover safety-related topics such as bloodborne pathogens and hazard communications without sufficient time. Human resources can assist in reducing safety-related costs by ensuring that new hires meet safety selection and qualification criteria. Many job descriptions should be updated to incorporate safety-related performance or qualification issues. Functional capacity testing could also help determine if new employees can adequately and safely accomplish their job assignments. Identify positions where professional education and certification would enhance a person’s performance. Plan and budget for those required to attend such sessions to maintain their licenses, registrations, or certifications.

Orientation — New worker orientation sessions should include activities outside the classroom, including a facility tour. It is not acceptable to require new hires to accept or decline the hepatitis B vaccination series before being trained on the entire OSHA standard; doing so is a violation of the standard. Most healthcare organizations provide additional orientation for nursing personnel, and it is highly recommended that all environmental services workers receive additional training after their basic orientation. Workers hired for second or third shifts should receive the orientation and training on their shifts.

Organized Labor and Safety Issues — Healthcare leadership can work in cooperation with labor organizations to improve the safety of all workers. Both must look for ways to truly improve workplace safety in a cooperative way. Management must respond to valid complaints in a timely manner, and labor must never use safety as a bargaining ploy.
N. SECURITY MANAGEMENT

- Designate a security coordinator (in writing) to oversee the program and develop procedures for reporting and investigating all security incidents.
- Provide a system for identifying patients, visitors, contractors, and staff members.
- Train workers with regard to security concerns, precautions, and emergency actions.
- Be aware that OSHA recently revised its publication, *Guidelines for Preventing Workplace Violence for Health Care and Social Service Workers*; these guidelines can help with planning, assessment, and training functions.

Violence Prevention Plan — In 1999, the U.S. Bureau of Labor Statistics estimated that 2637 nonfatal assaults on hospital workers took place, a rate of 8.3 assaults per 10,000 workers. This rate is much higher than the rate of nonfatal assaults for all private-sector industries (2 per 10,000 workers). Exposure to workplace violence is more likely when no violence prevention programs are in place to help reduce such hazards. OSHA recommends that employers establish and maintain a violence prevention program as part of their facility’s safety and health program. The prevention program should:

- Be made available to all employees, including managers and supervisors; all employees should receive specific training concerning its content and implementation.
- Track the progress of efforts to reduce the number of work-related assaults, to reduce the severity of injuries sustained by employees, and to decrease threats to worker safety.
- Reflect the level and nature of threats faced by employees.

Key Elements of a Violence Prevention Program

- Management commitment and employee involvement, including a demonstrated concern for employee emotional and physical safety and health incorporated into a written program for safety and security
- Workplace analysis, including a step-by-step, common-sense look at the workplace to reveal existing or potential workplace violence hazards
- Hazard prevention and control, including the implementation of engineering and work practices to prevent and control identified hazards
- Safety and health training, to raise staff awareness of security hazards and how to protect themselves through established policies, procedures, and training
- OSHA-required recordkeeping and program effectiveness evaluation

Written Violence Prevention Plan — To prevent workplace violence, a written program should incorporate the above areas and state clear goals and objectives suitable to the size and complexity of the given workplace. Although not every incident can be prevented, many can be, and the severity of injuries sustained by employees can be reduced by following a violence prevention plan. Universal precautions relating to violence state that violence should be expected but can be avoided or mitigated through preparation. A written violence prevention plan:

- Creates and disseminates a clear policy that violence, verbal and nonverbal threats, and related actions will not be tolerated.
- Ensures that no reprisals are taken against employees who report or experience workplace violence.
- Encourages prompt reporting of all violent incidents and recordkeeping of incidents to assess risk and to measure progress.
• Establishes a plan for maintaining security in the workplace which includes law enforcement officials and other specialists.
• For additional information refer to *Violence: Occupational Hazards in Hospitals* (Department of Health and Human Services [NIOSH] Publication No. 2002-101, April, 2002).

The purpose of this brochure is to increase worker and employer awareness of the risk factors for violence in hospitals and to provide strategies for reducing exposure to these factors.

**Management and Employee Commitment** — Management and employee commitment are complementary and essential elements of an effective violence prevention program. The lack of management support and employee involvement increases the likelihood of exposure to workplace violence. It is recommended that management and employees work together to reduce workplace violence. Management must provide the motivation and resources necessary to deal effectively with workplace violence and should establish a policy stating that violence, threats, harassment, intimidations, and other disruptive behavior in the workplace will not be tolerated and all reports of such incidents will be taken seriously and dealt with appropriately.

**Management Commitment Elements**

- Providing for the emotional as well as physical health of employees
- Appropriate allocation of authority and resources to responsible parties
- Equal commitment to worker safety and health and patient or client safety
- A system of accountability for involved managers and employees
- A comprehensive program of medical and psychological counseling for employees experiencing or witnessing violent incidents
- No employee reprisals for reporting incidents

**Employee Involvement** — Employees should:

- Understand, support, and comply with the workplace violence program.
- Participate in employee complaint or suggestions sessions.
- Provide prompt and accurate reporting of all workplace violence incidents.
- Understand that reporting violence will benefit them and should help management identify, address, and solve such problems.
- Believe that no reprisals will be taken by management or employer.
- Be aware that employees often do not report violent incidents because of a lack of administrative reporting policies or procedures.

**Security Worksite Analysis** — Complete a worksite analysis using an appointed threat-assessment team or similar task force or coordinator. This team analyzes records, trends, and workplace security and conducts screening surveys with staff to help identify hazards. OSHA has provided the following pointers to assist employers in identifying hazards:

- Identify potential reasons for why hospitals may be particularly hazardous, such as the availability of drugs or money in the pharmacy area which would make them likely robbery targets.
- Identify hospital or healthcare personnel who must work evenings and night shifts at facilities that may be located in high-crime areas.
- Be alert to an overall prevalence of firearms.
- Be aware of low staffing levels, high turnover rates, and stress.
• Recognize potential exposures to violent, confused, or mentally unstable patients, as well as combative, disoriented, or uncooperative patients who may possibly be dangerous.

• Be aware of the potential for workplace violence in rooms not prepared for violent patients (e.g., moveable furniture that could be used as weapons or to entrap employees; loose items on countertops that could be thrown at workers).

Violence Hazard Prevention and Control Suggestions

• Provide better visibility and good lighting, especially in areas of high risk, such as the pharmacy area, or in isolated treatment areas.

• Implement safety measures to deter handguns inside the facility (e.g., metal detectors).

• Install safety glass in payment windows in the pharmacy area.

• Use security devices such as panic buttons, beepers, surveillance cameras, alarm systems, two-way mirrors, card-key access systems, and security guards.

• Place curved mirrors at hallway intersections or concealed areas.

• Control access to work areas.

• Provide training for staff in recognizing and managing hostile and assaultive behavior.

• Provide adequate staffing, even during night shifts; increase staffing in areas where assaults by patients are more likely (e.g., emergency department).

• Increase worker safety during arrival and departure by encouraging car pools and providing security escorts and shuttle service to and from parking lots and public transportation.

• Ensure accurate reporting of all violent behavior.

• Make patients aware of a zero-tolerance policy for violence.

• Establish a liaison with police authorities to contact when needed.

• Obtain previous records of patients to learn of any past violent behaviors.

• Establish a system to chart or track and evaluate possible assaultive behaviors, including a way to pass on information from one shift to another.

• Implement a violence prevention plan to develop strategies to deal with possibly violent patients.

Training — It is not always possible to prevent violence, because it can be unpredictable, but it is possible to reduce the risk of violence by planning ahead and being prepared to act swiftly to deal with threats, intimidation, and other disruptive behavior at an early stage:

• It is recommended that facilities have a workplace violence prevention program in place that includes training of employees.

• The risk of violence is increased when staff is inadequately trained to deal with or identify potential violence problems.

• Training is a critical component of any prevention strategy for staff, supervisors, and other employees.

• Training could be conducted by a team of individuals, police force, or others specializing in this area.

• Personally knowing team members responsible for workplace safety programs encourages employees and supervisors to seek assistance from them at a much earlier stage.

Violence Prevention Training Topics

• Elements of the facility’s workplace violence policy and program

• Encouragement and support to report incidents
• Ways of preventing or diffusing situations of aggressive behavior and conflict resolution
• The dynamics of violence
• How to recognize and deal with hostile aggressive persons and nonviolent responses
• Managing anger
• Techniques and skills necessary to resolve conflicts
• Stress management and relaxation techniques
• Security procedures
• Personal security measures and self defense
• Techniques for victim support

Recordkeeping — This important function can document the success of a workplace violence prevention program because it can help to determine the severity of the problem, evaluate methods of hazard control, and identify training needs. Good records can also help when gathering or pooling data for other applications. Additional records to be considered include:

• Medical reports of work injury
• Incidents of abuse (such as verbal abuse) or other acts of aggression that do not result in injury
• Information on patients who have a history of past violence (such information should be recorded on the patient’s chart and staff should be made aware of the potential for aggression)
• Worker training records

Evaluation of the Program

• Identifies any problems or deficiencies that can then be corrected.
• Allows for management to review program effectiveness and reevaluate policies and procedures on a regular basis.
• Helps management analyze trends, measure improvements, and keep abreast of new trends to reduce workplace violence.

SUMMARY

The chapter has presented useful information about safety management and related functions. Key topics addressed include challenges facing healthcare safety personnel, development of policy statements, safety in healthcare environments, and written program development. The chapter listed the key safety responsibilities for management, supervisory personnel, and safety directors. The chapter also provided guidance for those desiring to develop their leadership skills and suggested goals of a true leader. A review of basic safety management definitions was provided. The information presented about human behaviors focused on safety performance and the correction of unsafe acts. The discussion regarding understanding organizational culture addressed differences between open and closed systems. The chapter also suggested ways to improve safety cultures. Other topics covered in the chapter include risk management, quality improvement, employee health, worker's compensation management, substance-abuse programs, and workplace violence. The chapter also addressed the staff functions of purchasing, materials management, and human resources.
FOR REVIEW AND DISCUSSION

1. List at five safety challenges facing healthcare organizations and explain how to better overcome them.

2. Write a short essay on why management deficiencies and inefficiencies contribute to errors of commission and omission.

3. Why is coordinating safety efforts so important and at the same time so difficult in many healthcare organizations?

4. Safety policy statements must communicate what to members of the organization? Why?

5. List at least five safety responsibilities of senior leaders, supervisors, and safety directors.

6. Discuss briefly three ways to get workers involved in the safety program.

7. Which step of writing or revising a written safety program is the most important? Why?

8. List at least seven reasons for many ineffective safety programs?

9. What three functions of management are vital for the success of a safety program?

10. Define the following management concepts or functions:
    a. Management by exception
    b. Overt culture
    c. Covert culture
    d. Span of control
    e. Controlling

11. Discuss the difference between a person's attitude and that person's behavior.

12. Explain how good human relations promotes workplace safety?

13. Contrast at least three past safety culture assumptions with new or current safety culture assumptions.

14. Why is it so important to educate third-shift workers? What challenges do these workers face and how do they impact their safety?

15. Explain the purpose of worker's compensation programs.

16. Discuss how purchasing and human resource functions can help and hurt organizational safety efforts.

17. Why is workplace violence prevention such an important aspect of a healthcare security management program?
A. INTRODUCTION

This chapter covers the key concepts and principles of hazard control and accident prevention. Topics addressed include understanding accidents, investigation procedures, and personal protective equipment, and detailed respirator information is provided. This chapter also presents information on hazard identification, analysis, and controls. The major components of any hazard control process include:

- Engineering and the science of safety
- Management and leadership
- Psychosocial issues and human behaviors

B. MANAGEMENT APPROACH TO HAZARD CONTROL

Managers should use a proactive approach to preventing accidents. Safety should be a part of doing business and a part of the company strategic plan. Doing so could be considered an integrated or systems approach. Management must identify management-related deficiencies that contribute to accidents. The major objective of the program should be to prevent injuries, reduce costs, and make efficient use of resources. The following considerations should be kept in mind when designing an effective safety program:

- The focus should be on gathering the information necessary for management to make decisions.
- Safety personnel should teach others about safety and hazard control.
- The safety function should serve as a resource and education center.
- Safety should be viewed as both a science and practice.
- Hazard control personnel must be aware of how others view safety.
- Planning, coordination, and accountability will achieve the desired results.
- Defining specific objectives is essential to expressing safety-related goals.
- People give value to safety when they express a voice and participate.
Hazard Control Challenges

- Applying sound management principles to the control process
- Using leadership and human-relations skills to encourage participation
- Learning how human factors and behaviors impact safety
- Creating a methodology to better calculate the costs of accidents
- Developing proactive approaches to hazardous environments
- Collecting and evaluating data to better understand causal factors
- Applying system safety methods to accident prevention processes
- Providing meaningful education, training, and professional development
- Merging proven management, engineering, science, and ergonomic principles
- Understanding how hazard closing impacts accident generation

(See Table 3.1.)

Measuring Hazard Control Performance — Safety should pay big dividends by improving organizational efficiency and use of resources. The iceberg theory suggests that the indirect costs of an accident event are four to ten times higher than the documented direct costs. Effective safety leadership will improve the bottom line of the organization by addressing the human causes and cultural elements of accidents. Healthcare organizations must recognize the costs associated with poor safety performance, not just accreditation or compliance issues; however, these organizations should also learn to look beyond the numbers and view the entire organization as an integrated safety system. Many healthcare organizations do not even consider worker’s compensation costs, perceptions of their staff, or employee turnover rates. Patient safety issues are the primary focus, and root-cause analyses are conducted for serious adverse events involving patients. Other safety problems or challenges receive little attention from top management.

Measuring safety continues to challenge hazard control personnel. The Occupational Safety and Health Administration (OSHA) uses incidence rates to benchmark safety performance and even schedule programmed inspections. Joint Commission-accredited organizations focus on written programs and some performance indicators to judge safety performance. Measuring organizational safety performance requires that key leaders focus on the big picture provided by many snapshots from throughout the organizations. The following are tools for measuring safety performance within the organization:

- Cost–benefit analyses
- Worker’s compensation data
- Frequency and severity rates of accidents
- Accuracy of accident and incident reporting systems

<table>
<thead>
<tr>
<th>TABLE 3.1 Basic Hazard Control Principles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Correcting causal factors results in better use of human and material resources.</td>
</tr>
<tr>
<td>Placing individual blame leads to organizational problems being ignored.</td>
</tr>
<tr>
<td>Data collection provides the foundation for effective analysis of hazards.</td>
</tr>
<tr>
<td>Hazard control includes dealing with unsafe behaviors.</td>
</tr>
<tr>
<td>Communication and human relation skills remain the key of an effective program.</td>
</tr>
<tr>
<td>Hazard control focuses on accomplishing the job with safety.</td>
</tr>
<tr>
<td>Hazard control becomes a production tool when integrated into all job functions.</td>
</tr>
<tr>
<td>Good hazard control and efficiency function as partners in an organization.</td>
</tr>
</tbody>
</table>
• Results of inspections, surveillance programs, and environmental tours
• Perceptions of employees and staff at all levels
• Employee turnover rates
• Performance on compliance inspections

C. UNDERSTANDING HAZARDS

Investigating a typical workplace accident or mishap may reveal 8 to 12 causal factors. A causal factor contributes to an accident event because it exhibits a hazardous characteristic. Causal factors come together under certain circumstances and generate an unplanned event, and the closing of causal factors is a key component of the accident generation cycle. Hazards can be found in liquid, solid, or gaseous agents. A wide variety of things can generate hazards, including electricity, heat, cold, noise, radiation, and people. Unsafe human behaviors can even be considered to be hazards.

Hazard Control — We must believe that humans can control hazards and prevent accidents. Prevention requires a process that considers engineering, identifying unsafe conditions, correcting unsafe behaviors, analyzing hazard information, and ultimately controlling or correcting identified hazards. Managers can obtain hazard information by reviewing technical publications and relevant regulatory standards. Removing, replacing, controlling, correcting, or avoiding a single hazard can prevent the start of the accident generation cycle. Hazard closing occurs when two or more hazards attempt to occupy the same space. Hazard closing can result in an accident or mishap that can include property damage, personal injury, or both. Hazard closing can also generate a near-hit event.

Hazard Warnings — Take the following actions to provide the necessary education, warning signs, audible signals, and other information regarding potentially hazardous conditions or equipment:

• Provide immediate warning of all dangers and take precautions.
• Describe known acute or chronic health effects of exposure to a hazard.
• Communicate hazard and exposure information to prevent traumatic injuries.
• Develop actions for preventing or reducing hazard exposures.
• Provide instructions for preventing, reducing, or minimizing illness or injury.
• Identify actions to be taken in case of illness or injury.
• Publish procedures to be used in emergency situations.
• Identify the population at risk so information can be provided.

Hazard Identification — Anticipating a hazard situation requires the intuition, training, and awareness of a trained hazard control or safety professional who can identify hazards by employing self-inspections, periodic safety surveys, worker's compensation surveys, safety team inspections, and fully documented safety audits. Hazard identification activities must address unsafe conditions, unsafe acts, hazardous behaviors, and dangerous attitudes among workers. Properly classifying and identifying hazards enables safety and management personnel to determine potential consequences and risks of occurrence:

• Hazard surveys enable management to quickly understand, evaluate, assign priorities for, and make decisions regarding hazard control.
• Hazard inspections should document unsafe conditions, environmental hazards, broken equipment, or deviations from accepted safety practices.
Healthcare Hazard Control and Safety Management

• Hazard surveys or safety inspections should focus on the human factors as well as situational work factors such as facilities, tools, and equipment.
• Management should examine environmental factors such as noise, vibration, temperature extremes, air quality, and illumination.
• Hazard control and accident prevention must place a strong emphasis on managing many interfacing organization elements.
• Accident reports can assist in identifying broken equipment, unsafe operations, or hazardous work areas. Reports can also provide insight about the human element of accident prevention and hazard control.
• Accreditation surveys can provide valuable information on hazards, problem areas, and safety deficiencies. These surveys should be reviewed each time a hazard evaluation effort is underway.
• Inspections from regulatory agencies such as OSHA, the Environmental Protection Agency (EPA), the Nuclear Regulatory Commission (NRC), state licensing boards, county health departments, and local fire marshal reports provide excellent information about hazards.
• Insurance companies are concerned about hazardous conditions, and many conduct on-site loss-control surveys to determine risks.
• Worker’s compensation injury data provide hazard control managers with information about accidents resulting in occupational injuries or illnesses.
• Material Safety Data Sheets (MSDSs) received from manufacturers and distributors of hazardous materials should be thoroughly reviewed upon receipt.

(See Chart 3.1.)

Conducting Periodic Safety Inspections — Healthcare facilities must learn to develop and use sound self-inspection techniques to identify unsafe conditions and unsafe acts. Department heads and supervisors should take the lead in conducting safety inspections as they know their areas and their workers very well. Department personnel should develop inspection checklists for their areas with assistance from the safety officer or director. A good inspection program provides valuable information on the location and severity of hazards; however, many good checklists fail to address safety behaviors. Identifying hazards remains the purpose of any good checklist, but even the best checklist can never identify all the risks, hazards, and safety deviations. Completing the checklist should never be the goal; a good inspector uses a safety checklist as a guide. The checklist becomes a tool, not merely a documentation form. Not everyone can perform a good safety inspection, so never give a checklist to an untrained person. This text contains a number of safety checklists for the use of the reader; however, most checklists must be adapted for a particular organization or environment.

Qualifications Necessary for Conducting Safety Inspections

Safety inspectors must:
• Practice good human relations.
• Learn to communicate and listen.
• Avoid confrontation.
• Understand the hazards and controls of inspected areas.
• Develop and exercise outstanding observation skills.
• Know how to use the inspection tool (checklist or guide).
• Use common sense during the process.
• Strive to validate findings and gather additional information.
Using Inspection Checklists

- Use a checklist like a tool.
- Consider a checklist as a inspection guide.
- Encourage or require supervisors to develop checklists for their work areas.

Worker surveys should focus on things beyond the written job requirements. Safety checklists should address competency, work stresses, and employee perceptions. (See Table 3.2.)

Healthcare Hazard Surveys or Environmental Tours — The Joint Commission requires environmental tours for identifying hazards at least semiannually in all patient or clinical areas. Senior management must focus on leading the organization in the maintenance of effective program.

### CHART 3.1 Healthcare Hazard Categories

<table>
<thead>
<tr>
<th>Hazard Category</th>
<th>Definition</th>
<th>Examples Found in the Healthcare Environment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biological</td>
<td>Infectious/biological agents, such as bacteria, viruses, fungi, or parasites, that may be transmitted by contact with infected patients or contaminated body secretions/fluids</td>
<td>Human immunodeficiency virus (HIV), vancomycin-resistant enterococcus (VRE), methicillin-resistant Staphylococcus aureus (MRSA), hepatitis B virus, hepatitis C virus, tuberculosis</td>
</tr>
<tr>
<td>Chemical</td>
<td>Various forms of chemicals that are potentially toxic or irritating to the body system, including medications, solutions, and gases</td>
<td>Ethylene oxide, formaldehyde, glutaraldehyde, waste anesthetic gases, hazardous drugs such as cytotoxic agents, pentamidine, and ribavirin</td>
</tr>
<tr>
<td>Psychological</td>
<td>Factors and situations encountered or associated with one's job or work environment that create or potentiate stress, emotional strain, or other interpersonal problems</td>
<td>Stress, workplace violence, shiftwork, inadequate staffing, and heavy workload</td>
</tr>
<tr>
<td>Physical</td>
<td>Agents within the work environment that can cause tissue trauma</td>
<td>Radiation, lasers, noise, electricity, extreme temperatures, workplace violence</td>
</tr>
<tr>
<td>Environmental, mechanical/biomechanical</td>
<td>Factors encountered in the work environment that cause or potentiate accidents, injuries, strains, or discomfort</td>
<td>Tripping hazards, unsafe/unguarded equipment, poor air quality, slippery floors, confined spaces, cluttered or obstructed work areas and passageways, forceful exertions, awkward postures, localized contact stresses, vibration, temperature extremes, repetitive or prolonged motions or activities, lifting and moving patients or residents</td>
</tr>
</tbody>
</table>
TABLE 3.2 Special Inspection Situations

<table>
<thead>
<tr>
<th>Situations</th>
</tr>
</thead>
<tbody>
<tr>
<td>When new equipment is installed</td>
</tr>
<tr>
<td>When new operations or procedures are added</td>
</tr>
<tr>
<td>When work or tasks are relocated or revised</td>
</tr>
<tr>
<td>When new construction or remodeling is in progress</td>
</tr>
<tr>
<td>When any special or unusual program arises</td>
</tr>
</tbody>
</table>

*Note: All contracts should be reviewed for safety-related considerations.*

- Conduct surveys annually in nonclinical areas.
- Develop a master schedule for conducting these environmental tours based on departmental schedules; proper scheduling allows trained personnel to walk throughout the facility on a frequent basis.
- Identify hazards by category or specific area, such as electrical.
- Document tours but make identifying real hazards the primary goal.
- Never make documentation for outside agencies the primary goal.
- Never attempt to identify all hazards during the annual or semiannual tours.
- Create a multidisciplinary team comprised of personnel with clinical or technical expertise.
- Include hourly workers.
- Be sure that this team, led by a safety professional, possesses the expertise to identify hazards and contribute to policy development.
- Consider persons with expertise in the following areas:
  - Industrial hygiene/toxicology
  - Occupational medicine and health
  - Ergonomics and work environment
  - Physical or occupational therapy
  - Infection control and epidemiological science
  - Safety and security management
  - Fire safety and facility management

Hazard Surveillance — Surveillance involves collecting and using employee data or information to determine trends, problems, and risks associated with hazards. The two primary types of surveillance are:

- Passive surveillance — Involves utilizing existing data to describe past trends. The availability of, and access to, these records will depend on hospital policy and legal limitations such as access to employee medical records. The person accessing and reviewing these records must be cognizant of the limitations of access to such information.
- Active surveillance — Involves collecting data not currently documented to describe current trends and identify problem areas. The data can be obtained from sources such as questionnaires, screening, or surveys, which can be used to determine the scope of the problem.

Hazard Analysis — Organizations must work to identify all hazards and unsafe behaviors through a process of inspections, baseline audits, and human perception surveys. Analysis efforts should include the evaluation of planned or new facilities, processes, materials, and equipment (see Table 3.3). Safety personnel and supervisors must learn how behaviors
TABLE 3.3 Fundamental Elements of Hazard Analysis

Understand that hazard analysis deals with the science of and standards relating to hazards.
Evaluate hazard information using a practical approach.
Investigate accidents and near-hit events to discover causes.
Conduct root-cause analysis to uncover contributing causes.
Determine worker perceptions about safety in the workplace.
Deal with perceptions (it cannot be avoided).
Collect sufficient hazard information for analysis.
Remember that effective hazard analysis leads to effective hazard control or correction.
Identify employees at risk of exposure and evaluate control measures.
Establish a baseline to be used throughout a continuous or ongoing process.
Use inspections to identify and assess the specific characteristics of hazards in each work environment.
Determine potential hazard severity and possible effects on workers.
Evaluate personal protective equipment effectiveness.
Develop orderly processes for evaluating frequent and serious hazards.
Involve workers in selecting the processes to be analyzed.
Use workers to help identify, evaluate, and correct hazards.

impact hazard identification actions. Hazards should be analyzed within the parameters of people, machines, and the environment.

Records Review — When conducting a workplace analysis, a review of all available records can reveal some very helpful information. Consider reviewing the following records:

- Monitoring, surveillance, accident, incident, and near-hit records
- OSHA injury/illness logs and worker’s compensation records (5 years)
- OSHA inspection reports and accreditation survey results
- Environmental compliance and regulatory visits
- Self-inspection surveys, insurance surveys, and underwriting reports
- Safety committee minutes and quarterly reports
- Employee health program records and data analyses
- Emergency planning documents and drill evaluation forms
- Written safety, health, and risk management programs
- Federal, state, and local regulatory reports
- Organizational policy and procedures manuals
- Infection control reports and informational data
- Quality improvement information and processes affecting safety

Hazard Evaluation Considerations

- Types of hazards that could create risks for the facility
- Risks posed by a hazard
- Problems created by a hazardous condition
- Contribution of a hazard to accidents or injuries
- Ways to reduce or eliminate major hazards first
- Likelihood a hazard will contribute to loss in some way
- Employee attitudes and compliance with policies
Hazard Analysis Considerations

- Identify hazards that have developed as a result of task or job operation.
- Break down a job to determine the sequence of events.
- Look at all factors, including environmental conditions.
- Identify unsafe work practices.
- Identify areas with exposure to biological, ergonomic/environmental, chemical, or physical hazards.
- Determine the tasks or equipment that must be modified to reduce human exposures.

Hazard Analysis Questions

- Environment: Where did or could it happen?
- Exposure: Who did or could it happen to?
- Trigger: What precipitated the hazard?
- Consequence: What outcome did or could occur?
- Feeders: What are other contributing factors?

Hazard Analysis Priorities

- Jobs and hazardous locations with the highest injury or illness rates
- Tasks with the potential to cause severe or disabling injuries or illness
- Situations when simple human error could lead to a severe accident
- Processes new to the organization
- Areas with changes in processes and procedures
- Complex tasks requiring detailed written instructions to accomplish

Job Hazard Analysis — Job hazard analysis (JHA; also referred to as a hazard hunt or job safety analysis) is performed for any task, procedure, or equipment operation that could pose a risk to someone’s safety. A common example of JHA is gathering information for locking out a machine. Job hazard analysis can also be beneficial in evaluating ergonomic risks. No special form is required to accomplish the process, which is designed to identify all potential risks or hazards, evaluate the findings, and develop appropriate control measures. The objective of the process is to prevent harm or injury by correcting hazards.

Step 1. Break Down the Job — Use the process to determine hazards or unsafe conditions that could develop while a job is being performed.

Step 2. Identify Hazards

- Clothing or jewelry worn by a worker that creates a hazard
- Fixed hazards or objects such as sharp corners
- Point-of-operation hazards or moving machine parts
- Unusual or dangerous positions assumed by the worker
- Repetitive motions and lifting requirements
- Environmental hazards such as noise, heat, and chemicals

Step 3. Evaluate the Hazards

- Are workers using or wearing the proper protective equipment?
- Are work areas and hazardous operations properly guarded?
- Are work practices such as lockout procedures being properly followed?
- Is the work area or flow properly organized?
- Is ventilation adequate to disperse harmful substances?
• Is proper control of physical hazards, such as noise or radiation, in place?
• Are the job safety training and supervision adequate?

Step 4. Implementing Safe Job Procedures — Analysis of the hazards identified should lead to the development of safer job procedures. This step requires coordination with other management personnel. It also requires that the new procedures and recommendations be approved and communicated to workers. Management must ensure that workers have the opportunity to provide suggestions.

Step 5. Revising the Job Hazard Analysis
• Review each analysis and update as required.
• Be sure to update all job changes or process modifications.
• Review the JHA in response to a new hazard or re-emergence of an old one.

Using Hazard Information — Readers can find the evaluation criteria for many hazards in OSHA, EPA, NFPA, ANSI, or other published standards. The National Institute for Occupational Safety and Health (NIOSH) and the OSHA Consulting Service agencies can assist facilities in evaluating workplace hazards. Probability decisions can be difficult and should be based on historical information and empirical calculations. When an evaluation reveals potential hazards and inadequate controls, the hazard or hazardous condition must be carefully evaluated again to determine how the situation could be better controlled. Other important factors to consider include:

• The frequency of monitoring depends on the extent of exposure, severity of the effects, complexity of the work process, protective measures, and environmental factors such as temperature or humidity.
• OSHA 29 CFR 1910 requires many hazardous situations to be monitored on a periodic or annual basis. When not mandated by a standard, the healthcare facility must decide when hazardous processes will be evaluated.
• A thorough workplace assessment can include a short survey form or informal conference with workers to try to identify hazards not recognized during the walkthrough survey.
• Workers should identify health problems that they or other workers may have developed while performing their jobs and should be given an opportunity to share their concerns about the safety of their jobs and the health risks associated with them.

Controlling Hazards — Correcting hazardous situations or behaviors requires time, people, and money. Hazards posing serious threats to workers, patients, or residents should have top priority. Any hazard requiring multiple controls should be addressed immediately. Also critical are any hazardous situations requiring worker or patient education. Policies and procedures should describe the use of appropriate methods of control (see Table 3.4).

D. UNDERSTANDING ACCIDENTS

Within the organization context, an accident can be defined as an unplanned event that interferes with a job or task. (See Table 3.5.) An accident event results in measurable loss, such as injury or property damage. A near-hit or near-miss event produces no measurable loss. Accident prevention must place a strong emphasis on identifying, evaluating, and controlling hazardous conditions and behaviors. To prevent accidents and control hazards it
TABLE 3.4 Hierarchical Hazard Controls

*Engineering Controls*

The most preferred method for controlling hazards uses technological means to isolate or remove hazards from the workplace. Examples of engineering controls include the use of systems to prevent needle sticks and the use of a scavenging system in the operating room to prevent exposure to waste anesthetic gases. A good equipment maintenance program helps keep engineering control systems working as intended to prevent hazards.

*Work Practice Controls*

These controls, in the form of safety rules, policies, and operating practices, reduce the likelihood of exposure to occupational hazards. Examples of work practice controls include prohibiting the recapping of needles, establishing lockout procedures when working on equipment, and requiring handwashing according to standard precautions.

*Administrative Controls*

These controls reduce or eliminate worker exposure by changing the duration, frequency, or severity of exposure. Examples of administrative controls include rotating employees to jobs free of the specific hazard, adjusting work schedules, and providing adequate staffing when increasing work output.

*Personal Protective Equipment (PPE)*

Before evaluating the need for PPE, consider the use of engineering, work practice, and administrative controls. Personal protective equipment remains the least preferred hazard control (refer to more complete PPE information later in this chapter).

Near-Hit Events — Near hits do not result in injury or property damage. These close calls are indications that something is not right in the workplace. It is very important to report near misses and to take corrective action to prevent them from becoming more serious incidents. Keep in mind that:

- Accidents are often preceded by some kind of near miss involving unsafe conditions, someone’s unsafe actions, or a less severe injury.
- Near-hit events should serve as wake-up calls.

TABLE 3.5 Common Accident Myths

Events can be explained by determining a single cause. Placing blame helps reduce the incidence of similar events in the future. Accidents must result in measurable loss, such as serious injury. An event can result from random variables that cannot be controlled. Accidents are unavoidable regardless of prevention efforts. Some accidents should simply be classified as acts of God or nature.
Reasons for Not Reporting Near-Hit Events

- People do not want to be blamed for problems or mistakes.
- People do not want to be accused of “rocking the boat” or being a “troubblemaker” when reporting near-hit events.
- People are concerned that reporting a near-hit will result in more work.

Ways To Encourage Reporting

- Stay positive: The best approach is to make the process of reporting near hits a positive experience that benefits everyone in the organization. Any near-hit event should be considered an opportunity to prevent accidents rather than to place personal blame.
- Incentives: Some organizations reward employees who report near-hit events.
- Anonymous reporting: Some organizations allow near hits to be reported anonymously.

Employee Involvement — Most organizations involve their employees in investigations of the near hits and in the implementation of corrective actions. Every near-hit event carries an important safety message: Stay alert and observe. Near-hit incidents deserve the same investigative attention as actual injuries do. Those involved in a near-hit event must complete the report.

Document All Events — Make report forms readily available to all employees. The report form should record the following information:

- Date, time, and specific location of the incident/potential hazard
- Detailed description of the incident or potential hazard
- Description of the factors that contributed to the near miss (unsafe conditions, unsafe actions, or a combination of the two)

Investigating Near-Hit Events — The following items may be included in the follow-up report:

- Names of all people involved in and witnessing the near miss
- Name of the supervisor in charge at the time of the incident
- Determination of causes (focusing on defects in the program)
- Corrective actions required
- Specific individual or teams responsible for each corrective action
- Signature of the supervisor or other manager indicating that the corrective actions have been satisfactorily completed

Accident Reporting, Investigation, and Causation Analysis — Accurate reporting provides the maximum sampling of accident experience for analysis.

- Never conduct an accident investigation with the intention of finding fault or placing blame.
- Concentrate on how and why an event occurred.
- Conduct an analysis immediately to discover the root causes and failure modes.
- Keep in mind that unsafe acts or unsafe conditions help generate accident events.
- Analyze the information to make improvement recommendations for management.
- Understand that management controls the causes of accidents; poor management generates accidents, and most events can be attributed to management deficiencies such as poor planning.
Healthcare Hazard Control and Safety Management

Accident Prevention — The failure of people, equipment, supplies, or surroundings to react or behave as expected causes most accidents. Accident investigations determine how these failures occur. The information gained by such an investigation can be used to prevent a similar or perhaps more disastrous accident. Accident investigations should be conducted with accident prevention in mind; they are not conducted to place blame. As noted earlier, an accident is an unplanned event that results in personal injury, property damage, environmental damage, or no damage at all. Accidents adversely affect the completion of a task. All accidents, regardless of the extent of injury or damage, should be investigated. Identifying and understanding accident causal factors, including unsafe human behaviors, can be beneficial when evaluating accidents and implementing preventive measures. (See Table 3.6.)

Accident Causal Factors — Accidents can be complex and involve a dozen or more causal events. A detailed analysis of an accident reveals that primary or direct causes of the event are the first to be discovered and easiest to document. Many times these factors remain very visible, and some investigators refer to them as surface factors. Secondary or contributing factors are more difficult to identify. Most of the time these factors remain hidden below the surface, and identifying them may require root-cause analysis. Investigations not using a root-cause analysis process may not uncover these important causal factors. An adverse event or accident occurs when a person or object receives the force or energy of a hazard that cannot be absorbed safely. Many contributing causes can be traced to poor management policies, bad decisions, personal factors, or poor environmental conditions. Eliminating or controlling one or more causal factors prevents accidents. Accident investigations should seek to find out the “what,” “when,” “where,” “who,” “how,” and most of all “why.” The investigation should go to the root cause to determine where the underlying processes failed. The information gained during accident investigations helps prevent the recurrence of similar events but also reveals the sequence of events that led to the accident. Determining the impact on the total safety system allows for better solutions.

Grouping Causal Factors — It is best to group the identified causal factors into appropriate categories. Grouping factors in this way permits the investigation or root-cause analysis team to better analyze the factors to answer the “why” of an event. The initial groupings of causal factors should be limited to the following categories, which can be further divided as needed:

---

**TABLE 3.6 Accident Prevention Principles**

<table>
<thead>
<tr>
<th>Accident Prevention Principles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accident prevention programs must place a strong emphasis on identifying, evaluating, and correcting hazards and hazardous conditions.</td>
</tr>
<tr>
<td>Accident prevention programs must address human behavior, which is the most unpredictable aspect of the accident prevention program.</td>
</tr>
<tr>
<td>Accident prevention programs must be organized, planned, and directed to achieve desired results.</td>
</tr>
<tr>
<td>Identifying the causal factors responsible for an accident is important in accident prevention.</td>
</tr>
<tr>
<td>Preventing accidents and controlling hazards must include some type of process innovation, machine safeguarding, personal protective equipment, training, and administrative procedures.</td>
</tr>
<tr>
<td>Monitoring systems allows assessment of the effectiveness of hazard-reducing controls and the accident prevention program.</td>
</tr>
</tbody>
</table>
• **Operational causes:** Factors relevant to the job, task, operation, or process.
• **Motivational causes:** Human factors such as unsafe behaviors, stress, or drug use.
• **Organizational factors:** Policies, procedures, rules, supervision, or training issues.

**Accident Investigations** — The purpose of an accident investigation is to identify procedural errors and hazards that contributed to an incident. An investigation focuses on primary and contributing causal factors. The investigative process should include the following tasks:

- Determine the persons involved in the accident, their status or job description, and the supervisor responsible for the area or job task.
- Document the exact date, time, location of, and witnesses to the event.
- Identify all objects, equipment, hazards, or other causal factors that could have contributed to the accident.
- Obtain a detailed description of what happened, including as many witness statements as possible.
- Evaluate only after all available evidence and information have been collected.
- Determine appropriate corrective actions or countermeasures.

**Formal Investigations** — Safety professionals should ensure that a formal investigation is conducted when preliminary reports indicate inconsistencies in the written policies, safety rules, or organizational procedures. Investigations should also be conducted if the event:

- Fits an established pattern of time, place, hazard, or person
- Resulted in personal injury of an employee, a patient, or a visitor
- Involved possible faulty equipment
- Involved workers who failed to use personal protective equipment
- Demonstrated a possible training deficiency
- Was inadequately staffed
- Involved personal factors such as tension or domestic problems

**Implementing Accident Investigation Procedures** — Healthcare facilities should develop a standardized system for reporting all incidents. Timely and accurate reporting of accidents allows safety personnel to discern patterns, uncover contributing causal factors, identify risks, and reduce loss by preventing or reducing mishaps. Forms and procedures should be easy to complete and provide for confidential reporting. The same office should receive, analyze, and document all accident information. Workers should be trained in the proper reporting of accidents and injuries. Good accident investigation techniques help determine direct causes, uncover contributing causes, prevent similar accidents from occurring, document facts, provide information on costs, and promote safety.

**Focus of Accident Investigations**

- Causal factors contributing to the event
- Why and how the hazard control system failed
- Documenting which safety policies and regulations were violated
- Determining whether defective machinery contributed to the accident
- Cataloging the environmental factors that contributed to the event
- Looking for problems that indirectly contributed to the accident
Sample Investigative Process — The actual investigative process used would depend on the nature and type of occurrence. The basic steps of any accident investigation process include defining the scope, determining who will investigate, and assigning specific tasks. Those performing the investigation should:

- Review a description of the event, including damage and injuries.
- Review information about similar events or accidents.
- Summarize normal operating procedures for the task, job, or process.
- Find out what happened preceding the event.
- Compile a list of witnesses and their initial statements (if documented).
- Interview all witnesses, including those present before and after the event.
- Keep accurate records of each interview.
- Inspect the accident site, if possible, and update information.
- Prepare necessary sketches and photographs.
- Label each exhibit carefully and keep accurate records.
- Secure the area and do not disturb the scene unless a hazard exists.
- Determine the role of all environmental factors.

Fact Finding

- Gather evidence and information from as many sources as possible during the investigation: witnesses, reported or documented information, and observations.
- Observe carefully throughout the investigation process.
- Interview witnesses as soon as possible after an accident, as people tend to change the facts over time.
- Inspect the accident site before any changes occur, and document your findings and observations.
- Always take photographs and make sketches of the accident scene if possible.
- Determine the most likely sequence of events and the most probable causes.
- Ask probing questions but do not jump to hasty conclusions.

Documenting Information

- Document pre-accident conditions, the accident sequence, post-accident conditions, locations of the victims, names of witnesses, machinery involved, energy sources present, and the existence of hazardous materials, including biohazards.
- Be aware that, in some investigations, a particular physical or chemical law, principle, or property may explain a sequence of events and should be noted during the investigation or in the later analysis of data.
- In addition, gather data during the investigation that may lend itself to analysis with respect to these laws, principles, or properties; an appendix in the final report can include an extended discussion.
- Document or explain deviations from normal operating procedures.
- Include information about the use of flow diagrams, equipment data, building plans, or maintenance procedures used to support findings.
- Report any difficulties or abnormalities experienced during the process.

Using Video Recorders or Cameras — Consider using video recorders or cameras when conducting accident investigations. Videotaping and taking photographs at an accident scene can be beneficial in analyzing hazards and determining causal factors. Accident videos can also be used in training sessions and can provide excellent documentation for future reference. Digital cameras can be challenged in cases involving litigation as the images can be altered so easily.
Determining Causal Factors — Accident investigations can help identify actions and improvements that could help prevent similar accidents. Human error contributes to most accidents in some manner, but simply placing blame may allow other hazards to go undiscovered and uncontrolled.

- Attempt to look beyond the obvious.
- Try to uncover primary and secondary causal factors.
- Determine the true loss potential of the occurrence.
- Develop practical recommendations to prevent a recurrence.
- Evaluate all human, situational, and environmental factors.

Interviewing Considerations — An experienced person should conduct all witness interviews, if possible, and should:

- Locate the position of each witness on a master chart, if necessary.
- Obtain preliminary statements as soon as possible from the witnesses.
- Arrange for a convenient time and place to talk to each witness.
- Explain the purpose of the investigation (accident prevention).
- Put the witnesses at ease, listen to them, and allow them to speak freely.
- Be courteous, considerate, and take notes without being distracting.
- Use sketches and diagrams to help the witness.
- Emphasize things directly observed by the witness.
- Label hearsay accordingly and never argue with the witness.
- Record the exact words used by the witnesses to describe their observations.
- Never put words in a witness' mouth, and word each question carefully.
- Identify each witness by name, occupation, special education, and experience.
- Provide each witness with a copy of the statement and obtain signatures, if possible.

Post-Interview Actions

- Interview witnesses again to confirm or clarify key points, as necessary.
- Assemble the available testimony in a logical order.
- Analyze witness information along with data obtained from the accident site.
- Be aware that some witnesses may change their stories after talking with others.
- Understand that a witness may have reasons to provide biased testimony.
- Keep in mind that eyesight, hearing, and other factors can affect the observations of witnesses.

Writing Investigation Reports — The following outline has been found to be especially useful when gathering information to be included in the formal report:

1. Background information
   - Where and when the accident occurred
   - Who and what were involved
   - Operating personnel and other witnesses
2. Account of the accident
   - Sequence of events
   - Extent of damage
   - Accident type
   - Agency or source (of energy or hazardous material)
3. Discussion (analysis of the accident)
   - Direct causes (e.g., energy sources, hazardous materials)
   - Indirect causes (e.g., unsafe acts and conditions)
   - Basic causes (e.g., management policies, personal or environmental factors)
4. Recommendations (to prevent recurrence)
   • Basic causes
   • Indirect causes
   • Direct causes (e.g., reduced quantities of protective equipment or structures)

Management Involvement — Management should emphasize the importance of timely reporting, investigation, and analysis by:
   • Promptly reviewing and analyzing reports
   • Taking follow-up actions when required
   • Assisting in coordinating and developing preventive procedures
   • Making constructive, purposeful, and timely recommendations
   • Reviewing all major incidents within 48 hours

Reviewing Accident Information — The accident information review process is critical because:
   • It serves as a bridge between accidents and safety training and education.
   • Training and hazard surveillance programs can be changed or modified based on information provided by the accident review process.
   • Controlling hazards in the healthcare environment is a challenging process that requires organization and coordination.

Summary of Accident Causal Factors — Many things contribute to accidents. Listed below are some of the more common causal factors:

1. Poor supervision
   • Lack of proper instructions
   • Job and/or safety rules not enforced
   • Inadequate personal protective equipment
   • Correct tools or equipment not provided
   • Inadequate inspection of equipment or jobs
   • Poor planning or improper job procedures
   • Rushed workers

2. Worker job practices
   • Using shortcuts or working too fast
   • Incorrect or no use of protective equipment
   • Horseplay or disregard of safety rules
   • Inattention or inexperience
   • Physical or mental impairment
   • Improper body motion
   • Actions of fellow worker
   • Improper personal clothing

3. Unsafe materials, tools, or equipment
   • Ineffective machine guarding
   • Unguarded equipment or defective materials or tools
   • Improper or poor equipment design
   • Failure to use proper tools or equipment
   • Poor preventive maintenance procedures
   • Equipment not approved by biomedical or maintenance departments
   • Strain on electrical cord
   • Inadequate repair of machine cords
4. Unsafe conditions
   • Poor lighting
   • Poor ventilation
   • Crowded work area
   • Poor storage or piling
   • Inadequate exits
   • Poor housekeeping practices
   • Unsafe environmental conditions, such as slippery floors

Root-Cause Analysis — Many investigations miss root causes and focus instead on finding fault, and many organizations have failed to use effective and systematic techniques to identify and correct system root causes. The key goals of an effective root-cause analysis include the following:

   • Determine why an event occurred.
   • Identify the problems and causal factors that fed the problem that impacted the system.
   • Provide insight for developing solutions, controls, or changes necessary to improve the organization.

Remember that “best guess” corrective actions do not deal with the actual causes of accidents. Ineffective quick-fix schemes cannot change the system. The analysis must focus on identifying causal factors, not placing blame. The process must use a systematic team approach to accomplish its goals.

What Happened? — When analyzing a problem we must know what happened before we can determine why it happened. Charting is an excellent tool to help investigators organize the information being collected so it can be easily understood. A chart or diagram helps identify missing and conflicting information that might require additional investigation. Such a diagram is an excellent presentation tool for explaining a problem to others. What is the reason for an investigation? What sequence of events led up to the incident? What factors could have helped prevent the incident or reduce the consequences?

Why? — When the team understands what happened then they are ready to analyze why it happened (see Table 3.7). The team must ask the appropriate questions to find fixable root causes of equipment, processes, systems, and human-related problems. The team can avoid jumping to conclusions or making baseless assumptions by using a fault tree or other graphic aid to help identify problems or causal factors leading to the event. Each problem identified is analyzed to determine the level of causation. When basic causes have been
identified as potential problems, the team checks each one to evaluate its impact on the event. Root causes might include such things as procedures, training, quality processes, communications, safety, supervision, and management systems. These root causes can then be analyzed further to see if they have generic (system/program) causes.

**Other Uses of Root-Cause Analysis** — Use this process to address problems areas:

- Safety issues and hazard control
- Efficiency and productivity
- Processes, communication, and systems
- Equipment selection and use
- Customer satisfaction
- Morale and interpersonal relationships

**E. HOSPITAL AND HEALTHCARE HAZARD CATEGORIES**

**General Health-Related Work Practices**

- Wash hands frequently and thoroughly; workers should wash their hands immediately after direct contact with any chemical, drug, blood, or other body fluids.
- Do not eat, drink, smoke, or apply cosmetics in the lab.
- Dispose of needles and other sharp objects promptly in impervious containers.
- Do not clip or recap needles by hand.
- Dispose of biohazardous waste immediately and in an appropriate manner.
- Do not use electrical equipment that appears to be damaged or in poor repair.
- Promptly report any shocks from electrical equipment to the maintenance department.
- Keep cylinders of compressed gases secured; they should never be dropped or allowed to strike each other with force.
- Remove large pieces of broken glass with brooms and dispose of them in a separate container.
- Remove small pieces of broken glass with tongs; glass should never be removed with fingers.
- Turn off vaporizers of anesthesia machines when not in use.
- Decrease the amount of waste anesthetic gases in the operating room through proper use of face masks, sufficiently inflated endotracheal tubes, and prevention of anesthetic spills.
- Use an isotonic wash to the body or eyes in case of chemotherapeutic drug contact.

**General Equipment Maintenance** — Hospital electrical equipment (including anesthesia machines, portable x-ray machines, laser systems, biosafety cabinets, and exhaust ventilation systems) should have a preventive maintenance schedule. Specific personnel should have responsibility for ensuring proper maintenance of portable x-ray machines (preventive and corrective maintenance programs for x-ray machines are detailed in 21 CFR 1000, Radiological Health). Anesthesia machines should be inspected and maintained at least every 4 months by factory service representatives or other qualified personnel. Leakage of gas should be less than 100 mL/min during normal operation. Laser systems should be properly maintained and serviced according to the manufacturer's instructions. Only qualified personnel from the manufacturer or in-house should maintain such systems. Maintenance may only be done according to written standard operating procedures. A written log is recommended to note any detected leaks and service done on ethylene oxide chambers. Sterilizer or aerator door gaskets, valves, and fittings must be replaced when necessary.
Health Hazard Training — All hospital staff members should receive training on electrical and fire safety, hazard communication, and infection control by qualified personnel. Some educators recommend hands-on training with testing before and after. In hospitals, specific training regarding hazardous substances should be given. Only qualified personnel may handle hazardous substances or operate specified machines. (See Table 3.8 for further guidelines.)

Warning Signs — Underwriters Laboratories (UL) standard 544 provides specific requirements regarding warning signs to be used on electrical equipment. Warning signs should be placed in areas where exposure to aerosolized drugs, chemotherapeutic agent spills, ethylene oxide, or lasers is likely to occur. Contract employees should not endanger hospital employees and can sometimes be controlled through the use of privileges contracts.

Biological Hazards — Healthcare workers are exposed to a variety of biological hazards. As discussed further below, effective immunization and infection control programs, as well as appropriate post-exposure evaluation and medical management policies, must be established. Bloodborne pathogens include hepatitis B, hepatitis C, and human immunodeficiency virus (HIV). Table 3.8 provides a list of addressing common hospital health hazards.
virus (HIV). Airborne and skin pathogens include tuberculosis, varicella, meningococcus, pertussis, measles, mumps, rubella, Legionella, molds and spores, and herpes simplex virus. Enteric pathogens include hepatitis A, Salmonella, and Shigella. (Refer to Chapter 8 for complete information on biohazard safety and infection control.)

**Chemical Hazards** — Healthcare workers may be exposed to a wide variety of potentially toxic materials. Exposures can occur during accidents or under normal working conditions. The effects may range from minor skin irritation to possible chronic disease or adverse reproductive outcomes. Employee health personnel should be familiar with clinical toxicology, appropriate industrial hygiene monitoring, environmental control methodology, and recommended or regulatory exposure levels. Material Safety Data Sheets (MSDSs), computerized databases, and poison control centers may be helpful in obtaining information regarding chemical exposures. (Refer to Chapter 7 for more detailed information regarding chemical and hazardous materials safety.)

**Physical Hazards** — A variety of physical hazards can be found in healthcare facilities. Employee health services should support the development of a comprehensive safety program that includes medical surveillance activities, environmental surveillance reports, safety reviews, incident reports, and the review and promotion of safe work practices. Physical hazards in a care environment might include electricity, ionizing radiation, nonionizing radiation (e.g., lasers), noise, inadequate ventilation or asphyxiation in confined spaces, and heat and cold stresses resulting from ambient weather or due to heating, ventilation, and air-conditioning problems. Note that some physical hazards can be classified as ergonomic and environmental hazards.

**Ergonomic and Environmental Hazards** — Many ergonomic and environmental hazards can also be classified as physical hazards. Where indicated, surveillance may be necessary for repetitive motion or cumulative trauma disorders, shop safety, vision and hearing protection, and instruction and compliance in the use of personal protective equipment. Healthcare institutions should develop safety programs that incorporate OSHA standards, corporate policies, and best-practice guidelines. These programs should provide for medical surveillance activities, environmental surveillance reports and reviews, safety reviews, incident report reviews, and mechanisms for employees to report hazardous activities and participate in the development of solutions. Ergonomic issues arise during the performance of many tasks in healthcare facilities. Of particular concern are back injuries and repetitive motion or cumulative trauma disorders. Back problems continue to be the leading lost-time injury among healthcare workers. Recent data suggest that the incidence of back injury is highest in nurse aides and exceeds even the incident rate of back injury among workers in industry. Cumulative trauma is an issue with clerical workers, laboratory personnel, custodial workers, and potentially the entire hospital work force. Employee health personnel should work closely with the purchasing, administration, and safety functions in the acquisition, implementation, and design of facilities and equipment. The use of ergonomic committees and surveys and the development of lifting teams may be helpful in addressing ergonomic issues. (Refer to Chapter 9 for additional information about healthcare ergonomics and lifting.)

**Psychosocial Hazards** — Psychosocial hazards includes such factors as stress, sleep deprivation, workplace violence, chemical dependency, drug abuse, depression, bad attitudes, improper behaviors, and sexual harassment.
F. PERSONAL PROTECTIVE EQUIPMENT

First-line supervisors must be convinced of the presence of a hazard and must be held accountable for their employees' use of personal protective equipment when required. A safety program for new employees is a necessary part of any orientation program. An ongoing safety program should be used to motivate employees to continue to use protective gear. Teaming the correct personal protective equipment with a good training program can give the worker a large measure of safety where other controls are inadequate or impossible. Personal protective equipment is effective only when the equipment is selected based on its intended use, employees are trained in its use, and the equipment is properly tested, maintained, and worn. In the final analysis, the best protection comes from an interested management and work force committed to sound work practices.

General Health Hazard Personal Protective Equipment — Employees should wear lab coats in the laboratory area and remove them before leaving; they should also wear plastic or rubber aprons when there is a potential for splashing and rubber-soled shoes to prevent slips and falls. Employees can also use rubber-lined shoe coverings to protect against spills or dropped objects and must wear fluid-proof shoes when leakage to the skin could occur. They should wear protective eyewear or shields if splashes of a hazardous substance are likely. Tight-fitting goggles may prevent eye irritation when aerosolized chemicals are present. All personnel in operating rooms during laser surgery should wear goggles that protect the cornea and conjunctive and other ocular tissues. The wavelength of the laser output is the most important factor in determining the type of eye protection to be used. Those in the direct x-ray field should wear opaque goggles. Employees likely to contact hazardous drugs and blood or other body fluids should wear impervious or low-permeability gowns. When contaminated, these gowns should be properly stored in the area of use; soiled gowns should be washed or discarded. Employees in the x-ray field should wear lead-lined aprons. Respirators may be required in case of emergencies, for spill response, decontamination activities, and exposure to specific chemicals such as formaldehyde and ethylene oxide.

General PPE Requirements (29 CFR 1910.132) — Personnel protective equipment:

- Includes all clothing and other work accessories designed to create a barrier against workplace hazards.
- Includes personal protective equipment for eyes, face, head and extremities; protective clothing; respiratory devices; and protective shields and barriers.
- Should be provided, used, and maintained in a sanitary and reliable condition wherever necessary by reason of hazards of processes or environment, chemical hazards, radiological hazards, or mechanical irritants encountered in a manner capable of causing injury or impairment in the function of any part of the body through absorption, inhalation, or physical contact.
- Should not be used as a substitute for engineering, work practice, or administrative controls.
- Should be used in conjunction with these controls to provide for employee safety and health in the workplace.

The basic element of any management program for personal protective equipment should be an in-depth evaluation of the equipment needed to protect against the hazards at the workplace. Management dedicated to the safety and health of the employees should use that evaluation to set a standard operating procedure for personnel and then train employees on the protective limitations of personal protective equipment and its proper use and maintenance. Using personal protective equipment requires hazard awareness and training on the
part of the user. Employees must be aware that the equipment does not eliminate the hazard. If the equipment fails, exposure will occur. To reduce the possibility of failure, equipment must be properly fitted and maintained in a clean and serviceable condition. This standard also discusses the use of equipment to protect against life-threatening hazards. Information on respiratory protective equipment may be found in 29 CFR 1910.134, which should be consulted for information on specialized equipment such as that used by firefighters.

PPE Hazard Assessment — Employers must assess the workplace to determine if hazards that require the use of personal protective equipment are present or are likely to be present. If hazards or the likelihood of hazards are found, employers must select — and have affected employees use — properly fitted personal protective equipment suitable for protection from these hazards. Employers must certify in writing that a workplace hazard assessment has been performed. Defective or damaged personal protective equipment must not be used. OSHA requires a PPE hazard survey to be conducted and certified in writing by an authorized person (see Table 3.9). The survey must show the date of assessment, workplace evaluations, and name of the certifying official.

PPE Training Elements

- When and under what conditions to wear PPE
- Types of PPE necessary to protect against particular hazards
- Limitations of the PPE
- How to adjust, wear, and remove PPE properly
- Procedures for maintaining, storing, and disposing of PPE

Employee Requirements — The standard requires employees to demonstrate an understanding of all requirements. Employers must also have procedures in effect to identify and remove from service all defective PPE. All PPE must meet ANSI standards or be equally effective. No combination of protective equipment is able to protect against all hazards; PPE should be used in conjunction with other protective methods. Using PPE improperly is worse than using no protection at all; without any protection, at least the worker knows he or she is vulnerable and is likely to take precautions. Employees should be aware that the use of PPE can cause its own hazards, such as heat stress, physical stress, impaired vision, and reduced mobility. The two objectives of any PPE program should be to protect the wearer from hazards and to prevent injury. To accomplish these goals, a safety program should also include medical monitoring and environmental surveillance.
Program Review — The program should be reviewed annually with respect to:

- Number of hours worked
- Accident and illness data
- Levels of exposure to hazard(s)
- Effectiveness of training
- Program documentation and costs
- Recommendations for program improvement/modification

Eye and Face Protection (29 CFR 1910.133) — Suitable eye protectors must be provided when the potential exists for injury to the eyes or face from flying particles, molten metal, liquid chemicals, acids or caustic liquids, chemical gases or vapors, potentially injurious light radiation, or a combination of these. Design, construction, testing, and use of eye and face protection purchased prior to July 5, 1994, must be in accordance with ANSI Z87.1-1968 (Standard Practice for Occupational and Educational Eye and Face Protection). Protective eye and face devices purchased after July 5, 1994, must comply with ANSI Z87.1-1989 (American National Standard Practice for Occupational and Educational Eye and Face Protection). Protectors must meet the following minimum requirements:

- Provide adequate protection against the particular hazards.
- Be reasonably comfortable when worn under the designated conditions.
- Fit snugly without interfering with the movements or vision of the wearer.
- Be durable, capable of being disinfected, easy to clean.
- Be clean and in good repair.

Head Protection (29 CFR 1910.135) — A head injury study revealed that the majority of workers have been injured while performing their normal jobs at their regular worksites. The survey showed that in most instances where head injuries occurred employers had not required their employees to wear head protection. Head injuries are caused by falling or flying objects or by bumping the head against a fixed object. Head protection, in the form of protective hats, must do two things: resist penetration and absorb the shock of a blow. This is accomplished by making the shell of the hat of a material hard enough to resist the blow and by utilizing a shock-absorbing lining composed of a headband and crown straps to keep the shell away from the wearer's skull. Protective hats are also used to protect against electric shock. The standards recognized by OSHA for protective hats purchased prior to July 5, 1994, are contained in ANSI Requirements for Industrial Head Protection (Z89.1-1969) and ANSI Requirements for Industrial Protective Helmets for Electrical Workers (Z89.2-1971), both of which should be consulted for further details. The standards for protective helmets purchased after July 5, 1994, are contained in ANSI Requirements for Personnel Protection Protective Headwear for Industrial Workers (Z89.1-1986). Later editions of these standards are available and acceptable for use. Each type and class of head protector is intended to provide protection against specific hazardous conditions. An understanding of these conditions will help in selecting the correct hat for a particular situation. Headbands are adjustable in 1/8 size increments.

Protective Hats

- Type 1: Helmets with full brim, not less than 1.25 inches wide
- Type 2: Brimless helmets with a peak extending forward from the crown
Classes of Helmets

- Class A: General service, limited voltage protection
- Class B: Utility service, high-voltage protection
- Class C: Special service, no voltage protection

Foot and Leg Protection (29 CFR 1910.136) — Safety shoes should be sturdy and have an impact-resistant toe. In some shoes, metal insoles protect against puncture wounds. Additional protection, such as metatarsal guards, may be found in some types of footwear. Safety shoes come in a variety of styles and materials, such as leather and rubber boots and oxfords. Safety footwear is classified according to its ability to meet minimum requirements for both compression and impact tests. These requirements and testing procedures may be found in ANSI standards. Protective footwear purchased prior to July 5, 1994, must comply with ANSI Z41.1-1967 (Standard for Men's Safety-Toe Footwear). Protective footwear purchased after July 5, 1994, must comply with ANSI Z41-1991 (Personal Protection — Protective Footwear).

Arm and Hand Protection (29 CFR 1910.137) — A wide assortment of gloves, hand pads, sleeves, and wristlets is available for protection against various hazardous situations. Employers need to determine what hand protection their employees need. The work activities of the employees will determine the degree of dexterity required; the duration, frequency, and degree of exposure to hazards; and the physical stresses applied. Before purchasing gloves, the employer should request documentation from the manufacturer that the gloves meet the appropriate test standards for the hazards anticipated. To achieve protection against chemical hazards, the toxic properties of the chemicals must be determined — particularly the ability of the chemicals to pass through the skin and cause systemic effects. The protective device should be selected to fit the job; for example, some gloves are designed to protect against specific chemical hazards. Employees should wear gloves when performing tasks such as handling hazardous chemicals, specimens, or hot materials. The type of glove selected depends on the task being performed. Also:

- Employees should change latex or vinyl gloves frequently and inspect them for punctures before putting them on.
- Double gloving can decrease the risk of exposure by penetration but should not interfere with the task.
- Less permeable surgical latex gloves are preferred over polyvinyl gloves.
- Employees in the direct x-ray field should wear lead-lined gloves.

Body Protection — In a healthcare setting, most body protection would address biohazards or hazardous drug mixing; however, other hazards could also threaten workers, including heat sources, hot metals during welding operations, hot liquids, cuts, acids, and radiation exposures. A variety of protective clothing is available, including gowns, vests, jackets, aprons, coveralls, and full body suits. Wool and specially treated cotton are two natural fibers that are fire resistant and comfortable as they adapt well to changing workplace temperatures. Duck, a closely woven cotton fabric, is good for light-duty protective clothing. It can protect against cuts and bruises on jobs where employees handle heavy, sharp, or rough material. Rubber or rubberized fabric such as neoprene can provide protection against acid and chemical exposures. It is important to refer to the manufacturers’ selection guides for the effectiveness of specific materials against specific materials. Disposable suits of plastic-like or other similar synthetic materials are particularly important for protection from dusty materials or materials that can splash. In the presence of an extremely toxic substance, a worker may have to wear a completely enclosed chemical suit. Protective clothing should be inspected regularly to ensure proper fit and function.
G. RESPIRATORS

Respiratory Protection (29 CFR 1910.134) — Respirators prevent the inhalation of harmful airborne substances and provide fresh air in an oxygen-deficient environment. An effective respiratory protection program must address the following:

- Defining the hazards that will be encountered
- Determining the degree of protection required
- Medical evaluation for respirator selection and use
- Selecting and fitting of the respirator
- Training on the correct use and care of the respirator
- Implementing a maintenance program to ensure respiratory protection

Procedures Specific to Each Worksite — Develop written respirator procedures for each site:

- Refer to other standards regulating specific hazards.
- Cover all site-specific conditions, hazards, or risks.
- Address the selection, use, and care of respirators.
- Update program as necessary to reflect changes in workplace conditions.

When To Wear Respirators

- Any time exposure levels exceed the permissible exposure limit (PEL)
- During implementation of engineering and work practice controls
- When maintenance and repair activities expose workers
- During brief or intermittent operations where exposures exceed the PEL
- When engineering and work practice controls are not feasible
- At locations where engineering and work practice controls cannot reduce exposures to or below the PEL
- During emergency egress or fire situations

Types of Respirators

- Air-purifying respirators can be either full-face or half masks with mechanical or chemical cartridges to filter dusts, mists, fumes, vapors, or gases. They are available in three types: disposable, reusable, and disposable/reusable.
- Disposable air-purifying respirators are intended to be used once or until the cartridge expires. The cartridges are permanently attached and have no replacement parts. Reusable air-purifying respirators use both replaceable cartridges and parts. Note: The replaceable cartridges and parts must be from the same manufacturer to retain NIOSH approval. Disposable/reusable air-purifying respirators have no replaceable parts except cartridges.
- Gas masks are designed for slightly higher concentrations of organic vapors, gases, dusts, mists, and fumes. The volume of sorbent used as the medium is higher than for a chemical cartridge.
- Powered air-purifying respirators use a blower to pass the contaminated air through a filter. The purified air is then delivered into a mask or hood. They filter dusts, mists, fumes, vapors, and gases, just like ordinary air-purifying respirators.
- Air-purifying respirators cannot be used in oxygen-deficient atmospheres, which can result when another gas displaces the oxygen or consumption of oxygen by a chemical reaction occurs. Oxygen levels below 19.5% require either a source of supplied air or supplied-air respirator protection. Levels below 16% are considered to be unsafe and could cause death.
• Supplied-air respirators provide the highest level of protection against highly toxic and unknown materials. "Supplied-air" refers to self-contained breathing apparatuses (SCBAs) and air-line respirators. SCBAs have a limited air supply that is carried by the user, allowing for good mobility and fewer restrictions than air-line respirators.
• Air-line respirators have an air hose that is connected to a fresh air supply from a central source. The source can be from a compressed air cylinder or air compressor that provides at least grade D breathing air.
• Emergency escape breathing apparatuses (EEBAs) provide oxygen for 5, 10, or 15 minutes, depending on the unit. These are intended for use in emergency situations when a worker must escape from environments posing an immediate danger to life and health (IDLH).

Material Types and Features — Respirators can be made from a variety of materials. The most popular facepiece materials are silicone, neoprene, and rubber. In general, rubber and neoprene are rigid, durable materials. Silicone is preferred for its comfort, flexibility, and ease in cleaning. Full-face respirators are available with six-strap harnesses or ratchet suspensions. The harness type can be worn with a hard hat, but ratchet suspensions are generally easier to adjust, making donning and doffing easier. Various features are available that allow customization of respirators to suit employees and the specific hazards they encounter; for example, nose cups reduce lens fogging, and lens covers protect the lens from paint, minor chemical splashes, and scratches. Spectacle kits are necessary for employees who must wear prescription corrective lenses; the frame mounts into full-face masks, and the prescription lenses are made by each wearer’s optometrist. This allows the wearer to maintain a proper fit and still wear prescription lenses.

Determining Cartridge Type — To determine the proper cartridge for air-purifying respirators it is necessary to contact a safety professional or consult the Material Safety Data Sheet (MSDS) of the substance to be filtered. All cartridges are assigned a color that designates the type of contaminants they will filter. The medium used as the filter is usually activated carbon. The adsorption capacity of the filter is limited; when the wearer of the respirator can detect an odor, irritation, or taste of the contaminant, the cartridge should be replaced.

Respirator Fit Types
• Tight-fitting respirators form a seal with the face of the wearer.
• Quarter masks cover the nose and mouth; the lower sealing surface rests between the chin and the mouth.
• Half masks cover the nose and mouth and fit under the chin.
• Full face pieces cover the face from below the chin to the hairline.
• Loose-fitting respirators contain a respiratory inlet designed to form a partial seal with the face. These include loose-fitting face pieces, as well as hoods, helmets, blouses, or full suits, all of which cover the head completely.

Respiratory Hazards — Airborne hazards result from either an oxygen-deficient atmosphere or breathing air contaminated with toxic particulate materials, vapors, gases, fumes, or mists (see Table 3.10). The proper selection and use of a respirator depend on an initial determination of the concentration of the hazard or hazards present in the workplace or the presence of an oxygen-deficient atmosphere.

Respirator Classifications — Air-purifying respirators provide protection by removing contaminants from the air. Supplied-air respirators provide an independent source of respirable
air. Either class may have tight-fitting and loose-fitting face pieces. The concept of negative and positive pressure becomes important when considering potential contaminant leakage into the respirator:

- **Negative-pressure respirators**: Air pressure within the face piece is negative during inhalation.
- **Positive-pressure respirators**: Air pressure is normally positive with respect to ambient air pressure throughout the breathing cycle.

**Air-Purifying Respirators**

- Particulate-removing respirators reduce the inhaled concentrations of nuisance dusts, fumes, mists, toxic dusts, asbestos-containing dusts or fibers, or any combination of these. These respirators may contain a single-use or replaceable filter.
- A powered air-purifying respirator (PAPR) uses a blower to force the ambient atmosphere through air-purifying elements to the inlet covering.
- Vapor- and gas-removing respirators contain sorbent elements (canisters or cartridges) to absorb vapors or gases from the contaminated air.
- Combination cartridges and canisters protect against particulate matter as well as vapors and gases.

**Supplied-Air Respirators**

- These respirators provide air from a source independent of the surrounding atmosphere; they do not remove contaminants from the atmosphere.
- In a self-contained breathing apparatus, air or oxygen is carried in a tank on the worker’s back.
- Compressed air is supplied from a stationary source through a high-pressure hose connected to the respirator.

### Table 3.10 Basic Respirator Categories

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dusts</td>
<td>Particles formed or generated from solid organic or inorganic materials by reducing their size through mechanical processes such as crushing, grinding, drilling, abrading, or blasting.</td>
</tr>
<tr>
<td>Fumes</td>
<td>Particles formed when a volatilized solid, such as a metal, condenses in cool air. This physical change is often accompanied by a chemical reaction such as iron oxide fumes from arc-welding.</td>
</tr>
<tr>
<td>Mists</td>
<td>Finely divided liquids that are suspended in the air. These suspended droplets can be generated by splashing, spraying, or foaming.</td>
</tr>
<tr>
<td>Vapors</td>
<td>Gaseous forms of substances normally in solid or liquid states at room temperature and pressure. They can be formed by evaporation from a liquid or solid and are normally present when solvents are being used.</td>
</tr>
<tr>
<td>Smoke</td>
<td>Created by carbon or soot particles resulting from the incomplete combustion of carbon-related materials such as coal or oil. Smoke can contain droplets as well as dry particles.</td>
</tr>
<tr>
<td>Oxygen deficiency</td>
<td>Occurs when oxygen content falls to less than 19.5% by volume. Oxygen deficiency may occur in confined spaces such as storage tanks, bins, sewers, underground utility tunnels, manholes, and pits. Under such circumstances, always use a supplied-air respirator.</td>
</tr>
</tbody>
</table>
Immediate Danger To Life and Health Atmospheres — Immediate danger to life and health (IDLH) atmospheres atmospheres, by definition, pose the most danger to workers, who must be fitted with the following: (1) full face piece and pressure-demand SCBA certified for a minimum service life of 30 minutes, or (2) a combination of full face piece and pressure-demand supplied-air respirator (SAR) with an auxiliary self-contained air supply.

Respirator Limitations

- Do not issue respirators to individuals with medical conditions such as asthma or emphysema.
- Do not issue respirators to men with beards or sideburns that interfere with proper fit.
- Recognize that respirators can hinder communication problems, create vision problems, contribute to fatigue, and reduce work efficiency.
- Never use respirators in lieu of other hazard controls.

Program Administration — Assign a qualified person to manage the program who has demonstrated expertise gained through appropriate training and experience (see Table 3.11). The duties of this person should include the proper selection, use, and maintenance of respirators, as well as regular evaluations of the effectiveness of the program. This administrator may delegate responsibilities to other qualified individuals; larger organizations can assign additional staff for specific areas of responsibility. Senior management support of the program should be documented.

Selecting Respirators — Respirator selection requires correctly matching the respirator with the degree of hazard and the user. Proper respirator selection involves choosing a device that fully protects the worker from respiratory hazards and allows the worker to perform the job with the least amount of physical burden. Consider the following when selecting a respirator:

- Physical and chemical properties of the air contaminant
- Concentration of the contaminant
- Relevant permissible exposure limits
- Nature of the work operation or process
- Length of time respirator will be worn

### TABLE 3.11 Respirator Program Elements

| Procedures for selecting respirators for use in the workplace |
| Medical evaluations of employees required to use respirators |
| Fit-testing procedures for tight-fitting respirators |
| Use of respirators in routine and reasonably foreseeable emergencies |
| Procedures and schedules for cleaning, disinfecting, storing, inspecting, repairing, and otherwise maintaining respirators |
| Procedures to ensure adequate air quality, quantity, and flow of breathing air for atmosphere-supplying respirators |
| Identifying potential exposures to respiratory hazards |
| Proper use of respirators, including donning, removal, limitations, and maintenance procedures |
| Procedures for evaluating program effectiveness |
• Work activities and physical or psychological stress
• Fit testing, functional capabilities, and limitations of the respirator
• Characteristics and form of the hazard (gas, dust, organic vapor, fume, mist, oxygen deficiency, or any combination)

Protection Considerations — Respirators must protect against overexposure by reducing and maintaining exposures at or below the relevant exposure limits:

• OSHA PELs found in 29 CFR 1910, Subpart Z, should be reviewed.
• Other voluntary standards include American Conference of Governmental Industrial Hygienists (ACGIH) threshold limit values (TLVs), NIOSH recommended exposure limits (RELs), or other occupational exposure limits.
• The nature of the operation, equipment and tools used, and motion or travel to the job site can influence the type of respirator selected.
• Employers must consider the period of time employees will use the respirator during a work shift.
• Breakthrough times for chemicals can vary greatly and depend on the concentrations of contaminants, patterns of respirator use, and environmental factors, including temperature or humidity.
• A respirator that provides adequate protection for one chemical may be inadequate for another chemical with a different breakthrough time.
• Work activities should be evaluated while employees are wearing the respirators.
• Temperature and humidity conditions in the workplace can affect the level of physical or psychological stress associated with wearing a respirator.

Medical Evaluations — Persons assigned to tasks that require the use of a respirator must be physically able to perform the work while using the respirator. Accordingly, employers have the responsibility of ensuring the medical fitness of workers wearing respirators. The fitness evaluation considers the physical and psychological stresses imposed by respirator use and stress originating from the job itself. Employees must be medically evaluated and found eligible to wear the selected respirator prior to fit testing or first-time use of the respirator in the workplace. Medical eligibility is to be determined by a physician or other licensed healthcare professional. A variety of qualified healthcare providers, including physicians, occupational health nurses, nurse practitioners, and physician assistants, can perform the medical evaluations if licensed to do so in the state in which they practice.

• When assessing the employee’s medical eligibility to use a respirator, the healthcare professional must perform a medical evaluation using a medical questionnaire (Appendix C to 1910.134) or provide a medical examination that obtains the same information as the medical questionnaire.
• The medical evaluation must be administered confidentially and at a time and place, during working hours, convenient to the employee.
• Employers can provide respirator users with a medical examination in lieu of the medical questionnaire if they choose to do so. The OSHA standard does not require a medical examination unless the employee gives a positive response to specific questions on the questionnaire.
• The medical evaluation should determine if employees can tolerate the physiological burden associated with respirator use, including the burden imposed by the respirator itself.
• Healthcare professionals should receive information about the burden of the respirator and the conditions related to its use to prior to their formal recommendations regarding an employee’s ability to use a respirator.
The medical evaluation should attempt to identify general medical conditions that place employees at risk of serious medical consequences.

Medical conditions known to compromise an employee's ability to tolerate wearing a respirator include a history of high blood pressure, angina, heart attack, cardiac arrhythmia, stroke, asthma, chronic bronchitis, or emphysema.

Other conditions include reduced pulmonary function caused by such factors as smoking or prior exposure to respiratory hazards; neurological or musculoskeletal disorders, such as ringing in the ears, epilepsy, or lower back pain; and impaired sensory functions, such as perforated eardrums or reduced or absent ability to smell.

The presence of psychological disorders, such as claustrophobia or severe anxiety, should also be evaluated.

**Written Recommendation for Wearing a Respirator**

- Employers must obtain written recommendations for respirator use from healthcare professionals; such a recommendation must identify any limitations on the employee's use of the respirator, as well as the need for follow-up medical evaluations to assist in making a recommendation.
- The worker should receive a copy of the healthcare professional's written recommendation.
- A powered air-purifying respirator (PAPR) must be provided to an employee if information from the medical evaluation indicates that the employee can use a PAPR but not a negative-pressure respirator.
- Employees must be required to report medical signs or symptoms related to their ability to use a respirator.
- Supervisors or respirator program administrators must report incidents when workers have experienced medical problems during respirator use.
- Information from the respiratory protection program, including observations made during fit testing and program evaluation, can help determine the need for employee re-evaluation.
- A change in workplace conditions such as physical work effort, type of respirator used, protective clothing worn, or workplace temperature may result in a substantial increase in the physiological burden placed on an employee.

**Fit Testing** — The OSHA standard states that employees required to use tight-fitting respirator must be fit tested with the same make, model, style, and size of respirator. OSHA does not exclude disposable particulate respirators from fit testing. Some employees may not achieve an adequate fit with certain respirator models or a particular type of respirator; in these cases, the employer should provide an alternative respirator model with an adequate fit or other type of respirator that provides suitable protection. Employers must provide a sufficient number of respirator models and sizes from which employees can choose to achieve an acceptable respirator fit. (See Table 3.12.)

**Fit-Testing Procedures** — Employers may conduct either a quantitative or qualitative fit test. The individual performing the fit test requires no special certification; however, the individual must be able to prepare the test solutions, calibrate the equipment, and perform the tests properly. The fit tester must be able to recognize invalid tests, ensure proper working order for all test equipment, and demonstrate the ability to calculate fit factors if administering a quantitative fit test (QNFT), which assesses the adequacy of respirator fit by numerically measuring the amount of leakage into the respirator. A QNFT uses an instrument to take a sample from within the wearer’s breathing zone while the respirator is being worn. (Refer to the protocol for a QNFT as detailed in Appendix A of 29 CFR 1910.134.)
A qualitative fit test (QLFT) refers to a pass/fail fit test to assess the adequacy of respirator fit that relies on the individual’s response to the test agent. A QLFT, according to 29 CFR 1910.134(f)(6), may only be used to fit test negative-pressure air-purifying respirators, which must achieve a fit factor of 100 or less. The QLFT relies upon the subjective response of the individual being tested, so reproducibility and accuracy may vary. Appendix A of 29 CFR 1910.134 defines four types of qualitative tests: (1) isoamyl acetate (more commonly known as banana oil), (2) saccharin solution aerosol, (3) bitrex solution aerosol, and (4) irritant smoke (stannic chloride). The test method performed will dictate the type of air-purifying element used on the face piece. Isoamyl acetate QLFT requires respirators equipped with organic vapor cartridges. Both the saccharin and bitrex QLFTs require respirators equipped with particulate filters (95-, 99-, or 100-series filters are acceptable). To perform the irritant smoke test, the respirator must be equipped with either a P100-series particulate filter or a high-efficiency particulate air (HEPA) filter. It is important to note that, when performing the irritant smoke test, no form of enclosure or hood for the test subject is to be used. The other QLFTs all require the use of an enclosure. Complete instructions for all QLFTs are detailed within Appendix A to 29 CFR 1910.134.

**Fit-Testing Frequency** — The OSHA standard found at 29 CFR 1910.134(f)(2) states that the employer will ensure the fit testing of employees using a tight-fitting face piece in the following circumstances:

- Prior to initial use of the respirator
- When using a different respirator face piece (size, style, model, or make)
- On an annual basis
- When an employee reports (or the employer, physician or other licensed healthcare professional, supervisor, or program administrator makes visual observations of) changes in the employee’s physical condition that could affect respirator fit

Any employee who passes a fit test but later finds the fit of the respirator unacceptable should be given the opportunity to select a new face piece.

**Fit Checking** — Testing should not be confused with a respirator fit check. A fit or user seal check (Appendix B to 29 CFR 1910.134) is to be performed each time a tight-fitting respirator is donned to ensure an adequate seal. Appendix B provides guidelines for performing positive- and negative-pressure fit checks. Never substitute a fit check for complete fit testing.
Fit-Test Exercises — Perform the following test exercises for all fit-testing methods described in the OSHA standards:

- Breathing normally in a normal standing position without talking
- Deep breathing in a normal standing position breathing slowly and deeply
- Turning head slowly from side to side while standing in place (holding head momentarily at each extreme and inhaling at each side)
- Moving head up and down slowly while standing in place (inhaling in the up position while looking toward the ceiling)
- Talking out loud slowly, reading from a prepared text, counting to 100, or reciting a memorized poem or song
- Grimacing by smiling or frowning (only for QNFT testing)
- Bending at the waist as if to touch toes (jogging in place if the fit-test enclosure does not permit bending)
- Breathing normally (as described above)

Each test exercise must be performed for one minute (except for the grimace, which must be performed for 15 seconds). Employees must not adjust their respirators after the fit-test exercise has begun; any adjustment voids the test. Employees must perform exercises in the test environment while wearing any applicable safety equipment required during actual respirator use. Employees who exhibit breathing difficulty during the fit test should be referred to a physician or other licensed healthcare professional for evaluation with regard to wearing a respirator.

Respirator Maintenance and Care — The OSHA standard requires that employers provide each respirator user with a respirator that is clean, sanitary, and in good working order. An effective maintenance program should be in place prior to respirator use. The OSHA respirator standard permits tailoring the program to the type of facilities, working conditions, and hazards involved. All programs must address the following:

- Cleaning and disinfecting procedures
- Proper storage
- Regular inspections for defects (including leak check)
- Repair methods.

Note: Consult the manufacturer’s instructions for inspection, cleaning, and maintenance of respirators to ensure that the respirator continues to function properly.

Cleaning and Disinfecting

- Clean and sanitize respirators to prevent skin irritation and dermatitis and to encourage worker acceptance.
- Do not let contaminants such as dusts, mists, or fumes build up on the respirator face piece or within the respirator. Such contamination can reduce the protection provided by the respirator because the contaminant compromises the seal. Built-up contamination on the respirator can contribute to deterioration of the materials which can also lead to reduced protection.
- Clean full face pieces to ensure that employees can see properly
- Clean and disinfect respirators exclusively used by a single employee as often as necessary.
- Clean and disinfect respirators used by more than one employee prior to reuse by another worker.
- Clean and disinfect emergency-use respirators and those used in fit testing and training after each use.
Storing Respirators

- Store all respirators to protect against damage, contamination, dust, sunlight, extreme temperatures, excessive moisture, and damaging chemicals.
- Store respirators to prevent facepiece and exhalation valve deformation.
- Store in a position that allows the respirator to retain its natural shape.
- Store emergency respirators where they are safe but accessible to the work area.
- Store emergency-use respirators in compartments or clearly marked covers.
- Store all respirators according to the manufacturer's specifications.

Inspecting and Repairing Respirators — The frequency of respirator inspections depends on their intended use. OSHA requires that all respirators used in nonemergency situations must be inspected before each use and during cleaning. In addition,

- Inspect respirators designated for use in emergency situations at least monthly and in accordance with the manufacturer's instructions.
- Check for proper function before and after each use.
- Check all respirators for proper function, tightness of connections, and condition of the various parts.
- Focus particularly on the face piece, head straps, valves, connecting tubes, cartridges, canisters, or filters; in addition, the elastomeric parts must be evaluated for pliability and signs of deterioration.
- Inspect SCBA devices monthly.
- Ensure that air and oxygen cylinders remain fully charged.
- Recharge when the pressure falls to 90% of the manufacturer's recommended pressure level.
- Inspect regulators and warning devices to ensure proper function.
- Remove from service all respirators that fail to pass inspection.
- Ensure that trained personnel perform all repairs or adjustments.
- Use only NIOSH-approved parts.
- Make repairs in accordance with the manufacturer's recommendations and specifications.

Training and Information — Employers are required by OSHA to provide training before employees use a respirator in the workplace. They should present training information in an understandable fashion and develop training programs based on the employees' educational levels and language background. Such an approach will ensure that all employees receive training that enables them to maximize the effectiveness of the respirators they use. Training must include a discussion of why the use of the respirator is necessary and should identify the hazards involved, the extent of employee exposures to those hazards, and the potential health effects of such exposures. Additional information provided should include the consequences of improper fit, usage, or maintenance on respirator effectiveness.

Proper fit, usage, and maintenance of respirators remain key elements to ensuring employee protection. In addition to specific training requirements regarding the proper use of respirators, employees must be informed of the general requirements of the OSHA respiratory protection standard. This discussion could simply inform employees that employers are obligated to develop a written program; properly select respirators; evaluate respirator use and correct deficiencies in use; conduct medical evaluations; provide for the maintenance, storage, and cleaning of respirators; and retain and provide access to specific records. Thus, employees will know in general what the employer's obligations are under the standard with respect to employee protection.
Annual training is required by the OSHA respiratory protection standard. With few exceptions, a new employee must be provided with respirator training prior to using a respirator in the workplace. OSHA believes that annual training is necessary and appropriate to ensure that employees know about the respiratory protection program and that they cooperate and actively participate in the program. A regular schedule of training and interaction with respirator instructors on at least an annual basis reinforces employee knowledge about the correct use of respirators and other pertinent elements of the respiratory protection program. It also builds employee confidence when using respirators.

Additional training is required to supplement the annual training. Circumstances that require additional training include situations where changes in the workplace (e.g., process changes, increase in exposure, emergence of new hazards) or the type of respirator used by the employee render previous training obsolete. Further training is also required when the employee has not retained the requisite understanding or skill to use the respirator properly or when any other situation arises for which retraining appears necessary.

**Key Training Considerations**

- Provide employees with an explanation of the limitations and capabilities of the respirator selected for employee use.
- Discuss the limitations and capabilities of the respirator.
- Explain how the respirator provides protection by filtering the air, absorbing the vapor or gas, or providing clean air from an uncontaminated source.
- Where appropriate, discuss limitations on the use of the equipment, such as prohibitions against using an air-purifying respirator in IDLH atmospheres, and explain why such a respirator should not be used in these situations.
- Be sure that employees know how to use the respirator effectively in emergency situations, including those in which the respirator malfunctions.
- Provide comprehensive training as necessary for respirators used in IDLH situations.
- Address procedures for inspecting the respirator, donning and removing it, checking the fit and respirator seal, and actually wearing it.
- Be sure employees are capable of recognizing any problems that may threaten the continued protective capability of the respirator.
- Give instruction to users regarding the proper procedures for maintenance and storage of respirators.

The extent of training may vary according to workplace conditions. Training programs must address signs and symptoms of medical conditions (e.g., shortness of breath, dizziness) that may limit or prevent the effective use of respirators. Employee knowledge of this information is important to ensure implementation of a successful respirator program.

**Program Evaluation** — Employers must conduct evaluations of the workplace to ensure that the provisions of the current written respirator program are being properly implemented for all employees required to use respirators. In addition, evaluations must be conducted to ensure the continued effectiveness of the program. Evaluations of the workplace will determine whether or not the correct respirators are being used and worn properly and will also serve to determine whether the training program is effective. Employers must regularly consult with employees wearing respirators to ascertain the employees’ views on program effectiveness and to identify any problems. This assessment must determine whether or not the respirators are properly fitted; employees are able to wear the respirators without interfering with effective workplace performance; respirators are correctly selected for the hazards encountered; respirators are being worn when necessary; and respirators are being maintained properly. The employer must correct any problems associated with wearing a respirator that are identified by employees or are revealed during any other part of this evaluation.
Maintaining Records — Employers are required by OSHA to establish and retain written information regarding medical evaluations, fit testing, and the respirator program. This information promotes employee involvement in the respirator program, assists the employer in auditing the adequacy of the program, and provides a record for compliance determinations by OSHA. Employees must retain a medical evaluation record for each employee subject to medical evaluation. This record is to include the result of the medical questionnaire and, if applicable, a copy of the healthcare professional’s written opinion and recommendations, including the results of relevant medical examinations and tests. Employers must retain medical evaluation records and make them available as required by 29 CFR 1910.1020 (Access to Employee Exposure and Medical Records). Employers must retain fit-test records for respirator users until the next fit test is administered. These records consist of:

- Name or identification of the employee tested;
- Type of fit test performed — QLFT or QNFT (irritant smoke, saccharin, etc.)
- Make, model, and size of the respirator fitted
- Date of the fit test
- Pass/fail results if a QLFT is used
- Fit factor and strip chart recording or other record of the test results if QNFT was performed.

NIOSH Guidelines: Selection and Use of Particulate Respirators — In June 1995, NIOSH updated and modernized the federal regulation for certifying air-purifying particulate respirators (42 CFR Part 84). As a consequence of this new regulation, NIOSH developed a user’s guide to familiarize respirator users with the new Part 84 certification regulations for particulate respirators and to provide guidance for the selection and use of the new particulate respirators. The new regulation became effective on July 10, 1995, and replaced 30 CFR Part 11, under which NIOSH and the Mine Safety and Health Administration (MSHA) jointly certified respirators before that date. The respirators certified under this new regulation are tested under much more demanding conditions than under the old regulation to provide increased worker protection. For information, refer to the NIOSH Guide to the Selection and Use of Particulate Respirators Certified Under 42 CFR 84.

H. PROMOTING SAFETY

Employers must seek ways to promote an interest in safety. The most important considerations are helping workers develop safe work habits and providing a safe and healthful work environment. Management personnel should select activities that will yield results. Budget constraints can affect the safety promotion program, and the size and type of organization can also affect the choice of activities or materials necessary for maintaining interest. It is important to include second- and third-shift employees because their support is vital to the overall accident prevention effort. An effective safety promotion program demonstrates management’s commitment, reminds employees to work safely, and, in the healthcare setting, contributes to quality care. Awards and other incentives can help promote the program, but they must be meaningful. Some ways to promote safety include the following:

- Focus attention on accident causal factors.
- Provide effective safety training to all employees.
- Give workers an opportunity to participate in the program.
- Encourage communication between workers and management.
- Stress the facility’s commitment to visitor and patient safety.
- Require employees to practice working safely.
**Safety Meetings** — Many organizations fail to use one of the most effective tools available for promoting safety — safety meetings, which keep the lines of communication open and reinforce training concepts. Effective meetings provide the following benefits:

- Promote safety awareness in the workplace.
- Encourage worker involvement.
- Motivate workers to practice safety on the job.
- Pinpoint problem areas and solicit corrective solutions.
- Introduce workers to new rules, procedures, and equipment.
- Provide information on causes and types of accidents.

**Safety Posters** — Safety posters cannot compensate for inadequate safety management, broken equipment, unsafe job procedures, poor supervision, or ineffective training. It has been found that workers prefer viewing posters over reading procedures. Posters should be simple, clever, and colorful; should be designed to stimulate worker interaction; and should demonstrate management’s interest in the welfare of workers. Safety posters should never be demeaning to the viewer’s intelligence, race, or sex. Posters should be placed in well-lit locations where employees congregate, such as lunchrooms, washrooms, entrances, and loading points. Many facilities rotate posters at regular intervals.

**Safety Bulletins and Newsletters** — One of the most effective tools an organization can use to promote safety is the safety bulletin or informational newsletter. A well-designed and informative bulletin that is employee oriented will pay immediate dividends. An effective newsletter that helps prevent one injury is well worth the effort and cost. A balanced publication provides information and recognizes employee accomplishments. A publication that is written sincerely using simple sentences is the most effective. Also:

- Look for ways to sell and promote the safety message.
- Personalize stories whenever possible.
- Look for ways to grab the reader’s attention without relying on cute gimmicks with no substance.
- Ask for suggestions, articles, feedback, and comments from readers.
- Develop some features or subjects that will appear on a regular basis.

**Off-the-Job Safety and Health Programs** — Management should communicate its concern for employee health and safety off the job. Healthcare organizations have access to professionals who could contribute to the development of a safety and health program for workers. When incorporating off-the-job safety topics into the safety program, the organization should strive to meet the special needs of its facility and employees. Some suggested topics include:

- Seasonal hazards such as winter, holiday, or vacation safety
- Diet and exercise, including how to maintain a healthy back
- Alcohol, drug, and smoking cessation
- Automobile and travel safety
- Home safety, including fire and fall prevention
- Stress and other health risks

**Health and Fitness Programs** — These programs assist employees in being proactive with their own health and can be effective in diminishing absenteeism, injuries, and lost time from work. Elective health risk assessments with appropriate laboratory assessments assist employees in earlier identification and intervention for health problems. Employee health service staff and occupational and environmental physicians should work with others.
in planning and implementing health fairs, “brown bag lunch” educational sessions, and other health education and health promotion activities at the facility. Healthcare organizations should be the leaders in providing health information to workers because of the resources available and the specialists who could contribute to the program. An effective health program should:

- Be a part of the employee health program and adequately funded to provide quality service to all workers.
- Include a newsletter or bulletin to promote the program and keep workers informed on new topics or programs.
- Distribute educational materials, including informational booklets and videos.
- Schedule formal presentations, risk assessment clinics, and health-related workshops.
- Develop preventive activities such as aerobic classes, athletic teams, and smoking cessation programs.
- Look for ways to show support for the program by rewarding participation.

I. SAFETY ORIENTATION, TRAINING, AND EDUCATION

One of the greatest hazard control techniques is simply educating people to follow safe work practices. Safety training, new employee orientation, and continuing education sessions are crucial to the effectiveness of healthcare safety management programs. Safety training programs must strive to build understanding, positively affect worker attitudes, and improve safety knowledge. Training must facilitate the transfer of knowledge and skills to normal work activities. Many training programs are not being evaluated to determine their effectiveness. Healthcare organizations should follow sound educational principles. A program that merely takes attendance cannot be effective. The safety training function could very easily be the weak link in many healthcare safety management programs. Most organizations do not want to dedicate sufficient time, allocate sufficient resources, or require workers to attend lengthy training sessions. The around-the-clock operation of healthcare facilities also makes training second- and third-shift employees difficult. Professional and medical staff normally receive in-service education as required; however, in many instances, personnel in support departments do not receive adequate safety training. Safety training and education must be a priority because the human element is a causal factor in the majority of accidents.

Healthcare Training Topics

- Fire and life safety
- Handling hazardous chemicals
- Accident reporting and investigation
- Use of respirators and PPE
- Biological hazards and infection control
- Laboratory safety
- Radiation control
- Safe lifting and back care
- Lockout procedures
- Equipment safety
- Internal emergencies
- Slip, trip, and fall prevention
- Electrical safety
- Waste handling
- External disasters
- Formaldehyde exposure
Suggested Annual Safety Training Topics

**Hazardous Materials**
- MSDS booklets and locations
- Container markings
- NFPA system and explanation
- Marking portable containers
- Chemical storage locations

**Respiratory Protection**
- Explanation of standard and how it affects employees
- Pulmonary function testing
- Proper use and limitations of different types of respiratory protection
- Fit-testing procedures
- New respirator ratings

**Lockout Procedures**
- Policy statement
- Procedures
- Testing or positioning
- Location in safety manual

**Confined Space Entry**
- Permits
- Atmospheric monitoring
- Warning signs for spaces
- Duties of entrants, attendants, and supervisors
- Equipment needs
- Terms and definitions

**Hearing Conservation**
- Monitoring of work areas
- Effects of noise on hearing
- Types of protection and noise reduction ratings (NRRs)
- Explanation of time-weighted averages (TWAs) and dose rates

**Personal Protective Equipment**
- Types of PPE (gloves, face shield, rubber gloves, goggles, etc.)
- What is provided by the company
- Different types of protection for different situations
- Hazard assessments

**Ionizing Radiation Safety**
- Guidelines for exposure
- Posting in active areas
- Low-level sources (used for level and density measuring)
- Wipe tests
- Standard operating procedures
- Locations of sources
Biological Hazards (Bloodborne Pathogens)

- Reason for the program
- Potentially infectious materials
- Universal or standard precautions
- Engineering and work practice controls
- Exposure risks
- Post-exposure procedures

Emergency Procedures

- Emergency numbers
- Posting of procedures at each phone
- Severe weather
- Fire evacuation
- Bomb threat
- Responsibility of employees

Fire Extinguishers

- System
- What to do in the event of a fire

Additional Safety-Related Topics

- Barrier tapes
- Compressed gas
- Fall protection
- Flammable liquids and gases
- Hand tools
- Housekeeping
- Material handling (lifting)
- Office safety
- Power tools
- Slips, trips, and falls
- Violence in the workplace
- Welding and cutting

Ergonomics

- Basic principles
- Work station assessments and design
- Exercises
- Computer workstations

Training Program Development — Training should focus on good practices that can be learned through repetition. Policies should always translate into actual procedures. Workers usually support the program when they see management’s concern or the importance of the training. Participation strengthens the program while enhancing learning. Safety training must cover the theory and purpose of each safety measure. Employees are most likely to resent a new safety program when no one has bothered to explain its purpose. Instructors should always emphasize the risks that threaten to cause bodily harm and the ability of the facility to operate. If the hiring process recruits qualified new workers, orientation will heighten their existing safety skills. Employers should identify training needs using an inventory of hazardous jobs along with task analysis, job procedures, accident data, and regulatory requirements. They should also develop objectives for supervisors and other
key staff personnel. Developing an effective safety management program takes time, and developing the training also requires considerable time and attention. Employers should consider the following when developing a program:

- Assess what needs exist and what may be projected, and determine the training capabilities of the facility.
- Assign training responsibilities, and encourage professional development of those involved in safety.
- Remember that safety is simply part of job training, and effective training can maintain enthusiasm among workers.
- Use safety bulletins, posters, and videos to supplement a training program but do not substitute them for a good program.
- Present off-the-job safety topics at employee safety meetings.
- Publish a training policy statement that does not conflict with other facility policies or programs.

Training Objectives — All training and education programs should have measurable, observable, realistic goals or objectives. The objectives should state exactly what the employee should be able to do or know. The information collection and evaluation system (ICES) can be an important tool for monitoring and evaluating each element of the training program.

Instruction Techniques — A pretest evaluates a student’s knowledge level and can motivate students to look for the concepts or principles presented on the test. Training programs must use a variety of techniques to ensure that workers are learning the necessary information. Some training experts believe that using appropriate videos or other visual aids greatly increases student retention. Hands-on practice and guided discussions or informal lectures can greatly increase retention levels. Listed below are some training techniques that healthcare training specialists should consider using to improve the quality of training:

- **Informal discussion or lecture** — An informal session coupled with a question-and-answer session allows student participation.
- **Demonstration** — This hands-on technique allows for application of knowledge and demonstration of required skills.
- **Simulated drills and exercises** — Some training topics can only be effectively trained when students participate in hands-on situations.
- **Interactive software programs** — The use of computers allows the student to control the flow of information during the training session.
- **Information sheets and handouts** — Students have the material for future reference.
- **Visual aids** — The proper use of computer-generated slides, overhead transparencies, marker boards, or white/blackboards to communicate visual clues can enhance learning.
- **Formal test** — Testing at the end of the sessions can reinforce key points while documenting training effectiveness and student learning.

Know the Audience — One of the important elements in the preparation process is to know the audience. Knowing as much as possible about the students will allow the training to be presented in a more effective manner. Some things to know about the audience include:

- Type of workers
- Average age or experience level
- Educational level or literacy level
- Job skills and interests
- Whether or not all students need the training
Training Preparation

- Review regulatory and accreditation requirements for the subject being presented.
- Review lesson plans, books, videos, and all training aids.
- Know the number of students to be trained, and make sure the training area is adequate for the session.
- Coordinate all training to be done on the job or in a work area with the supervisor or department head.
- Check all equipment before beginning the session.
- Gather all materials needed for the session, including test booklets, answer sheets, and student handouts.
- Arrive at the training site before the students and ensure things are in order.

Determining Training Needs — Facilities should determine training needs in a variety of ways. Regulatory and voluntary agencies require safety training and education to ensure quality care and worker protection. Organizations must place a strong emphasis on the importance of the human element in the safety equation. Training must publicize the importance of safety while reinforcing and providing information on a specific subject. It must also focus on hazardous conditions and emphasize ways workers can reduce their risk of exposure. Healthcare safety training should be coordinated by the safety department or managed by an education department. The safety director along with the safety committee should determine training needs, monitor sessions, and evaluate training effectiveness. Safety training responsibilities should be clearly communicated to all management personnel and department heads.

Training Methods — Healthcare facilities can use a variety of ways to train and reinforce the knowledge of their workers. The program begins with a strong orientation program and continues with ongoing sessions. Healthcare organizations should rely on a number of training methods, such as safety posters, flyers, bulletins, newsletters, self-study programs, classroom presentations, on-the-job training sessions, professional seminars, safety training fairs, and computer-assisted programs. Some facilities delegate a number of training responsibilities to the individual departments, while others employ a full-time educational coordinator. Large or specialized departments in some organizations, such as laboratories, conduct most of their own training programs. The safety department or educational coordinator must be active in monitoring the program regardless of the system. Training program reviews should take place when new standards are issued, but at least annually. Information provided by accident reviews and hazard surveillance programs should be analyzed to help evaluate training program effectiveness. Testing and surveying employees also provide important information on program effectiveness and worker needs.

Adult Education Techniques — Effective training allows all employees, supervisors, and managers to actively participate in the health and safety program. Participation encourages commitment to the program and a desire to solve safety problems. Management must communicate clearly with all employees its commitment to provide a safe and healthful work environment. Employees must be made aware of all potential hazards to which they may be exposed. Some important suggestions for doing so are listed below:

- Use adult education and training techniques to facilitate learning.
- Be aware that some occupational safety and health standards require employees to demonstrate competency in the topic being trained.
- Present material in understandable language and in a format that encourages learning.
• Evaluate training presentations to ensure that learning goals are mastered by the students.
• Document all training and keep good records on training as required by safety and health standards.
• Remember that OSHA requires records to be made available for review during compliance inspections.

New Employee Orientation — A staff orientation program should provide initial job training and information, including assessments of a person’s ability to perform specified job responsibilities. Organizations should maintain individual employee records that document both facility-wide and departmental orientation training. New worker orientation should address emergency procedures, accident reporting, hazard identification, security measures, smoking regulations, and equipment management. Orientation helps workers find their way.

Continuing Education — Continuing or ongoing education should provide on-the-job training and refresher sessions to ensure employees remain current in worker-related issues, including safety topics. Changes covered might include updated technology procedures, new government regulatory requirements, and improved standards of practice. Some safety regulations may require training in some subjects at different intervals (e.g., all workers exposed to bloodborne pathogens must receive annual refresher training).

Specialized Training — Specialized training normally applies to specific hazards, safety problems, or exposures. This training could include bloodborne-pathogen-exposure training, use of PPE, or procedures for working with patient care equipment. Not all training requirements are covered under Joint Commission standards. Hazard control managers must be aware of the need for other training requirements, including OSHA, NRC, and EPA requirements.

Supervisor Training Effectiveness
• Training should be presented so its organization and meaning are clear to employees (see Table 3.13).
• Supervisors should provide overviews of the material to be learned, relate this information to the job, and reinforce the key points of the information covered.
• Training should include a method for measuring effectiveness.
• An evaluation plan should be developed when the course objectives and content are developed; such evaluations will help employers or supervisors determine the level of education achieved and whether or not an employee’s performance has improved on the job.
• Evaluation methods include student opinion surveys, supervisors’ observations, and workplace improvements.
• One way to differentiate between employees who have priority needs for training and those who do not is to identify employee populations that are at higher levels of risk.
• The nature of the work will provide an indication that such groups should be given priority for receiving information on occupational safety and health risks.
• One way to identify employee populations at high levels of occupational risk is to pinpoint hazardous occupations.
• Another way to identify employee populations at high levels of risk is to examine the incidence of accidents and injuries.
• If employees in certain occupational categories are experiencing higher accident and injury rates than other employees, training may be one way to reduce that rate.
TABLE 3.13  Training Topics Addressed by Supervisors

<table>
<thead>
<tr>
<th>Training Topics Addressed by Supervisors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hazardous operations and tasks found in the workplace</td>
</tr>
<tr>
<td>Department safety procedures and rules</td>
</tr>
<tr>
<td>Biohazards and other hazardous substances used in the department</td>
</tr>
<tr>
<td>Standards and regulations that apply to job safety</td>
</tr>
<tr>
<td>Personal protective equipment (PPE) and how, when, and where to use it</td>
</tr>
<tr>
<td>Location and use of emergency and fire protection equipment</td>
</tr>
<tr>
<td>Emergency procedures that apply to job and workplace</td>
</tr>
<tr>
<td>How to report unsafe equipment, conditions, or procedures</td>
</tr>
<tr>
<td>Accident, incident, and injury reporting procedures</td>
</tr>
<tr>
<td>Location of written safety programs and information</td>
</tr>
</tbody>
</table>

Documenting Training — Do not use sign-in sheets to document training or education; instead, use a sign-out sheet or short quiz to document attendance. A review of the safety training can help to determine how frequently certain programs should be held. The evaluation of these programs is also important in determining the quality of the education programs, particularly the relevance of programs to daily activities. Some regulatory agencies such as OSHA mandate training in specific standards. Employees exposed to certain levels of ethylene oxide must receive annual training. Facilities should also provide training when:

- New equipment, materials, or processes are introduced.
- Procedures are revised or updated.
- Information indicates that employee performance must be improved.
- A new standard becomes effective.
- New hazards or exposures are identified.

Training Budget — Budget considerations are always crucial to the program. Top management should consider and communicate the following:

- Training is the foundation of the safety program.
- Facilities must provide certain regulatory training.
- The costs of accidents and injuries must be determined.
- Training helps identify, eliminate, or control hazards.
- Training allows for personal development and increased efficiency.

SUMMARY

This chapter addressed the hazard control aspect of the safety management process. It discussed hazard control challenges, measuring hazard control performance, and the basic hazard control principle. The chapter also addressed the process of identifying, analyzing, and controlling hazards. It placed special emphasis on safety inspections and hazard surveillance activities, including job hazard analysis. This chapter also developed an understanding of accidents and near-hit events and discussed reporting and documentation activities. The chapter provided an overview of accident investigation techniques and root-cause analysis activities. It also presented information about specific hazards found in healthcare environments, the use of personal protective equipment, and detailed information about respirator usage. The chapter concluded with some timely information on safety orientation, training, education, and promotion.
FOR REVIEW AND DISCUSSION

1. List the three key elements of hazard control.

2. Why is the process of measuring the effectiveness of safety and hazard control a challenge?

3. List and explain the importance of five basic hazard control principles.

4. Explain the difference between hazards and accident causal factors.

5. Why must a safety checklist be used as a tool?

6. Explain the two types of hazard surveillance.

7. Why must unsafe behaviors be considered an important aspect of hazard control?

8. List and explain the five steps in the job hazard analysis process.

9. List in sequence the four key hierarchical hazard controls.

10. Name at least four common myths about accidents.

11. Why should an accident investigation be a fact-finding and not a fault-finding mission?

12. What is the ultimate goal of a good root-cause analysis process?

13. List and define the five categories of healthcare hazards.

14. List the five basic elements of personal protective equipment training.

15. List the six elements that must be addressed in an OSHA-required respirator program.

16. Respirators provide protection against airborne hazards. List the six basic categories of airborne hazards.

17. What are three ways in which an organization can promote the importance of safety to workers?
A. INTRODUCTION

Healthcare administrators, safety personnel, risk managers, and other healthcare professionals must be aware of the numerous agencies involved in healthcare regulation. Regulatory compliance plays a key role in maintaining quality of care and safety. This chapter provides a brief look at selected laws, standards, and codes enforced or issued by regulatory agencies and voluntary compliance organizations involved in healthcare safety. Safety and hazard control professionals must know where to access information in the federal publication system and from voluntary standards organization.

B. FEDERAL ADMINISTRATIVE LAW


Administrative Procedure Act — The Administrative Procedure Act was passed in 1945 (5 USC 551) and added several provisions to the Federal Register system. The act gave the public the right (in most instances) to participate in the rule-making process by commenting on proposed standards. The act requires an effective date of a regulation to be not less than 30 days from the publication date (unless the agency can show cause for an earlier date). The act provides for the publication of federal agency statements about organization and procedural rules. Informing the public about proposed rule-making actions remains the primary purpose of the Federal Register.

The Federal Register — Governmental agencies can promulgate standards using the administrative law process. The Federal Register (FR) is published each work day by the National Archives and Record Service to provide public access to federal regulations, proposed standards, and legal notices. An agency desiring to develop a standard prepares a proposed
version and publishes it in the FR to give the public an opportunity to provide comments. The agency then considers the comments offered and prints the final rule in the FR. The rule then becomes law in 30 days. Most federal agencies publish a regulatory agenda semiannually in the FR to inform the public of proposed or expected actions. The pages in the FR are numbered sequentially throughout the year, beginning January 1 and ending December 31.

**U.S. Code** — The U.S. Code (USC) is the official document containing general and permanent laws; the relevant statutory authority is cited in parentheses at the end of each section or group of sections and could include congressional acts, joint resolutions, presidential Executive Orders, or reorganization plans. The publication is well indexed, with a table of contents for each of the 50 titles. The U.S. Code is a compilation of law in force from 1789 to the present. It is *prima facie*, or presumed to be law; therefore, it does not include repealed or expired acts.

**Code of Federal Regulations** — The National Archives and Record Service publishes the Code of Federal Regulations annually in paperback volumes. The compilation of rules previously published in the *Federal Register* produces a codification with the force of administrative law. The government divides the CFR into 50 titles representing the various areas of federal regulation (see Table 4.1). The CFR format uses a period to separate part numbers from the section number; for example, 29 CFR 1910.119 precedes 29 CFR 1910.120. A lower-case “a” precedes an upper-case “A.” This system confuses many who are unfamiliar with it. A good reference is *The Federal Register: What It Is and How To Use It*, published by the Office of the Federal Register, National Archives and Records Administration.

<table>
<thead>
<tr>
<th>Table 4.1</th>
<th>CFR Titles of Interest</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>No.</strong></td>
<td><strong>Standard</strong></td>
</tr>
<tr>
<td>Title 10</td>
<td>Energy</td>
</tr>
<tr>
<td>Title 18</td>
<td>Conservation of Power and Water Resources</td>
</tr>
<tr>
<td>Title 21</td>
<td>Food and Drugs</td>
</tr>
<tr>
<td>Title 29</td>
<td>Labor</td>
</tr>
<tr>
<td>Title 32</td>
<td>National Defense</td>
</tr>
<tr>
<td>Title 39</td>
<td>Postal Service</td>
</tr>
<tr>
<td>Title 40</td>
<td>Protection of Environment</td>
</tr>
<tr>
<td>Title 42</td>
<td>Public Health</td>
</tr>
<tr>
<td>Title 44</td>
<td>Emergency Management</td>
</tr>
<tr>
<td>Title 49</td>
<td>Transportation</td>
</tr>
</tbody>
</table>

**Revision Schedule**

| Titles 1 to 16 | January 1 |
| Titles 17 to 27 | April 1 |
| Titles 28 to 41 | July 1 |
| Titles 42 to 50 | October 1 |
C. OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION

Occupational Safety and Health Act General Duty Clause — This broad clause of the Occupational Safety and Health Act of 1970 (see Table 4.2) enabled the Occupational Safety and Health Administration (OSHA) to protect workers from recognized hazards when no standard applies to a particular hazardous situation. Some healthcare hazards addressed under this clause include latex allergies, workplace violence, ergonomics, hazardous drugs, and tuberculosis.

OSHA Standards — The Occupational Safety and Health Administration promulgates legally enforceable safety and health standards:

- General Industry Standards, 29 CFR 1910 (apply on a daily basis)
- Construction Standards, 29 CFR 1926 (apply during construction activities)

Approved state programs must be at least as effective as the federal standards.

Summary of General Industry Standards

- Walking/Working Surfaces (1910.21 to 1910.30) — Aisles, stairways, and ladders
- Means of Egress (1910.35 to 1910.38) — Access to exits and emergency plans
- Occupational Health and Environmental Control (1910.94 to 1910.98) — Noise ventilation and nonionizing radiation
- Hazardous Materials (1910.101 to 1910.126) — Hazardous material storage and waste operations
- Personal Protective Equipment (1910.132 to 1910.138) — Eye protection, protective clothing, respiratory protection, head protection, foot protection, electrical protective equipment, and hand protection
- General Environmental Controls (1910.141 to 1910.147 Appendix A) — Permit-required confined spaces and lockout
- Medical and First Aid (1910.151 to 1910.152) — First-aid and training
- Fire Protection (1910.155 to 1910.165) — Fire extinguishers, fixed fire-suppression equipment, and other systems
- Compressed Gas and Compressed Air Equipment (1910.166 to 1910.169) — Air receiver installation and safety
- Materials Handling and Storage (1910.176 to 1910.184) — Use and care of powered industrial trucks, cranes, and helicopters
- Machinery and Machine Guarding (1910.211 to 1910.219)
- Hand and Portable Powered Tools and Other Hand-Held Equipment (1910.241 to 1910.244) — Guarding and maintenance of hand-powered equipment

---

**TABLE 4.2 The Occupational Safety and Health Act of 1970**

- Created OSHA to encourage employers and employees to reduce workplace hazards
- Created NIOSH to address occupational safety research and evaluation of hazards
- Established reporting and recordkeeping requirements for occupational injuries
- Established provisions for promulgating safety and health standards
- Empowered OSHA to enforce workplace safety standards
- Provided for approval of state occupational safety and health programs
Welding, Cutting, and Brazing (1910.251 to 1910.255) — Oxygen-fuel, arc, and resistance welding requirements

Electrical (1910.301 to 1910.399) — Design safety standards, safe work practices, and maintenance requirements

Toxic and Hazardous Substances (1910.1000 to 1910.1450 Appendix B) — Permissible exposure limits, hazard communication, bloodborne pathogens, and chemical laboratories

(See Table 4.3.)

OSHA Healthcare Training Requirements — The OSHA requirements may differ from Joint Commission requirements. More than 100 OSHA standards require employers to provide workers with some type of training. Listed below are some training requirements for standards applicable to healthcare organizations (more information on OSHA training requirements is provided in Appendix N):

- Emergency Action and Fire Prevention (1910.38) — Train upon job assignment, when transferred to another position, or when emergency procedures change.
- Hearing Conservation (1910.95) — Train all employees exposed above the action level of 85 dB for an 8-hour time-weighted average (TWA). Annual retraining is required for all workers in the hearing conservation program. Employers must train employees in the use and care of hearing protectors.
- Ionizing Radiation (1910.96) — Train all individuals working in or frequenting areas where radiation exposure could occur. Training should cover safe work practices and precautions to minimize exposure.
- Hazardous Waste Operation and Emergency Response (1910.120) — Train all workers involved in handling hazardous waste to the level required by their job. The scope of training varies depending on exposures and responsibilities. Emergency responders are also trained to meet their expected level of response. The standard requires annual refresher training.
- Respiratory Protection (1910.134) — Train workers required to wear respirators in their proper use and limitations. Users must receive fitting instructions that include demonstration and practice. Retraining should take place annually.
- Confined Spaces (1910.146) — Train all employees involved in working within confined spaces. Training must be completed before assignment to duties involving confined spaces.
- Lockout of Hazard Energy Sources (1910.147) — Train workers authorized to conduct lockout/tagout actions on lockout procedures, including training on isolating specific energy sources and machines. Other workers in the area must receive awareness-type training. Training must also be conducted on procedures for removing lockout devices.
- Laundry Machine Operating Rules (1910.264) — Instruct laundry workers on the hazards of their work and safe work practices, including training on preventing exposure to bloodborne pathogens.
- Electrical Safe Work Practices (1910.332) — Train workers exposed to electrical circuits on specific job hazards.
- Asbestos (1910.1001) — Train all workers exposed to asbestos fibers at or above the action level during their initial assignment. Retraining must take place annually.
- Lead (1910.1025) — Inform employees of any potential lead exposures using Appendices A and B of the standard. Conduct initial and annual training if exposures exceed action levels or if skin or eye irritations are possible.
- Benzene (1910.1028) — Provide training and information to employees assigned to work areas where benzene is present. All employees exposed at or above the action level must receive annual training.
- Bloodborne Pathogens (1910.1030) — Train exposed or potentially exposed workers upon initial assignment. Workers must complete retraining within 12 months of their initial training. Document training and maintain records for 3 years.
- Ethylene Oxide (1910.1047) — Provide initial training to employees assigned to areas with potential ethylene oxide exposures. All employees potentially exposed to ethylene oxide must receive annual training.
- Formaldehyde (1910.1048) — Establish a training program for workers exposed to 0.1 ppm or higher. Provide initial training at the time of assignment with annual retraining for all potentially exposed employees.
- Hazard Communication (1910.1200) — Train workers exposed to hazardous materials in program requirements upon initial assignment. Employees must complete additional training when new hazardous substances are introduced into the workplace.
- Lab Safety (1910.1450) — Train workers on the hazardous substances found in their work areas. Training must be accomplished when new hazards are introduced into the work area.

**OSHA Poster** — Every regulated workplace must display the OSHA poster (OSHA Publication 3165) or the state plan equivalent. The poster explains worker rights to a safe workplace and how to file a complaint. The poster must be placed where employees can see it. Employers can download a copy or order one free copy from OSHA's website (www.osha.gov) or by calling 800-321-OSHA.

**OSHA Inspections** — The OSHA inspector visits a facility to conduct a programmed inspection or other category of inspection. A programmed inspection is scheduled using OSHA selection criteria, which may be injury rates, death rates, exposure to toxic substances, or an unusually high number of lost workdays for a particular type of industry. A nonprogrammed inspection occurs when an employee files a formal complaint with OSHA.
regarding a possible unsafe working condition or if the employee feels in imminent danger at the workplace. If an inspector arrives at a facility but does not have a warrant, the employer does not have to give the inspector access to the facility (according to the Fourth Amendment of the Constitution). One of the primary benefits of demanding a warrant is that OSHA may simply go away. For example, in 1994, 135 employers denied OSHA’s request to inspect; in response, OSHA sought warrants for only 33 of these employers. The time it takes the inspector to obtain a warrant varies greatly (from later that same day to several days or months later). This passage of time may be critical for employers to resolve any immediate compliance issues. The opposite response — allowing the inspector in without a warrant — has the benefit of minimizing the number of citations per inspection. It is the employer’s decision as to whether to require a warrant or voluntarily consent to an inspection. OSHA issues an inspection checklist, but the agency also advises inspectors to develop their own. It would be wise for employers to prepare detailed self-inspection lists and have employees from the various areas take turns checking for any hazards they encounter on a weekly basis. This would help employees work safer and become familiar with any violations in their immediate work area. In addition, the facility would always be ready for an OSHA inspection.

OSHA Hospital Health Hazard Evaluation — Compliance officers check the OSHA 300 Log and other documents to determine occupational health hazard trends. Inspectors can check hospital safety program records and facility-enabling equipment licenses such as Nuclear Regulatory Commission (NRC) radioisotope and radiation-source licenses. Evaluations of policies and procedures should outline the training that all employees receive; for example, general hospital training should include fire and electrical safety, infection control procedures, and hazard communication education. Policies should clearly outline procedures and methods for preparing, mixing, applying, storing, removing, and disposing of any hazardous agents. Emergency procedures should address fires, evacuation, chemical or radioactive spills, extensive blood or body fluid spills, and power failure. OSHA inspectors will also check to see that procedures are in place for dealing with the release of compressed, toxic, and corrosive gases.

OSHA Fatality Inspections — According to OSHA regulations, employers must report deaths on the job within 8 hours. Employers may call their local office or use the agency’s toll-free number (800-321-OSHA). The agency then investigates the circumstances of the death, usually on-site, to determine the cause of death and if violations of the Occupational Safety and Health Act are involved (exceptions to this would include when the matter is clearly outside OSHA’s jurisdiction, such as over-the-road traffic accidents and some apparent sudden deaths on the job, such as those due to heart attacks or strokes). Depending on the nature and complexity of the incident, an OSHA investigation can take as long as 6 months. If the agency determines that the employer has failed to follow safety and health requirements, it issues citations and proposed civil penalties. The proposed penalties are based on the statutory factors of employer size, gravity of violation, good faith of the employer, and history of previous violations. The maximum penalty that can be assessed is $7000 for each serious violation or $70,000 for a repeated or willful violation (note that OSHA penalties do not correspond to or reflect the value of a worker’s life or the cost of an injury or illness). Although oftentimes this seems unfair, these penalties are primarily designed to deter future violations. An important consideration for the agency is to get hazardous conditions corrected as soon as possible so no further injuries or deaths occur and the workplace complies with all applicable safety and health standards; therefore, the agency often settles citations and penalties when doing so will speed abatement. This willingness to settle may lead to reduced penalties in exchange for prompt correction of hazards and other measures that help reduce risk to other workers and provide a safer workplace. (See Table 4.4 and Table 4.5.)
Criminal Prosecution of Willful Deaths — When OSHA can document that an employer willfully violated an OSHA standard and that the violation caused the death of a worker, the matter may be referred to the Justice Department for consideration for criminal prosecution. Any criminal prosecution that the Department of Justice pursues is usually in addition to civil citations and penalties. The threat of criminal prosecution is certainly an enforcement tool that OSHA uses, but in many cases willful citations are issued as a result of fatality investigations that do not merit criminal prosecution. Each element of a criminal violation, including willfulness, must be proven to a jury beyond a reasonable doubt; by contrast, to have a civil citation upheld OSHA can meet a lesser standard of proof or preponderance of the evidence. The Department of Labor does not refer a case that OSHA and the Office of the Solicitor do not believe can meet the higher burden of proof required for acceptance by the Department of Justice for consideration for criminal prosecution.

### TABLE 4.4 Top 10 OSHA Citations in Nursing Care Facilities (2002)

<table>
<thead>
<tr>
<th>Standard</th>
<th>Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bloodborne Pathogens</td>
<td>1910.1030</td>
</tr>
<tr>
<td>Hazard Communication</td>
<td>1910.1200</td>
</tr>
<tr>
<td>Electrical, Wiring Methods, Components, and Equipment</td>
<td>1910.305</td>
</tr>
<tr>
<td>Medical Services and First Aid</td>
<td>1910.151</td>
</tr>
<tr>
<td>Electrical Systems Design, General Requirements</td>
<td>1910.303</td>
</tr>
<tr>
<td>Control of Hazardous Energy, Lockout/Tagout</td>
<td>1910.147</td>
</tr>
<tr>
<td>Personal Protective Equipment, General Requirements</td>
<td>1910.132</td>
</tr>
<tr>
<td>Machines, General Requirements</td>
<td>1910.212</td>
</tr>
<tr>
<td>Respiratory Protection</td>
<td>1910.134</td>
</tr>
<tr>
<td>Electrical, Wiring Design and Protection</td>
<td>1910.304</td>
</tr>
</tbody>
</table>

### TABLE 4.5 Top 10 OSHA Citations in Hospitals (2002)

<table>
<thead>
<tr>
<th>Standard</th>
<th>Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bloodborne Pathogens</td>
<td>1910.1030</td>
</tr>
<tr>
<td>Hazard Communication</td>
<td>1910.1200</td>
</tr>
<tr>
<td>Electrical Systems Design, General Requirements</td>
<td>1910.303</td>
</tr>
<tr>
<td>Control of Hazardous Energy, Lockout/Tagout</td>
<td>1910.147</td>
</tr>
<tr>
<td>Electrical, Wiring Methods, Components and Equipment</td>
<td>1910.305</td>
</tr>
<tr>
<td>Means of Egress, General</td>
<td>1910.37</td>
</tr>
<tr>
<td>Asbestos, Tremolite, Anthophyllite, and Actinolite</td>
<td>1910.1001</td>
</tr>
<tr>
<td>Formaldehyde</td>
<td>1910.1048</td>
</tr>
<tr>
<td>Personal Protective Equipment, General Requirements</td>
<td>1910.132</td>
</tr>
<tr>
<td>Permit-Required Confined Spaces</td>
<td>1910.146</td>
</tr>
</tbody>
</table>
Preparing for an OSHA Inspection — To prepare for an OSHA inspection at least one representative should be designated prior to the inspector’s arrival and should be notified by the reception area when the inspector arrives. Such representatives should check the inspector’s credentials (e.g., photograph and serial number) and confirm them with the nearest OSHA office. Inspectors should be accompanied by representatives at all times. These representatives should be the same throughout an inspection (to avoid providing conflicting information). If at any time a representative has difficulty responding to a question, he or she should call for a “time out” to seek help. The representative may then go to a telephone to call for advice from an attorney or another knowledgeable source. The inspection will include an opening conference, a tour of the facility, and a closing conference.

Managing the Inspection — Representatives should treat compliance officers with respect but not do their job for them; however, they must accompany compliance officers during the entire inspection procedure and should never explain processes or operations. Other suggestions for representatives include the following:

- Do not point out problems or indicate awareness of any alleged violations.
- Refrain from discussing extenuating circumstances.
- Be sure two facility representatives accompany the inspector at all times.
- Make sure someone is taking detailed notes.
- Arrange a time and place for worker interviews.
- Allow employees to have their interviews conducted in private; it is their right.
- Attempt to interview employees who met with the inspectors.

Opening Conference — During the opening conference, which usually takes about an hour, the inspector will want to discuss a number of topics. The purpose for the visit is explained (complaint, accident, or programmed inspection), along with the scope of the inspection (part of the facility or wall to wall). The inspector will provide a copy of the complaint, if relevant. Representatives should make a note of why the facility was selected and what is going to be inspected. They should keep all of the OSHA pamphlets provided by the inspector, noting the date and name of the inspector who issued them. Records that are not specified on the warrant do not have to be provided, and representatives need to be careful about providing OSHA with any company documents. The following records or programs generally are specified by the warrant:

- The facility’s written hazard communication program (including provisions for labeling, Material Safety Data Sheets, employee training, and a list of hazardous chemicals used in the facility)
- Lockout/tagout written program (with which representatives should be familiar)
- Injury and illness log (29 CFR 1904)
- Exposure records for any hazardous materials to which employees are exposed

Tour of the Facility — The route and duration of the tour are determined by the inspector and accompanying representatives. If an inspector wants to see a specific area, representatives should take the inspector there by the most direct route, rather than walking through the entire facility. Detailed observation of the facility by inspectors can include talking with employees, taking notes, making instrument readings, and taking photographs or using a video camera. Representatives should never leave inspectors alone and should never volunteer information. Department managers should be advised to answer all questions honestly, but without volunteering information. Inspectors may consult with employees as long as doing so does not interfere with work operations and the employee does not object. Inspectors may also meet with an employee in private if the employee does not object (29
During the tour, inspectors may point out things they “believe” are violations. If a facility representative agrees that they are, indeed, violations, then the facility will surely be cited and fined. If the representative is able to correct conditions on the spot, they should do so, but the facility may still receive a citation and penalty.

Documenting the Inspection — If the inspector takes notes or measurements and uses a camera or videocamera, the facility representatives should do likewise by recording everything that happens, including the time and date. A stenographer can help with notes and another staff person can do the videotaping, if necessary. What representatives say can and will be used against them, so they should not engage in idle talk or chit-chat. They should never give any type of estimates when they do not have accurate information available; otherwise, they run the risk of providing OSHA with false information, which is a criminal offense. At the end of each day’s inspection, representatives should go over their notes and measurements for accuracy and completeness. Have the notes typed (keep originals), and add who said what, the inspector’s name, date, times, measuring techniques, equipment used, calibration dates and procedures, and who was present. For information on the closing conference, see Table 4.6.

Violations, Classifications, and Penalties — If any violations were voluntarily corrected on the spot, before leaving the facility the inspector must state that such violations were abated, noting the date, time, place, and witnesses present. An inspector may ask a representative how long it might take and how much it would cost to correct a violation, but representatives must be careful not to agree that such observations are violations. For obvious violations, providing information may help OSHA determine the time required for abatement; the inspector does not propose penalties. The U.S. Department of Labor area director notifies facilities in writing by certified mail of any citations or penalties imposed. Employers have 15 working days to either pay the penalties or contest the citations or penalties, or both. Failure to contest the citation confirms the penalty. Contacting legal assistance would be advised at this point. Violations and penalties for the workplace are classified as follows:

- **Other than serious violation** — This citation is given for violations not threatening to cause death or serious harm.
- **Serious violation** — This citation is given when death or serious physical harm could result, and the employer knew or should have known about the hazard. An example of this is not locking out or tagging out equipment. The fine for such a citation is up to $7000 for each violation. This fine may be decreased through negotiations or good faith on the part of the employer.
- **Willful violation** — One of the most serious violations an employer can have, this citation is given when the employer intentionally and knowingly has committed a violation. The penalty for this type of violation increases significantly. The penalty

### TABLE 4.6 Purpose of OSHA Closing Conference

<table>
<thead>
<tr>
<th>Purpose of OSHA Closing Conference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advise the employer of conditions observed in the facility.</td>
</tr>
<tr>
<td>Obtain further information.</td>
</tr>
<tr>
<td>Relate any possible citing that may be issued.</td>
</tr>
<tr>
<td>Explain employer’s right to appeal and time limits.</td>
</tr>
<tr>
<td>Answer questions.</td>
</tr>
</tbody>
</table>
Healthcare Hazard Control and Safety Management

...can go as high as $70,000 per violation, with a minimum of $5000 per violation. If an employee is killed on a job as a result of a willful violation, the employer, if convicted, can face very large fines and possible imprisonment.

- **Repeat violation** — This citation is given when the violation has not been corrected. It can also result in a $70,000 fine, plus $7000 a day until corrected.

(See Table 4.7.)

**Multi-Employer Citation Policy** — On multi-employer worksites (in all industry sectors), more than one employer may be cited for a hazardous condition that violates an OSHA standard. OSHA follows a two-step process to determine whether more than one employer is to be cited:

- The first step is to determine whether the employer is a creating, exposing, correcting, or controlling employer (see below); however, an employer may have multiple roles. After identifying the role of the employer, OSHA proceeds to the next step to determine if a citation is appropriate. (*Note: Only exposing employers can be cited for General Duty Clause violations.*)

- If an employer falls into one of the above categories, it has obligations with respect to OSHA requirements. OSHA now determines if the employer’s actions were sufficient to meet those obligations. The extent of the actions required of employers varies based on which of the above categories applies. The extent of the measures that a controlling employer must take to satisfy its duty to exercise reasonable care to prevent and detect violations is less than what is required of an employer with respect to protecting its own employees.

**Creating Employer** — The creating employer is an employer that has caused a hazardous condition that violates an OSHA standard. Employers must not create violations; an employer that does can be cited even if the only employees exposed are those of other employers at the site.

**Exposing Employer** — The exposing employer is an employer whose own employees are exposed to the hazard. If the exposing employer created the violation, it is cited for the violation as a creating employer. If the violation was created by another employer, the

---

**TABLE 4.7  OSHA Inspection Priorities**

<table>
<thead>
<tr>
<th>Type of Inspection</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Imminent danger</td>
<td>Reasonable certainty exists that a hazardous condition is present</td>
</tr>
<tr>
<td></td>
<td>that could cause death or serious physical harm</td>
</tr>
<tr>
<td>Fatalities or catastrophic</td>
<td>Events resulting in hospitalization of three or more employees</td>
</tr>
<tr>
<td>Employee complaints</td>
<td>Allegations of violations or unsafe or unhealthful working conditions</td>
</tr>
<tr>
<td>Referrals</td>
<td>Allegations of hazards from other governmental agencies, organizations,</td>
</tr>
<tr>
<td></td>
<td>individuals, or media</td>
</tr>
<tr>
<td>Follow-up inspections</td>
<td>Checking for abatement actions or under special circumstances</td>
</tr>
<tr>
<td>Planned or programmed inspections</td>
<td>Targeted inspections based on high-hazard industries or workplaces</td>
</tr>
<tr>
<td></td>
<td>experiencing high injury and illness rates</td>
</tr>
</tbody>
</table>
exposing employer would receive the citation if it knew of the hazardous condition or failed to exercise reasonable diligence to discover the condition and failed to take steps consistent with its authority to protect its employees. If the exposing employer has authority to correct the hazard, it must do so. If the exposing employer lacks the authority to correct the hazard, it is the cited employer’s responsibility to correct the hazard, inform its employees of the hazard, and take reasonable alternative protective measures. In extreme circumstances (e.g., imminent danger situations), the exposing employer is cited for failing to remove its employees from the job to avoid the hazard.

Correcting Employer — The correcting employer is an employer who is engaged in a common undertaking, on the same worksite, as the exposing employer and is responsible for correcting a hazard. This usually occurs where an employer is given the responsibility of installing or maintaining particular safety and health equipment or devices. The correcting employer must exercise reasonable care in preventing and discovering violations and meet its obligations of correcting the hazard.

Controlling Employer — The controlling employer is an employer who has general supervisory authority over the worksite, including the power to correct safety and health violations itself or require others to correct them. Control can be established by contract or, in the absence of explicit contractual provisions, by the exercise of control in practice. A controlling employer must exercise reasonable care to prevent and detect violations on the site. The extent of the measures that a controlling employer must implement to satisfy this duty of reasonable care is less than what is required of an employer with respect to protecting its employees. This means that the controlling employer is not normally required to inspect for hazards as frequently or to have the same level of knowledge of the applicable standards or trade expertise as the employer it has hired.

Reasonable Care Standard — Factors that affect how frequently and closely a controlling employer must inspect to meet its standard of reasonable care include:

- Scale of the project
- Nature and pace of the work, including the frequency with which the number or types of hazards change as the work progresses
- How much the controlling employer knows both about the safety history and safety practices of the employer it controls and about that employer’s level of expertise

More frequent inspections are normally needed if the controlling employer knows that the other employer has a history of noncompliance. Greater inspection frequency may also be needed, especially at the beginning of the project, if the controlling employer had never before worked with this other employer and does not know its compliance history. Less frequent inspections may be appropriate where the controlling employer sees strong indications that the other employer has implemented effective safety and health efforts. The most important indicator of an effective safety and health effort by the other employer is a consistently high level of compliance. Other indicators include the use of an effective, graduated system of enforcement for noncompliance with safety and health requirements coupled with regular job site safety meetings and safety training.

Evaluating Reasonable Care — When evaluating whether or not a controlling employer has exercised reasonable care in preventing and discovering violations, OSHA considers questions such as whether the controlling employer conducted periodic inspections of appropriate frequency or implemented an effective system for promptly correcting hazards. OSHA enforces the other employer’s compliance with safety and health requirements with an effective, graduated system of enforcement and follow-up inspections.
Control Established by Contract — When control is established by contract, the employer has a specific contract right to control safety. To be a controlling employer, the employer must itself be able to prevent or correct a violation or to require another employer to prevent or correct the violation. One source of this ability is explicit contract authority. This can take the form of a specific contract right to require another employer to adhere to safety and health requirements and to correct violations the controlling employer discovers.

Program Management Guidelines — Published in the Federal Register (54(16):3904–3916, January 26, 1989), OSHA’s Program Management Guidelines are voluntary guidelines that can be applied to all places of employment covered by OSHA. The guidelines identify four general elements critical to the development of a successful safety and health management system:

• Management leadership and employee involvement
• Workplace analysis
• Hazard prevention and control
• Safety and health training

State Programs — Under plans approved by OSHA, 26 states and jurisdictions operate their own occupational safety and health programs (23 cover both the private sector and state and local government employees, and the remaining three cover public employees only). These states have standards that are identical to or at least as effective as federal OSHA standards, including those for bloodborne pathogens and hazard communications, and are required to extend their coverage to state and local government workers, including health-care workers.

Strategic Partnership Programs — The newest member of OSHA’s cooperative programs, the Strategic Partnership Program, encourages, assists, and recognizes the efforts of partners to eliminate serious workplace hazards and achieve a high level of worker safety and health. Whereas OSHA’s Consultation Program and Voluntary Protection Program (VPP) entail one-on-one relationships between OSHA and individual worksites, most strategic partnerships seek to have a broader impact by building cooperative relationships with groups of employers and employees. These partnerships promote voluntary, cooperative relationships among OSHA, employers, employee representatives, trade unions, professional associations, universities, and other government agencies.

OSHA Alliance Programs — Alliances enable organizations committed to workplace safety and health to collaborate with OSHA to prevent injuries and illnesses in the workplace. OSHA and its allies work together to reach out to, educate, and lead the nation’s employers and their employees in improving and advancing workplace safety and health. Alliances are open to all, including trade or professional organizations, businesses, labor organizations, educational institutions, and government agencies. In some cases, organizations may be building on existing relationships with OSHA through other cooperative programs. Alliances have few formal program requirements, which are less structured than other cooperative agreements, and the agreements do not include an enforcement component. However, OSHA and the participating organizations must define, implement, and meet a set of short- and long-term goals that fall into three categories: training and education, outreach and communication, and promotion of a national dialog on workplace safety and health.

OSHA Training and Education — The area offices of OSHA offer a variety of information services, such as compliance assistance, technical advice, publications, audiovisual aids, and speakers for special engagements.
OSHA Website — The OSHA website (www.osha.gov) offers a variety of materials and tools, including such e-tools as expert advisors, electronic compliance assistance tools (e-cats), and technical links; regulations, directives, publications; videos; and other information for employers and employees. OSHA’s software and compliance assistance tools walk users through challenging safety and health issues to find the best solutions to common problems.

Recordkeeping (29 CFR 1904) — The new rule that took effect January 1, 2002, increased employee involvement and employee privacy protection. OSHA created simpler forms and clearly describes the regulatory requirements. The rule permits more flexibility to use computers to meet OSHA recordkeeping requirements; in addition, it:

- Provides a single set of recording criteria for both work-related injuries and work-related illnesses (the former rule required employers to record all illnesses, regardless of severity)
- Requires records to include a work-related injury or illness resulting in one of the following: death, days away from work, restricted work or transfer to another job, medical treatment beyond first aid, loss of consciousness, or diagnosis of a significant injury/illness by a physician or other licensed healthcare professional
- Includes new definitions of medical treatment, first aid, and restricted work to simplify recording decisions
- Requires a significant degree of aggravation before a preexisting injury or illness is considered work related
- Adds further exceptions to the definition of work-relatedness to limit recording of cases involving eating and drinking of food and beverages, common colds and flu, blood donations, exercise programs, and mental illnesses
- Clarifies the recording of “light duty” or restricted work cases and requires employers to record cases when the injured or ill employee is restricted from their “routine job functions,” which are defined as work activities the employee regularly performs at least once weekly
- Requires employers to record all needlestick and sharps injuries involving contamination by another person’s blood or other potentially infectious materials
- Includes separate provisions describing the recording criteria for cases involving the work-related transmission of tuberculosis
- Eliminates the term “lost workdays” and requires recording of days away from work or days restricted or days transferred to another job; calls for employers to count calendar days rather than workdays
- Requires employers to establish a procedure for employees to report injuries and illnesses and tell their employees how to report
- For the first time, guarantees employees and former employees access to their individual OSHA 301 forms (employee representatives will be provided access to the “information about the case” section of the OSHA 301 form in establishments where they represent employees)
- Protects employee privacy by (1) prohibiting employers from entering an individual’s name on Form 300 for certain types of injuries/illnesses (e.g., sexual assaults, HIV infections, mental illnesses); (2) allowing employers not to describe the nature of sensitive injuries where the employer’s identity would be known; (3) giving employee representatives access only to the portion of Form 301 that contains no personal information; and (4) requiring employers to remove employees’ names before providing the data to persons not provided access rights under the rule
- Requires the annual summary to be posted for three months instead of one and requires certification of the summary by a company executive
- Excludes some public transportation and motor vehicle accidents from the reporting of fatalities and catastrophes
TABLE 4.8 OSHA Recording Requirements

<table>
<thead>
<tr>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Death</td>
</tr>
<tr>
<td>Loss of consciousness</td>
</tr>
<tr>
<td>Days away from work</td>
</tr>
<tr>
<td>Restricted work activity or job transfer</td>
</tr>
<tr>
<td>Medical treatment beyond first aid</td>
</tr>
</tbody>
</table>

Recording Work-Related Injuries and Illnesses

OSHA Log of Work-Related Injuries and Illnesses (Form 300) — Form 300 is used to document and classify work-related injuries and illnesses (see Table 4.8). It also documents the extent and severity of each case. Employers use the log to record specific details about what happened and how it happened.

The Summary (Form 300A) — Form 300A shows the totals for the year in each category. At the end of the year, an employer posts the summary in a visible location so employees are aware of the injuries and illnesses occurring in their workplace. Employers must keep a log for each establishment or site. In the case of more than one establishment, employers must maintain a separate log and summary for each physical location that is expected to be in operation for one year or longer. Logs must be kept for five years. Employees have the right to review their employer’s injury and illness records (for more information, see 29 CFR 1904.35).

Employee Involvement — Cases listed on the OSHA log may not be eligible for worker's compensation or other insurance benefits. Listing a case on the log does not mean that the employer or worker was at fault or that an OSHA standard was violated. An injury or illness is considered work related if an event or exposure in the work environment caused or contributed to the condition or significantly aggravated a preexisting condition. Work-relatedness is presumed for injuries and illnesses resulting from events or exposures occurring in the workplace, unless an exception specifically applies (see 29 CFR 19904.5(b)(2) for the exceptions). The work environment includes the establishment and other locations where one or more employees are working or are present as a condition of their employment (see 29 CFR 1904.5(b)(1)).

Recording Requirements — Employers must record work-related injuries or illnesses that are diagnosed by a physician or other licensed healthcare professional, as well as any work-related cases involving cancer, chronic irreversible disease, a fractured or cracked bone, or a punctured eardrum (see 29 CFR 1904.7). Employers must record the following conditions when they are work related:

- Any needlestick injury or cut from a sharp object that is contaminated with another person’s blood or other potentially infectious material
- Any case requiring an employee to be medically removed under the requirements of an OSHA health standard
- A tuberculosis infection as evidenced by a positive skin test or diagnosis by a physician or other licensed healthcare professional after exposure to a known case of active tuberculosis

Medical Treatment — Medical treatment includes managing and caring for a patient for the purpose of combating a disease or disorder. The following are not considered medical treatments and are not recordable:
Visits to a doctor or healthcare professional solely for observation or counseling
Diagnostic procedures, including administering prescription medications that are used solely for diagnostic purposes
Any procedure that can be labeled first aid (see Table 4.9)

Restricted Work — Restricted work activity occurs when, as the result of a work-related injury or illness, an employer or healthcare professional keeps, or recommends keeping, an employee from doing the routine functions of his or her job or from working the full workday that the employee would have been scheduled to work before the injury or illness occurred. The employer counts the number of calendar days the employee was on restricted work activity or was away from work as a result of the recordable injury or illness; the employer does not include the day on which the injury or illness occurred in this number but begins counting days from the day after the incident occurs. If a single injury or illness involved both days away from work and days of restricted work activity, the employer enters the total number of days for each. An employer may stop counting days of restricted work activity or days away from work once the total of either or the combination of both reaches 180 days.

Privacy Cases — The following types of injuries or illnesses are privacy concern cases:

- Injury or illness to an intimate body part or to the reproductive system
- Injury or illness resulting from a sexual assault
- Mental illness
- Case of HIV infection, hepatitis, or tuberculosis
- Needlestick injury or cut from a sharp object that is contaminated with blood or other potentially infectious material (see 29 CFR Part 1904.8 for definition)
- Other illnesses if the employee independently and voluntarily requests that his or her name not be entered on the log

---

**TABLE 4.9 First Aid**

If the incident required any of the following types of treatment, consider it first aid. *Do not record any case involving only:*

Use of nonprescription medications at nonprescription strength
Administration of tetanus immunizations
Cleaning, flushing, or soaking wounds on the skin surface
Covering wounds with adhesive, gauze, or butterfly bandages
Use of hot or cold therapy
Use of any totally nonrigid means of support, such as elastic bandages, wraps, nonrigid back belts, or similar treatments
Use of temporary immobilization devices while transporting an accident victim (splints, slings, neck collars, or back boards)
Drilling a fingernail or toenail to relieve pressure
Draining fluids from blisters
Use of eye patches or simple irrigation or a cotton swab to remove foreign bodies not embedded in or adhered to the eye
Use of irrigation, tweezers, cotton swab, or other simple means to remove splinters or other foreign material from areas other than the eye
Use of finger guards
Use of massages
Drinking fluids to relieve heat stress
The employer must not enter the employee’s name on the OSHA 300 log for these cases; instead, the employer enters “privacy case” in the space normally used for the employee’s name. The employer must keep a separate, confidential list of the case numbers and employee names for the establishment’s privacy concern cases to allow updates of the cases and provide information to the government if asked to do so. An employer who has a reasonable basis to believe that information describing the privacy concern case may be personally identifiable even though the employee’s name has been omitted may use discretion in describing the injury or illness on both the OSHA 300 and 301 forms. The employer must enter enough information to identify the cause of the incident and general severity of the injury or illness but does not need to include details of an intimate or private nature. If the outcome or extent of an injury or illness changes after the case has been recorded, the employer simply draws a line through the original entry or deletes or white-outs the original entry. The employer then writes the new entry where it belongs. Remember, employers must record the most serious outcome for each case.

Classifying Injuries — An injury is any wound or damage to the body resulting from an event in the work environment. Examples include cut, puncture, laceration, abrasion, fracture, bruise, contusion, chipped tooth, amputation, insect bite, electrocution, or a thermal, chemical, electrical, or radiation burn. Sprain and strain injuries to muscles, joints, and connective tissues are classified as injuries when they result from a slip, trip, fall, or other similar accidents.

Classifying Illnesses

- **Skin diseases or disorders** — Illnesses caused by work exposure to chemicals, plants, or other substances. Examples include contact dermatitis, eczema, or rash caused by primary irritants, sensitizing substances, poisonous plants, friction blisters, chrome ulcers, and inflammation of the skin.
- **Respiratory conditions** — Illnesses associated with breathing hazardous biological agents, chemicals, dust, gases, vapors, or fumes at work. Example include silicosis, asbestosis, pneumonitis, pharyngitis, rhinitis, farmer’s lung, beryllium disease, tuberculosis, occupational asthma, reactive airways dysfunction syndrome, chronic obstructive pulmonary disease, hypersensitivity pneumonitis, metal fume fever, and chronic obstructive bronchitis.
- **Poisoning** — Disorders evidenced by abnormal concentrations of toxic substances in blood, other tissues, other bodily fluids, or the breath that are caused by ingestion or absorption of toxic substances into the body. Examples include poisoning by lead, mercury, cadmium, carbon monoxide, benzene, organic solvents, pesticides, and formaldehyde.
- **Other illnesses** — Examples include heatstroke, hypothermia, decompression sickness, effects of ionizing radiation, exposure to ultraviolet rays, anthrax, bloodborne pathogenic diseases, tumors, and coccidioidomycosis.

Posting the Summary — The employer must post OSHA Form 300A only (not the log) by February 1 of the year following the year covered by the form and must keep it posted until April 30 of that year. Employers must retain the log and summary for 5 years following the year to which they pertain. They do not send the completed forms to OSHA unless specifically asked to do so.

**OSHA Form 301 Injury and Illness Incident Report** — Employers may use OSHA Form 301 or an equivalent form that documents the same information. Some state worker’s compensation, insurance, or other reports may be acceptable substitutes, as long as they provide the same information as the OSHA 301.
TABLE 4.10 Recording Cases on the OSHA Log

Within 7 calendar days after receiving information about a case, decide if the case is recordable under the OSHA recordkeeping requirements. Determine whether the incident is a new case or a recurrence of an existing one. Establish whether the case was work related. If the case is recordable, decide which injury and illness incident report form to fill out.

Filling Out the OSHA 300 Log — (See Table 4.10.)

- Identify the employee involved unless it is a privacy concern case.
- Identify when and where the case occurred.
- Describe the case as specifically as possible.
- Classify the seriousness of the case by recording the most serious outcome associated with the case, where column J (Other Recordable Cases) is the least serious and column G (Death) is the most serious.
- Identify whether the case is an injury or illness. If the case is an injury, check the injury category; if the case is an illness, check the appropriate illness category.

Access to Employee Exposure and Medical Records (29 CFR 1910.1020) — Employees who may have been exposed to toxic substances or harmful physical agents in the workplace have the right to access relevant exposure and medical records. Access includes current workers, former employees, and employees assigned or transferred to work involving toxic substances or harmful physical agents. Designated employee representatives may access employee medical or exposure records and analyses created from those records only in very specific circumstances. Designated employee representatives include any individual or organization to whom an employee has given written authorization to exercise a right of access. The standard covers records documenting the amount of employee exposure to toxic substances and harmful physical agents including lead, cadmium, and silica. The standard also covers biological agents such as bacteria, viruses, and fungi. Physical hazards include noise, heat, cold, vibration, repetitive motion, and radiation. Access gives the right to examine or copy medical and exposure records. Employees have the right to access records and analyses based on work concerns. Employers must permit access free of charge and within a reasonable period of time. Employees access records in one of three ways:

- Employer may provide a copy of the document.
- Employer may provide facilities for the employee to copy the document.
- Employer may loan the document to the employee to copy off site.

Types of Records — Employers must provide access to any record showing measurement or monitoring of personal exposure to a toxic substance or harmful physical agent. Workers may access the exposure records of employees who engage in similar work or working conditions if personal records are not available. Employee exposure records include:

- Monitoring results of workplace air or measurements of toxic substances or harmful physical agents in the workplace, including personal, area, grab, wipe, or other forms of sampling results
- Biological monitoring results, such as blood and urine test results
- Material Safety Data Sheets (MSDSs) containing information about the hazards of a substance hazards to human health
- Any employee medical record created or maintained by a physician, nurse, health-care professional, or technician (see Table 4.11)
Types of Access — Workers can access any analyses including compilations of data or statistical studies of the workplace. Employers must remove identifiers if records could directly or indirectly reveal an individual employee. Examples of identifiers include an employee’s name, address, Social Security number, and job title. Designated representatives may access the medical records of any employees who have given the representative specific written consent. As with employee access to medical records, access is limited to those records pertaining to the authorizing employees. OSHA recognizes two types of designated representatives: (1) an individual or organization to whom the employee has given written authorization to access his or her medical or exposure records, and (2) a recognized or certified collective bargaining agent.

Employer Responsibilities

- Preserve and maintain accurate medical and exposure records for each employee.
- Inform workers of the existence, location, and availability of those medical and exposure records.
- Give employees any informational material regarding this standard that OSHA has made available.
- Make records available to employees, their designated representatives, and OSHA, as required.

Documents Not Defined as Medical Records

- Physical specimens, such as blood and urine samples
- Health insurance claims maintained separately from medical program records
- Records created only for use in litigation that are privileged from discovery
- Separate records created as part of voluntary employee assistance programs

Maintaining Records — Employers must maintain employee medical records for at least the duration of the employee’s employment plus 30 years. Note that:

- Exceptions are granted for health insurance claim records maintained separately from the medical program and its records.
- Exceptions are granted for records of first aid made onsite by a nonphysician of one-time treatment or follow-up observations of minor scratches, scrapes, or other injuries not involving medical treatment, loss of consciousness, restriction of work or motion, or transfer to another job.
- Exceptions are granted for medical records of employees who have worked for less than one year as long as the employer offers all such records to the employee upon termination of employment.

### TABLE 4.11  OSHA-Defined Employee Medical Records

<table>
<thead>
<tr>
<th>Medical and employment questionnaires or histories</th>
</tr>
</thead>
<tbody>
<tr>
<td>Results of medical examinations and laboratory tests</td>
</tr>
<tr>
<td>Medical opinions, diagnoses, progress notes, and recommendations</td>
</tr>
<tr>
<td>First-aid records</td>
</tr>
<tr>
<td>Descriptions of treatments and prescriptions</td>
</tr>
<tr>
<td>Employee medical complaints</td>
</tr>
</tbody>
</table>
Employers must:

- Keep employee exposure records for at least 30 years except for background data related to environmental or workplace monitoring.
- Retain background records for one year but preserve documents relevant to the interpretation of the data for 30 years.
- Keep MSDSs and other specified records for 30 years, including the identity of a substance or agent and information on when and where it was used.
- Preserve and maintain biological monitoring results designated as exposure records by specific OSHA standards as required by the specific standards governing their use.
- Keep all analysis documents using medical or exposure records for at least 30 years.

D. ENVIRONMENTAL PROTECTION AGENCY

The Environmental Protection Agency (EPA) was created in 1970 to protect the environment, to exercise control over the release of harmful substances that could threaten public health, and to control and abate environmental pollution. Many of the EPA’s rules define which substances can be hazardous to human health or pose a threat to the environment. The EPA and state-approved agencies provide guidance for handling hazardous materials, regulate the operation of waste disposal sites, and establish procedures for dealing with environmental incidents such as leaks or spills. The EPA also has an interest in hazardous and infectious wastes produced by healthcare facilities. It publishes informative guides to assist risk managers in understanding and complying with a number of environmental laws and regulations. Environmental laws are published in 40 CFR.

Resource Conservation and Recovery Act — The Resource Conservation and Recovery Act (RCRA) was passed in 1976 as an amendment to the Solid Waste Disposal Act and is one of the EPA’s main statutory weapons. The act created a “cradle-to-grave” management system for current and future wastes, while the EPA authorizes cleanup of released hazardous substances. Several statutes are media specific and limit the amount of wastes introduced into the air, waterways, oceans, and drinking water. Other statutes directly limit the production, rather than the release, of chemical substances and products that may contribute to the nation’s wastes. RCRA is unique in that its primary purpose is to protect human health and the environment from the dangers of hazardous waste. RCRA has a regulatory focus and authorizes control over the management of wastes from the moment of generation until final disposal; for example,

- Whenever a breakdown in the waste management system occurs, such as the release of a hazardous substance, the statute authorizes cleanup actions (e.g., Superfund).
- General RCRA goals are (1) to protect human health and the environment; (2) to reduce waste and conserve natural resources and energy; and (3) to reduce or eliminate generation of hazardous waste as expeditiously as possible.
- Waste generators can be classified as: (1) large-quantity generators (over 1000 kg/month); (2) small-quantity generators (100 to 1000 kg/month); (3) conditionally exempt generators (less than 100 kg/month with no more than 1 kg acutely hazardous waste).
RCRA Regulations — Regulatory requirements of RCRA require facilities that generate waste to:

- Identify and label all wastes.
- Notify the EPA of hazardous waste operations.
- Maintain secure storage areas.
- Keep records and train waste handlers.
- Use permitted treatment, storage, and disposal facilities.

Underground Storage Tanks — RCRA was amended in 1984 by passage of the Hazardous and Solid Waste Amendment. This action enabled the EPA to regulate underground storage tanks (USTs) to better control and prevent leaks. Title I of RCRA regulated substances including petroleum products and CERCLA-regulated substances (see below). Tanks with hazardous wastes are not regulated under Subtitle I but are regulated under Subtitle C of RCRA. A UST has been defined as a container that has at least 10% of its contents underground. Facilities with underground tanks should take action to ensure that piping does not fail, control corrosion of tanks and piping, and prevent spills and overflows. Refer to 40 CFR 280 for a listing of tanks excluded from the regulation. Most regulated tanks are those that hold petroleum-based substances.

Comprehensive Environmental Response, Compensation, and Liability Act — The Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) was intended to remedy mistakes in past hazardous waste management, whereas RCRA is concerned with avoiding such mistakes through proper management in the present and future. RCRA primarily regulates how wastes should be managed to avoid potential threats to human health and the environment. CERCLA regulation comes into play primarily when mismanagement has occurred or when a release or a substantial threat of a release of a hazardous substance or contaminant presents an imminent and substantial threat to human health or the environment. CERCLA authorizes a number of government actions to remedy the conditions or the effects of a release. CERCLA, as originally enacted in 1980, authorized a five-year program by the federal government to perform the following primary tasks:

- Identify those sites where the release of hazardous substances has already occurred or might occur and poses a serious threat to human health, welfare, or the environment.
- Take appropriate actions to remedy those releases.
- See that the parties responsible for the releases pay for the cleanup actions.

Superfund Amendments and Reauthorization Act of 1986 — It became clear that the problem of abandoned hazardous waste sites was more extensive than originally believed, and solutions would be complex and time consuming. The Superfund Amendments and Reauthorization Act of 1986 (SARA) established new standards and schedules for site cleanup and also created new programs for informing the public of risks from hazardous substances in the community and for preparing communities for hazardous substance emergencies. Under Public Law 99-499, SARA specified new requirements for state and local governments. It also has provisions for the private sector related to hazardous chemicals.

The Emergency Planning and Community Right-To-Know Act — The Emergency Planning and Community Right-To-Know Act specifically requires states to establish a State Emergency Response Commission (SERC). The SERC must designate emergency planning districts within the state. The SERC appoints a local emergency planning committee (LEPC) for each district. SERC and LEPC responsibilities include implementing various emergency planning provisions of Title III and serve as points of contact for the community right-to-
TABLE 4.12 Summary of Title III Provisions

<table>
<thead>
<tr>
<th>Section</th>
<th>Provisions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Section 302 (Substances and Facilities Covered and Notification)</td>
<td>Requires facilities producing, storing, or using certain “extremely hazardous substances” in excess of threshold planning quantities to notify the State Emergency Response Commission (SERC) if these substances are present at the facility. (A list of 406 extremely hazardous substances with corresponding threshold planning quantities was published in the April 22, 1987, Federal Register, which is available in local libraries.) The presence of these chemicals triggers certain local emergency planning requirements under Title III.</td>
</tr>
<tr>
<td>Section 303 (Comprehensive Emergency Response Plans)</td>
<td>Requires covered facilities to provide the local emergency planning committee (LEPC) with the name of a facility representative who will participate in the emergency planning process as a facility emergency coordinator. Facilities are also required to provide to the LEPC information necessary for developing and implementing an emergency plan.</td>
</tr>
<tr>
<td>Section 305 (Emergency Notification)</td>
<td>Requires covered facilities to notify appropriate authorities upon the release of certain hazardous chemicals.</td>
</tr>
<tr>
<td>Section 311 (Material Safety Data Sheets)</td>
<td>Requires each facility that must prepare or have available Material Safety Data Sheets (MSDSs) under OSHA regulations to submit either copies of MSDSs or a list of MSDS chemicals to the SERC, LEPC, and local fire department with jurisdiction over the facility.</td>
</tr>
<tr>
<td>Section 312 (Emergency and Hazardous Chemical Inventory Forms)</td>
<td>Requires each facility having MSDSs to submit an inventory form annually to the SERC, LEPC, and local fire department, including information aggregated by categories on estimated amounts and locations of chemicals in the facility. The facility may also be requested to provide this information on a chemical-by-chemical basis.</td>
</tr>
<tr>
<td>Section 313 (Toxic Chemical Release Form)</td>
<td>Requires facilities to complete an annual inventory of toxic chemical emissions for specific chemicals.</td>
</tr>
</tbody>
</table>

know reporting requirements (see Table 4.12). SARA Title III requires that the local committees must include, at a minimum, representatives from the following groups: state and local officials, law enforcement, civil defense, firefighting, environmental, hospital, media, first aid, health, transportation, and facility owners or operators subject to the emergency planning requirements. Each LEPC is primarily responsible for preparing a comprehensive emergency response plan for its district and for making information on hazardous chemicals, submitted under Title III available to the public. To develop their emergency response plans, the LEPCs used information about the presence of potentially hazardous chemicals reported by businesses and other facilities under Title III. As part of the planning process, the LEPCs evaluated available resources for developing, implementing, and exercising their plans, which included the following:
• Identification of facilities subject to planning provisions under Title III
• Identification of transportation routes for extremely hazardous substances
• Identification of risk-related facilities
• Methods and procedures for response
• Designated community and facility coordinators
• Procedures for public notification
• Methods for determining release occurrence and area affected
• Description of emergency equipment and facilities and those responsible
• Evacuation plans and training programs

Under Title III’s planning provisions, the EPA was mandated by Congress to establish a list of chemicals to help focus local emergency planning activities. In April 1987, the EPA listed 406 extremely hazardous substances (EHSs) and established a threshold planning quantity (TPQ) for each. If a business or facility contains any of these EHSs, in an amount equal to or greater than their respective TPQs, the facility owner or operator is required to notify the SERC and LEPC. These facilities must name a facility coordinator to work with the LEPC for specific inclusion of that facility in the local plan. Representative facilities covered under the planning provisions include not only major chemical manufacturing facilities but also a wide variety of chemical users, such as farmers, dry cleaners, and other service-related businesses. Exemptions under this provision apply only to vessels (ship/boat), federal facilities, and transportation. Storage incidental to transportation is exempt provided that the EHSs are still moving under active shipping papers and have not reached the final consignee.

Clean Air Act — The Clean Air Act (CAA) was passed to limit the emission of pollutants into the atmosphere; it protects human health and the environment from the effects of airborne pollution. The EPA established National Ambient Air Quality Standards (NAAQS, otherwise known as KNACKS) for several substances. The KNACKS provide the public some protection from toxic air pollutants. Primary responsibility for meeting the requirements of the CAA rests with each state. States must submit plans for achieving KNACKS. Under Section 112 of the CAA, the EPA has the authority to designate hazardous air pollutants and set national emission standards for hazardous air pollutants.

Common Air Pollutants
• Ozone is the chemical reaction of pollutants, especially volatile organic compounds.
• Nitrogen dioxide results primarily from burning gasoline, natural gas, coal, and oil.
• Carbon monoxide results from burning gasoline, wood, coal, natural gas, and oil.
• Particulate matter comes from burning wood, diesel, and other fuels. It also comes from industrial plants, burning fields, unpaved roads, and agricultural operations.
• Sulfur dioxide comes primarily from burning high-sulfur coal and from metal and paper industrial processes.
• Lead gasoline is being phased out; other sources of lead include paint, metal refineries, and the manufacture of lead batteries.

CAA and RCRA Interactions
• Air emissions from incinerators regulated under RCRA must comply with applicable ambient air standards or emission limitations of the CAA.
• The EPA is using authority contained in Section 3004(n) of RCRA to develop more stringent air emission standards.
• Extraction of pollutants from air emissions under CAA controls such as scrubbers can create hazardous wastes or sludge containing such wastes.
• Disposal of incinerator materials must also comply with RCRA.
Clean Water Act — The Clean Water Act (CWA) of 1977 strengthened and renamed the Federal Water Pollution Control Act of 1972. The CWA has several major provisions:

- National Pollutant Discharge Elimination System (NPDES) permit program — A primary element of the act is the CWA granting permits to discharge into the nation’s waterways.
- Direct discharge — Direct discharges into surface water require an NPDES permit.
- Indirect discharge — The waste is first sent to a publicly owned treatment works and then discharged according to the NPDES permit.
- Wastewater treatment — Sludge resulting from wastewater treatment and pretreatment under the CWA must be handled as RCRA waste and disposed of at an RCRA facility if it is hazardous.
- RCRA-permitted facilities — Discharges for an RARA-permitted facility are subject to restrictions spelled out in the NPDES permit. This means that either the facility itself has obtained an NPDES permit or the wastes meet CWA pretreatment standards and have been transported to a publicly owned treatment works.
- Water quality standards — States adopt water quality standards for all streams within their borders; the standards address designated use provisions and prohibit water degradation actions.
- Discharge of oil and hazardous substances — The act prohibits the discharge of oil and hazardous substances into navigable waters of the United States.
- Stormwater discharges — The act requires that certain industrial and municipal stormwater discharges be regulated under the NPDES permit system.

Federal Insecticide, Fungicide, and Rodenticide Act — The Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) was passed in 1947 and was administered by the U.S. Department of Agriculture. The EPA became responsible for administering the act in 1970, and a 1972 amendment included provisions to protect public health and the environment. FIFRA controls the risks of pesticides through a registration system. No new pesticide can be marketed until it is registered with the EPA. The EPA can refuse to register a pesticide or to limit its use if evidence indicates a threat to humans and the environment. All pesticides and general disinfectants used in healthcare facilities should be approved and registered by the EPA.

Toxic Substances Control Act — The Toxic Substances Control Act (TSCA) was enacted in 1976 to help control the risk of substances not regulated as drugs, food additives, cosmetics, or pesticides. Under this law, the EPA can regulate the manufacture, use, and distribution of chemical substances. The TSCA mandates that the EPA be notified prior to the manufacture of any new chemical substance. The EPA ensures that all chemicals are tested to determine risks to humans. The TSCA also allows the EPA to regulate polychlorinated biphenyls (PCBs) under 40 CFR 761.

State Environmental Regulation — Most states have created environmental management agencies to address environmental issues. States operate programs approved by the EPA under memoranda of agreement and air quality state implementation plans. The EPA still retains authority and relies on eight major environmental statutes to address hazardous waste and environmental problems. The RARA allows day-to-day management of solid and hazardous wastes. CERCLA provides guidance for cleanup in the event of waste releases. The CAA and CWA statutes limit the amount of materials released into the air and waterways.
E. FOOD AND DRUG ADMINISTRATION

The Food and Drug Administration (FDA) was created by the Appropriation Act of 1931 and is an agency of the Department of Health and Human Services (HHS). The FDA approves prescription and over-the-counter drugs, including labeling requirements. The Bureau of Drugs develops policy on the safety, effectiveness, and labeling of all drugs developed for human consumption. The FDA monitors biologic and synthetic drugs. Biologic substances are found in the human body; all other substances are classified as synthetics. Two separate monitoring groups have been established; each works independently and maintains separate approval policies. The FDA has established drug development procedures which include animal testing and provisions for human testing for drugs that seem to be promising. The Bureau of Radiological Health issues standards for radiation exposure and develops methods to control exposures. The FDA supervises an electronic product radiation program that strives to protect the public by developing standards to control the emission of radiation from electronic products.

FDA Laws — The FDA enforces other laws enacted by Congress or promulgated under congressional authority. These laws include:

- Food, Drug, and Cosmetic Act of 1938, which gave the FDA authority to regulate drug safety
- Fair Packaging and Labeling Act (15 USC 1451–1461)
- Portions of the Public Health Service Act relating to biological products (42 CFR 262–263)
- Radiation Control for Health and Safety Act, which relates to electronic products such as lasers, x-rays, and microwaves (42 CFR 263)

Medical Device Regulation — The FDA also regulates and classifies medical devices. Regulations are found in 21 CFR 860 and 862–890. The FDA requires healthcare facilities to take actions to protect the safety of patients, residents, staff, and visitors whenever a hazardous product is used in the facility. Each healthcare facility must have procedures in place to obtain, evaluate, and take corrective action in all situations concerning hazardous equipment, drugs, and food substances.

Biological Products — Biological products include, for example, toxins, antitoxins, vaccines, blood products, and therapeutic serum products and are controlled under standards described in 21 CFR 600–611. Drugs are regulated by dividing them into the following categories:

- New drugs (application for approval is submitted under procedures found in 21 CFR 314)
- Investigational drugs (regulated under 21 CFR 312)
- Antibiotics (certified under Section 507 of the law and regulated much like all new drugs)
- Insulin (subject to Section 506 of the law and certified by the FDA)

Prescription Drugs — The FDA requires prescription drugs to be dispensed or prescribed by a licensed practitioner. The label must read “Caution. Federal Law Prohibits Dispensing without Prescription.” All establishments that manufacture or process drugs are required to register with the FDA. Drug listing and registration requirements are in Section 510 of the Federal Food, Drug, and Cosmetic Act and are explained in detail in 21 CFR 207.
Safe Medical Device Act of 1990 — The Safe Medical Device Act (SMDA) of 1990 expanded FDA authority to regulate medical devices more effectively. The act permits the FDA to learn quickly about any medical product that has caused a serious illness, injury, or death and to take action to track or recall the product for further action. Facilities must make regular reports to the FDA on medical device failure (see Table 4.13). Following are some aspects of the law:

- A medical device is any instrument, apparatus, implant, *in vitro* agent, or other similar or related article or component used in the prevention, diagnosis, treatment, or care of disease.
- User facilities such as ambulatory care agencies, hospitals, and physicians' offices are required to report patient incidents involving medical devices and drugs to manufacturers and the FDA.
- Healthcare personnel are expected to report any adverse experiences and events relating to the use of medical devices.
- Hospital personnel are required to report any medical device incident even if they did not personally observe it.
- Events involving patient injury or death must be reported if the probability exists that it was caused or contributed to by a medical device or drug interaction.
- The device must be removed from use immediately.
- The device must be delivered to a biomedical engineering department for evaluation.
- Package information must be provided if available.
- An event report must be completed, listing the patient’s name, age, gender, and diagnosis.
- The date of the event, the name of the person operating the device, and the type of injury incurred must be documented.
- The specific location of the incident, the department affected, and any specific information required by the local facility must be reported.
- The report must be forwarded to the appropriate action office within 48 hours.

### TABLE 4.13  Safe Medical Device Act of 1990 Reporting Definitions

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Device failure</td>
<td>When a device fails to perform as required or is not functioning within proper specifications of intended use</td>
</tr>
<tr>
<td>Device-related incident</td>
<td>Results from the device being operated in an incorrect manner; such an incident could be caused by a power failure or other extenuating circumstances</td>
</tr>
<tr>
<td>Patient adverse reaction</td>
<td>Do not report if the event was caused by the patient’s adverse reaction to proper use of medical equipment</td>
</tr>
</tbody>
</table>

*Note: The Medical Devices Amendments of 1992 amended the SMDA to require organizations to report user errors.*
F. NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH

The National Institute for Occupational Safety and Health (NIOSH) was created to conduct research and make recommendations to help prevent work-related injury and illness. A part of the Centers for Disease Control and Prevention (CDC), the institute is part of the Department of Health and Human Services. The Occupational Safety and Health Act of 1970 created both NIOSH and OSHA. Headquartered in Washington, D.C., NIOSH maintains research laboratories and offices in Cincinnati, OH; Morgantown, WV; Pittsburgh, PA; Spokane, WA; and Atlanta, GA. NIOSH is a professionally diverse organization with a staff of over 1400 people representing a wide range of disciplines including epidemiology, medicine, industrial hygiene, safety, psychology, engineering, chemistry, and statistics. Recently, NIOSH evaluated the effectiveness of ultraviolet germicidal irradiation to prevent the transmission of tuberculosis in healthcare settings. The institute also evaluated state-of-the-art lifting equipment to eliminate low-back injuries among nursing aides, orderlies, and attendants.

NIOSH Health Hazard Evaluation Program — The Health Hazard Evaluation (HHE) program responds to requests for workplace evaluations from employers, employees, and their representatives, as well as other agencies. Through the HHE program, NIOSH identifies current hazards and recommends practical, scientifically valid solutions for reducing exposures and preventing disease, injury, and disability. In 1998, NIOSH established the Fire Fighter Fatality Investigation and Prevention Program to reduce firefighter line-of-duty deaths and injuries through surveillance, investigations of fatalities, and development and dissemination of practical recommendations. Individual reports from the program are disseminated to over 25,000 volunteer and career fire departments across the country.

The National Personal Protective Technology Laboratory — The National Personal Protective Technology Laboratory (NPPTL), located in Pittsburgh, provides research for the prevention of injury and illness among workers who must rely on personal protective equipment, including respirators, gloves, and hard hats. The strategic research program ensures that the development of new personal protective equipment will meet real needs as work settings, technologies, and worker populations change and new threats emerge. NIOSH also supports training of occupational safety and health professionals and researchers through 16 regional education and research centers. These programs are critical for meeting the increasing demand for occupational physicians, occupational nurses, industrial hygienists, and other safety professionals. The NIOSH website provides access to the full range of NIOSH information and publications. In 2002, the site supported nearly 500,000 visitor sessions a month, and the average monthly page views totaled 1.75 million. NIOSH is also communicating occupational safety and health information in Spanish through NIOSH en Español.

NIOSH Healthcare Resources — Topics found on the NIOSH website include:

- Compendium of NIOSH healthcare worker research
- HIV/AIDS, hepatitis B virus, and hepatitis C virus
- Tuberculosis
- Chemical hazards: ethylene oxide
- Ethylene oxide sterilizers in healthcare facilities (engineering controls and work practices)
- Control technology for ethylene oxide sterilization in hospitals
- Glutaraldehyde: occupational hazards in hospitals
TABLE 4.14 National Institute for Occupational Safety and Health Summary

NIOSH has the same entry rights as OSHA and conducts workplace safety and health evaluations.

NIOSH can recommend hazard controls and abatement procedures but does not possess enforcement or citation authority.

NIOSH conducts industry-wide research, evaluates hazard control measures, develops standards, and publishes occupational safety studies.

NIOSH offers occupational safety, health, and hygiene classes throughout the country by working closely with colleges and universities.

NIOSH is a leader in assessing and documenting the effectiveness of new hazard control technologies; it often assists other agencies in investigating fatal workplace accidents.

NIOSH tests and approves respiratory devices, including gas masks, respirators, and self-contained breathing apparatus.

NIOSH publishes policy documents on numerous hazardous substances.

- Latex
- Nitrous oxide
- Chemical safety
- Effects of workplace hazards on female reproductive health
- Control of smoke from laser/electric surgical procedures
- Controlling formaldehyde exposures during embalming
- Ergonomics and musculoskeletal disorders
- Occupational violence
- Stress at work
- Worker health chartbook

NIOSH and OSHA — The Occupational Safety and Health Act of 1970 established both NIOSH and OSHA. Although NIOSH and OSHA were created by the same act of Congress, they are two distinct agencies with separate responsibilities. NIOSH falls under the U.S. Department of Health and Human Services and is a research agency (see Table 4.14). OSHA is a function of the U.S. Department of Labor and is responsible for creating and enforcing workplace safety and health regulations. NIOSH and OSHA often work together toward the common goal of protecting worker safety and health. NIOSH is committed to a workplace where all people are respected as individuals and are valued for their contributions to accomplishing its mission. The NIOSH vision for diversity is to enhance the organization’s ability to attract, recruit, hire, mentor, develop, retain, and serve a diverse population by fostering an inclusive environment that embraces, values, and respects all individuals.

G. NUCLEAR REGULATORY COMMISSION

The Nuclear Regulatory Commission (NRC) is an independent agency established by the Energy Reorganization Act of 1974 to regulate civilian use of nuclear materials. NRC employs a staff of 3000, the majority of whom work at the Rockville, MD, headquarters. The NRC staffs four regional offices and assigns a resident inspector officer at each commercial nuclear power plant and some fuel cycle locations. Headed by a five-member commission, the NRC
regulates byproduct, source, and special nuclear materials to ensure adequate public health and safety and common defense and security and to protect the environment. Key areas of responsibility include:

- **Reactors** — Commercial reactors for generating electric power and research and test reactors used for research, testing, and training.
- **Materials** — Uses of nuclear materials in medical, industrial, and academic settings and facilities that produce nuclear fuel.
- **Waste** — Transportation, storage, and disposal of nuclear materials and waste and decommissioning of nuclear facilities from service.

### NRC Principal Regulatory Functions

- Establish standards and regulations.
- Issue licenses for nuclear facilities and users of nuclear materials.
- Inspect facilities and users of nuclear materials to ensure compliance with the requirements.

### Types of Facilities Regulated

- Nuclear power plants.
- Department of nuclear medicine at hospitals.
- Academic activities at educational institutions.
- Research work in scientific organizations.
- Industrial applications such as gauges and testing equipment.

### Licenses

The NRC issues a license to all commercial nuclear fuel facilities that process and fabricate uranium ore into reactor fuel. Licenses for over 100 commercial nuclear power plants and their operators are also issued by the NRC. Licenses for other uses of radioactive materials are issued either by the NRC or by state governments (of Agreement States) under NRC-approved regulatory programs. States also have regulatory jurisdiction over certain radioactive substances that occur naturally or are produced by particle accelerators. The NRC or state license specifies the types and quantities of radioactive materials that may be possessed and used. Typically, a license will describe the location of use, the training and qualifications of workers, specific procedures for using the materials, and any special safety precautions required. The license holder must follow the specific license requirements as well as the more general NRC regulations.

### Standards Enforcement

The NRC adopts and enforces standards for nuclear medicine departments in healthcare facilities. Some states have agreements with the government to assume these regulatory responsibilities. The NRC issues five-year licenses to qualified healthcare organizations that follow prescribed safety precautions and standards. Information that must be provided to the NRC includes identifying authorized users, designating a radiation safety officer, and the address and location of radioactive materials. Any changes require the organization to file for a licensing amendment. The NRC’s regulatory program establishes limits for radiation exposure to workers and the general public as a result of the various uses of radioactive materials licensed by the NRC. In addition, the NRC requires users to take steps to keep exposures well below the limits. Each licensee must have a written radiation control program that covers the following:

- Required participation in the program by all users, organizational administrators, and the radiation safety officer
- Procedures to inform all workers about the types and amounts of materials used, including dosing information, safety precautions, recurring training, and continuing education
• Information and guidelines to be used to keep doses at as low as reasonably achievable (ALARA) levels
• Training and education requirements for radiation safety officers

H. DEPARTMENT OF TRANSPORTATION

Mission — The Department of Transportation (DOT) was established by an act of Congress on October 15, 1966, and the Department’s first official day of operation was April 1, 1967. Its mission is to ensure a fast, safe, efficient, accessible, and convenient transportation system that meets vital national interests and enhances the quality of life of the American people. Leadership of the DOT is provided by the Secretary of Transportation, who is the principal adviser to the President in all matters relating to federal transportation programs. The Secretary is assisted by the Deputy Secretary in this role. The Office of the Secretary oversees the formulation of national transportation policy and promotes intermodal transportation. Other responsibilities range from negotiation and implementation of international transportation agreements, evaluating the fitness of U.S. airlines, enforcing airline consumer protection regulations, issuing regulations to prevent alcohol and illegal drug misuse in transportation systems, and preparing transportation legislation.

Hazardous Materials Regulation — The Federal Aviation Administration (FAA) regulates a program to protect the security of civil aviation and enforces regulations under the Hazardous Materials Transportation Act for shipments by air. The FAA also regulates the shipment of biohazardous materials by air. The Research and Special Programs Administration (RSPA) oversees rules governing the safe transportation and packaging of hazardous materials by all modes of transportation. The DOT regulates the transportation of hazardous materials under the Hazardous Materials Transportation Uniform Safety Act of 1990. The act requires those engaged in the transportation of hazardous chemicals to register with the secretary of transportation. Safety permits are required by carriers transporting class A or B explosives, liquefied natural gas, or any hazardous material that is extremely toxic by inhalation. The act requires training for all hazardous materials handlers, including those who unload, handle, store, or transport such materials. Recent changes require other workers involved in the hazardous materials transportation industry to receive training.

I. CENTERS FOR DISEASE CONTROL AND PREVENTION

The Centers for Disease Control and Prevention (CDC), located in Atlanta, GA, is an agency of the U.S. Department of Health and Human Services. It works to protect the health of the American people by tracking, monitoring, preventing, and researching disease. It is also responsible for the surveillance and investigation of infectious diseases in healthcare facilities. The CDC conducts research and publishes results in its Morbidity and Mortality Weekly Report. This weekly publication provides healthcare facilities with timely information on topics such as infection control, isolation procedures, bloodborne pathogens, tuberculosis management, infectious waste disposal recommendations, and how to protect workers. The CDC performs many of the administrative functions for the Agency for Toxic Substances and Disease Registry (ATSDR), a sister agency of the CDC, and is one of eight federal public health agencies within HHS. The CDC seeks to accomplish its mission by working with partners throughout the nation and world to monitor health, detect and investigate health problems, conduct research to enhance prevention, develop and advocate sound public health policies, implement prevention strategies, promote healthy behaviors, foster safe and healthful environments, and provide
leadership and training. The CDC has developed and sustained many vital partnerships with public and private entities that improve service to the American people.

**Challenges**

- Improving people’s health by putting science into action
- Preventing violence and unintentional injury
- Meeting the health and safety needs of a changing workforce
- Utilizing new technologies to provide credible health information
- Protecting individuals against emerging infectious diseases including bioterrorism
- Eliminating racial/ethnic health disparities
- Fostering safe and healthy environments
- Working with partners to improve global health

**CDC Organization** — The agency is comprised of these organizational components:

- National Center on Birth Defects and Developmental Disabilities, which provides national leadership for preventing birth defects and developmental disabilities and for improving the health and wellness of people with disabilities
- National Center for Chronic Disease Prevention and Health Promotion, which works to prevent premature death and disability from chronic diseases and promotes healthy personal behaviors
- National Center for Environmental Health, which provides national leadership in preventing and controlling disease and death resulting from the interactions between people and their environment
- National Center for Health Statistics, which provides statistical information that will guide actions and policies to improve the health of the American people
- National Center for HIV, STD, and TB Prevention, which provides national leadership in preventing and controlling human immunodeficiency virus infection, sexually transmitted diseases, and tuberculosis
- National Center for Infectious Diseases, which prevents illness, disability, and death caused by infectious diseases in the United States and around the world
- National Center for Injury Prevention and Control, which prevents death and disability from nonoccupational injuries, including those that are unintentional and those that result from violence
- National Immunization Program, which works to prevent disease, disability, and death from vaccine-preventable diseases in children and adults
- National Institute for Occupational Safety and Health, which ensures safety and health for all people in the workplace through research and prevention
- Epidemiology Program Office, which strengthens the public health system by coordinating public health surveillance; providing support in scientific communications, statistics, and epidemiology; and training in surveillance, epidemiology, and prevention effectiveness
- Public Health Practice Program Office, which strengthens community practice of public health by creating an effective workforce, building information networks, conducting practice research, and ensuring laboratory quality

### J. AGENCY FOR HEALTHCARE RESEARCH AND QUALITY

The Agency for Healthcare Research and Quality (AHRQ) serves as the health services research arm of the U.S. Department of Health and Human Services. AHRQ provides a major source of funding and technical assistance for health services research and research training.
at leading universities and other institutions and is a science partner, working with the public and private sectors to build a knowledge base for what works — and does not work — in health and health care and to translate this knowledge into everyday practice and policymaking. Health services research examines how people get access to health care, how much healthcare costs, and what happens to patients as a result of this care. The main goals of health services research are to identify the most effective ways to organize, manage, finance, and deliver high-quality care; reduce medical errors; and improve patient safety. The agency’s research findings help practitioners diagnose and treat patients more effectively. A computerized clinical information system developed with the agency’s support now helps healthcare professionals determine the most appropriate timing for giving antibiotics to surgical patients. A national clearinghouse gives clinicians, health plans, healthcare delivery systems, and purchasers a free, web-based mechanism for obtaining objective, detailed information on clinical practice guidelines. The agency complements the biomedical research mission of its sister agency, the National Institutes of Health, and specializes in major areas of healthcare research including:

- Quality improvement and patient safety
- Outcomes and effectiveness of care
- Clinical practice and technology assessment
- Healthcare organization and delivery systems
- Primary care (including preventive services)
- Healthcare costs and sources of payment

Quality Measurement and Improvement — The AHRQ works to improve healthcare quality by:

- Identifying factors that put patients at risk
- Using computers and other information technology to reduce and prevent errors
- Developing innovative approaches that reduce errors and improve safety in various healthcare settings and geographically diverse locations
- Disseminating research results and improving patient safety education and training for clinicians and other providers
- Overseeing the operations of the Patient Safety Task Force, an HHS effort to integrate research, data collection, and analysis of medical errors and promote interagency collaboration in reducing the number of injuries resulting from these errors
- Providing hospitals, health data organizations, and states with enhanced quality assessment tools that they can use with their own hospital administrative data to highlight potential quality concerns and track changes over time in three areas: ambulatory-care-sensitive conditions, inpatient quality (volume, mortality, and resource use), and patient safety

K. NATIONAL INSTITUTES OF HEALTH

The National Institutes of Health (NIH) operates 27 centers and serves as one of the world’s foremost medical research organizations. NIH, an agency of HHS, is located in Bethesda, MD. The agency is the focal point for federal health research and is the steward of medical and behavioral research for the nation. Its mission is to use science in the pursuit of fundamental knowledge about the nature and behavior of living systems and applying that knowledge to extend the healthy life of humans and reduce the burdens of illness and disability. The NIH provides leadership and direction to programs designed to improve the health of the nation by conducting and supporting research in the causes, diagnosis, prevention, and cure of human diseases; in the processes of human growth and development;
in the biological effects of environmental contaminants; in the understanding of mental, addictive, and physical disorders; and in directing programs for the collection, dissemination, and exchange of information in medicine and health, including the development and support of medical libraries and the training of medical librarians and other health information specialists. The goals of the NIH include:

- Fostering fundamental creative discoveries, innovative research strategies, and their applications as a basis to advance significantly the nation’s capacity to protect and improve health
- Developing, maintaining, and renewing scientific human and physical resources that will promote the nation’s capability to prevent disease
- Expanding the knowledge base in medical and associated sciences in order to enhance the nation’s economic well-being and ensure a continued high return on the public investment in research
- Exemplifying and promoting the highest level of scientific integrity, public accountability, and social responsibility in the conduct of science

I. AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

The mission of the Agency for Toxic Substances and Disease Registry (ATSDR), as an agency of HHS, is to prevent exposure and adverse human health effects and diminished quality of life associated with exposure to hazardous substances from waste sites, unplanned releases, and other sources of pollution present in the environment. ATSDR is directed by congressional mandate to perform specific functions concerning the effect on public health of hazardous substances in the environment. These functions include public health assessments of waste sites, health consultations concerning specific hazardous substances, applied research in support of public health assessments, information development and dissemination, and education and training concerning hazardous substances.

M. OCCUPATIONAL SAFETY AND HEALTH REVIEW COMMISSION

The Occupational Safety and Health Review Commission (OSHRC) is a quasi-official, three-member board appointed by the President and confirmed by the Senate. It is an independent agency of the executive branch. OSHRC adjudicates cases that have been brought by OSHA and contested by the employer or employees. The commission may conduct investigations and can uphold, change, or dismiss OSHA’s findings. Some cases are determined by an administrative law judge, but the three-member board has final rule. Rulings by OSHRC can be reviewed further by the Federal Appeals Courts. Rules of procedures can be found in 29 CFR 2200. The burden of proof rests with the government attorney.

N. HEALTH RESOURCES SERVICES ADMINISTRATION

The mission of the Health Resources and Services Administration (HRSA) is to improve and expand access to quality health care for all. The agency employs about 2000 individuals in Washington, D.C., and in its ten regional offices. Considered as the access agency of the Department of Health and Human Services, the Administration ensures the availability of quality health care to low-income, uninsured, isolated, vulnerable, and special-needs populations. Goals of the HRSA include the following:
• Eliminate barriers to care.
• Eliminate health disparities.
• Ensure quality of care.
• Improve public health.
• Improve healthcare systems.

Rural Health Promotion — The Office of Rural Health Policy promotes better healthcare service in rural areas. Established in August 1987 by the Reagan Administration, the office was subsequently authorized by Congress in December 1987 and located in the Health Resources and Services Administration. Congress charged the office with informing and advising HHS on matters affecting rural hospitals and health care, coordinating activities within the department relating to rural health care, and maintaining a national information clearinghouse.

Special Programs Bureau
• Facilities Compliance and Recovery operates the grant program that provides construction assistance to health facilities.
• The Division of Facilities and Loans manages the Hill–Burton direct and guaranteed loan programs.
• The Office of Engineering Services provides architectural and engineering services during the application, design, bidding, and construction phases of federally assisted projects for HHS.
• The State Planning Grants Program provides one-year grants to individual states to develop plans for providing access to affordable health insurance coverage to all their citizens.
• The National Vaccine Injury Compensation Program oversees the federal “no-fault” system, which compensates individuals or families of individuals injured by childhood vaccines, whether administered in the private or public sector.
• The Smallpox Vaccine Injury Compensation Program provides benefits or compensation to eligible smallpox vaccine recipients or their survivors.
• The Division of Emergency Health Care Preparedness works with facilities in the areas of trauma/emergency medical services and bioterrorism hospital preparedness.

O. CENTERS FOR MEDICARE AND MEDICAID SERVICES
Serving healthcare facilities that receive federal funding through Medicare and Medicaid programs, the Centers for Medicare and Medicaid Services (CMS) expands healthcare choices and further strengthens programs and services to adapt to beneficiary needs and improve the quality of care and health outcomes for beneficiaries of CMS programs. CMS improves access to services for underserved and vulnerable beneficiary populations, in part by eliminating healthcare disparities and protecting beneficiaries from substandard or unnecessary care. The agency also publishes guidelines governing long-term nursing facilities. The guidelines emphasize residents’ rights and quality of care. The Omnibus Budget Reconciliation Act (OBRA) of 1987 gave the CMS the power to regulate facilities receiving federal funds. The CMS is organized around three centers that support the agency’s key functions:
• The Center for Medicare Management focuses on management of the traditional fee-for-service Medicare program, including development of payment policy and management of the Medicare fee-for-service contractors.
• The Center for Beneficiary Choices focuses on providing beneficiaries with information on Medicare, Medicare Select, Medicare+Choice, and MediGap options. It also includes management of the Medicare+Choice plans, consumer research and demonstrations, and grievance and appeals functions.

• The Center for Medicaid and State Operations focuses on programs administered by states such as Medicaid, the State Children’s Health Insurance Program (SCHIP), insurance regulation functions, survey and certification, and the Clinical Laboratory Improvement Amendments (CLIA).

Goals

• Protect and improve beneficiary health and satisfaction.
• Foster appropriate and predictable payments and high-quality care.
• Promote understanding of CMS programs among beneficiaries, the healthcare community, and the public.
• Promote the fiscal integrity of CMS programs and be an accountable steward of public funds.
• Foster excellence in the design and administration of CMS programs.
• Provide leadership in the broader healthcare marketplace to improve health.

P. DEPARTMENT OF HOMELAND SECURITY

The creation of the Department of Homeland Security is the most significant transformation of the U.S. government since 1947, when Harry S. Truman merged the various branches of the U.S. armed forces into the Department of Defense to better coordinate the nation’s defense against military threats. The Department of Homeland Security represents a similar consolidation, both in style and substance. In the aftermath of the terrorist attacks against America on September 11, 2001, President George W. Bush decided 22 previously disparate domestic agencies needed to be coordinated into one department to more effectively protect the nation against threats to the homeland. The new department’s first priority is to protect the nation against further terrorist attacks. Component agencies that are being put into place to analyze threats and intelligence, guard our borders and airports, protect our critical infrastructure, and coordinate the response of our nation for future emergencies include:

• The U.S. Customs Service (Treasury)
• The Immigration and Naturalization Service (part; Justice)
• The Federal Protective Service (General Services Administration)
• The Transportation Security Administration (Transportation)
• Federal Law Enforcement Training Center (Treasury)
• Animal and Plant Health Inspection Service (part; Agriculture)
• Office for Domestic Preparedness (Justice)

Emergency Preparedness and Response — The Emergency Preparedness and Response Directorate oversees domestic disaster preparedness training and coordinates government disaster response. It brings together:

• The Federal Emergency Management Agency (FEMA)
• Strategic National Stockpile and the National Disaster Medical System (HHS)
• Nuclear Incident Response Team (Energy)
• Domestic Emergency Support Teams (Justice)
• National Domestic Preparedness Office (Federal Bureau of Investigation)
Science and Technology — The Science and Technology Directorate seeks to utilize all scientific and technological advantages when securing the homeland. The following assets will contribute to this effort:

- CBRN Countermeasures Programs (Energy)
- Environmental Measurements Laboratory (Energy)
- National BW Defense Analysis Center (Defense)
- Plum Island Animal Disease Center (Agriculture)

Information Analysis and Infrastructure Protection — The Information Analysis and Infrastructure Protection Directorate analyzes intelligence and information from other agencies (including the Central Intelligence Agency [CIA], FBI, Defense Intelligence Agency [DIA], and National Security Agency [NSA]) involving threats to homeland security and evaluates vulnerabilities in the nation’s infrastructure. It brings together:

- Critical Infrastructure Assurance Office (Commerce)
- Federal Computer Incident Response Center (GSA)
- National Communications System (Defense)
- National Infrastructure Protection Center (FBI)
- Energy Security and Assurance Program (Energy)

Q. FEDERAL EMERGENCY MANAGEMENT AGENCY

The Federal Emergency Management Agency (FEMA), formerly an independent agency, became part of the new Department of Homeland Security in March 2003. FEMA goals include responding to, planning for, recovering from, and mitigating against disasters. FEMA can trace its beginnings to the Congressional Act of 1803. FEMA maintains headquarters in Washington, D.C., and regional and area offices across the country, including the Mount Weather Emergency Operations Center and the FEMA training center in Emmitsburg, MD. FEMA also has nearly 4000 standby disaster assistance employees who are available to help out after disasters. Often FEMA works in partnership with other organizations that are part of the nation’s emergency management system and is responsible for coordinating assistance to areas hit by catastrophic events or natural disasters. FEMA works with local governments, industries, and response agencies to coordinate emergency planning activities within a geographic area or region.

R. AMERICANS WITH DISABILITIES ACT

The Americans with Disabilities Act (ADA) is divided into five sections or titles: Title I, Employment; Title II, Public Services; Title III, Public Accommodations and Services Operated by Private Entities; Title IV, Telecommunications; and Title V, Miscellaneous. These titles define the rights of disabled individuals and the responsibilities of employers, government agencies, telecommunications companies, and privately owned public facilities. Not all of the titles will apply to a particular company or situation; however, it is likely that the ADA will affect the operations of every organization to some degree.

The ADA’s definition of a disability is based upon the definition used by the Rehabilitation Act of 1973. The Equal Employment Opportunity Commission (EEOC) technical manual defines a disability as:
A physical or mental impairment that greatly limits one or more major life activities — These major life activities include, but are not limited to, walking, hearing, seeing, speaking, learning, breathing, working, caring for oneself, or performing manual tasks.

A record of such an impairment — This part protects people with mental or physical illnesses that have been cured or controlled or are in remission. Examples include heart disease and cancer.

A presumed impairment — This part protects individuals who are perceived as having an impairment that is substantially limiting. Examples might include high blood pressure or a facial disfigurement.

The ADA excludes certain behaviors or disorders from being classified as disabilities. Examples include current illegal use of drugs, homosexuality, bisexuality, transvestitism, exhibitionism, voyeurism, gender identity disorder not resulting from a physical impairment, other sexual behavior disorders, compulsive gambling, kleptomania, pyromania, or psychoactive substance use disorders resulting from current illegal use of drugs. An individual is qualified if he or she has a disability and can meet the skills, experience, education, and other job-related requirements of a position held or desired and who may — with or without reasonable accommodation — perform the essential functions of a job held or desired.

**Reasonable Accommodation** — A reasonable accommodation is a modification or adjustment of a job to allow a qualified individual with a disability the same opportunity to perform the job as an individual without a disability. This may be accomplished by:

- Making a facility accessible
- Changing jobs or work schedules
- Modifying equipment, tools, policies, or training procedures
- Providing qualified readers or interpreters

**Undue Hardship** — Determined on a case-by-case basis taking into consideration if the accommodation is unduly costly, extensive, substantial, or disruptive or would fundamentally change the nature or operation of the business.

**Title I: Employment** — Title I does not allow discrimination against individuals with disabilities in a workplace with 15 or more employees (this includes part-time workers if they work each day for 20 or more weeks in the current or preceding calendar year). Employers are not allowed to ask about disabilities, require a medical history survey, or conduct a medical examination until after an offer of employment has been made. Title I also requires employers to provide reasonable accommodations to qualified individuals with disabilities so that they have the same employment opportunities as other nondisabled persons. This law does not require employers to hire disabled individuals who are not qualified; however, an employer may not use an individual’s disability to disqualify or deny him or her any employment activities. The provisions of Title I cover all aspects of employment, including application, testing, hiring, assignment, evaluation, disciplinary action, training, promotion, medical examination, layoff/recall, termination, compensation, leave, and benefits. It is considered to be discriminatory to use qualification standards, employment tests, or other practices that may intentionally or unintentionally screen out qualified individuals with a disability unless it is job related and essential to the job. Employers are encouraged to develop written job descriptions that detail the essential functions of a particular job to help prevent ADA claims and investigations.
Job Description and Essential Functions — A practical means of protecting a business is to develop a written job description that identifies the essential functions. Essential functions are defined as requirements of a job that are required to perform that job at a satisfactory level. The employer should not add other functions that are not essential or require an unjustified level of performance. If an ADA discrimination claim is made, the job description becomes a key piece of evidence during the investigation. If an investigation finds that nonessential functions or unjustified performance requirements were used to deny or disqualify a qualified individual with a disability, such a finding may suggest bad faith on the part of the employer and possibly discrimination. It is very important that the job description be accurate and represent the true functions of a particular position in order to protect the employer.

Illegal Drug Use and Alcohol — The provisions of the ADA allow employers to use drug testing to preserve a workplace that is free from the illegal use of drugs. The ADA also has provisions that protect recovering illegal drug users and alcoholics. If a person is classified as an alcoholic or recovering illegal drug user, he or she is considered to be a disabled individual and possibly a qualified individual with a disability; therefore, employers are obligated not to discipline or discharge that person as long as he or she is a qualified disabled worker. On the other hand, a person who uses illegal drugs is not considered a disabled individual and does not qualify for ADA protection. Illegal use of drugs may be defined as the use, possession, or distribution of drugs listed under the Controlled Substance Act. If the work performance of alcoholic persons or recovering illegal drug users begins to deteriorate to a level such that they are no longer qualified individuals, the employer may then take disciplinary actions. It should be noted that early intervention and treatment on the part of the employer of employees with alcohol and illegal drug use problems is the most beneficial solution for all concerned parties.

Title II: Public Services — Title II covers all services, programs, activities, and employment conducted by government agencies. The majority of Title II is directed at government agencies that provide public transportation. It requires that new buses, rail cars, taxis, or other types of vehicles purchased or leased by government agencies must be accessible to disabled individuals.

Title III: Public Accommodation and Services Operated by Private Entities — Title III requires anyone who owns, leases, or operates a public business to comply with the provisions of this title. This includes, but is not limited to, hotels, theaters, concert halls, grocery stores, shopping centers, gas stations, professional offices, zoos, golf courses, places of education, and stations for public transportation. In addition, operators of privately owned buses, vans, and cars used for public transportation must also comply with these provisions (an exception being taxi cab companies; for further information, contact the DOT). The provisions of Title III can be divided into three areas. The first provision requires public businesses to change all policies, procedures, or practices that deny, exclude, segregate, or treat persons with disabilities differently. The second provision requires that all services and accommodations offered by a business be the same for disabled and nondisabled patrons. The third provision requires public businesses to remove all architectural, communication, and transportation barriers that may be easily removed. Employers may want to survey their facilities to ensure that they are barrier free. For a complete listing of items that should be surveyed, refer to the EEOC technical manual.
Title IV: Telecommunications — Title IV requires telephone companies to provide relay stations for hearing- or speech-impaired individuals to businesses or employers with voice-only phones. This does not require employers to buy telecommunication devices for the deaf (TDD), unless it is a reasonable accommodation. Employers or businesses that receive TDD telephone calls will need to train employees on how to handle such situations.

Title V: Miscellaneous — Title V has only two provisions that may impact an employer or public business. The first part encourages disputing parties to settle their differences outside of a court room. The second part allows state and local laws that are equal to or greater than the ADA to take precedence. This part of the title should encourage employers to research state and local laws to find out which ones they must comply with.

S. CLINICAL LABORATORY IMPROVEMENT AMENDMENTS

The Clinical Laboratory Improvement Amendments (CLIA) established quality standards for all laboratory testing to ensure the accuracy, reliability, and timeliness of patient test results regardless of where the tests were performed. A laboratory is defined as any facility that performs laboratory testing on specimens derived from humans for the purpose of providing information for the diagnosis, prevention, or treatment of disease or impairment of health. CLIA is user-fee funded; therefore, all costs of administering the program must be covered by the regulated facilities, including certificate and survey costs. The final CLIA regulations were published on February 28, 1992, and are based on the complexity of the test method; thus, the more complicated the test, the more stringent the requirements. Three categories of tests have been established: waived complexity; moderate complexity, which includes the subcategory of provider-performed microscopy (PPM); and high complexity. CLIA specifies quality standards for proficiency testing (PT), patient test management, quality control, personnel qualifications, and quality assurance for laboratories performing moderate- or high-complexity tests. Waived laboratories must enroll in CLIA, pay the applicable fee, and follow manufacturers’ instructions.

The Centers for Medicare and Medicaid Services (CMS) oversees CLIA, including laboratory registration, fee collection, surveys, surveyor guidelines and training, enforcement, approvals of PT providers, accrediting organizations, and exempt states. The Centers for Disease Control and Prevention (CDC) is responsible for the CLIA studies, convening the Clinical Laboratory Improvement Amendments Committee (CLIAC), and providing scientific and technical support and consultation to HHS and the CMS. The Food and Drug Administration is responsible for test categorization. Laboratories register by completing an application, paying fees, being surveyed if applicable, and becoming certified. CLIA fees are based on the certificate requested by the laboratory (that is, waived, PPM, accreditation, or compliance) and, for moderate- and high-complexity laboratories, on the annual volume and types of testing performed. Waived and PPM laboratories may apply directly for their certificate as they are not subject to routine inspections. Those laboratories that must be surveyed routinely (i.e., those performing moderate- or high-complexity testing) can choose whether they wish to be surveyed by CMS or by a private accrediting organization. The CMS survey process is outcome oriented and utilizes a quality assurance focus and an educational approach to assess compliance. Data indicate that CLIA has helped to improve the quality of testing in the United States. The total number of quality deficiencies has decreased approximately 40% from the first laboratory survey to the second and further on subsequent surveys. Similar findings were demonstrated in the review of PT data. The educational value of PT in laboratories was known before CLIA existed. Initial PT failures are also addressed with an educational, rather than punitive, approach by CLIA. CLIA issues the following certificates:
Certificate of Waiver — Issued to a laboratory to perform only waived tests.

Certificate for Provider-Performed Microscopy Procedures (PPMP) — Issued to a laboratory in which a physician, mid-level practitioner, or dentist performs no tests other than the microscopy procedures. This certificate permits the laboratory to also perform waived tests.

Certificate of Registration — Issued to a laboratory that enables the entity to conduct moderate- or high-complexity laboratory testing or both until the entity is determined by survey to be in compliance with CLIA regulations.

Certificate of Compliance — Issued to a laboratory after an inspection finds the laboratory to be in compliance with all applicable CLIA requirements.

Certificate of Accreditation — Issued to a laboratory on the basis of the laboratory’s accreditation by an accreditation organization approved by CMS.

Approved Accrediting Organizations Under CLIA

- American Association of Blood Banks
- American Osteopathic Association
- American Society of Histocompatibility and Immunogenetics
- College of American Pathologists
- Laboratory Accreditation Program–COLA
- Joint Commission on Accreditation of Healthcare Organizations

T. VOLUNTARY ORGANIZATIONS

National Fire Protection Association — The primary mission of the National Fire Protection Association (NFPA) is to develop and promote scientifically based consensus codes and standards. NFPA also conducts research and provides education opportunities. As an international nonprofit membership organization, the association has over 70,000 members from around the world. NFPA serves as the world’s leading advocate of fire prevention and has published about 300 safety codes and standards. The influence of NFPA is visible in every building, process, service, design, and installation. NFPA encourages the broadest possible participation in its consensus code development process. NFPA relies on more than 6000 volunteers from diverse professional backgrounds to serve on over 200 technical code and standard development committees. This code development process has earned accreditation from the American National Standards Institute (ANSI). Some examples of NFPA codes relevant to healthcare include NFPA 70, National Electrical Code; NFPA 99, Healthcare Facilities; and NFPA 101, Life Safety Code. NFPA offers excellent education and training programs dealing with the latest fire and life safety requirements, technologies, and practices. Many healthcare safety directors and engineering personnel rely on these outstanding programs to gain insight into the meaning, intent, and proper application of the most widely used fire and electrical safety codes. NFPA also administers several professional certification programs, including Certified Fire Protection Specialist, Certified Fire Inspector, and Certified Fire Plans Examiner. NFPA also develops dozens of texts, guides, and other materials to assist firefighters and first responders. The healthcare industry relies on NFPA for fire data analysis. NFPA publishes more relevant healthcare standards than any other organization.

American National Standards Institute — The American National Standards Institute (ANSI) was founded in 1918 to consolidate voluntary standards. ANSI is a federation of more than 1500 professional, trade, governmental, industrial, labor, and consumer organizations. It publishes national consensus standards that have been developed by various technical,
professional, trade, and consumer organizations. ANSI also serves as the coordinating agency for safety standards that have been adopted for international implementation. ANSI represents the United States as a member of the International Organization for Standardization and the International Electrotechnical Commission. Many ANSI standards have been adopted by OSHA, and others are widely followed throughout complete industries. Any of the safety-related ANSI standards are developed by ANSI-accredited standards committees. ANSI provides members access to more than 9000 standards from around the world and publishes specifications for the following:

- Protective eyewear, including safety glasses and goggles
- Hard hats, safety shoes, and fall-protection equipment
- Eyewash stations and emergency shower equipment

Safety Equipment Institute — Located in McLean, VA, the Safety Equipment Institute (SEI) is a private, nonprofit organization that was established in 1981 to administer the first nongovernmental, third-party certification programs to test and certify a broad range of safety equipment products. SEI’s certification programs are accredited by ANSI in accordance with the standard, ISO Guide 65, General Requirements for Bodies Operating Product Certification Systems. The purpose of SEI’s certification programs is to assist government agencies along with users and manufacturers of safety equipment in meeting their mutual goals of protecting those who use safety equipment on or off the job, in keeping with recognized standards and the current state of the art. SEI certification programs are voluntary and available to any manufacturer of safety and protective equipment seeking to have product models certified by SEI. The certification programs include ongoing product testing and quality assurance audits that qualify a product model for SEI certification. All product testing is done in accordance with the selected voluntary, government, or other standards available for the given product. Current standards are promulgated for various products by such organizations as ANSI, the American Society for Testing and Materials (ASTM), and NFPA.

Underwriters Laboratories — Underwriters Laboratories (UL) is a nonprofit organization founded in 1894 that maintains laboratories for the examination and testing of systems, devices, and materials to ensure compliance with safety and health standards. UL inspects or tests more than 70,000 products each year, including firefighting equipment, lockout/tagout supplies, lighting fixtures, and flammable liquid storage containers. UL certification pertains only to the area of safety and does not involve performance testing. UL has issued more than 500 standards, many of which ANSI has adopted. UL publishes directories of companies whose products meet or exceed criteria outlined in appropriate standards. Some of the areas covered by these directories include:

- Building Materials
- Fire Protection Equipment
- Hazardous Location Equipment
- Electrical Appliance Equipment

ASTM International — Formerly known as the American Society for Testing and Materials, ASTM is the world’s largest source of voluntary consensus standards; research is carried out by its more than 30,000 members. ASTM publishes more than 8000 standards yearly in a 68-volume set, utilizing categories such as medical devices, occupational safety and health, environmental effects, energy, and security systems. The six major categories of standards are:

- Classification — Information on materials grouped together by characteristics.
- Practices — Procedures detailing how to accomplish a process or function.
Safety Regulations, Standards, and Organizations

- **Test Methods** — Procedures developed to test certain products or materials.
- **Guides** — A set of directional procedures.
- **Specifications** — Precise information about material specifications.
- **Terminology** — A compilation of definitions and terms.

**American Society of Heating, Refrigerating, and Air-Conditioning Engineers** —
The American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) is an international organization of 50,000 persons and has chapters throughout the world. ASHRAE is organized for the sole purpose of advancing the arts and sciences of heating, ventilation, air-conditioning, and refrigeration (HVAC&R) for the public’s benefit through research, standards writing, continuing education, and publications. Through its membership, ASHRAE writes standards that set uniform methods of testing and rating equipment and establish accepted practices for HVAC&R industries worldwide (e.g., regarding the design of energy-efficient buildings). The society’s research program, currently encompassing more than 100 research projects worth nearly $8 million, investigates numerous issues, such as identifying new refrigerants that are environmentally safe. ASHRAE organizes broad-based technical programs for presentation at its semiannual meetings.

**Factory Mutual Research Corporation** — A nationally recognized testing laboratory and approval service organization recognized by OSHA, Factory Mutual Research Corporation (FM) was established to focus on industrial loss control. It employs engineers and scientists to investigate fire losses and determine ways to prevent losses. It also does third-party testing on fire-extinguishing equipment, sprinklers, building materials, and smoke detectors. FM lists approved equipment, materials, and other services in its annual 500-page guide. Manufacturers can display a special symbol on approved items to inform users and buyers that the product or piece of equipment has been tested and approved by an independent laboratory. The FM laboratory is recognized by OSHA.

**Compressed Gas Association** — The Compressed Gas Association (CGA) is dedicated to the development and promotion of safety standards and safe practices in the industrial gas industry. It is due to the efforts of the CGA that the industry remained largely self-regulating throughout the 20th century. More than 200 member companies worldwide work together through the committee to cooperate with governmental agencies in formulating responsible regulations and standards and to promote compliance with these regulations and standards in the workplace. CGA represents all facets of the industry: manufacturers, distributors, suppliers, and transporters of gases, cryogenic liquids, and related products. Its sphere of influence encompasses industrial, medical, and specialty gases in compressed or liquefied form, as well as a range of gas handling equipment. The work of CGA is carried out by committees of volunteers from member companies having expertise in the particular areas targeted. Each of these committees focuses on docket projects through the subcommittees and task forces. These working groups meet regularly at CGA headquarters in Arlington, VA, or at other sites around the United States and Canada. CGA’s staff provides coordination and technical support. The CGA mission is to:

- Gather and disseminate information about incidents and accidents involving industrial gases and cryogenic liquids so recurrence can be eliminated by a real understanding of the causes and of the preventative measures needed.
- Cooperate with federal, state, provincial, and local government departments and regulatory agencies in developing responsible regulations for the industry.
- Develop, publish, and promote the broadest possible distribution of technical information, standards, and recommendations for safe and environmentally responsible practices in the manufacture, storage, transportation, distribution, and use of industrial gases, cryogenic liquids, and related products.
• Conduct seminars and produce video-based training programs and material, based on CGA technical publications, on safe and environmentally responsible production, distribution, and use of industrial gases, cryogenic liquids, and related products for industry and user personnel.
• Support and coordinate research and development that benefit both producers and users of industrial gas, cryogenic liquids, and related products.
• Work with other organizations to address issues of mutual concern.

The CGA develops technical and safety standards for the compressed gas industry. Members work together through a committee system to develop technical specifications, safety standards, and educational materials and to promote compliance with regulations and standards in the workplace. Member companies represent manufacturers, distributors, suppliers, and transporters of gases, cryogenic liquids, and related products. The CGA publishes more than 100 technical standards, many of which are formally recognized by U.S. government agencies. The association publishes the Handbook of Compressed Gases, which is widely used and sets forth the recognized safe methods for handling, storing, and transporting industrial gases.

U. TRADE AND PROFESSIONAL ORGANIZATIONS

National Restaurant Association — The National Restaurant Association (NRA) organization publishes policies designed to reduce accidents and hazards that affect the safety of food-service employees and patrons. A major association activity is the preparation and distribution of educational materials, including self-inspection guidelines on general safety concerns, OSHA requirements, and fire protection. Materials are also available for purchase through the association’s Information Services department. Safety-related information appears in the association’s Washington Weekly report and its monthly magazine, Restaurants USA.

National Sanitation Foundation International — National Sanitation Foundation (NSF) International, founded in 1944 as the National Sanitation Foundation, is known for the development of standards, product testing, and certification services in the areas of public health safety and protection of the environment. The NSF mark is placed on millions of consumer, commercial, and industrial products annually and is trusted by users, regulators, and manufacturers. Technical resources at NSF include physical and performance testing facilities, as well as analytical chemistry and microbiology laboratories. The NSF provides clients and the public with objective, quality, and timely services, including development of consensus standards, voluntary product testing, and certification. Their standards address the following topics:
• Food-service equipment
• Drinking water treatment systems
• Wastewater treatment devices
• Biohazard cabinets
• Special categories of equipment and products
• Registries
• Bottled water
• Packaged ice
• Drinking water laboratory accreditation
• Sanitizers/disinfectants
• Standards and criteria
American Conference of Governmental Industrial Hygienists — The American Conference of Governmental Industrial Hygienists (ACGIH) actively promotes the administrative and technical aspects of worker safety. The organization provides leadership and educational and professional development opportunities to personnel representing governmental and educational organizations. The ACGIH is well known for its publication, *Threshold Limit Values/Biological Exposure Indices*. The conference also publishes a monthly journal, *Applied Occupational and Environmental Hygiene*. This publication provides peer-reviewed papers/articles and technical articles for the practicing professional. The ACGIH also has a publications catalog that lists hundreds of titles in the areas of occupational safety and industrial hygiene.

National Council on Radiation Protection and Measurements — The National Council on Radiation Protection and Measurements (NCRP) has been active in the areas of radiation protection and measurements since its inception as the Advisory Committee on X-Ray and Radium Protection in 1929. It was originally established to represent all of the national radiological organizations in the United States on a collective, scientific basis and to serve, in essence, as the U.S. national analog of the International X-Ray and Radium Protection Committee, which was created in July 1928 under the auspices of the Second International Congress of Radiology and subsequently evolved into the International Commission on Radiological Protection. The NCRP originally operated as an informal association of scientists seeking to make available information and recommendations on radiation protection and measurements. The council was reorganized and chartered by the U.S. Congress in 1964 as the National Council on Radiation Protection and Measurements. The Charter of the council (Public Law 88-376) states that its objectives are to:

- Collect, analyze, develop, and disseminate in the public interest information and recommendations about (a) protection against radiation (referred to herein as radiation protection) and (b) radiation measurements, quantities, and units, particularly those concerned with radiation protection.
- Provide a means by which organizations concerned with the scientific and related aspects of radiation protection and of radiation quantities, units, and measures may cooperate for effective utilization of their combined resources, and to stimulate the work of such organization.
- Develop basic concepts about radiation quantities, units, and measurements; about the application of these concepts; and about radiation protection.
- Cooperate with the International Commission on Radiological Protection, the Federal Radiation Council, the International Commission on Radiation Units and Measurements, and other national and international organizations, governmental and private, concerned with radiation quantities, units, and measurements and with radiation protection.

Board of Certified Hazard Control Management — The Board of Certified Hazard Control Management (BCHCM) was founded in 1976 to evaluate and certify the capabilities of practitioners engaged in the administration of safety and health programs. Certification is at the Master and Senior levels; individuals achieving the Master level possess the skill and knowledge to effectively manage comprehensive safety and health programs. The BCHCM offers advice and assistance to those wishing to improve their status in the profession. It also strives to increase competence and stimulate professional development by providing recognition and status for those who, by education, experience, and achievement, are deemed qualified. The BCHCM promotes the exchange of ideas and technology that will improve performance of practicing hazard control professionals and has a program to certify healthcare
safety professionals through an evaluation and examination process. Healthcare organizations are constantly being challenged to deliver services safely, efficiently, and economically. This need is reflected in the more stringent requirements being reflected by the Joint Commission. Healthcare organizations are seeking professionals who possess hazard control skills and can understand and assist in controlling the many serious hazards found in healthcare facilities and activities. These individuals are more readily identified by their designation as a Certified Healthcare Safety Professional (CHSP). CHSP program objectives include:

- Evaluate the qualifications of persons engaged in hazard control activities in healthcare facilities.
- Certify as proficient individuals who meet the level of competency for this recognition.
- Increase the competence of and stimulate professional development of practitioners.
- Provide recognition and status to those individuals who by education, experience, and achievement are considered qualified.
- Facilitate the exchange of ideas and technology that will improve performance.

**CHSP Knowledge Topics**

- JCAHO standards
- Life safety code and fire prevention
- Disaster management
- Biological hazard safety and infection control
- Hazardous materials and wastes
- Controlling physical hazards
- Maintenance, engineering, and ventilation
- Selection and use of personal protective equipment
- Hazard control and accident prevention
- Safety training and education principles
- Governmental regulatory agencies and standards
- Voluntary safety organizations and standards

*Note:* The Board plans to offer a patient safety officer (PSO) specialty in late 2005. Receiving the PSO designation will require passing a written exam.

### V. OTHER SAFETY-RELATED PROFESSIONAL ORGANIZATIONS

**American Society of Safety Engineers** — The American Society of Safety Engineers (ASSE) was founded in October 1911; its original name was the United Society of Casualty Inspectors. This nonprofit organization is the only organization of individual safety professionals. It works to promote the safety profession and foster the professional development of its members. The ASSE plays an important role in the development of many national programs and standards and continues to expand its focus in the United States; it also has chapters in the Middle East and Great Britain. The ASSE currently has 31,000 members and is guided by a 25-member board of directors which includes 13 regional vice presidents. The objectives of the society’s 138 chapters are to promote, establish, and maintain standards for the safety profession; to develop educational programs; to conduct research in areas that further the purpose of the society; to provide forums for the exchange of information among society members; and to provide a liaison to related disciplines. The ASSE conducts an annual professional development conference and works closely with the Board of Certified Safety Professionals of America. The society also publishes a monthly journal, *Safety Professional*, and sponsors a number of educational conferences, seminars, and educational programs. The society has a healthcare division that publishes a periodic newsletter.
National Safety Council — The National Safety Council (NSC) is the world’s largest organization that devotes its entire efforts to safety promotion and accident prevention. The council is the largest nongovernmental and not-for-profit organization promoting safety in the United States. It oversees the activities of local safety councils, which work under the leadership of local citizens, industrial interests, responsible official agencies, and other important groups. Each council is self-supporting and has the goal of reducing accidents and injuries through prevention training. The NSC publication *Safety Management System* provides companies both large and small the structure to implement a comprehensive and balanced safety management program. This unique management system provides equal consideration of administrative, operational, and cultural elements to achieve and maintain maximum safety performance, with safety as a core business value. It is the only management system applying a continuous improvement process that begins with management leadership and commitment. The result is that safety becomes an integral management principle of the organization. This unique system provides the organized and structured means for ensuring that an organization, or a defined part of it, is capable of achieving and maintaining high standards of safety performance by aligning safety actions with business objectives.

W. STATE, COUNTY, AND MUNICIPAL HEALTH AGENCIES

State health departments adopt and enforce regulations and licensing requirements in areas such as radiation, nuclear medicine, infectious disease control, hazardous waste disposal, and food handling. In some states, health departments and the Joint Commission accredit hospitals through a joint effort. The state departments of health and the Joint Commission focus primarily on patient safety rather than worker safety. County and city health and fire departments may also have jurisdiction in food handling, fire safety, and other hospital functions.

SUMMARY

This chapter provided readers with a comprehensive overview of the many agencies and organizations involved in regulating, accrediting, or assisting healthcare organizations. The chapter addresses many of the voluntary standards, trade, and professional organizations relevant to healthcare. The chapter began by addressing federal administrative law procedures including the *Federal Register* and Code of Federal Regulations. It provided a comprehensive overview of OSHA and a survey of key EPA laws impacting healthcare facilities including RCRA requirements. The chapter also provided information about the FDA, NIOSH, CDC, and NRC. Because of this book’s strong emphasis on patient safety, the chapter also addressed the Agency for Health Care Research and Quality and the National Institutes of Health. Other federal agencies covered in the chapter include the Agency for Toxic Substances and Disease Registry, Health Resources Services Administration, Centers for Medicare and Medicaid Services, and the Department of Homeland Security. Legislative acts covered include the Safe Medical Devices Act, Clinical Laboratory Improvement Amendments, and Americans with Disabilities Act. Voluntary organizations addressed include the National Fire Protection Association, Safety Equipment Institute, Underwriters Laboratories, and American Society for Testing and Materials. Other organizations included in the text include the National Restaurant Association, National Sanitation Foundation, American Conference of Governmental Industrial Hygienists, and the Board of Certified Hazard Control and Healthcare Safety Management.
1. Explain the basic provisions of the Federal Register Act and the subsequent Administrative Procedure Act. How do these two laws work together to make government standards and rulemaking processes open to the public?

2. Explain the purpose of the U.S. Code.

3. List at least three of the key provisions of the Occupational Safety and Health Act of 1970.


5. Name at least five OSHA standards that have written program requirements.

6. What were the top three OSHA violations for hospitals in 2002? Nursing homes?

7. List and explain the six OSHA inspection priorities.

8. How does the EPA use the Resource Conservation and Recovery Act to improve environmental waste management?

9. What makes the Emergency Planning and Community Right-To-Know Act so vital to protecting human and environmental resources?

10. How does the Safe Medical Devices Act help improve the quality of patient care?

11. What legislation created the National Institute of Occupational Safety and Health (NIOSH).

12. What do NIOSH and OSHA have in common?

13. What role does the Nuclear Regulatory Commission play in healthcare safety?

14. What organization offers a professional certification in healthcare safety?
CHAPTER 5

EMERGENCY MANAGEMENT AND FIRE SAFETY

A. INTRODUCTION

This chapter provides an overview of emergency management as well as some detailed information on topics related to planning, mitigation, response, and recovery activities. The chapter also addresses community involvement, responses to potential terrorist events, fire safety management, life safety, and egress information relevant to healthcare organizations. The text presents information about fire drills, interim life safety, standards compliance, and storing flammable liquids. Fire and life safety compliance involves the entire healthcare facility, and this chapter presents some of the key concepts and principles of fire safety. Understanding this information will help reduce confusion and will allow the facility to continue to provide quality care during a fire emergency.

B. DEFINING EMERGENCIES

An emergency is defined here as an unplanned natural or manmade event that significantly disrupts care, impacts treatment, hinders normal operations, or places increased demands for services on the organization. Many people consider emergencies to be disasters if death or injury occurs. An emergency situation can arise within a facility or in the community. Healthcare organizations must develop, coordinate, and implement emergency management plans to ensure an appropriate response in any contingency. They should also conduct an event or hazard vulnerability analysis to identify any potential emergency situations that could occur. A good hazard vulnerability analysis will prioritize risks and drive the development of response, mitigation, and recovery efforts.

NFPA 1600-2004 Standard (Disaster Management, Emergency Management, and Business Continuity Programs) — The National Fire Protection Association (NFPA) Standards Council established the Disaster Management Committee during the early 1990s. The mission of the committee was to develop a document of recommended disaster management practices. The project resulted in a standard, published in 1995, that is known as the NFPA 1600 document. In 2000, the scope of NFPA 1600 was expanded beyond disaster management to include both emergency management and business continuity management. NFPA published the revised edition on April 1, 2004. The purpose of NFPA 1600 is to help the disaster management, emergency management, and business continuity communities to
cope with disasters and emergencies. NFPA 1600 establishes a common set of criteria for disaster management, emergency management, and business continuity programs. In addition, it identifies methodologies for exercising those plans and provides a listing of resource organizations within the fields of disaster recovery, emergency management, and business continuity planning. The American National Standards Institute (ANSI) is now recommending that NFPA 1600 be adopted as the national preparedness standard. The purpose of the standard is to assist organizations in planning to:

- Mitigate disasters and emergencies.
- Prepare for disasters and emergencies.
- Respond to disasters and emergencies.
- Recover from disasters and emergencies.

C. EMERGENCY MANAGEMENT AND PLANNING

Healthcare organizations, regardless of size or location, must:

- Focus their efforts on emergency readiness.
- Establish an emergency management planning committee and a disaster response team. Team members should include the hospital senior leadership, director of nursing, a physician, and support department representatives.
- Ensure that departments such as pharmacy, laboratory, emergency, social services, risk management, and public relations provide representation.
- Conduct a hazard vulnerability analysis to determine what events and hazards could take place in the facility and community.
- Develop a plan in response to findings during a hazard vulnerability analysis.
- Be sure that the plan addresses mass casualty situations, including terrorist events of a chemical, biological, or radiological nature. The plan should include risk management principles because of potential liabilities and risks identified prior to any event or disaster.
- Prepare and coordinate plans to help maintain a predictable environment of care during an emergency situation.
- Develop plans to guide responses for any situation. The plan must provide for a command structure to assess situations, coordinate actions, and make decisions and address mitigation, preparedness, response, and recovery actions.
- Focus on specific facility readiness elements that would ensure adequate organizational response.

Emergencies are natural or manmade events that significantly disrupt the environment of care or patient treatment and plan accordingly. Emergencies can be referred to as disasters or potential injury-causing events. They can occur within a facility or in the local community. An emergency event could require a healthcare organization’s services while at the same time significantly hindering its ability to provide those services. Refer to NFPA 1600 and NFPA 99 (Health Care Facilities); OSHA standard 29 CFR 1910.138, applicable accreditation standards; and Federal Emergency Management Agency (FEMA) publications for additional information and guidance.

The Written Plan — Each organization must develop, implement, and maintain a comprehensive written emergency management plan (see Table 5.1). Organizations should be careful not to copy another organization’s plan without validating and adapting it as necessary. The plan must outline the processes for emergency or disaster readiness to meet a number of contingencies. The scope of the plan will vary, depending on a number of factors:
Emergency Management and Fire Safety

Managing Under Emergency Conditions — The plan should provide processes for managing under emergency conditions, including activities related to care, treatment, or services, and should also address scheduling, modifying, or discontinuing services. The facility should develop policies for controlling information about patients, referrals, and transporting patients. Other important emergency management issues include:

- Support activities (e.g., housing, transportation, incident stress debriefing)
- Family support activities
- Logistics related to critical supplies such as food, linens, and water
- Security (e.g., facility access, crowd control, traffic control)
- Communication with the local or national news media

Community Disaster Planning — Healthcare organizations must adopt a community-wide perspective when planning for mass casualty incidents. Senior leaders must maintain good relationships with response agencies in the community including other area healthcare facilities. Clinics and nursing homes may play key roles in large disasters. Public health departments will usually institute appropriate public health interventions including immunizations and prophylactic antibiotics. Healthcare organizations should establish working relationships with all responders, including local emergency management agencies, law
enforcement personnel, and local fire officials. They should also coordinate their emergency management plan with the official responsible for the area-wide disaster plan. Healthcare organizations must work to help assess community health needs and available resources to treat evacuees from other areas. Many facilities store emergency materials and use a rotation system to ensure the availability of fresh medical supplies during an emergency.

It is important for healthcare organizations to make arrangements with suppliers to ensure the availability of critical utilities to meet high-priority emergency needs. The organization must determine community priorities based on their hazard vulnerability analysis, should clarify the organization's role during a community-wide emergency, and should make sure that its incident command system is consistent with that used by the community's command structure. At a minimum, healthcare organizations should identify:

- Elements of command structures and control centers for emergency response
- Names and roles of key command personnel
- Command center and local response agency telephone numbers
- Resources and assets that could potentially be shared in an emergency response

**OSHA and Community Response —** The Occupational Safety and Health Administration (OSHA) and Environmental Protection Agency (EPA) have regulations designed to help protect workers dealing with hazardous waste and emergency response activities. Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA) requires each state to establish a State Emergency Response Commission (SERC) to designate and coordinate the activities of local emergency planning committees (LEPCs), which develop community emergency management plans for responding to emergency contingencies involving facility owners, law enforcement, hospitals, emergency responders, and emergency medical personnel. The EPA generates these requirements and ensures that states implement emergency response planning programs. These same committees now play an even bigger role in planning for all emergencies, including terrorist activities. LEPCs coordinate with local hospitals to provide medical treatment to victims of emergency events. Hospitals accepting roles in responding to local emergencies should participate in the planning and coordinating activities of their representative LEPCs. SARA directs OSHA to establish a comprehensive rule to protect employee health and safety during hazardous waste operations and emergency response to releases of hazardous substances. OSHA published the Hazardous Waste Operations and Emergency Response (HAZWOPER) standard (29 CFR 1910.120) in 1990. This standard requires hospitals to plan for emergencies and protect their employees responding to events that involve hazardous materials, including biohazard events. Hospitals designated by a community emergency response plan to care for hazardous substance emergency victims must develop an emergency response plan, obtain adequate decontamination equipment, provide workers with the proper personal protective equipment, and conduct thorough training for all involved personnel. The emergency response section of 29 CFR 1910.120(q) outlines the required response elements. This plan must also meet Joint Commission on Accreditation of Healthcare Organizations (JCAHO) standards.

**Hospital Response to a Hazardous Substance Event —** The emergency response plan for hospitals involved in a community response to a hazardous substance incident should address the following elements:

- Pre-emergency drills implementing the hospital's emergency response plan
- Training involving the use of an Incident Command System with local response agencies
- Lines of authority and communication between the incident site and hospital personnel
• Designation of a decontamination team, including emergency and support personnel
• Details on how the hospital plans to access information on toxic materials
• Plan for managing emergency treatment of noncontaminated patients
• Decontamination procedures and designation of decontamination areas
• Hospital staff use of personal protective equipment, depending on hazards and duties
• Cross-contamination prevention of airborne hazards through the ventilation system
• Air monitoring to ensure safety of facility following decontamination activities

Coordinating the OSHA Emergency Response Plan — Hospitals designated by the local planning committee to provide medical assistance during community emergencies must actively coordinate such activities with local agencies. In addition, such a healthcare organization should:

• Define its role in the community emergency response plan.
• Coordinate all response elements, including operation of the incident command system.
• Train personnel on how to safely respond to events and potential hazards.
• Base training on the duties and responsibilities of each employee.
• Develop plans to maintain care of other patients in the emergency response system during decontamination activities.
• Verify how the incident command system plans to communicate with the hospital with regard to hazards and potential contaminants found at the incident site.
• Be sure that the hospital gains access to the local planning database that identifies hazardous or toxic materials that could pose risks during an emergency incident.

Training Employees for Community Emergency Response — OSHA’s HAZWOPER standard requires varying levels of training depending on the situation and hazardous materials involved. This performance standard gives organizations some flexibility in meeting the requirements. OSHA does not expect every person serving on emergency teams to receive highly specialized hazardous materials training. LEPCs should consider the hazards anticipated by a hazard vulnerability analysis. This determination should be based on worst-case scenarios, and responders must be adequately trained to perform their anticipated job duties.

Medical Personnel — Healthcare organizations should train the medical personnel who will decontaminate victims at the first-responder operations level (level 1) with an emphasis on the use of personal protective equipment (PPE) and decontamination procedures (refer to 29 CFR 1910.120(q)(6) for additional guidance). The employer must certify the training of all personnel to safely perform their job duties and responsibilities. This requirement includes a minimum of 8 hours of training or demonstrated competencies with an annual refresher. Hospitals may develop in-house training for decontamination and personal protective equipment usage. They must train personnel on how to prevent the spread of contamination to other facility locations. The hospital may also provide additional training in decontamination and PPE usage after sending personnel to a standard first-responder operations level course.

EMS Personnel — Train emergency medical services (EMS) personnel at the first-responder awareness level (level 2) as a minimum. No specific hourly minimum is required but the training must be sufficient or the employees must demonstrate proficiency in specific competencies with an annual refresher. EMS personnel with only awareness-level training should conduct the transport or treatment of contaminated patients. EMS personnel expected to transport or treat contaminated patients at the release area should be trained to the first-responder operations level (level 1).
Emergency Planners, Trainers, and Other Support Personnel — Personnel developing decontamination procedures, assisting with decontamination activities, or selecting PPE must receive training at the first-responder operations level, as well as additional training in decontamination procedures. Under life-threatening emergency situations, other hospital personnel may need to enter the decontamination area to monitor and treat victims. These employees may be considered skilled support personnel.

Emergency Department Staff — Members of the emergency department clinical staff, including any other hospital worker who might be exposed to hazardous substances during an emergency response incident, should be (1) familiar with how the hospital intends to respond to hazardous substance incidents, (2) trained in the appropriate use of PPE, and (3) required to participate in scheduled drills. The organization should train all hospital employees, including environmental services and laundry staff, to safely perform their assigned duties. Personnel cleaning up the decontamination area must be trained in accordance with 29 CFR 1910.120(q)(11). Clean-up personnel must have access to Material Data Safety Sheets (MSDSs) for those chemicals used in the process. The emergency response plan should include community resources for clean-up assistance.

Performing Emergency Response Drills — Emergency response drills should be considered an integral part of pre-emergency planning provisions. Title III of SARA requires emergency response drills to be part of a local contingency plan. JCAHO requires accredited hospitals to implement their response plans for casualty emergencies at least annually. These drills should also focus on compliance with 29 CFR 1910.120, not just JCAHO requirements.

Documenting Training — Employers must certify training with some form of written documentation. The hospital should also document its training plan for personnel who respond to hazardous substance incidents and contaminated victims in its emergency response plan.

Medical Facility and Clinical Staff Issues — Emergency situations may require physicians, nurses, and allied medical staff to provide extraordinary medical services to their communities. Healthcare organizations located in small towns, remote locations, or rural areas should develop a community-wide reserve staff of physicians, nurses, and other health care professionals by targeting retired medical personnel or those no longer working in healthcare. Any reserve staff should be augmented with nonclinical support staff, such as firemen and police officers, in noncritical care areas. The healthcare organization should also:

- Set up communication systems to meet both internal and external requirements.
- Stay in contact with local, state, and federal agencies.
- Have loudspeakers or bullhorns available for communicating with individuals gathered at the hospital during an emergency.
- Place direction and function signs within the facility to communicate with patients or to designate emergency areas.
- Ensure the proper functioning and lockdown capability of the following:
  - Auxiliary and backup power sources
  - Storage areas and tanks containing fuels for generating power
  - Negative air-pressure machines containing high-efficiency filters.
  - Water purification equipment
  - Designated areas for hospital personnel quarantine
  - Patient isolation and decontamination facilities
  - Backup or standby communication systems

Medical Supplies — Facilities located near transportation systems should maintain a 2-day supply of drugs and medical supplies. Remote and rural facilities should plan for maintaining at least a 3- to 5-day supply or more. Remote facilities should plan to obtain drugs and other
supplies from existing vendors, group purchasing organizations, other hospital systems, and state hospital associations. The CDC's National Pharmaceutical Stockpile can normally make drugs available within 24 to 48 hours after detection of a biological or chemical agent. The stockpile serves as a national repository of antibiotics, chemical antidotes, antitoxins, life-support medications, intravenous (IV) administration supplies, airway maintenance supplies, and medical and surgical items. The stockpile serves as a supplemental source of supplies and should not be considered a first-response source. State and local health officials can use the stockpile to help their response actions to a biological or chemical terrorism attack.

Model Emergency Planning Process

Step 1. Establish a Planning Team — The size of the planning team depends on facility operations, requirements, and resources. The organization should determine the active members, identify those who will serve in an advisory capacity, and attempt to provide representation from all relevant functional areas.

Step 2. Analyze Capabilities and Hazards — An effective hazard vulnerability analysis will identify possible hazards and emergencies, and organizations can refer to the results of such an analysis when determining their capabilities for handling emergencies. A review of internal plans and policies would include:

- Evacuation, egress, and fire protection plans
- Safety program, environmental policies, and security procedures
- Insurance requirements, finance records, and purchasing procedures
- Employee manuals, hazardous materials plans, and risk management plans
- Capital improvement programs and all mutual aid agreements

Step 3. Develop the Executive Summary — The executive summary serves as a blueprint for the planning team and addresses the following:

- Purpose and scope of the plan, including mitigation and recovery actions
- Description of the organizational emergency management responsibilities
- Authority and responsibilities of key personnel or positions
- Types of events that could occur as determined by the hazard vulnerability analysis
- Management process used for response and contingency operations
- Incident command structure and resources

Step 4. Developing the Plan

- Refer to OSHA requirements and JCAHO standards as appropriate during the development or revision process.
- Use information obtained from other federal agencies such as the Department of Homeland Security (DHS), Federal Emergency Management Agency (FEMA), National Institute for Occupational Safety and Health (NIOSH), and the Centers for Disease Control and Prevention (CDC).
- Obtain other information from the local emergency management agency; many times the local agency can provide written materials and manuals that can assist with plan development.
- Consider the following as core areas to address when developing the plan:
  - Direction and control
  - Communications
  - Life safety
  - Property protection
  - Community outreach
  - Recovery and restoration
  - Administration and logistics
Step 5. Coordinate and Implement the Plan

- Coordinate all elements of the plan with senior leaders, departments with responsibilities, and key personnel.
- Be sure to coordinate portions of the plan that could impact area-wide events with appropriate agencies.
- Address recommendations made during the vulnerability analysis process.
- Implement the completed or revised plan when all required personnel understand the specific responsibilities outlined.
- Understand that integrating the plan into facility operations and training staff members are vital to the implementation process.
- Make emergency management a part of the organizational culture.

Step 6. Plan Evaluation

- Evaluate all elements of the plan within 24 to 48 hours after each actual emergency or planned drill execution. Drill evaluations should expose problems and deficiencies in the master plan.
- Have key personnel and departments provide input using evaluation forms that compare actual responses during the event to required or necessary responses.
- Analyze all deviations and variances and submit the analysis to the final report planning committee, facility safety committee, and senior leaders.
- Modify the plan as needed to correct deviations or improve performance.
- Review the hazard vulnerability analysis at least quarterly.
- Validate the analysis on an annual basis; the hazard vulnerability analysis provides the foundation for the plan.

D. HAZARD VULNERABILITY ANALYSIS

- Select a qualified group to conduct a comprehensive hazard vulnerability analysis that will identify and rate all major potential emergency or disaster situations.
- Consider the impact a particular event could have on the need for healthcare services or how the event could hinder the ability to provide services.
- Establish priorities and rank each emergency situation identified by the hazard vulnerability analysis.
- Determine the organization's role in responding to community emergencies identified during the process.
- Use a vulnerability analysis chart to guide the process and help with assignment of probabilities by assessing resources and estimating an event's impact on the community or the organization.
- Use a simple numerical system to assess risks of an event — the lower the score the better.
- List all potential emergency situations, including those from community sources; for example:
  - Weather events, such as hurricanes, tornados, thunderstorms, floods, and drought
  - Hazardous material spills and transportation accidents
  - Earthquakes, wildfires, and mudslides
  - Terrorism and sabotage
  - Utility outages
  - Building collapses and trapped persons
  - Chemical releases and air or water contamination
  - Explosions or weapons of mass destruction
Geography, Demographics, and Politics — The plan should take into consideration the following as they might be related to particular events or hazards:

- Flood plains, seismic faults, and dams
- Location (e.g., near the coast, rural, remote)
- Companies that produce, store, use, or transport hazardous materials
- Major transportation routes, pipelines, airports, and nuclear power plants
- Large metropolitan areas with bridges and tunnels
- Nearby governmental, defense, and military facilities or installations
- National landmarks and historical places

Technology — The plan should define the role of technology in such events as:

- Fires, explosions, and hazardous materials incidents
- Safety system or telecommunications failures
- Computer or communication system failures
- Power failures, blackout, brownouts, or loss of other utilities
- Heating or cooling system failures
- Emergency notification system failures

Human Error Factors — Human factors that should not be overlooked include:

- Poor training or improper maintenance
- Carelessness or misconduct
- Substance abuse or fatigue

Physical Design of Buildings — Designs issues include:

- Physical construction of the facility
- Hazardous processes or byproducts
- Facilities for storing combustibles
- Layout of equipment
- Lighting
- Evacuation routes and exits
- Proximity of shelter areas

Regulatory Issues

- Prohibited access to the facility
- Loss of electric power
- Communication lines down
- Ruptured gas mains
- Water damage
- Smoke damage
- Structural damage

Estimating the Probability of an Emergency

- Use a simple scale (1 representing the lowest probability; 5, the highest) to rate the probability of an emergency.
- Assess the potential human impact issues.
- Analyze the potential human impact of an event with regard to the possibility of death or injury.
- Rate the potential human impact using a simple scale.
Assess the Potential Impact on Property

- Consider the potential for property losses and damages by assigning a rating using the same simple scale of 1 to 5.
- Consider the costs to replace, set up temporary replacements for, or repair the property.

Assess the Potential Operational Impact on the Organization — Healthcare facilities should assess the impact of a particular event by determining the:

- Degree of interruption or delay of providing care or medical treatment
- Need for critical medical and patient care supplies
- Resources needed to continue operations or support emergency responses
- Capability to respond to both internal and external community events
- Realistic role the facility will play in particular emergency situations

E. DRILLS AND TRAINING

Healthcare organizations must provide realistic training and education for all emergency response personnel and:

- Ensure that staff understand their roles and responsibilities, and validate that understanding during readiness drills.
- Use educational sessions to help reduce fear among hospital personnel responding to terrorist events.
- Train medical and hospital staff to report unexpected illness patterns to appropriate health departments or the CDC as appropriate.
- Work with the local public health department to coordinate education of the community to help alleviate public panic or hysteria.
- If possible, make a physician available to local media to provide updated information about medical issues.
- Make the public aware of changes in hospital treatment procedures.

Conducting Drills and Plan Activations

- Consider every worker, visitor, or patient as someone needing training, education, or helpful information; this could include employee discussion sessions to review procedures, providing technical training on equipment to emergency responders, or conducting evacuation drills.
- Conduct drills as required to evaluate the emergency management planning effectiveness.
- Conduct drills at least 4 months apart but no greater than 8 months apart.
- Evaluate emergency management plans by conducting drills at least semiannually in healthcare occupancies.
- Document an actual emergency situation or evaluate a planned drill.

Functions classified as a business occupancy by the Life Safety Code® (see later discussion) that do not offer emergency services or are designated as a disaster receiving station need to participate in only one emergency preparedness drill annually. Organizations that offer emergency services or are community-designated disaster receiving stations must conduct at least one drill that includes an influx of people. Organizations receiving casualties must participate in one community-wide drill annually relevant to emergencies identified in its hazard vulnerability analysis (where “community-wide” is defined as a contiguous geographic
area served by the same healthcare providers). Community-wide drills must include an influx of volunteers or simulated patients. Such drills should be relevant to the priorities identified by the hazard vulnerability analysis. Drill activations must evaluate the communication, coordination, and effectiveness of the organizational and community incident command structures. Healthcare organizations should use tabletop exercises for planning or training purposes only; tabletop exercises are not acceptable for documenting plan activation. Each drill should be critiqued to identify deficiencies to improve plan execution.

**Tabletop Exercise** — Members of the emergency response group meet to discuss components of the plan, including roles, responsibilities, and response actions. Such exercises are a cost-effective way to identify overlapping responsibilities and areas of confusion before an actual event or drill.

**Walk-Through Drill** — The emergency response group and dedicated teams actually perform their emergency response functions by conducting a paper coordination drill. Doing so can help identify problems before an actual event or planned drill exercise.

**Functional Drills** — Functional drills test specific functions such as medical response, emergency notifications, warnings, and communications procedures and equipment, though not necessarily at the same time. Personnel are asked to evaluate the systems and identify problem areas.

**Full Emergency Drill** — A full emergency drill is a simulated real-life activation in response to an emergency situation. This exercise can involve casualties, emergency response staff, support employees, senior management, and appropriate community response organizations.

**Training** — (See Table 5.2.)

- Conduct ongoing training to ensure the execution of the plan in emergency situations.
- Carefully observe plan implementation and thoroughly debrief the staff.
- Focus on execution issues, training deficiencies, and problem areas.
- Be sure the evaluation team did not plan and execute the plan.
- Never gloss over real problems and overemphasize the good points.
- Address each identified problem through training, education, reassignment, equipment upgrades, or revising planning documents.

<table>
<thead>
<tr>
<th>TABLE 5.2 General Emergency Drill Training Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individual roles and responsibilities</td>
</tr>
<tr>
<td>Threats, hazards, and protective actions</td>
</tr>
<tr>
<td>Notification, warning, and communications procedures</td>
</tr>
<tr>
<td>Locating family members in an emergency</td>
</tr>
<tr>
<td>Emergency response procedures</td>
</tr>
<tr>
<td>Evacuation, shelter, and accountability procedures</td>
</tr>
<tr>
<td>Location and use of common emergency equipment</td>
</tr>
<tr>
<td>Emergency shutdown procedures</td>
</tr>
</tbody>
</table>

*Note: Use scenarios identified by the vulnerability analysis.*
F. PLAN EVALUATION AND REVISION

Healthcare organizations should conduct formal audits of their emergency response plans at least once a year. During the evaluation process, the organization should:

- Consider ways to improve management involvement in evaluating the plan.
- Determine if the drills addressed problem areas identified in the hazard analysis.
- Be sure the plan reflects lessons learned from drills and actual events.
- Determine if emergency team and key leaders understand their respective responsibilities.
- Determine the number of new members receiving training since the last review.
- Be sure the plan reflects any changes in the physical layout of the facility or new processes.
- Determine how well the emergency management training meets established objectives.
- Verify that the plan contains current names, titles, agencies, and contact numbers or methods.
- Be sure community agencies and organizations receive briefings and updates on the plan.

Other Times To Modify the Plan — In addition to a yearly audit, healthcare organizations should evaluate and modify their plans at these times:

- After each training drill or exercise
- After each emergency
- When personnel or their responsibilities change
- When the layout or design of the facility changes
- When policies or procedures change

Organizations must remember to brief personnel on changes to the plan.

Incident Command System — Coordination of the emergency plan requirements remains the key element for ensuring effective responses to disaster situations. Emergency planning directors should become familiar with the authority, organization, and emergency procedures that become effective in case of an emergency. As a result of the development of the Hospital Emergency Incident Command System (HEICS) during the late 1990s, healthcare organizations realized the need for a command structure during emergencies (see Table 5.5). As an emergency management system, HEICS employs a logical management structure, defined responsibilities, clear reporting channels, and common terms to unify hospitals and other emergency responders. Emergency management response plans directing the use of an Incident Command System (ICS) share many organizational qualities used by other agencies; for example, the Department of Homeland Security recently released a National Incident Command System (NICS). The ICS establishes five basic functional areas of management during a major incident: (1) command, (2) operations, (3) planning, (4) logistics, and (5) finance/administration. The system coordinates responses for incidents involving multiple jurisdictions or agencies, retains the principle of unified command for coordinating the efforts of many jurisdictions, and ensures joint decisions in the areas of objectives, strategies, plans, priorities, and public communications.

Incident Commander Responsibilities — Incident commander duties are assigned to certain positions, not specific individuals. The incident commander must maintain emergency command center effectiveness and maintain communications and security. Key duties include providing public information and media releases, as well as coordinating facilities. Other responsibilities include sheltering, feeding, and counseling as needed. The incident
commander must also oversee establishing a morgue and making emergency medical services available as needed.

**National Incident Management System** — The National Incident Management System (NIMS) became active in 2004 and outlines a standard incident management organization. This national system strengthens the country’s response capabilities by identifying and integrating core elements. The system balances flexibility and standardization by using common doctrine, terminology, concepts, principles, and processes to execute response actions during a real incident. The new system allows responders to focus more on the actual response than on organizing the response. The system promotes teamwork and assignments among all authorities. The NIMS will continue to provide guidance for those managing responses to terrorism, natural disasters, and other emergencies.

**Preparedness** — The NIMS focuses on responder readiness to manage and conduct incident actions by coordinating such activities before an event. It recognizes the importance of planning, training, conducting exercises, qualification, certification, equipment acquisition, and publication management. Preparedness incorporates mitigation activities such as public education, enforcement of building standards and codes, and preventive measures to lessen the loss of life or property.

**Communications and Information Management** — Maintaining standardized communications during an event can prove invaluable. The NIMS prescribes interoperable communications systems for both incident and information management. Responders and managers in all agencies and jurisdictions must have a common operating picture for a more efficient and effective incident response.

**Joint Information System** — The national system provides measures to enhance public communication efforts, while the Joint Information System (JIS) provides the public with timely, accurate, and consistent incident information. This system employs joint information centers and brings incident communicators together during an incident to develop, coordinate, and deliver a unified message. This ensures that federal, state, and local governments release the same information during an incident.

**NIMS Integration Center** — The NIMS Integration Center (NIC) ensures that the national system remains an accurate and effective management tool. The NIC was established by the Secretary of Homeland Security to assess any proposed changes to the NIMS. The center will provide strategic direction and oversight supporting routine maintenance and continuous improvement efforts; will develop and facilitate national standards for education and training, first-responder communications, equipment, typing of resources, qualification, and credentialing of incident management and responder personnel; and will also ensure standardization of equipment, maintenance, and resources.

**TABLE 5.3 Benefits of an Effective Hospital Emergency Incident Command System (HEICS)**

<table>
<thead>
<tr>
<th>Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Predictable chain of management accountability</td>
</tr>
<tr>
<td>Organizational chart that allows flexible responses to specific emergencies</td>
</tr>
<tr>
<td>Improved documentation of facility issues</td>
</tr>
<tr>
<td>Use of common language to facilitate outside assistance</td>
</tr>
<tr>
<td>Prioritized response checklists</td>
</tr>
<tr>
<td>Cost-effective emergency planning</td>
</tr>
</tbody>
</table>
G. EVACUATION PLANNING

Training for each type of disaster is essential in developing a good evacuation control plan. The plan should:

- Specify procedures for evacuating the entire facility both horizontally and vertically.
- Detail how to identify care providers and other personnel during emergencies.
- Create a priority listing of institutions or facilities to which the patients or residents will be evacuated.
- Specify the locations that will serve as staging areas pending further decisions.
- Address procedures covering the movement of patients and residents from special care areas.

The healthcare organization must:

- Ensure that the plan provides processes for establishing alternative care sites to meet the needs of those evacuated.
- Consider transporting patients, staff, and equipment to the designated alternative care sites when the environment cannot support adequate care, treatment, or services; this type of action would require meeting the needs of patients, including providing medications and maintaining medical records.
- Develop procedures to track the status and location of all patients.
- Maintain communication between the organization and alternative care sites.

Developing an Evacuation Procedure

- Determine situations that could require patient evacuation actions.
- Establish a clear chain of command to coordinate and direct the process.
- Designate evacuation coordinators to assist with the evacuation.
- Develop specific evacuation procedures.
- Establish a system for accounting for personnel.
- Plan for employee transportation needs for community-wide evacuations.
- Develop procedures for assisting persons with disabilities.
- Plan to communicate to those who may not speak English.
- Outline major post-evacuation procedures.
- Designate personnel to continue or shut down critical operations.
- Coordinate plans with the local emergency management agency.

Assembly Areas and Accountability — Healthcare organizations must plan to obtain an accurate count of personnel after completion of the evacuation, designate assembly areas where personnel should gather after evacuating, and take a head count after the evacuation. The names and last known locations of patients or employees not accounted for should be given to the incident command center. The organization should also establish a method for accounting for nonemployees, such as suppliers and visitors. The emergency plan must consider disabled visitors and employees. The Americans with Disabilities Act (ADA) defines a disabled person as anyone who has a physical or mental impairment that substantially limits one or more major life activities, such as seeing, hearing, walking, breathing, performing manual tasks, learning, caring for oneself, or working. Good procedures and training can help avoid confusion in the assembly areas, whereas poor evacuation planning can lead to unnecessary and dangerous search or rescue operations by responders. It is important to establish procedures for further evacuation in case the scope of the incident expands.
H. COMMUNITY INVOLVEMENT

A facility’s relationship with the community will influence its ability to protect personnel and property during emergency operations. It is essential for healthcare organizations to maintain a dialog with community leaders, first responders, government agencies, community organizations, and utility companies. To avoid confusion and conflict in an emergency, mutual-aid agreements with local response agencies and businesses should be developed. These agreements should define the type of assistance needed, specify procedures for activation, and outline communication procedures. Community groups or agencies could include the following:

- Appointed and elected community leaders
- Fire, police, and emergency medical services personnel
- Local emergency planning committee
- Emergency management director
- Public works department
- American Red Cross
- Other hospitals and healthcare facilities
- Telephone company
- Electric and gas utility companies
- Neighborhood and community action groups

Citizen’s Protection Guide — To help individuals prepare for disasters, the FEMA publication entitled Are You Ready? A Guide to Citizen Preparedness (FEMA Publication H-34) brings together disaster survival techniques, disaster-specific information, and pointers on how to prepare for and respond to both natural and manmade disasters. The guide details opportunities for every citizen to become involved in safeguarding their neighbors and communities through the Citizens Corps initiative and community emergency response team training program. In community-wide emergencies, business and industry are often asked to assist the community with:

- Personnel, equipment, shelter, and feeding facilities
- Training, storage, and command facilities
- Food, clothing, building materials, funding, and transportation

Media Relations — With respect to the media, it is important to:

- Develop plans for coordinating with the media, who provide the most important communication link to the public.
- Outline procedures for senior management personnel to handle media issues.
- Develop a sample statement for informing the media about the emergency or disaster situation as soon as possible.
- Develop a call or inquiry log to track all inquiries from the media; media communication becomes very complex when considering privacy issues and the requirements of the Health Insurance Portability and Accountability Act (HIPAA).
- Develop and maintain positive relations with media outlets in the area.
- Determine the best methods for communicating important public information through the media during an emergency.
- Designate a trained spokespersons to deal with the media face to face.
- Establish a media briefing area with established security procedures.
- Establish procedures for ensuring the accuracy and completeness of all information approved for public release.
• Determine an appropriate method of communicating technical or medical information.
• Prepare a background and information packet about the facility for distribution as needed.
• Provide information to the media considering the following protocols:
  • Give all media equal access to information.
  • As appropriate, conduct press briefings and interviews.
  • Give local and national media equal time.
  • Try to observe media deadlines.
  • Keep records of all released information.
  • Provide press releases when possible.
  • Do not speculate about the incident.
  • Never permit unauthorized personnel to release information.
  • Do not cover up facts or mislead the media.
  • Never assign blame for the incident.

Note: Press releases about facility-generated emergencies should describe the incident and include “what,” “when,” and “where.” Describe the “why” and “how” when they are known and confirmed.

I. HAZARDOUS MATERIAL EMERGENCIES

Hazardous materials can exhibit any number of characteristics depending on the substance. A hazardous material spill or release can pose risk to life, health, or property. The federal laws that regulate hazardous materials include the Superfund Amendments and Reauthorization Act (SARA) of 1986, Resource Conservation and Recovery Act (RCRA) of 1976, Hazardous Materials Transportation Act (HMTA), Occupational Safety and Health Act, Toxic Substances Control Act (TSCA), and Clean Air Act (CAA). Title III of SARA regulates the packaging, labeling, handling, storage, and transportation of hazardous materials. The law requires facilities to furnish information about the quantities and health effects of materials used at the facility and to promptly notify local and state officials whenever a significant release of hazardous materials occurs. Hospitals must plan for off-site incidents that could require medical services or directly affect providing services. Because hospitals and healthcare facilities can experience hazardous material releases or spills (e.g., formaldehyde, ethylene oxide, xylene, benzene), it is important for them to:

• Identify and label all hazardous materials stored, handled, produced, and disposed of by the facility, following applicable government regulations.
• Obtain Material Safety Data Sheets (MSDS) for all hazardous materials at the facility.
• Coordinate with emergency agencies when developing response procedures.
• Educate employees to recognize and report hazardous material spills and releases.
• Train employees in proper handling and storage.
• Develop a hazardous material spill response plan.
• Establish procedures to notify management and emergency response organizations.
• Implement procedures for warning employees of an incident.
• Establish evacuation procedures.
• Depending on the facility’s operations, organize and train an emergency response team to confine and control hazardous material spills in accordance with applicable standards (e.g., OSHA’s 29 CFR 1910.120).
• Identify other facilities in the area that use hazardous materials.
• Determine whether an incident could affect the healthcare facility.
Emergency Management and Fire Safety

• Identify highways, railroads, and waterways near the facility that are used for the transportation of hazardous materials and determine how a transportation accident near the facility could affect operations.

Responding to Hazardous Material Incidents (29 CFR 1910.120) — The Occupational Safety and Health Administration requires any facility engaged in storing, treating, and disposing of hazardous wastes to meet the requirement of 29 CFR 1910.120. This standard outlines training requirements in Appendix E, which follows guidelines issued by the EPA concerning contingency planning and emergency response actions (see Table 5.4). Healthcare facilities should evaluate their hazards and provide training at the appropriate level.

Chemical Decontamination and Treatment — Hospitals must develop plans to respond to hazardous material emergencies occurring in industrial or agriculture settings. Although the situations could be similar, these procedures should not address incidents of terrorism. Responding to terrorism events should be addressed in separate planning documents. Emergency departments should know their responsibilities for treating persons exposed to hazardous materials in work-related events. Consider the following important issues:

• Contact a predesignated resource center such as the regional poison control center or Agency for Toxic Substances and Disease Registry (ATSDR) for information regarding definitive care procedures, including decontamination methods.
• Make ambulance personnel aware of any special approach or entrance to the emergency department.
• Normally, do not transport the patient into the emergency department until the patient has been assessed and accepted by the treating physician; a victim could be transported to the emergency department unannounced or in a private vehicle.
• Set a decontamination area outside the ambulance entrance; some hospitals may have designated indoor decontamination areas due to extreme weather conditions.
• Isolate the victim from other patients.
• Assess and decontaminate as soon as possible.

Pre-Arrival Actions

• Develop a checklist of information for communication center personnel to help initiate appropriate actions.
• Attempt to document the following:

<table>
<thead>
<tr>
<th>TABLE 5.4  OSHA Emergency Response Plan Elements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-emergency planning with outside parties</td>
</tr>
<tr>
<td>Personnel roles, lines of authority, training, and communication</td>
</tr>
<tr>
<td>Emergency recognition and prevention</td>
</tr>
<tr>
<td>Safe distances and places of refuge</td>
</tr>
<tr>
<td>Site security and control procedures</td>
</tr>
<tr>
<td>Evacuation routes and procedures</td>
</tr>
<tr>
<td>Decontamination and emergency medical treatment procedures</td>
</tr>
<tr>
<td>Emergency alerting and response procedures</td>
</tr>
<tr>
<td>Personal protective equipment and emergency equipment</td>
</tr>
<tr>
<td>Use of local and state plans by local emergency organizations</td>
</tr>
</tbody>
</table>
• Type and nature of incident and caller’s telephone number
• Number of patients and signs or symptoms being experienced
• Nature of other injuries
• Name of chemical involved and extent of patient decontamination in the field
• Estimated time of arrival

Managing Hazardous Material Incident Guidelines — The ATSDR has published hazardous materials response guidelines in a three-volume set that offers recommendations for on-scene emergency response personnel, hospital emergency departments, and medical management for the treatment of patients exposed during a hazardous materials incident. (Contact ATSDR at 1-888-422-8737 to order a free set of the guidelines.) The guidelines explain to emergency personnel how to appropriately decontaminate and treat victims, what follow-up care they should recommend to exposed persons, and measures they should take to protect themselves. Following is a summary of information contained in the publication:

• Volume II, *Hospital Emergency Departments: A Planning Guide for the Management of Contaminated Patients*, provides planning guides to assist hospital emergency department personnel in planning for incidents that involve hazardous materials.
• Volume III, *Medical Management Guidelines (MMGs) for Acute Chemical Exposures*, provides guides for healthcare professionals who treat persons exposed to hazardous materials.

In addition, ATSDR has available the video “Community Challenge: Hazardous Materials Response.”

### J. WEATHER AND NATURAL DISASTERS

An emergency plan assumes that most disasters occur with very little warning and carry the potential for substantial destruction. Healthcare facilities must plan to respond and recover from any emergency situation, including natural disasters. This section provides an overview of most natural disasters, such as tropical storms, flood, earthquakes, and wildfires.

**Tropical Storms** — The National Weather Service is responsible for issuing warnings when hurricanes appear to be a threat to the U.S. mainland, Puerto Rico, the Virgin Islands, Hawaii, and the Pacific Territories. As soon as conditions intensify to the tropical storm level, even if 1000 miles or more from the mainland, the storm is given a name, and the Weather Service begins issuing advisories. The advisories are issued every 3 hours, or more frequently as the storm nears land. Location, wind intensity, speed, and direction are given. As a hurricane moves toward the mainland, hurricane watch notices are issued. Authorities issue tropical storm warnings to areas that are expected to receive gale-force winds of greater than 40 mph.

**Hurricane Watch**

• A hurricane is possible within 24 to 36 hours.
• Residents should tune to local radio and television stations for information.
• Residents should stay tuned for additional advisories.
• Evacuation may be necessary.
Hurricane Warning

- Residents should take precautions, as a hurricane will hit land within 24 hours.
- Residents should expect a combination of dangerously high water and very rough seas.
- Winds will exceed 74 mph and could reach 160 mph.

Hurricanes produce torrential rains and a storm surge of ocean water. They can continue inland for hundreds of miles and spawn tornadoes and thunderstorms. The hurricane season lasts from June through November.

Planning and Preparations

- Check with the local emergency management office for community evacuation plans.
- Establish facility shutdown or evacuation procedures.
- Develop warning and evacuation procedures.
- Make plans for assisting employees who may need transportation.
- Plan for communicating with employees' families before and after a hurricane.
- Be prepared to tune to NOAA Weather Radio (using a radio with warning alarm tone and battery backup) for updates.
- Survey the facility and plan to protect outside equipment and structures.
- Plan to protect windows; permanent storm shutters offer the best protection, but cover windows with 5/8-inch marine plywood if necessary.
- Use portable pumps to remove floodwater.
- Plan for backup power sources such as generators or gasoline-powered pumps.
- Install battery-powered emergency lighting.
- Prepare to move records, computers, and other items to another location.

Thunderstorms — A severe thunderstorm is capable of producing frequent lightning, damaging winds of greater than 50 mph, hail 1/2 inch or more in diameter (about the size of a dime), and heavy rain. A severe thunderstorm watch indicates the possibility of tornadoes or thunderstorms, as well as frequent lightning, hail, and strong winds (see Table 5.5).

Tornadoes — Tornadoes are violent local storms with whirling winds that can exceed 300 mph. An individual tornado appears as a rotating, funnel-shaped cloud that extends toward the ground from the base of a thundercloud varying from gray to black in color. A tornado spins like a top and may sound like the roaring of an airplane or locomotive. These short-lived storms are the most violent of all atmospheric phenomena. The width of a tornado path generally ranges from 200 yards to 1 mile. They can travel 5 to 50 miles along the ground at speeds of 30 to 75 mph. Tornadoes sometimes reverse or move in circles. Others remain motionless for a while before moving on. Tornadoes can occur in every state but primarily in the central plains and southeastern United States. The best protection is to seek shelter in an underground area. In buildings without basements, interior hallways on the lowest floor can serve as tornado shelter areas. Healthcare organizations should:

- Schedule periodic drills to be sure that employees know where and how to best protect themselves.
- Continuously monitor news broadcasts following a tornado watch announcement.
- Direct actions to ensure the safety of patients, residents, visitors, and employees when a tornado warning is issued.
- Instruct everyone to take shelter immediately, crouch down, and cover their heads with their arms.
- Close all doors to outside rooms.
- Check all damaged facilities for survivors after a tornado.
- Avoid downed power lines, check for gas leaks, and contain small fires.
Floods — Except for flash flooding due to thunderstorms, coastal storms, or dam failure, the onset of most floods is a relatively slow process with adequate warning, as the buildup usually occurs over several days. Floods are the most common and widespread of all natural disasters. Many communities in the United States experience some degree of flooding after spring rains, heavy thunderstorms, or winter snow thaws. Most floods develop slowly over a period of days, but flash floods are walls of water that develop in a matter of minutes. Flash floods can be caused by intense storms or dam failure. A flood watch indicates that a flood could occur with little notice. During a flood watch, facilities should monitor the latest weather information and be prepared to evacuate. A flood warning indicates that flooding currently exists or will occur soon. In this case, facilities should take precautions at once and be prepared to go to higher ground. If necessary, the facility should be evacuated immediately.

Flood Emergency Planning — Consider the following when preparing for floods:

- Ask the local emergency management office whether the healthcare facility is located in a flood plain. Investigate the history of flooding in the area and find out the elevation of the facility in relation to streams, rivers, and dams.
- Review the community's emergency plan.
- Learn the community's evacuation routes.
- Know where to find higher ground in case of a flood.
- Establish warning and evacuation procedures for the facility.
- Make plans for assisting employees who may need transportation.
- Inspect areas in the facility subject to flooding.

TABLE 5.5  Severe Weather Planning Considerations

| Use a weather radio with a warning alarm and backup battery. |
| Remember that a tornado watch means that tornadoes could occur in or near the watch area and a tornado warning indicates a visible sighting or detection by radar. |
| Stay tuned to radio and television stations for additional information. |
| Establish procedures to inform personnel when tornado warnings are posted. |
| Evaluate the need for spotters to look out for approaching storms. |
| Be aware that adults require about 6 square feet of space; however, nursing-home residents and hospital patients require more space. |
| Remember that the best protection in a tornado can usually be found in an underground area. |
| Consider small interior rooms on the lowest floor and without windows as alternatives to underground areas. |
| Use a hallway on the lowest floor, away from doors and windows. |
| Go to a room constructed with reinforced concrete, brick, or block. |
| Look for rooms with a solid roof system and no windows. |
| Look for any protected areas away from doors and windows. |
| Do not consider auditoriums, cafeterias, or gyms to be safe places. |
| Evacuate personnel away from lightweight modular offices or mobile buildings. |
| Conduct tornado drills. |
| Tell personnel to protect their heads with their arms and crouch down. |
| Contact the local emergency management office or National Weather Service office for guidance with regard to determining the best shelter areas |

Floods — Except for flash flooding due to thunderstorms, coastal storms, or dam failure, the onset of most floods is a relatively slow process with adequate warning, as the buildup usually occurs over several days. Floods are the most common and widespread of all natural disasters. Many communities in the United States experience some degree of flooding after spring rains, heavy thunderstorms, or winter snow thaws. Most floods develop slowly over a period of days, but flash floods are walls of water that develop in a matter of minutes. Flash floods can be caused by intense storms or dam failure. A flood watch indicates that a flood could occur with little notice. During a flood watch, facilities should monitor the latest weather information and be prepared to evacuate. A flood warning indicates that flooding currently exists or will occur soon. In this case, facilities should take precautions at once and be prepared to go to higher ground. If necessary, the facility should be evacuated immediately.

Flood Emergency Planning — Consider the following when preparing for floods:

- Ask the local emergency management office whether the healthcare facility is located in a flood plain. Investigate the history of flooding in the area and find out the elevation of the facility in relation to streams, rivers, and dams.
- Review the community’s emergency plan.
- Learn the community’s evacuation routes.
- Know where to find higher ground in case of a flood.
- Establish warning and evacuation procedures for the facility.
- Make plans for assisting employees who may need transportation.
- Inspect areas in the facility subject to flooding.
• Identify records and equipment that can be moved to a higher location.
• Make plans to move records and equipment in case of flood.

Flood Damage Prevention Measures — Regular property and casualty insurance does not cover flooding; thus, healthcare organizations should consider the feasibility of taking flood-proofing measures before a flood, such as:

• Filling windows, doors, or other openings with water-resistant materials such as concrete blocks or bricks (this approach assumes that the structure is strong enough to withstand flood waters)
• Installing check valves to prevent water from intruding where utility and sewer lines enter the facility
• Reinforcing walls to resist water pressure
• Sealing walls to prevent or reduce seepage
• Building watertight walls around equipment or work areas within the facility that are particularly susceptible to flood damage
• Constructing flood walls or levees outside the facility to keep flood waters away
• Elevating the facility on walls, columns, or compacted fill (most applicable to new construction, although many types of existing buildings can be elevated)

Contingent floodproofing measures can also be taken before a flood but require some additional action when flooding occurs. These measures include:

• Installing watertight barriers (flood shields) to prevent the passage of water through doors, windows, ventilation shafts, or other openings
• Installing permanent watertight doors
• Constructing movable flood walls
• Installing permanent pumps to remove flood waters

Winter Storms — Severe winter storms bring heavy snow, ice, strong winds, and freezing rain. Winter storms can prevent employees and customers from reaching the facility, leading to a temporary shutdown until roads are cleared. Heavy snow and ice can also cause structural damage and power outages. Winter storms vary in size and intensity. A winter storm watch indicates that severe winter weather conditions may affect the area. The storm could produce freezing rain, sleet, or heavy snow. A winter storm warning indicates the approach of severe winter weather conditions. To summarize:

• A high wind watch indicates that sustained winds of at least 40 mph, or gusts of 50 mph or greater, are expected to last for at least 1 hour (in some areas, such a watch can mean strong gusty winds occurring over a shorter time period).
• A heavy snow warning indicates that snowfalls of at least 4 inches in 12 hours or 6 inches in 24 hours are expected (heavy snow can mean lesser amounts where winter storms are infrequent).
• A blizzard warning indicates the possibility of sustained wind speeds of at least 35 mph accompanied by considerable falling and blowing snow; visibility is dangerously restricted.
• A traveler's advisory indicates that falling, blowing, or drifting snow; freezing rain; drizzle; sleet; or strong winds may make driving difficult.

Planning Considerations

• Listen to weather radio frequencies, local radio stations, or television broadcasts for the latest information.
• Establish procedures for emergency facility operations.
• Store food, water, blankets, battery-powered radios with extra batteries, and other emergency supplies for employees who become stranded at the facility.
• Provide a backup power source for critical operations.
• Arrange for snow and ice removal from parking lots, walkways, and roads.
• Implement recalls and ensure staffing to maintain care environments.

Wildfires — Healthcare organizations located in areas where wildfires can pose great threats must develop procedures to address the risks to the facility’s operation. In some western states, wildfires can be a highly probable event and should be addressed by the hazard vulnerability analysis. The National Interagency Fire Center (NIFC) in Boise, ID, serves as the country’s support center for wildland firefighting. Seven federal agencies from the Departments of the Interior, Agriculture, and Commerce make up the fire center. These agencies work together to exchange protection responsibilities, information, and training to provide efficient means for protecting lives, property, and natural resources from fire. The NIFC website provides information on safety training, safety advisories, and fire incident reporting.

Earthquakes — Earthquakes can seriously damage buildings and their contents; disrupt gas, electric, and telephone services; and trigger landslides, avalanches, flash floods, fires, and huge ocean waves known as tsunamis. Aftershocks can occur for weeks following an earthquake. In many buildings, the greatest danger to people in an earthquake is when equipment and nonstructural elements such as ceilings, partitions, windows, and lighting fixtures shake loose. Earthquakes occur most frequently west of the Rocky Mountains, although historically the most violent earthquakes have occurred in the central United States. Earthquakes occur suddenly and without warning. It is important for healthcare facilities to assess their vulnerability to earthquakes. They should ask local government agencies for seismic information for their area and should have their facilities inspected by structural engineers. In addition, they should develop and prioritize such strengthening measures as:

• Adding steel bracing to frames
• Adding sheer walls to frames
• Strengthening columns and building foundations
• Replacing unreinforced brick filler walls

Facilities should follow all safety codes when constructing a facility or making major renovations, being sure to:

• Inspect nonstructural systems such as air conditioning, communications, and pollution-control systems to assess the potential for damage; prioritize measures to prevent damages.
• Inspect the facility for any item that could fall, spill, break, or move during an earthquake, taking steps to reduce these hazards:
  • Move large and heavy objects to lower shelves or the floor.
  • Hang heavy items away from where people work.
  • Secure shelves, filing cabinets, tall furniture, desktop equipment, computers, printers, copiers, and light fixtures.
  • Secure fixed equipment and heavy machinery to the floor; larger equipment can be placed on casters and attached to tethers attached to the wall.
• Add bracing to suspended ceilings, if necessary.
• Install safety glass where appropriate.
• Secure large utility and process piping.
• Keep copies of design drawings of the facility to be used in assessing the facility’s safety after an earthquake.
• Review processes for handling and storing hazardous materials; store incompatible chemicals separately.
• Ask the facility’s insurance carrier about earthquake insurance and mitigation techniques.
• Establish procedures to determine the need for evacuation actions.
• Designate areas in the facility away from exterior walls and windows where occupants should gather after an earthquake if an evacuation is not necessary.
• Conduct earthquake drills.

Provide Safety Information
• If indoors, stay there.
• Take cover under a sturdy piece of furniture or counter, or brace yourself against an inside wall; protect your head and neck.
• If outdoors, move into the open, away from buildings, streetlights, and utility wires.
• After an earthquake, stay away from windows, skylights, and items that could fall.
• Do not use the elevators.
• Use stairways to leave the building if it is determined that a building evacuation is necessary.

K. OTHER EMERGENCY SITUATIONS

Technological Emergencies — Technological emergencies include any interruption or loss of a utility service, power source, life-support system, information system, or equipment required to keep the business in operation. Healthcare facilities should identify all critical operations, including:

- Utilities (e.g., electric power, gas, water, hydraulics, compressed-air, municipal and internal sewer systems, wastewater treatment services)
- Security and alarm systems; elevators; lighting; life-support systems; heating, ventilation, and air-conditioning systems; electrical distribution system
- Manufacturing and pollution-control equipment
- Communications systems, both data and voice computer networks
- Transportation systems (air, highway, railroad, and waterway)

It is important for facilities to:

- Determine the impact of service disruption.
- Ensure that key safety and maintenance personnel are thoroughly familiar with all building systems.
- Establish procedures for restoring systems.
- Determine the need for backup systems.
- Develop preventive maintenance schedules for all systems and equipment.

Transportation Accidents — The U.S. Department of Transportation (DOT) regulates the movement of hazardous chemicals. When hazardous chemicals that would pose a significant hazard to the public if released from their packing are transported interstate, they must be clearly labeled with the appropriate identifications and cautions. Shipping papers identifying the hazardous material being transported are required to be in the vehicle or vessel. Major transportation accidents often cause chemical spills, fires, explosions, and other problems that call for special operations such as rescue and evacuation. Usually, transportation accidents affect only relatively small areas and involve only a small number of people.
Regardless of the type of transportation accident, the first consideration should be to save lives. This can be accomplished through quick response and coordination with emergency services, local police, fire, and medical services.

**Public Demonstrations or Civil Disturbances** — Recent years have witnessed a variety of demonstrations in many locations throughout the country. Some demonstrations have developed slowly, allowing authorities to assess the problem, conduct negotiations with the organizers, and arrange for control measures. On other occasions, violence may flare up with little advance notice, but even these incidents are usually preceded by earlier indications of a buildup of tensions and pressures. In a situation where there is a sudden eruption of violence, accompanied perhaps by attempted arson and assaults, company security personnel usually will be involved initially and will serve as the source of information regarding the characteristics and extent of the disturbance. They should cooperate completely with local law enforcement agencies, which will provide the information needed to make appropriate decisions. An effective employee notification and recall system is a must.

**Planning for Sabotage** — No facility is immune to sabotage; however, the most likely targets for sabotage can usually be determined with reasonable accuracy. The saboteur will generally look for a target that is critical, vulnerable, accessible, and at least partially conducive to self-destruction. Saboteurs in general are foreign agents, disgruntled employees who commit sabotage for revenge, or individuals who are mentally ill or have been swayed by enemy propaganda. Sabotage may be linked to, or be another form of, terrorism.

**L. TERRORISM AND WEAPONS OF MASS DESTRUCTION**

Some examples of terrorist groups include certain ethnic groups, separatists, radical political organizations, racist groups, or issue-oriented groups. Acts of terrorism are usually directed at key assets of an organization, system, or physical plant, the loss of which could have significant economic or social impact. Potential targets of terrorist acts can be civilian or military government facilities, industries (especially those that are part of the military-industrial complex or have high economic impact), financial institutions, infrastructure systems (mass transit, telecommunications, energy, etc.), storage installations for explosive devices, sports or special event venues, schools, hospitals and clinics, shopping centers (or places with large groups of people), and places of historical or symbolic significance. The following definitions might be helpful:

- **Terrorism** — Unlawful use of force against persons or property to intimidate or coerce a government, the civilian population, or any segment thereof in the furtherance of political or social objectives.
- **Domestic terrorism** — Acts directed at elements of the U.S. government or population without foreign direction.
- **International terrorism** — Foreign-based terrorism directed by countries or groups outside the United States.

**Planning for Terrorism** — Compared with other facility emergencies, the covert and criminal nature of terrorism, including bombing incidents, bomb threats, and the taking of hostages, is a highly complex problem for healthcare management and emergency service personnel. Appropriate action should be taken in each case to provide for the safety of patients, employees, visitors, and property.
**Bomb Threats** — Locating the suspected explosive or incendiary device so it can be neutralized is critical. The first line of response to a bomb threat is threat analysis. In order to do this effectively, it is necessary to get all the information possible on the person or group making the threat, as well as information regarding the size and location of the bomb. Industries concerned about such threats will want receptionists who can remain calm and have had training in what type of questions to ask. A list of relevant questions placed near the telephone can be very useful. The information gathered based on these questions may be sufficient to discount the threat or may indicate that actions other than evacuation may be taken. It is not as unlikely that the caller will give his or her address as one might think. If a suspicious object is located and thought to be a bomb, and local law enforcement personnel cannot dispose of it, the Emergency Management Agency should be contacted to secure the services of the nearest explosive/bomb disposal team for assistance and training. According to the Federal Bureau of Investigation (FBI), many of these callers are seeking someone to talk to. A simple ruse (such as “We’ll have the manager get back to you. Could I have your name and address so he or she can do so?”) may be all it takes to get important information. Knowing the questions to ask may be the single most important resource in dealing with bomb threats.

**Weapons of Mass Destruction** — Hospitals make up a substantial portion of the emergency response system, so they must educate and train their staff with regard to possible weapons of mass destruction events and response actions. Experts advise that local communities should be prepared to deal with the consequences of a terrorist event for 12 to 36 hours before federal agencies can augment the local response and provide specialized support. The potential use of nuclear, chemical, biological, or radiological weapons by terrorists calls for a sound emergency plan. Terrorist events can result in a potentially large numbers of casualties. The psychological impact of the threat of weapons of mass destruction and the relative ease of their acquisition pose a great threat to this country. It remains extremely difficult to identify the acquisition of weapons of mass destruction due to the widespread availability of the necessary technology and raw materials.

**Hazardous and Toxic Materials Entry Routes**
- Absorption through the skin or the eyes
- Entering the bloodstream via open wounds or needle injection
- Ingestion by eating or drinking contaminated foods and liquids
- Via spray or splash into the mouth or nose
- Inhalation and absorption into the mucous membranes of the nose, upper respiratory tract, and lungs via aerosols or spray devices

**Bioterrorism Readiness** — Healthcare facilities preparing a bioterrorism response plan should reference *A Template for Healthcare Facilities*, published by the Association for Professionals in Infection Control and Epidemiology. This resource outlines the steps necessary for responding to biological agents such as smallpox, botulism toxin, anthrax, and plague. It also provides information regarding the unique characteristics and management of each of these agents and makes specific recommendations. The *National Public Health Strategy for Terrorism Preparedness and Response Guide*, published in 2004 by the Centers for Disease Control and Prevention, provides information on the following areas:
- Detection and investigation
- Laboratory sciences
- Prevention programs
- Worker safety
• Communication
• Emergency response
• Research
• Long-term consequence management
• Workforce development

**Biological Agents** — Biological agents are a type of warfare that provides terrorists an economical and easily concealed weapon. Clinical symptoms may not appear for some time after an exposure. Initial medical cases of exposure may not be attributed to an actual attack which makes it difficult to respond to exposures of a large number of people. A disadvantage of using biological agents relates to the rapid degradation of certain agents when exposed to ultraviolet and visible radiation, heat, drying, or humidity. Biological agent organisms can be transported as liquid droplets, aerosols, or dry matter. The signs and symptoms of infection are usually nonspecific and may mimic natural infections such as the flu. Pathogens, or disease-causing organisms, include bacteria, viruses, and fungi. These organisms vary greatly in their physiological effects:

• Terrorists can grow and develop disease-causing bacteria (single-cell organisms); examples include the bacteria that cause tularemia (*Francisella tularensis*) and anthrax (*Bacillus anthracis*).
• Viruses are submicroscopic organisms that require living cells to reproduce and multiply; terrorists could use variola major (smallpox) as a biological agent.
• Fungi usually do not affect healthy individuals but can pose a significant hazard to the sick, old, and extremely young.
• Toxins are metabolic byproducts of living organisms, such as microbes, insects, snakes, and plants; terrorists could extract the toxin ricin from castor beans.

**Biological Agent Characteristics** — Contaminated food or water or aerosol contamination can spread biological agents. The speed and accuracy of healthcare workers in recognizing and reporting the suspicion of biological agent use can directly impact mortality and morbidity. The following situations should alert healthcare workers to the possibility of a bioterrorism event:

• Signs and symptoms that develop at an uncharacteristic time of the year, in an unusual pattern, or in a normally healthy population
• Groups of patients from a single location or event
• Lower incidence of symptoms among people who have been indoors
• Large number of fatalities
• Unusual numbers of sick or dying people or animals
• Vector-borne diseases without vectors
• Patients suffering an uncommon disease with bioterrorism potential

**Types of Biological Agents**

• **Bacteria** are self-sustaining organisms that do not require a host to reproduce:
  • Anthrax
  • Plague
  • Cholera
  • Tularemia
• **Viruses** are much smaller than bacteria and require a host to survive (e.g., plant, animal, insect, bacteria, human):
  • Smallpox
  • Venezuelan equine encephalitis (VEE)
• Ebola
• Marburg (hemorrhagic fevers)
• Lassa

• Biological toxins are poisonous chemical compounds produced by living organisms such as animals, plants, and microbes. These agents demonstrate lethality about 1000 times higher than standard chemical agents. These agents can cause diseases that can incapacitate or kill and, because of the prolonged period of illness, can also have a tremendous impact on healthcare resources. Toxins normally do not pose an absorption risk. They include:
  • Botulism
  • Ricin
  • Staphylococcal enterotoxin B
  • Mycotoxins

Chemical Agents — Chemical agents are toxic substances that cause incapacitation or death upon exposure. These agents can be classified into the general categories of blood, blister, choking, irritating, and nerve. The toxicity, mode of action, and effects can vary depending on the agent. Chemical agents act within minutes, and people exposed will develop symptoms immediately. Inhalation is the primary route of exposure. Toxicity of the agent depends on the size of the particles and water solubility of the gas. Large particles and highly water-soluble gases become trapped in the nasopharynx. Small particles and gases with low solubility penetrate more deeply into the lungs. Quick decontamination and immediate administration of an antidote remain the best course of action for some agents.

Blood Agents — Blood agents interfere with the ability of blood to transport oxygen. All blood agents are toxic at high concentrations. Exposure can lead to rapid asphyxiati on and death. Symptoms can include respiratory distress, vomiting, diarrhea, vertigo, and headaches. Fresh air and respiratory therapy may help some victims. An example of a blood agent is cyanide (hydrogen cyanide and cyanogen chloride).

Blister Agents (Vesicants) — Blister agents cause burns to the eyes, skin, and respiratory tract tissues. They can penetrate clothing and be absorbed into the skin. Symptoms vary and can include tear ing eyes, swollen eyelids, itching, burning pain, and blisters in warm, moist areas such as the groin. A burning sensation in the nose and throat, hoarse voice, shortness of breath, cough, abdominal pain, and diarrhea can also be observed. The blisters from sulfur mustard exposure heal slowly and are more susceptible to infection than chemical or physical burns. Examples of blister agents include mustard and lewisite.

Choking Agents — Choking agents stress the respiratory tract and can result in asphyxiation. Edema can develop in the lungs, and patient symptoms may resemble those of drowning victims. Symptoms include eye irritation, choking and coughing, and respiratory distress. Victims may smell like chlorine or newly cut hay (characteristic of the gas phosgene). Examples of choking agents include chlorine and phosgene.

Irritating Agents — These agents cause respiratory distress and tearing and are used with the intention of incapacitating the victim. Most irritating agents are not fatal but in some circumstances an agent can result in asphyxiation. Symptoms include severe pain to the skin, burning and irritation of the eyes and throat, respiratory distress, coughing, choking, nausea, and vomiting. Most exposed people smell of pepper or tear gas. Examples of irritating agents include tear gas and pepper spray.
Nerve Agents — Nerve agents are the most toxic chemical agents and can cause death in minutes. All demonstrate toxicity at small concentrations. They can be inhaled or absorbed through the skin. Nerve agents affect organs with cholinergic receptors such as smooth muscles and glands, resulting in increased secretions of saliva, tears, and mucus. Other symptoms include secretions in airways and the gastrointestinal tract along with sweating, muscle contractions, and hyperactivity of the digestive tract. Some victims demonstrate symptoms of twitching, weakness, and hypertension. Examples include sarin and soman.

Industrial Chemical Agents — Although security agencies generally focus on traditional agents (choking, blood, blister, and nerve), terrorist groups may use readily available toxic industrial chemicals as well. A wide variety of potential chemicals could be used for malicious purposes including organophosphate pesticides such as malathion or parathion. These agents are chemically related to nerve agents but are not as toxic. These compounds disrupt the acetyl cholinesterase enzyme just as nerve agents do. Carbamates (e.g., Sevin®) produce the same effects as nerve agents and organophosphate pesticides. Metallic poisons affect a person in a variety of ways and usually pose an inhalation or ingestion risk. Arsenic trioxide is a metallic poison.

Nuclear Devices — A nuclear terrorist incident can involve the detonation or threatened detonation of a nuclear bomb or the detonation or threatened detonation of an explosive device that includes nuclear materials. Terrorists could also cause a nuclear incident by detonating an explosive device near a nuclear power plant or attacking nuclear cargo during transport. Terrorists could contaminate food or other products with radioactive materials. Simple radiological devices such as an isotope could spread radioactive material without the use of an explosive device if placed in a public location. Radiological dispersal devices work as a combination of an explosive agent with radioactive materials. The initial explosion kills or injures those closest to the explosion while the radioactive substances remain to expose and contaminate survivors and emergency responders. Sabotage of a nuclear reactor plant is another possibility. Improvised nuclear devices pose a risk because it could be difficult to make sure they are detonated when and where desired. Nuclear weapons or bombs could produce a 1-kiloton bomb with devastating consequences. (Refer to Chapter 10 for additional information on the types of ionizing radiation and other radiation information.)

Radiation Protection Principles

- **Time** — The shorter the time in a radiation field, the less the radiation exposure. It is important to work quickly and efficiently. A rotating team approach can be used to keep individual radiation exposures to a minimum.
- **Distance** — The farther a person is from a source of radiation, the lower the radiation dose.
- **Shielding** — Shielding offered by barriers can reduce radiation exposure.
- **Quantity** — Limiting the amount of radioactive material in the working area decreases exposure.

External Irradiation — External irradiation occurs when all or part of the body is exposed to penetrating radiation from an external source, similar to what happens during an ordinary chest x-ray. Following external exposure, an individual is not radioactive and can be treated like any other patient.

Contamination — When radioactive materials in gaseous, liquid, or solid form are released into the environment they can contaminate people externally (e.g., via skin) or internally (e.g., via the lungs, gut, or open wounds), or both.
Incorporation — Incorporation refers to the uptake of radioactive materials by body cells, tissues, and target organs such as bone, liver, thyroid, or kidney. Incorporation cannot occur unless contamination has occurred. General symptoms of acute radiation sickness include dermal irritation and burns, nausea, vomiting, high fever, and hair loss. The severity of symptoms is related to the amount and type of radiation and the length of exposure.

Nuclear Incident Response Team (Department of Energy) — The Nuclear Incident Response Team of the Department of Energy provides expert personnel and specialized equipment to a number of federal emergency response entities that deal with nuclear emergencies, nuclear accidents, and nuclear terrorism. These emergency response personnel are experts in such fields as device assessment, device disablesments, intelligence analysis, credibility assessment, and health physics.

National Nuclear Security Administration — The Office of the National Nuclear Security Administration includes the functions of legislative and public affairs and also serves as a liaison with other federal agencies; state, tribal, and local governments; and the public. It provides support for resource management in the areas of budget formulation, guidance, and execution; personnel; and procurement management and administration of contracts, among other activities.

Dissemination Devices — Terrorist groups can acquire common devices to disseminate chemical or biological materials. Agents can be distributed using simple containers such as glass bottles or modified aerosol generators. In general, the effects of chemical agents occur more rapidly and contaminate smaller areas than biological agents on a per-weight basis. Biological agents, however, can cover vast areas, resulting in large numbers of indiscriminate casualties comparable to those of nuclear devastation.

Incendiary Devices — An incendiary device can be mechanical, electrical, or chemical and is used to start combustion and intentionally set fire to something else. These devices can be simple or complex but usually consist of three basic parts: (1) fuse or igniter, (2) container (glass, metal, plastic or paper), and (3) incendiary material. Gasoline and rags may be used as accelerants to make the fire burn more quickly and at a higher temperature. Burns and smoke or toxic gas inhalation are common injuries secondary to incendiary devices.

Explosive Devices — An explosive device is any substance or article designed to explode, either by a rapid release of gas and heat or by a chemical reaction. Examples of explosive devices include homemade bombs, pipe bombs, letter bombs, dynamite and military ordinances, and fertilizer bombs. The FBI reports that 70% of all terrorist attacks in the world involve explosives (usually bombs) and that 3163 bombing incidents occurred in the United States in 1994. The FBI also states that: (1) public safety agencies have only a 20% chance of finding an explosive device, (2) only 4% of bombings are preceded by a warning or threat, (3) hundreds of “hoax” bomb incidents are reported each year, and (4) residential properties are the most common targets for bombers. The dissemination of nuclear, biological, and chemical agents as aerosols may often be attempted through the use of bombs or explosives.

NIOSH Publication No. 2002-139 — NIOSH Publication No. 2002-139 identifies actions that a building owner or manager can implement without undue delay to enhance occupant protection from an airborne chemical, biological, or radiological attack. This document includes information about:

- What a building owner or manager can do
- Things not to do
- Specific recommendations
Healthcare Hazard Control and Safety Management

- Physical security
- Ventilation and filtration
- Maintenance, administration, and training

National Disaster Medical System — The National Disaster Medical System functions as a cooperative asset-sharing program among government agencies, including state and local governments. The system also interacts with private enterprise and civilian volunteers to ensure the availability of resources to support medical services following a disaster that overwhelms local healthcare resources. It is a federally coordinated system that augments the nation’s emergency medical response capability. The overall purpose of the system is to establish an integrated national medical response capability for assisting state and local authorities in dealing with the medical and health effects of major peacetime disasters. It also provides support to Department of Defense and Veterans Health Administration medical systems in caring for casualties evacuated back to the United States from armed conflicts.

Hospital Response — Safety, security, and crowd control can become big issues in the event of an attack, and hospitals should have contingency plans to deal with the probable large influx of upset, agitated and frightened patients. If available, police and National Guard officers may be needed to augment hospital security. Assistance from psychologists, social workers, and the clergy will be needed. Early activation of Emergency Response Plans are critical. In the case of a chemical or biological situation, activation will need to occur when the first patient arrives. Early response can keep a situation from getting out of control. Plans need to be utilized and followed as closely as possible. Most facilities have plans for the following situations:

- Mass casualty incident
- Hazardous materials incident
- Decontamination plan
- Bioterrorism response plan
- Facility lockdown or access control

M. DECONTAMINATION ACTIVITIES (WEAPONS OF MASS DESTRUCTION)

Hospital personnel need to recognize when a hazardous material situation exists and must understand the importance of maintaining staff safety. The need for decontamination depends on the suspected time of exposure, route of entry, and agent involved. Contamination occurs when a person has hazardous substances on his or her body and may transfer this substance to others. Primary considerations in managing victims exposed to hazardous materials include:

- Protecting the facility
- Minimizing additional exposure of the victim to the toxic substance
- Removing the agent from the skin and clothing to reduce further exposure to others
- Protecting hospital staff members and current patients from secondary exposure
- Working to identify the substance quickly and provide treatment

Emergency Department Preparation — Every member of the emergency department should understand the provisions of the hazardous materials response plan. Emergency department personnel must participate in scheduled drills. Before a contaminated victim
arrives at the facility, all services involved should be notified, a decontamination area should be readied, and the decontamination team should suit up. The person receiving a call of incoming victims should notify the nursing supervisor, who will notify appropriate personnel according to the hospital’s response plan. The hospital operator should be instructed to notify security and facility departments.

Decontamination Areas — Consider any victim of a hazardous materials incident as contaminated until confirmed otherwise. The route from the emergency drop-off point to the decontamination area could become contaminated, so all personnel along the route should be instructed to leave the vicinity. Security personnel should be stationed at the main entrance of the emergency department and the decontamination area to prevent unauthorized entry, control the entrance of the contaminated victim, and direct the vehicle transporting the patient to the appropriate area. A reception area should be set up just outside the emergency department entrance to meet arriving victims and conduct screenings to ensure decontamination before patients enter the emergency department. The decontamination area must be large enough to facilitate decontamination of more than one victim at a time and allow patient treatment and decontamination personnel to perform their functions. Facility personnel must take actions to prevent contaminants from entering the ventilation system during decontamination. OSHA requires air monitoring in such situations under 29 CFR 1910.120(q)(3)(iv). Weather permitting, decontamination could be performed outdoors or in a tent, as well as evaluations and initial treatment of contaminated patients, because ambient ventilation will keep cross-exposures low. An outside or portable decontamination system provides a viable solution to conducting indoor decontamination.

Protecting the Decontamination Team — The decontamination team (see Table 5.6) should be equipped with personal protective clothing appropriate for the substance involved. The necessary PPE may be determined by consulting reference guidebooks, database networks, or telephone hotlines. Appropriate dress for the decontamination team should include:

- Scrub suit
- Plastic shoe covers
- Disposable chemical protective clothing (CPC) with hood and booties built in (tape hood at neck)
- Polyvinylchloride (PVC) gloves (taped to sleeves)
- Respiratory protection as appropriate
- Multiple layers of surgical gloves, neoprene, or disposable nitrile gloves
- Protective eyewear

<table>
<thead>
<tr>
<th>TABLE 5.6  Members of a Decontamination Team</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emergency physician</td>
</tr>
<tr>
<td>Emergency department nurses and aides</td>
</tr>
<tr>
<td>Support personnel</td>
</tr>
<tr>
<td>Nursing supervisor</td>
</tr>
<tr>
<td>OSHA officer</td>
</tr>
<tr>
<td>Security</td>
</tr>
<tr>
<td>Maintenance</td>
</tr>
<tr>
<td>Recorder</td>
</tr>
</tbody>
</table>
Note: Applying a 2-inch-wide piece of masking tape with the team member's name written on it to the back of protective suits can assist employee communication.

Patient Arrival — The emergency physician in charge or emergency department director should meet the ambulance to assess the condition of the victims. An attempt should be made to identify the hazardous materials involved (if not yet known). Personnel should keep in mind that the contamination itself could result in a life-threatening condition. Emergency personnel should give priority to checking the victim's breathing and circulation and immediately address life-threatening situations, then direct their attention to decontamination and secondary injury assessment. Triage procedures should be initiated at this point, if necessary. During the initial patient survey and stabilization, contamination reduction should also be performed (e.g., cutting away or otherwise removing all suspected contaminated clothing, including jewelry and watches; brushing or wiping off any contamination). Open wounds should be protected from contamination. Emergency department personnel should make every effort to avoid contact with any potentially hazardous substance and should assume that all hazardous materials victims require decontamination. Removing the victim's clothing upon arrival, if not already done, will reduce further exposure to the patient and lessen the extent of contamination introduced to the emergency department. Contaminated clothing should be double bagged in plastic bags, sealed, and labeled. Effective decontamination consists of making the patient as clean as possible (ACAP), which means reducing the contamination to a level that no longer poses a threat to the patient or other personnel. The decontamination team should bring a prepared stretcher to the ambulance for transferring the victim to the decontamination area. Staff members must wear proper protective clothing until it has been determined that they are no longer in danger.

Decontamination and Treatment Suggestions — In mass-casualty incidents, decontamination normally occurs first and then treatment. Patients can receive visual triage to evaluate their need for decontamination. The primary goals for emergency department personnel when handling a contaminated patient are termination of exposure to the patient, patient stabilization, and patient treatment; however, doing so must be achieved without jeopardizing the safety of the emergency department personnel. Following is a suggested procedure for decontamination:

- Begin the process at the head of the victim and proceed downward, with initial attention given to contaminated eyes and open wounds.
- Give top priority to decontaminating open wounds.
- Irrigate wounds with large amounts of normal saline solution and be sure no recontamination occurs.
- Cover wounds with a waterproof dressing.
- Flush exposed skin and eyes with water or normal saline for an extended period of time, as required (e.g., for chemicals such as strong alkali).
- Perform external decontamination using the least aggressive layer methods.
- Try to limit mechanical or chemical irritation to the skin to prevent damage to the epidermal layer.
- Gently wash contaminated skin with a spray of water and use a sponge with mild soap; washing with soap and tepid water will usually remove contamination.
- Use warm water and do not allow contaminants to enter open wounds.
- Never use hot water, stiff brushes, or vigorous scrubbing, as these activities increase the chances for absorption of hazardous materials through the skin.
- Collect all run-off for proper disposal.
- Perform deep cleaning only when particles or pieces of material have been embedded in the tissues.
• Give high priority to decontaminating the eyes.
• Gently irrigate eyes with a stream of normal saline diverted away from the medial canthus so it does not force material into the lacrimal duct.
• Gently irrigate contaminated nares and ear canals with frequent suction to prevent forcing any material deeper into those cavities.

As appropriate and when conditions allow, it is important to implement proper triage procedures for multiple-patient situations to treat presenting signs and symptoms. The sooner the team can decontaminate victims, the sooner they can be treated like a normal patient. Until completion of decontamination, invasive procedures should be reserved only for life-threatening conditions. Frequent assessment of patients is essential, as many hazardous materials have latent physiological effects. Bloodwork, x-rays, cultures, and more advanced tests can help identify biological agents and direct treatment. Specimens may need to be sent to large laboratories with advanced testing capability, such as the CDC or U.S. Army Medical Research Institute of Infectious Diseases (note that shipping specimens requires special packaging and transport to protect the public and maintain the chain of custody). A supply of doxycycline, atropine, and ciprofloxin should be available for treating victims of biological or chemical weapons exposure. Following CDC standard precautions (e.g., handwashing) and wearing appropriate protective clothing (e.g., gloves, mask or eye protection, face shields, gowns) are essential to preventing direct contact with body fluids. Certain diseases and syndromes require taking additional measures, such as airborne, contact, or droplet precautions.

Controlling Contamination — To prevent unnecessary contamination, all equipment that is neither essential nor disposable should be removed from the decontamination area. All door knobs, cabinet handles, light switches, and other areas that come into contact with hands should be taped, and floors should be covered with plastic or paper sheeting to prevent contamination. Floor coverings should be securely taped to prevent slipping, and the entrance to the room should be marked with a wide strip of colored tape to indicate a contaminated area. Personnel should not enter the area unless properly protected, and no personnel or equipment should leave the area until properly decontaminated. A “clean” member of the staff should stand on the clean side of the entrance to hand in supplies and receive medical specimens.

N. INTRODUCTION TO FIRE SAFETY MANAGEMENT

Healthcare facilities contain many fire-related hazards, including medical equipment, combustible gases, chemicals with low flash points, and electrical hazards of all types. Planning should include proper design that considers prevention features and egress requirements. Planning a response to fire remains a key element of any emergency planning process. The items discussed below should be considered when evaluating fire hazards located within the facility. It is important to maintain a balance should between the needs of the facility and fire safety considerations.

Fire Development Stages — Fire is a chemical combustion process created by the rapid combination of fuel, oxygen, and heat. Most fires develop in four distinct stages:

• Incipient stage — No visible smoke, flame, or significant heat develops but a large amount of combustion particles is generated over time. These particles, created by chemical decomposition, have weight and mass but are too small to be visible to the human eye. They behave according to gas laws and quickly rise to the ceiling. Ionization detectors respond to these particles.
- **Smoldering stage** — As the incipient stage continues, the combustion particles increase until they become visible, a condition described as “smoke.” No flame or significant heat has developed. Photoelectric detectors “see” visible smoke.
- **Flame stage** — As the fire condition develops further, ignition occurs and flames start. The level of visible smoke decreases and the heat level increases. Infrared detectors react to the infrared energy being given off.
- **Heat stage** — At this point, large amounts of heat, flame, smoke, and toxic gases are produced. This stage develops very quickly, usually in seconds. Thermal detectors respond to the heat energy produced.

**O. LIFE SAFETY CODE®**

Healthcare organizations must adhere to NFPA 101 for newly constructed and existing environments of care, and a qualified individual must prepare a current statement of conditions. Facilities can also meet this standard through an equivalency approved by the Joint Commission or by completing a Plan for Improvement. The organization must follow *Guidelines for Construction and Equipment of Hospitals and Medical Facilities*. The guidelines are published by the American Institute of Architects (AIA). NFPA 101 establishes minimum fire and egress requirements for healthcare occupancies. The life safety concept began in 1963 with publication of the Building Exits Code, and the National Fire Protection Association published the first edition of the *Life Safety Code®* in 1966. Building codes provide design criteria, but NFPA 101 addresses the general requirements for fire protection and systems safety necessary to ensure the safety of building occupants during a fire. The code specifies minimum hourly fire resistance ratings and does not specify how such ratings are to be achieved. NFPA 101 now contains 42 chapters:

- Chapters 1–4 address administration, mandatory references, definitions, goals, objectives, and compliance options.
- Chapters 5–7 cover performance-based options, occupancy classifications, hazard of contents, and means of egress.
- Chapters 8–42 cover the various occupancies covered under the code and the protection requirements for occupancy-related hazards.

Note that Chapters 18 to 21 address specific healthcare occupancies, including new healthcare occupancies, existing healthcare occupancies, new ambulatory care occupancies, and existing ambulatory care occupancies.

**Hand Rub Dispensers Amendment** — The National Fire Protection Association has amended NFPA 101 to address the use of hand rub dispensers. The following conditions must be met:

- Where dispensers are installed in a corridor, the corridor shall have a minimum width of 1830 mm or 72 inches.
- The maximum individual dispenser fluid capacity shall be 1.2 liters or 0.32 gallons for dispensers located in rooms, corridors, and areas open to corridors.
- The maximum fluid capacity for dispensers in suites of rooms will be 2.0 liters or 0.53 gallons.
- The dispensers shall have a minimum horizontal spacing of 1220 mm or 48 inches from each other.
• No more than an aggregate of 37.8 liters or 10 gallons of alcohol-based hand-rub solution shall be in use in a single smoke compartment outside of a storage cabinet.
• Storage of quantities greater than 18.9 liters or 5 gallons in a single smoke compartment shall meet the requirements of NFPA 30 (Flammable and Combustible Liquids Code).
• Dispensers shall not be installed over or directly adjacent to an ignition source.
• In locations with carpeted floor coverings, dispensers installed directly over carpeted surfaces shall be permitted only in sprinkled smoke compartments.

Occupancies — Some standards recognize that certain healthcare environments may contain more risks that others (see Table 5.7). Some requirements apply only to certain “occupancy types.” Occupancy refers to the purpose of the building or allocated space:

• Healthcare occupancy — This type of facility is used for purposes of medical or other treatment of care of four or more persons who are generally incapable of self-preservation due to age, physical condition, or mental disability. It also includes areas with security measures not under an occupant's control. Healthcare occupancies include hospitals, long-term-care facilities, and limited facilities in which people cannot ensure their own safety during an emergency situation. Chapters 18 and 19 cover requirements for hospitals, hospices, and nursing homes.
• Ambulatory healthcare occupancy — This type of facility is used to provide care to four or more patients at the same time. The space could be outpatient services or treatment that render them incapable of taking actions for self-preservation under emergency conditions without the assistance of others (e.g., administered anesthesia that renders a person incapable of taking actions for self-preservation under emergency conditions without the assistance of others). Chapters 20 and 21 of NFPA 101 address ambulatory healthcare occupancies.
• Business occupancy — This type of facility is used to provide outpatient services and treatment that do not meet the criteria in the ambulatory healthcare occupancy definition.
• Residential occupancy — These facilities include dormitories and rooming houses. Occupants must be able to ensure their own safety during an emergency. Chapters 22, 23, 32, and 33 cover the various requirements for residential occupancies, including detention centers.

Deficiencies — Fire safety deficiencies are found on a building-by-building basis and are rated according to how the deficiency affects overall fire safety. Deficiencies are classified as level I, II, or III:

• Level I — A deficiency or series of deficiencies indicating a lack of proper maintenance of building components that play a role in the unit concept.
• Level II — A deficiency or series of deficiencies involving one or more unit-concept units that pose a threat to life. The scope of the deficiencies is significant in a limited area.
• Level III — A deficiency or deficiencies indicating pervasive violation of one or more of the unit-concept units. The scope of the deficiencies is such that correction in less than three years is not possible.

Statement of Conditions

• Part 1. Instructions (e.g., the statement of conditions [SOC] must be accomplished by a knowledgeable individual)
• Part 2. Basic building information (document specific safety features)
TABLE 5.7  Life Safety Considerations

Adhere to the appropriate edition of the code.
Determine a facility’s occupancy type in order to apply the standard.
Apply the unit concept to all fire safety programs.
Understand equivalencies and how they can be used for accreditation compliance.
Develop a correction plan to deal with safety deficiencies.
Ensure safe access for physically disabled individuals.
Maintain a level of safety during all phases of construction.
Maintain safety in emergency care areas.
Use a statement of conditions as a tool to ensure compliance.
Create an improvement plan as necessary to address deficiencies.
Implement interim life safety measures, when necessary.
Maintain and install fire protection equipment to meet NFPA requirements.
Provide necessary management and training to reduce the risk of fire.
Evaluate the effectiveness of training annually.

- Part 3. Life safety assessment (document any existing life safety deficiencies)
- Part 4. Plans for improvement, which address:
  - Type and scope of all deficiencies
  - Corrective actions being implemented
  - Schedule of corrective actions
  - Type and source of funds committed to improvement actions

Equivalencies — An equivalency may be developed using the traditional approach or the Fire Safety Evaluation System (FSES). The traditional approach must consider the following:

- Identification of the deficiency and intent of the applicable requirement
- Written description of the alternative methods that will be employed to ensure life safety
- Verification in writing by a qualified person such as a fire protection engineer, registered architect, or local authority that alternative methods meet the intent of the requirements

Plans for Improvement — Organizations with deficiencies must develop a written plan that addresses the following:

- All deficiencies to be corrected
- Specific actions underway or to be taken to correct the problems
- Source, availability, and management commitment for funding corrective actions
- Schedule or timeline for correcting all deficiencies

Note: Facilities must use interim measures for all level III and some level II deficiencies. These administrative measures temporarily compensate for existing deficiencies.

NFPA 101-2000 — Each new edition of the code builds on the prior editions. NFPA 101 can be used with a building code or alone if the jurisdiction has no building code. The provisions vary, depending on the type of occupancy and whether the building is new or an existing construction, but the 2000 edition of NFPA 101:
• Provides minimum requirements for the design, operation, and maintenance of healthcare organization buildings and structures required to ensure safety to life during fire and similar emergencies.
• Requires that new and existing buildings allow for prompt escape or provide people with a reasonable degree of safety through other means.
• Defines hazards and addresses general requirements for egress.
• Covers fire protection features such as fire doors.
• Addresses building service and fire protection equipment such as heating, ventilation, and air-conditioning systems; sprinkler systems; fire detection systems; and localized extinguishers.
• Requires unobstructed exits, multiple exits, exit signs, fire doors, and fire drills.
• Requires that evacuation signals be both audible and visible.

Adoption of NFPA 101-2000 by Centers for Medicare and Medicaid Services —
The final rule of the Centers for Medicare and Medicaid Services (CMS) removed prior editions of the NFPA 101, including the 1967, 1973, 1981, and 1985 editions, from the Federal Register. Existing facilities are now subject to the requirements of Chapter 19 (Existing Health Care Occupancies) of the 2000 edition. Healthcare facilities not affected by the change include facilities not participating in Medicare/Medicaid programs, such as residential hospice programs, private-pay facilities, and end-stage renal disease facilities.

Critical Requirements Identified by the CMS
• Roller latches (19.3.6.3.2) — Requires replacement of corridor door roller latches with standard latching hardware. The phase-in for compliance ends March 13, 2006.
• Emergency lighting (19.2.9) — Requires providing emergency lighting for 1.5 hours, to be phased in over a 3-year period beginning March 11, 2003, and ending March 13, 2006.
• Protection of vertical openings (19.3.1) — Requires vertical openings to be enclosed, with 1-hour construction.
• Emergency forces notification (19.3.4.3.2) — Requires the fire alarm system to provide automatic notification of a fire to emergency forces without any delay.
• Corridors (19.3.6.1) — Requires all areas of nonsprinkled buildings to be separated from the corridor with 1/2-hour-rated walls
• Upholstered furniture (19.7.5.2 and 19.7.5.3) — Requires rooms with patient- or resident-owned furniture to have a smoke detector installed.
• Renovations, alterations, modernizations, or repairs shall not reduce the life safety below the level that previously existed.

CMS and Mattress and Upholstery Flammability Requirements — The Centers for Medicare and Medicaid Services surveys nursing homes and other healthcare facilities for fire safety compliance as a part of the conditions of participation (COP). "Newly introduced upholstered furniture and mattresses" refers to items purchased after March 2003. Mattresses and upholstered furniture purchased after that date must meet the NFPA 101 criteria for burn testing that can be found in Sections 10.3.3 and 10.3.4. This reference gives the specific testing standards that must be met unless the furniture or mattress is in a room or space protected by an approved automatic sprinkler system. Section 19.7.5 deals with these items but provides an exception for nursing homes provided the items are patient owned and the sleeping room has a smoke detector.

CMS Waiver Authority — The Centers for Medicare and Medicaid Services retained the authority to waive provisions of the 2000 edition of the Life Safety Code® on a case-by-case basis. This reduces the exposure to additional costs and burdens for those facilities with
situations that warrant such a waiver or equivalency. CMS also retained the authority to apply the Fire Safety Evaluation System as an alternative approach to meeting NFPA 101 requirements. This approach does not allow patient or resident safety to be compromised in any way. The alternative approach must be conducted by qualified individuals who are trained and experienced in the proper application and limitations of the process. CMS may grant a waiver for a specific requirement providing the waiver will not adversely affect patient and staff health and safety. A waiver may be granted to alleviate an unreasonable hardship on a facility trying to meet the life safety requirement. CMS will not grant a waiver if patient or resident safety is compromised.

Fire Safety Evaluation System — The Center for Fire Research at the National Bureau of Standards, through the support of the U.S. Department of Health and Human Services, developed the Fire Safety Evaluation System for determining how combinations of fire safety elements can meet the intent of NFPA 101. This quantitative evaluation system grades fire safety zone by zone in healthcare facilities. The following areas are scored:

- **Containment** — Safety actions taken to control and contain fire and smoke.
- **Extinguishment** — Systems and procedures in place to effectively extinguish a fire.
- **Moving occupants** — Safety features and procedures that allow people to safely leave a fire or smoke zone.
- **General fire safety** — Safety procedures and policies that affect the overall safety of the fire or smoke zone.

P. HEALTHCARE FACILITY FIRE SAFETY MANAGEMENT

The Joint Commission on Accreditation of Healthcare Organizations (JCAHO) requires accredited facilities to develop and maintain a written management plan describing the processes it implements to effectively manage fire safety (see Table 5.8). The organization identifies and implements proactive processes for protecting patients, staff, and others coming to the organization's facilities as well as for protecting property from fire, smoke, and other products of combustion. The organization identifies and implements processes for regularly inspecting, testing, and maintaining fire protection and fire safety systems, equipment, and components. All facilities must be designed, constructed, maintained, and operated to minimize the possibility of a fire emergency requiring the evacuation of occupants.

<table>
<thead>
<tr>
<th>TABLE 5.8 Basic Written Fire Plan Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Policies implemented to manage fire safety</td>
</tr>
<tr>
<td>Processes developed to protect patients, staff, and others from fire and smoke</td>
</tr>
<tr>
<td>Procedures for inspecting, testing, and maintaining fire protection systems</td>
</tr>
<tr>
<td>Facility-wide fire response procedures</td>
</tr>
<tr>
<td>Area-specific needs, including fire evacuation routes</td>
</tr>
<tr>
<td>Specific roles and responsibilities of staff and others at the point of origin of the fire</td>
</tr>
<tr>
<td>Specific roles and responsibilities of staff and others in preparing for building evacuation</td>
</tr>
</tbody>
</table>
TABLE 5.9 Basic Response Plan Topics

- Facility-wide fire response
- Area-specific needs, including fire evacuation routes
- Specific roles and responsibilities of staff for response at point of origin
- Specific roles and responsibilities of staff away from point of origin
- Specific roles and responsibilities of staff for evacuation
- Alarm systems or signals
- Location and use of firefighting equipment
- Basic fire containment procedures
- Detailed evacuation routes necessary to meet the needs of the facility

OSHA Master Fire Plan Elements (29 CFR 1910.38)

- Fire department notification and follow-up procedures.
- Procedures for announcing the fire location using an appropriate method such as intercom or public address system.
- Locations where key personnel should assemble to manage the situation
- Procedures for determining who will keep facility departments apprised of the situation.
- Designated personnel who will meet and direct fire department personnel.
- Procedure for holding nonemergency calls and giving an “all-clear” signal when the emergency is over.
- Fire response is an unique challenge to those working in a health care.
- Residents will not be able to move quickly so healthcare workers must be trained in fire safety prevention and response actions.

Life Safety Code® Fire Response Planning Considerations — (See Table 5.9.) All proposed purchases of bedding materials, window coverings, furnishings, decorations, and other equipment must be evaluated for fire safety. Newly constructed and existing environments must comply with NFPA 101. Each building in which patients are housed or receive care, treatment, or services that does not comply with the NFPA 101 may be granted an equivalency status approved by the Joint Commission. Facilities can demonstrate continued progress by completing an acceptable plan for improvement. The codes require that a building be designed, constructed, and maintained in a fire-safe way. When undertaking the design of a newly remodeled building, the organization must also satisfy the requirements of other authorities having jurisdiction, such as local, state, or federal agencies, which may be more stringent. It is important to maintain a current organization-wide statement of conditions. The statement serves as a proactive document that guides the facility through a detailed self-assessment of life safety compliance. The document also describes how the facility will resolve any life safety deficiencies. Exempt healthcare facilities include freestanding buildings classified as business occupancies. An exemption also applies to any building classified as a business occupancy but connected to a healthcare occupancy, provided the separation includes a 2-hour-rated fire barrier. The business occupancy cannot serve as a required means of egress from the healthcare occupancy. The final exemption covers buildings housing three or fewer patients.
Design Considerations — Facilities must be designed, constructed, maintained, and operated to minimize the possibility of a fire requiring the evacuation of occupants. The safety of occupants must be provided by appropriate arrangement of facilities, including an adequate and well-trained staff. Operating and maintenance procedures should address:

- Design, construction, and compartmentalization
- Fire prevention planning and training
- Detection, alarm, isolation, and extinguishment of fire
- Transfer of occupants to areas of refuge
- Evacuation of the building

Healthcare Facility Fire Drills — The facility fire response plan guides the facility in evaluating response actions and equipment efficiency during drills or real fire events (see Table 5.10):

- Conduct plan implementation drills using realistic scenarios at varied times; however, be aware that a drill conducted at shift change may present an unrealistic picture as to the number of staff likely to be available when a fire occurs. Actual evacuation of patients during the drills is not required.
- Conduct quarterly drills for all shifts in all buildings for ambulatory and healthcare occupancies.
- Conduct drills in freestanding buildings classified as business occupancies.
- Conduct at least half of the required drills unannounced.
- Require staff in all areas of every building where patients are housed or treated to participate in the drill as required by the fire response plan.
- Use a coded announcement instead of audible alarms for drills conducted during overnight hours.
- Critique all drills to determine improvement needs and performance deficiencies.
- Emphasize that good housekeeping measures are crucial in preventing fires, and employees must be alert for fire hazards.
- Provide each department with a copy of the facility fire plan.

Staff Knowledge Assessment — Evaluate the effectiveness of fire response training on an annual basis. During a drill assess staff knowledge with regard to:

- When and how to sound fire alarms (where such alarms are available)
- When and how to transmit to an offsite fire responder
- Containment of smoke and fire
- Transfer of patients to areas of safety
- Fire extinguishing techniques
- Specific response duties
- Preparation for building evacuation

Q. FIRE PREVENTION ACTIVITIES

- Document fire prevention and protection measures in written policies and procedures.
- Install air-conditioning and heating ducts and related equipment in accordance with NFPA 90A (Installation of Air-Conditioning and Ventilating Systems).
- Install a fire alarm or fire detection system that automatically activates an alarm in the event of a fire; the sound of the alarm must be distinct and loud enough to be heard over normal operational noise levels.
- Connect the electrical monitoring devices of automatic sprinkler systems to the fire alarm system and test them at least annually.
Locate manual fire alarm stations near all exits.

Locate fire extinguishers so the distance to a unit never exceeds 75 feet; fire extinguishers must be appropriate for the type of fire likely in a particular area and must be clearly identified.

Inspect fire extinguishers at least monthly and maintain them regularly; retain inspection and maintenance records.

Test all fire alarm and detection systems once a quarter.

Be sure new materials such as bedding, draperies, furnishings, and decorations are flame resistant.

Conduct fire drills for all personnel on all shifts as required by standards, regulations, or codes.

Enforce a facility-wide no-smoking policy.

Put electrical safety policies in writing and enforce them.

Train personnel in fire safety, including response plans.

**Inspections** — Quarterly fire inspections should be performed for each fire zone (see Table 5.11). Inspections should emphasize the following:

- Assessment of all equipment
- Testing of alarms, detectors, and pull stations
- Evaluation of housekeeping practices and security alarms
- Inspection of sprinkler pressure
- Evaluation of water availability and hydrant operation
- Annual evaluations of suppression, detection, and activation systems
- Coordination with the facility’s engineering and maintenance departments and the local fire marshal
TABLE 5.11 Fire Hazard Considerations

- Use of flame-resistant materials
- Location and placement of equipment, furnishings, and bedding
- Use of noncombustible vs. combustible materials
- Maintaining flame-resistant coatings and coverings
- Smoking policy
- Electrical equipment and appliances
- Potential spontaneous combustion sites
- Use and storage of flammable materials
- Use of oxygen and other compressed gases

Fire Warning and Safety — Any system that meets NFPA standards and local requirements is acceptable. Each facility must have a manually operated fire alarm system that is electronically supervised. The system must automatically transmit an alarm to the fire department. The local fire department must also be notified by other means when the alarm has been activated.

Fire Alarms — Methods of transmitting fire alarms to the local fire department:

- Central station service (NFPA 71)
- Auxiliary protective signaling system (NFPA 72)
- Proprietary protective signaling system (NFPA 72)
- Remote station protective signaling system (NFPA 72)

General Requirements — Facilities must also meet some general requirements:

- Fire alarms must be received at a central location within the facility.
- The supervised location must be continuously manned.
- The supervised location must be adequately protected as a hazardous area in accordance with NFPA 101-1991.
- The supervised location must have the necessary equipment to receive fire alarm signals.
- A record of all system status changes must be maintained at the receiving location.
- Signals received must be transmitted at once to the local fire department.
- A copy of the master fire plan and other emergency planning documents must be available at the supervised location.

Manual Alarm Stations — Manual alarm stations should be located throughout the facility. They should be positioned so no more than 200 feet must be traveled to reach an alarm station on the same floor.

Alarm Levels — Audible alarms must be designed to exceed the level of any operational noise. Installing visual alarms to accompany the audible alarm is recommended.

Electrically Supervised Systems — Components must be monitored so personnel are aware when a part of the system requires repair. The system should signal trouble when:

- A break or ground fault prohibits normal system operation.
- The main power source fails.
- A break occurs in the circuit wiring.
Special Requirements for Cooking Areas — Use approved systems to protect cooking surfaces, exhaust hoods, and ducts for commercial cooking equipment, such as:

- Automatic carbon dioxide system
- Automatic dry chemical system
- Automatic foam water or wet chemical system
- Automatic sprinkler systems approved by NFPA 13 (Standards for Installation of Sprinkler Systems)

Fire Alarm System Inspection

- Inspect and test all components of a fire alarm system regularly, and visually inspect all systems each quarter.
- Test and inspect automatic systems on an annual basis.
- Include fire alarm systems in the facility’s fire prevention program.

Testing Fire Detection Equipment and Alarms

- Test all supervisory signal devices (except valve tamper switches) on a quarterly basis.
- Test valve tamper switches and water flow devices semiannually.
- Test duct detectors, electromechanical releasing devices, heat detectors, manual fire alarm boxes, and smoke detectors semiannually.
- Test occupant alarm notification devices, including audible and visible devices, at least annually.
- Maintain appropriate documentation on all fire-related system testing.
- Test off-premise emergency forces notification transmission equipment quarterly.
- Test water-based automatic fire extinguishing systems, including all fire pumps, at least weekly under no-flow condition.
- Test water-based automatic fire extinguishing systems, including water storage tanks (at high and low water levels), semiannually.
- Test water-based automatic fire extinguishing system water storage tanks (low-water-temperature alarms during cold weather only) at least monthly.
- Test water-based automatic fire extinguishing system main drain (at all system risers) annually.
- Inspect water-based automatic fire extinguishing system fire department connections quarterly.
- Test water-based automatic fire extinguishing system fire pumps (under flow) annually.
- Inspect kitchen automatic fire extinguishing systems for proper operation semiannually.
- Check operation of carbon dioxide and other gaseous automatic fire extinguishing systems annually.
- Inspect portable fire extinguishers monthly and maintain annually.
- Hydrostatically test standpipe occupant hoses 5 years after installation and then every 3 years.
- Water-flow test standpipe systems at least every 5 years.
- Operate fire and smoke dampers at least every 4 years (with fusible links removed where applicable) to verify full closure (NFPA 90A).
- Test automatic smoke-detection shutdown devices for air-handling equipment annually (NFPA 90A).
- Test horizontal and vertical sliding and rolling fire doors for proper operation and full closure annually (NFPA 80, Standard for Fire Doors and Fire Windows).
R. INTERIM LIFE SAFETY

The organization should develop and implement activities to protect occupants during periods when a building does not meet the applicable provisions of NFPA 101. This does not apply to facilities with a business occupancy classification. When building code deficiencies are identified but cannot be immediately corrected or when renovation or construction activities are taking place, the safety of patients, staff, and other people coming to the facility is diminished. In these cases, the facility must:

- Proactively identify necessary administrative actions to be taken and any additional training, inspections, and fire drills that might be required.
- Develop and implement activities to protect occupants during periods when a building does not meet the applicable provisions of NFPA 101 (does not apply to facilities classified as a business occupancy).
- Develop written criteria for evaluating various deficiencies and construction hazards and their impact on life safety.

Facilities implement interim life safety measures as defined in their policies.

Deficiencies and Construction Considerations — A facility’s policy should include written criteria for evaluating various deficiencies and construction hazards to determine the extent to which the following requirements may apply:

- Ensure free and unobstructed exits.
- Provide staff with information about alternative exits.
- Maintain escape routes for construction workers at all times.
- Inspect means of egress daily.
- Ensure unobstructed access to emergency services, fire, and police.
- Be sure fire alarm, detection, and suppression systems work.
- Provide temporary but equivalent systems for impaired systems.
- Test and inspect temporary systems monthly.
- Notify the fire department and establish a fire watch when a fire alarm or automatic sprinkler system does not work for 4 hours in a 24-hour period in an occupied building.
- Be sure temporary construction partitions are smoke tight and built of noncombustible or limited-combustion materials.
- Provide additional firefighting equipment and staff training.
- Prohibit smoking in the buildings and at construction areas.
- Establish debris removal practices to reduce flammable and combustible fire loads.
- Conduct a minimum of two fire drills per shift per quarter.
- Increase surveillance of buildings and grounds.
- Train staff to compensate for impaired structural or compartmentalization features.
- Conduct organization-wide safety education programs to promote awareness of firesafety building deficiencies and construction hazards.
- Implement and evaluate interim life safety measures as defined in the organizational policy.

S. FIRE CONFINEMENT

Confinement Measures — By dividing a building into smaller cells, fires will remain localized and can be more easily suppressed. To prevent fire from spreading from one unit to another, various building codes require that these smaller cells be made structurally sound
enough to withstand full fire exposure without major damage and that the boundaries of these units must be capable of acting as nonconducting heat barriers. Regardless of the type of building construction, stair enclosures are necessary to provide a safe exit path for occupants. Such enclosures also retard the upward spread of fire.

**Fire Doors** — Fire doors are a widely accepted means of protection. They usually have a rating of between 3/4 and 3 hours and may be constructed of metal or metal-clad treated-wood materials. Types of fire doors include hinged, rolling (sliding), and curtain. Fire doors must be installed in accordance with NFPA 80.

**Controlling Smoke** — Fire may spread under the roof a considerable distance from the point of origin, and smoke and gases generated by an uncontrolled fire can seriously impair firefighting operations. The movement of smoke within a structure is determined by many factors, including building height, ceiling height, type of ceiling (e.g., suspended), venting, external wind force, and direction of the wind. One method of smoke control uses a physical barrier, such as a door or damper, to block movement of the smoke. An alternative approach is to use a pressure differential between the smoke-filled area and the protected area. Venting is another way to remove smoke, heat, and gases from a building. Vents are also useful in windowless and underground buildings. They are not, however, a substitute for automatic sprinkler protection. Many variables affect the burning of combustible material, and formulas have been developed that can be used to compute the amount of venting required.

**The Unit Concept** — The unit concept involves setting up consecutive units of defense for each occupancy type to prevent the spread of fire and to provide a safe means of egress:

- **Unit one (room)** — The room is the main unit of defense because it provides the initial barrier against the spread of fire and smoke. Evacuation of patients is very difficult. The main objective is to isolate and protect patients in their rooms.

- **Unit two (smoke compartment)** — Partitions designed to stop smoke must be used to subdivide floors into compartments. These fire or smoke zones provide a secondary area of refuge against smoke. Doors and other openings in the smoke partitions must be protected. Doors and dampers must close when the fire alarm or smoke detector is activated to create an unbroken wall. Smoke partitions run from outside wall to outside wall and therefore segment corridors into limited areas.

- **Unit three (floor assembly)** — The third level of defense is floor assemblies that create barriers between stories and resist the vertical passage of fire and smoke. Vertical penetrations of floors should be designed to withstand the passage of fire and smoke. Openings, such as those made for pipes, must be sealed. In the case of stairways, elevators, and chutes, vertical partitions must provide protection.

- **Unit four (building)** — The structure of the building itself is the fourth unit of defense. The entire building must be built to remain structurally sound during a fire. The building must be designed to contain the fire within its bounds for a specified length of time. The height of the building determines the time that the building must withstand the fire.

- **Unit five (exits)** — Facilities must have a minimum of two approved exits that are remote from each other for each section or floor. The following are approved for healthcare occupancies:
  - Doors that open or leading directly outside
  - Class A or class B interior stairs and ramps
  - Smoke-proof towers
  - Outside stairs or fire escapes
  - Horizontal means of egress or exit passageways
Evacuation Responsibilities — Evacuation involves the removal of patients, residents, and equipment from an unsafe area to a safe area during a fire or other emergency situations. Residents are moved primarily to protect them from smoke but also because the liberated heat may render the adjoining corridor impassable. For this reason, it is necessary, while the fire is contained within the room of origin, to move residents beyond that point to safety. Any patient who is in immediate danger should be removed without waiting for special instructions and should be taken to the nearest safe place as calmly as possible. If fire, smoke, or panic do not threaten other patients on the floor, personnel should await evacuation orders. It is important to get visitors out of the facility. Evacuation may be ordered out of necessity or as a general precaution and may be partial or complete:

- **Partial evacuations** — A partial evacuation involves moving patients to a nearby safe area (e.g., on the same floor but on the other side of the building).
- **Total evacuations** — In a total evacuation, patients and equipment are moved from one or more wings to an adjoining area or outside of the building.

Stretcher Patients and Residents

- Evacuate stretcher patients and residents first.
- Ask patients to yield their stretchers after reaching safety if it is necessary for them to do so.

Wheelchair or Disabled Patients, Residents, Employees, or Visitors

- Use wheelchairs to remove wheelchair patients, residents, and visitors to a safe area.
- Use the same wheelchairs to transport additional patients or residents; patients or residents restrained in chairs in their rooms may be pushed out in these chairs instead of taking the time to transfer them to wheelchairs.
- Lead the group to a safe area and put someone in place to monitor them.
- Do not leave ambulatory patients without guidance, as panic could result.
- Develop plans to evacuate disabled or wheelchair employees per OSHA requirements.

Title III of the Americans with Disabilities Act requires organizations to develop plans to safely evacuate disabled visitors.

T. EGRESS

Designing exits involves more than a study of numbers, flow rate, and population densities. Exits must also provide a safe path of escape from fire. Exits must provide alternative pathways in case one exit is blocked by fire. Management must consider many issues when planning the emergency evacuation of buildings. The population of the building and degree of hazard are major factors to be considered when designing exits. NFPA 101 provides a reasonable and comprehensive guide to exit requirements, including such pointers as:

- Do not design exits and other safeguards to depend solely on any single safeguard.
- Be sure that exit doors can withstand fire and smoke for the length of time for which they are designed to be in use.
- Provide alternative exits and pathways in case one exit is blocked by fire.
- Provide exits with adequate lighting and mark exits and access to exits with readily visible signs.
- To protect exiting personnel, safeguard equipment and areas of any unusual hazards that might spread fire and smoke.
Requirements for Exit Sign Illumination — Required exit signs must be suitably illuminated by a reliable light source and be visible in both normal and emergency lighting modes. The illuminated surface of the exit sign should have a value of not less than 5 foot-candles to meet 29 CFR 1910.37(q)(4) requirements. NFPA 101 also requires 5 foot-candles for internally and externally illuminated signs with some exceptions, such as approved self-luminous or electroluminescent signs that provide evenly illuminated letters. Signs cannot have decorations, furnishings, or pieces of equipment that impair the visibility of an exit sign. Other brightly illuminated signs, displays, or objects must never be placed in the line of vision of a required exit sign (29 CFR 1910.37(q)(3)). NFPA 101 defines the four methods of illumination for exit signs:

- **Externally illuminated** — The light source is contained outside of the device or legend that is to be illuminated. The light source is typically a dedicated incandescent or fluorescent source.
- **Internally illuminated** — The light source is contained inside the device (e.g., incandescent, fluorescent, electroluminescent, light-emitting diodes, self-luminous).
- **Self-luminous** — The sign is illuminated by self-contained power sources such as tritium and operates independently of external power sources (batteries do not qualify); the light source is contained inside the device.
- **Electroluminescent** — Light-emitting capacitors are contained inside the device.

Emergency Lighting — Requirements for emergency lighting are established by NFPA 101. Emergency illumination, if required, must provide a minimum of 1.5 hours of light. Emergency lighting should be installed to provide initial illumination of not less than an average of 1 foot-candle. This level can decline to a minimum average of 0.6 foot-candle or 0.06 foot-candle at any one point at the end of an emergency lighting time of 1.5 hours. The maximum illumination at any one point can be no more than 40 times the minimum illumination at any one point to prevent excessively bright and dark spots. The intensity of visible light is measured in units of candles. The rate of flow of light or luminous flux is measured in lumen. A single lumen is the flux on 1 square foot of a sphere, 1 foot in radius, with a light source of 1 candle at the center and radiating uniformly in all directions. One lux is a unit of illumination equal to 1 lumen per square meter. Foot-candle is the direct measurement of visible radiation falling on a surface. Foot-lambert is the unit measure of physical brightness on any surface emitting or reflecting visible light.

OSHA Egress Requirements — An employer who demonstrates compliance with the exit route provisions of NFPA 101-2000 will be deemed to be in compliance with the corresponding requirements found in 29 CFR 1910.34, 1910.36, and 1910.37; however, 29 CFR 1910.35 defines a means of egress as a continuous and unobstructed way of exit travel from any point in a building or structure to a public way and consisting of three separate and distinct parts:

- **Exit access** — That portion that leads to the entrance of an exit
- **Exit** — That portion that is separated from all other spaces of a building or structure by construction or equipment to provide a protected way of travel to the exit discharge
- **Exit discharge** — That portion between the termination of an exit and a public way

OSHA Exit Requirements

- Exits must be marked with a visible sign.
- Exit accesses must be marked with readily visible signs whenever the exit or the way to reach an exit would not be immediately visible to occupants (29 CFR 1910.37(q)(1)).
• Any door, passageway, or stairway that is not an exit or way of exit access, but is located or arranged in such a way that it could be mistaken for an exit, should be identified by a sign reading “Not an Exit” or something similar; alternatively, a sign indicating its actual character, such as “To Basement” or “To Storeroom,” should be installed (29 CFR 1910.37(q)(2)).
• Signs designating an exit or a way of exit access must be distinctive in color and contrast with decorations, interior finish, or other signs (29 CFR 1910.37(q)(4)).
• Every sign must have the word “EXIT” in plainly legible letters not less than 6 inches high, with the principal stroke of the letter being .75 inches wide (29 CFR 1910.37(q)(8)).
• Where the direction of travel to the nearest exit is not immediately apparent, a sign reading "EXIT" or similar designation with an arrow indicating the direction to the exit is required (29 CFR 1910.37(q)(5)).

U. PORTABLE FIRE EXTINGUISHERS

Two basic types of equipment are used to fight and control fires. Fixed systems, which include automatic sprinklers, standpipe hoses, and various pipe systems, must be supplemented by portable fire extinguishers. Personnel expected to use portable fire extinguishers must be trained annually on their operation and safe use and should be advised to follow the basic “PASS” guidelines listed below:

- Pull the pin on the extinguisher.
- Aim the nozzle at the base of the fire.
- Squeeze the handle firmly.
- Spray in a sweeping motion.

Basic Requirements — Fire extinguishers must be:

- Approved by an approved testing lab such as Factory Mutual Research Corporation (FM) or Underwriters Laboratories (UL)
- The appropriate type for the class of fire that could occur in the area
- Of sufficient size and quantity to protect the area
- Accessible for immediate use and easy to reach
- Inspected and maintained in peak operating condition
- Used only by trained personnel

Understanding How a Fire Extinguisher Works — Portable fire extinguishers apply an agent that will cool burning fuel, displace or remove oxygen, or stop the chemical reaction so a fire cannot continue to burn. Pressing the handle of an extinguisher opens an inner canister of high-pressure gas that forces the extinguishing agent from the main cylinder through a siphon tube and out the nozzle. Fire is the result of a very rapid chemical reaction between oxygen and a combustible material, which produces heat, light, flame, and smoke. For fire to exist, the following three elements must be present at the same time:

- Oxygen (enough to sustain combustion)
- Fuel or combustible material
- Heat (enough to raise the material to its ignition temperature)

Types of Fire Extinguishers — Different types of fire extinguishers are designed to fight different types of fire (see Table 5.12). Equipment that passes laboratory testing is labeled and given an alpha-numeric classification based on the type and size of fire it will extinguish.
The letters A, B, and C represent the types of fire for which an extinguisher has been approved. The number in front of the A rating indicates how much water the extinguisher is equal to at a ratio of 1.25:1; for example, a 4-A rated extinguisher would be equal to 5 (4 × 1.25) gallons of water. The number in front of the B rating represents the area in square feet of a class B fire that a nonexpert user should be able to extinguish. Using the example of 10-B, a nonexpert user should be able to put out a flammable liquid fire that is as large as 10 square feet.

Most Common Types of Fire Extinguishers

- Air-pressurized water extinguishers
- \( \text{CO}_2 \) (carbon dioxide) extinguishers
- Dry-chemical extinguishers

Travel Distances

- Class A extinguishers must have a travel distance of 75 feet or less. Facilities may meet this requirement with uniformly spaced standpipe systems or hose stations installed for emergency use. These systems must meet the requirements of 29 CFR 1910.158 or 1910.159.
- Class B extinguishers must have a travel distance of 50 feet or less.
- Class C extinguishers must have a travel distance that is based on the appropriate A or B hazard.
- Class D extinguishers must have a travel distance of 75 feet.

Proper Maintenance — Proper maintenance includes a complete examination and involves disassembly and inspection of each part, replacing it when necessary (see Table 5.13). Maintenance should be done at least annually or more often if conditions warrant. Hydrostatic testing of portable fire extinguishers is done to protect against unexpected in-service failure caused by internal corrosion, external corrosion, damage from abuse, etc. Hydrostatic testing must be performed by trained personnel with proper test equipment and facilities. Table 1 of 29 CFR 1910.157 provides test intervals for various types of extinguishers.

### TABLE 5.12 Classes of Fire Extinguishers

<table>
<thead>
<tr>
<th>Class</th>
<th>Type of Fire</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Fires involving ordinary combustible materials, such as wood, paper, or clothing, where the quenching and cooling effects of water are most effective; use a pressurized water extinguisher or an A/B/C dry-chemical extinguisher.</td>
</tr>
<tr>
<td>B</td>
<td>Fires involving flammable liquids and similar materials; use type B/C or A/B/C dry-chemical extinguishers. Carbon dioxide (( \text{CO}_2 )) extinguishers may also be used.</td>
</tr>
<tr>
<td>C</td>
<td>Fires in or near energized electrical equipment where the use of a nonconductive extinguishing agent is of first importance; use ( \text{CO}_2 ) or dry chemical (B/C or A/B/C) extinguishers. Water must never be used. (Halon extinguishers have been declared an environmental danger and will no longer be produced.)</td>
</tr>
<tr>
<td>D</td>
<td>Metal fires; combustible metals such as magnesium and sodium require these special extinguishers.</td>
</tr>
<tr>
<td>K</td>
<td>Grease fires; use a portable extinguisher specifically designed for cooling this types of fire.</td>
</tr>
</tbody>
</table>
Air-Pressurized Water Extinguishers — Water is the most commonly used extinguishing agent for type A fires. Water extinguishers can be recognized by their large silver containers. They are filled about two thirds of the way with ordinary water, then pressurized with air. In some cases, detergents are added to the water to produce a foam. These extinguishers stand about 2 to 3 feet tall and weigh approximately 25 pounds when full. Pressurized water extinguishes fire by cooling the surface of the fuel to remove the heat element of the fire triangle. These extinguishers are designed for class A (wood, paper, cloth, rubber, and certain plastics) fires only; never use water to extinguish flammable liquid fires, as water is extremely ineffective at extinguishing this type of fire and may make matters worse by spreading the fire. Also, never use water to extinguish an electrical fire, as water is a good conductor and may lead to electrocution if used to extinguish an electrical fire. Electrical equipment must be unplugged or de-energized before using a water extinguisher on an electrical fire.

Carbon Dioxide Extinguishers — Carbon dioxide extinguishers are filled with carbon dioxide (CO₂), a nonflammable gas under extreme pressure. These extinguishers put out fires by displacing oxygen, thus removing the oxygen element of the fire triangle. Because of its high pressure, pieces of dry ice shoot from the horn, which also has a cooling effect on the fire. This type of extinguisher has a hard horn and no pressure gauge. CO₂ cylinders are red and range in size from 5 to 100 pounds or larger. CO₂ extinguishers are designed for class B and C (flammable liquid and electrical) fires only. CO₂ extinguishers are not recommended for class A fires because such fires may continue to smolder and re-ignite after the CO₂ dissipates. CO₂ extinguishers should never be used in a confined space when people are present without proper respiratory protection. This type of extinguisher is frequently found in industrial vehicles, mechanical rooms, offices, computer labs, and flammable liquid storage areas.

Dry-Chemical Extinguishers — Dry-chemical extinguishers put out fires by coating the fuel with a thin layer of fire-retardant powder, thus separating the fuel from the oxygen. The powder also works to interrupt the chemical reaction which makes these extinguishers extremely effective. Dry-chemical extinguishers are usually rated for class B and C fires and may be marked multiple purpose for use in A, B, and C fires. They contain an extinguishing agent and use a compressed, nonflammable gas as the propellant. Dry-chemical extinguishers have a label indicating they may be used on class A, B, and C fires. They are red in color and range in size from 5 to 20 pounds. These extinguishers can be found in a variety of locations, including public hallways, laboratories, mechanical rooms, breakrooms, chemical storage areas, offices, commercial vehicles, and other areas with flammable liquids.

Marking Extinguishers — Recommendations for marking extinguishers and/or extinguisher locations are provided in NFPA 10 (Portable Fire Extinguishers). Extinguishers suitable for more than one class of fire may be identified by multiple symbols, applied in such a way as

---

**TABLE 5.13 Monthly Extinguisher Inspections**

- Determine proper location and type.
- Make sure extinguisher locations are not blocked or hidden.
- Document that extinguishers are properly mounted according to NFPA 10.
- Check gauges to verify that pressure is adequate.
- Be sure pins and seals are in place.
- Look for evidence of damage or tampering.
- Be sure nozzles are free of blockage.
to ensure legibility and durability. Markings should be applied to the extinguisher on the front and should be of a size and form to be easily read at a distance of 3 feet. A highly visible picture/symbol labeling system has been devised by the National Association of Fire Equipment Distributors.

**Extinguisher Ratings** — Additional information on the label includes the water equivalency rating and amount of square footage that the extinguisher can handle if operated by someone properly trained. As noted earlier, a 4-A extinguisher would be equivalent to 5 gallons of water. The B/C rating indicates square footage (e.g., 25-B/C). No such ratings are provided for class C or D fires. OSHA requires fire extinguishers to be selected and placed based on the class and size of fires anticipated in the work area. OSHA provides guidance on the classes of fires and travel distances to an extinguisher. Local fire codes may be more stringent.

**V. NFPA 99 (HEALTHCARE FACILITIES)**

The Healthcare Facilities standard (NFPA 99) contains criteria for safeguarding patients and healthcare personnel from fire, explosion, electrical, and related hazards. It addresses the use of anesthetic agents, medical gas equipment, electrical apparatus, and high-frequency electricity. Facilities should plan for external incidents that disrupt normal patient care, fire and explosion hazards associated with laboratory practices, the use of hyperbaric and hypobaric facilities for medical purposes, and maintenance and testing criteria for electrical systems. They should also be aware of the maintenance, testing, and installation criteria for medical or surgical vacuums and medical gas systems. Refer to NFPA 99B (Standard for Hypobaric Facilities) for additional guidance. Following are just some of the issues covered by NFPA 99:

- Electrical system wiring and transfer switches
- Storage and use of flammable and combustible liquids in laboratories
- Emergency management to maintain a facility’s services and recover from a disaster
- Safety director responsibilities and emergency procedures for hyperbaric facilities
- Individual oxygen storage in patient care areas
- Gas and vacuum systems piping
- Alarms
- Design considerations

**NFPA 99 Contents**

- Chapters 1 to 3 address administration, referenced publications, and definitions.
- Chapters 4 to 6 cover electrical, gas, vacuum, and environmental systems.
- Chapters 7 to 10 address materials, electrical equipment, gas equipment, and manufacturer requirements.
- Chapter 11 addresses requirements for laboratories.
- Chapter 12 covers healthcare emergency management.
- Chapters 13 to 14 address hospitals and other healthcare facilities.
- Chapters 17 to 18 address nursing home and limited-care facility requirements.
- Chapter 19 covers electrical and gas equipment for home care.
- Annex D addresses the safe use of high-frequency electricity in healthcare facilities.

**W. ELECTRICAL EQUIPMENT INSTALLATIONS**

Electrical equipment should be maintained and installed to meet NFPA/ANSI 70 (National Electrical Code [NEC]):
Use only Underwriters Laboratories (UL)-listed or Factory Mutual (FM)-approved equipment where flammable gases or vapors could be present.

Be aware that temporary or makeshift wiring, particularly if defective or overloaded, is a very common cause of electrical fires; do not use this type of wiring.

Be aware that overloaded or partially grounded wiring may also heat up enough to ignite combustibles without blowing fuses or tripping circuit breakers.

Where flammable liquids are used, provide bonding and grounding with adequate and true grounds in accord with the NEC.

X. FLAMMABLE/COMBUSTIBLE MATERIALS

Flammable and combustible liquids, vapors, and gases present a major fire hazard in all healthcare facilities. Although workers usually recognize this potential hazard, they should also be aware of important facts about flammable liquids that can help to prevent fires. Many liquids have vapors that are flammable or combustible and can be ignited by a spark from a motor, friction, or static electricity. A liquid may be classified as either combustible or flammable, depending on its flash point (see Table 5.14), which is the temperature at which it gives off enough vapor to form an ignitable mixture with air. When a liquid reaches its flash point, contact with any source of ignition will cause the vapor to burst into flame.

OSHA Requirements for Flammable Storage Areas

- Use approved containers and portable tanks for the handling and storage of flammable and combustible liquids (29 CFR 1910.106(d)(2)).
- Maintain tight connections on drums and combustible liquid piping (29 CFR 1910.106(c)(3)).
- Keep flammable liquids in closed containers when not in use (29 CFR 1910.106(e)(2)(iv)(a)).
- Ground or bond bulk drums of flammable materials to containers during dispensing (29 CFR 1910.106(c)(6)(ii)).
- Use safety cans for dispensing flammable or combustible liquids (29 CFR 1910.106(d)(5)(iii)).
- Adequately vent all storage tanks to prevent the development of excessive vacuum or pressure as a result of filling, emptying, or atmospheric temperature changes (29 CFR 1910.106(b)(4)(ii)).
- Equip portable tanks with emergency venting to relieve internal pressure raised by exposure to fire (29 CFR 1910.106(d)(2)(ii)).
- Label storage cabinets that store flammable liquids “Flammable: Keep Fire Away” (29 CFR 1910.106(d)(3)(ii)).
- Store flammable liquids in approved safety cans (29 CFR 1910.106(d)(2) and 29 CFR 1910.144(a)(1)).

### TABLE 5.14 Flashpoint Definitions

<table>
<thead>
<tr>
<th>Classification</th>
<th>Flash Point Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flammable</td>
<td>Below 100°F (37.8°C)</td>
</tr>
<tr>
<td>Combustible</td>
<td>At or above 100°F (37.8°C)</td>
</tr>
</tbody>
</table>

Flammable liquids can reach their flash points at room temperature, and any unrecognized leak can pose a hazard.
• Enforce no-smoking rules in areas where hazardous materials are stored and used (29 CFR 1910.106(e)(9)).
• Be sure the appropriate fire extinguishers are mounted, located, and identified so they are readily accessible to employees (29 CFR 1910.157(c)(1)).
• Be sure all fire extinguishers are inspected and recharged regularly and that the inspections are documented (29 CFR 1910.157(e)).
• Provide an adequate number of portable fire extinguishers of the proper type (29 CFR 1910.157(d)).
• For a fixed extinguishing system, post warning signs to inform people of the hazards presented by the extinguishing medium (29 CFR 1910.160(b)(5)).

General Precautions

• Clean up spills of flammable and combustible liquids promptly; cleanup personnel should use appropriate personal protective equipment.
• Be sure flammable or combustible liquid storage and use containers meet approval standards of NFPA 30 (Flammable and Combustible Liquids Code).
• Store combustible waste material, such as oily shop rags and paint rags, in covered metal containers.
• Post storage areas as no-smoking areas, per 29 CFR 1910.106 (Flammable and Combustible Liquids).
• Be sure piping systems, including tubing, flanges, bolting, gaskets, valves, fittings, and all pressurized parts containing flammable and combustible liquids, meet the requirements of NFPA 30.

Inside Storage Areas — Inside storage areas should be prominently posted as no-smoking areas. The NFPA National Fire Code details requirements for inside storage areas for flammable and combustible liquids. The NFPA 30 handbook is an essential reference for those involved with the distribution or use of flammable and combustible liquids. The code covers general provisions, tank storage, piping systems, container and portable tank storage, and operational requirements. The code also contains information relevant to the design, construction, and testing of flammable liquid safety cabinets and requirements for safety cans.

Fire and Chemical Hazard Symbols — Identifying the hazardous qualities of materials is covered by NFPA 704 (Standard System for the Identification of the Hazards of Materials for Emergency Response). This simple, recognizable, and easily understood marking system indicates the severity of the hazards presented by a particular material. The standard applies to industrial, commercial, and institutional facilities that manufacture, process, use, or store hazardous materials. NFPA 704 does not apply to transportation requirements, general public use, or occupational exposure. A system of categories, colors, and numbers was created to provide basic hazard information that enables firefighters and other emergency personnel to easily decide whether or not to evacuate an area or proceed with emergency control operations. Two key categories of identification are “health” and “flammability.” A numerical range from 0 to 4 indicates the severity of a hazard, with 4 representing the most severe hazard and 0 a minimal hazard.

Assignment of Ratings — Only people who are technically competent and experienced in interpreting the hazard criteria contained in the NFPA 704 standard can determine the correct numerical ratings for a specific material. The system is based on relative, rather than absolute, values; therefore, varying conditions of storage and use can result in different ratings being assigned to the same material. When a variety of materials is present at one
location (e.g., warehouses, storage rooms, or laboratories), considerable judgment is required to properly assign ratings to that area. The assignment of ratings is based on factors that encompass both knowledge of the inherent hazards of the material as well as its anticipated behavior under conditions of exposure to fire or fire control procedures. For additional information on hazard rating assignment, refer to NFPA 704, NFPA 49 (Hazardous Chemicals Data), and NFPA 325 (Guide to Fire-Hazard Properties of Flammable Liquids, Gases, and Volatile Solids).

Bonding and Grounding — A bonding and grounding pathway eliminates the buildup of static electricity and allows it to safely dissipate into the ground. 29 CFR 1910.106(e)(6)(ii) and the Uniform Fire Code (UFC) Div. VIII, Sec. 79.803(a), state, “Class I liquids shall not be run/dispensed into containers unless the nozzle and container are electrically interconnected. Where the metallic floor plate on which the container stands while filling is electrically connected to the stem or where the fill stem is bonded to the container during filling operations by means of a bond wire, the provisions of this section shall be deemed to have been complied with.” This means that all containers of class I liquids (liquids with a flash point lower than 73°F) need to be bonded and grounded during dispensing. This includes nonmetallic containers, even though the construction material may not be recognized as conductive (for example, polyethylene). If the containers are not properly bonded and grounded, the resulting static spark could be capable of raising the vapor temperature above the flash point, causing an explosion. Some common examples of class I liquids include alcohol, toluene, acetone, and benzene. Flash points can be found on the Material Safety Data Sheet (MSDS) that accompany chemicals from the manufacturer or distributor. For bonding and grounding to be effective, a metal-to-metal connection must be maintained between the bonding/grounding cables and containers. To accomplish this, all paint, dirt, rust, etc. must be removed from the area of the connection. These connections can be of two basic types: permanent or temporary. Permanent connections can be made by using solid or braided wires and must incorporate screw-type clamps, welding, or other similar means of connection. Temporary connections should use only braided wires in conjunction with spring clamps, magnetic clamps, or other similar methods of maintaining metal-to-metal contact. The difference between solid and braided wire is that solid wire is a single, complete strand of wire that is not known for its durability; for this reason, solid wires should only be used for permanent connections or those that will not be handled often. Braided wires consist of several strands of wire wrapped together to provide greater strength and flexibility; thus, braided wires are recommended for use with temporary connections. Additionally, NFPA 77 states that either insulated or uninsulated cables can be used. Insulated cables are those with a protective rubber coating that completely encompasses the wire. Uninsulated cables, which have no coating, allow for quick, easy inspection. Insulated cables should be checked frequently for continuity. The minimum size (gauge) of the cables is determined by strength and durability rather than current-carrying capabilities.

Y. SURGICAL FIRES

Fires on or in a surgical patient occur only rarely, but their consequences can be grave. They can kill or seriously injure patients, injure surgical staff, and damage critical equipment. The risk of surgical fires is present whenever and wherever surgery is performed, whether in an operating room, a medical office, or a surgery clinic. Common fire locations are the airway and head or face. An oxygen-enriched atmosphere has been a contributing factor in most situations. Flammable materials present in surgical suites include alcohol-based prepping agents, drapes, towels, gowns, hoods, and masks. Common ignition sources found in
operating rooms include electrosurgical or electrocautery units, fiberoptic light sources and cables, and lasers. High-speed drills can produce incandescent sparks that can fly off the target tissue and ignite some fuels, especially in oxygen-enriched atmospheres. Staff should participate in special drills and training on the use of firefighting equipment, proper methods for rescue and escape, and the identification and location of medical gas, ventilation, and electrical systems and controls, as well as when, where, and how to shut off these systems. In addition, they should be familiar with use of the hospital’s alarm system and system for contacting the local fire department.

**Joint Commission Recommendations** — The Joint Commission recommends that healthcare organizations prevent surgical fires by:

- Informing staff members, including surgeons and anesthesiologists, about the importance of controlling heat sources by following laser and electrosurgical unit safety practices; managing fuels by allowing sufficient time for patient prep; and establishing guidelines for minimizing oxygen concentration under the drapes.
- Developing, implementing, and testing procedures to ensure appropriate response by all members of the surgical team to fires in the operating room.

Organizations are strongly encouraged to report any instances of surgical fires as a means of raising awareness and ultimately preventing the occurrence of fires in the future. Reports can be made to JCAHO, ECRI, the Food and Drug Administration (FDA), and state agencies.

**ATSM Standard Development** — The causes and prevention of surgical fires are covered by ASTM’s *Standard Guide to Surgical Fires: Fire-Risk Assessment, Prevention, and Extinguishment*, developed by ASTM Committee F29 on Anesthetic and Respiratory Equipment. The final standard, released in 2004, offers instruction on the risks of potentially flammable materials used in surgery. The standard is directed at doctors, nurses, anesthesiologists, technicians, engineers, risk managers, and health administrators.

**Surgical Fire Prevention Topics**

- Minimize ignition risks during the use of electrosurgical devices and surgical lasers (safe and appropriate use of electrosurgical pencils, use of bipolar electrosurgery, use of the laser standby mode).
- Minimize ignition risks by selective pre-use wetting of likely fuels present at the incision (gauze, sponges, pledgets, towels).
- Use specific procedures to minimize ignition risks in oropharyngeal surgery (oropharyngeal gas scavenging, wetted gauze, sponges, or pledgets).
- Minimize oxidizer risks (oxygen and nitrous oxide) in general surgery and specifically during oropharyngeal surgery.
- Use open-source supplemental oxygen safely and appropriately.
- Minimize fuel risks with flammable surgical preps and in general (e.g., cautious use of alcohol-based preps and other flammable liquids, coating of facial hairs).
- Plan the response to surgical fires.
- Extinguish small fires with the hand.
- For large fires on or in the patient, stop the flow of oxidizers, remove burning materials from the patient, extinguish burning material, and care for the patient.
- Follow correct procedures for using recommended types of fire extinguishers, such as carbon dioxide (for surgical fires, water-based and dry-powder extinguishers are not recommended).
• Use aqueous solutions, fire blankets, sprinkler systems, and fire hoses to extinguish fires (fire blankets and fire hoses are specifically not recommended, and sprinkler systems are not likely to become activated by a surgical fire).
• Develop evacuation procedures (RACE: rescue the patient, alert staff, confine the smoke and fire, evacuate the area).

The Elements of Surgical Fires — The three basic elements of surgical fires constitute the traditional fire triangle. In the operating room, these elements are present in the following forms:

• Ignition sources include electrosurgical equipment, surgical lasers, electrocautery equipment, fiberoptic light sources, and defibrillators.
• Oxidizers include oxygen-enriched atmospheres, nitrous oxide, medical air, and ambient air.
• Fuels include common operating room materials, such as mattresses, sheets, gowns, towels, drapes, dressings, and sponges, in addition to volatile organic chemicals, body hair, intestinal gases, tracheal tubes, and body tissue.

Each member of the surgical team is associated with — and should be concerned with — one or more sides of the fire triangle. Surgeons are involved primarily with ignition sources, anesthesia providers with oxidizers, and nurses with fuels, although these areas frequently overlap. Each member of the team should understand the fire hazards presented by each side of the fire triangle and should make a point of communicating information on the risks to the other team members — intraoperatively or in seminars, for example.

Additional Recommendations for Preventing Surgical Fires

• Avoid pooling of flammable liquid skin preps.
• Allow flammable liquid preps to dry fully before draping; pooled or wicked liquid will take longer to dry than will prep on the skin alone.
• Use a properly applied incise drape, if possible, to help isolate head and neck incisions from O2-enriched atmospheres and from flammable vapors beneath the drapes. Proper application of an incise drape prevents gas communication channels from developing in the under-drape space to the surgical site.

First Response — Small fires on a patient, such as those caused when a hot electrosurgical pencil ignites drapes on a patient or when an electrocautery pencil ignites a blotting sponge, can be extinguished by patting out the fire with a gloved hand or towel. Large fires on or in the patient require a more comprehensive response that stops the flow of oxidizers to the patient. In many cases, doing so will cause the fire to go out or at least lessen in intensity. The burning materials must then be removed from the patient and extinguished to protect the patient from the heat of these materials. The patient should receive immediate care; breathing should be restored, if necessary (with air, never O2), and injuries dealt with. Some debate exists with regard to this sequence — specifically, the order in which these steps should be carried out. In any case, they should both be done as close to instantaneously as possible.

If Evacuation Is Necessary — In some very rare cases, extreme smoke and fire conditions may force evacuation of the operating room. In such cases, RACE defines the actions that should take place: Rescue the patient; if possible, alert staff in nearby operating rooms and activate fire alarm systems; confine the smoke and fire by shutting all doors and closing off gas, vacuum, and power systems; and evacuate the operating room and, if necessary, the surgical suite.
Fire Extinguishers — Although they should not be the weapon of first resort when dealing with a surgical fire, fire extinguishers may be required to deal with fires that engulf or have migrated off the patient. As noted earlier, the correct procedure for using any fire extinguisher can be recalled by the acronym PASS (pull the pin, aim the horn or nozzle, squeeze the trigger, and spray in a sweeping motion to put out the fire). The types of fire extinguishing devices commonly available in operating rooms are water based, CO₂, and dry powder. Not all of these are equally safe or effective. Some experts recommend CO₂ extinguishers and recommend that a 5-lb CO₂ extinguisher be mounted just inside the entrance of each operating room in the hospital.

Fire Blankets — Typically, fire blankets are wool blankets treated with fire retardants that are placed over a fire to smother it. They should never be located in an operating room and should never be used for patient fires. Their use will likely cause more severe injuries to the patient; however, they can be placed outside the operating room in case of a fire on a conscious person, such as a surgical team member. In such a fire, the person can exit the operating room to use the blanket in a room that likely is not oxygen enriched and can tell others about the fire.

Sprinkler Systems — Sprinkler systems can be found in the operating rooms of newer facilities but may activate only in response to large fires. Like water from extinguishers, sprinkler system water is not sterile and could, under some circumstances, present an electric shock hazard. Fire hoses are sometimes found in hallways and stairwells of older facilities. Water from hoses is also not sterile and can also create an electric shock hazard. In addition, the water stream itself can deliver sufficient force to cause injury or mechanical damage and can make the hose difficult to hold onto. The use of fire hoses to extinguish surgical fires is not recommended.

Fire Drills — Fire drills not only allow staff to practice for a fire but also help troubleshoot any difficulties that might occur. Some elements to consider in planning a fire drill include:

- The proper response of surgical team members and the operating suite staff
- How the patient can easily and safely be moved to another operating room
- How the spread of smoke could be prevented (for example, through the use of smoke doors and air duct dampers)
- Location and operation of fire extinguishers, fire alarm pull stations, and exits
- The response of additional firefighting personnel (such as the fire response team and local fire department)

SUMMARY

This chapter addressed two major topics impacting healthcare organizations: emergency and fire safety management. The first part of the chapter covers emergency management, including the four elements of the planning process. The chapter provided basic information about the emergency planning process, including writing a plan, drills, assessment of available resources, and coordinating community involvement. The text also addressed OSHA, EPA, and other governmental agencies involvement in emergency situations. Other topics presented in the chapter include some of the training, medical, and staff issues faced by healthcare organizations in emergency situations. The text focused on the importance of conducting a valid hazard vulnerability analysis to serve as the foundation of an effective emergency contingency plan. The chapter also provided information about hazardous material emergencies, weather and natural disasters, transportation accidents, bioterrorism,
and weapons of mass destruction. The chapter also addressed fire safety and life safety requirements for healthcare facilities, including fire prevention activities and drills. Special topics found in the chapter include information on interim life safety, egress actions, NFPA 99 requirements, storing flammable materials, and preventing surgical department fires.

FOR REVIEW AND DISCUSSION

1. Define an emergency.
2. What is the purpose of NFPA 1600, published in 2004?
3. What four required elements must be addressed in an emergency plan?
4. List at least seven elements of a hospital emergency plan.
5. Why is coordinating an emergency plan with community agencies so important?
6. Briefly describe the six steps of the model emergency planning process.
7. What actions can help make the hazard vulnerability analysis a valid planning instrument?
8. Discuss at least three important essentials for conducting realistic emergency drills.
9. Why is the incident command system so important to healthcare leaders during emergency response situations?
10. What role do good media relations have in effective emergency management?
11. What federal agency publishes specific guidance for healthcare organizations dealing with hazardous materials incidents?
12. Why must healthcare facilities in some parts of the United States plan for wildfire emergencies?
13. Which federal agency published the national strategy guide for dealing with terrorist events?
14. List and define at least five types of terrorism agents.
15. Describe the four stages of fire development.
16. List the four required parts of the statement of conditions (SOC).
17. What four areas are scored by the Fire Safety Evaluation System criteria?
18. List and describe the elements of the unit concept.
19. List and describe the four NFPA requirements for illuminating exit signs.
20. List the five classes of fire as described in the text.
21. Define the following:
   Flashpoint
   Flammable liquid
   Combustible liquid
   Bonding
   Grounding
A. INTRODUCTION

This chapter provides an overview of some of the facility safety challenges facing healthcare organizations. Standards pertinent to healthcare facilities and maintenance functions can be found in 29 CFR 1910, 29 CFR 1926, American National Standards Institute (ANSI) standards, and National Fire Protection Association (NFPA) codes or standards. Most facilities also must deal with a myriad of local and state laws, codes, and regulations. Control measures should be implemented to reduce facility hazards. Healthcare organizations must deal with safety issues on a daily basis, such as wet floors, stairway obstructions, chemical use, tools, and faulty ladders, to name a few. Safety, facility, and engineering personnel must identify risks and implement processes to minimize adverse impacts on buildings, grounds, equipment, occupants, and the entire care environment. Healthcare leaders must address the safety risks associated with providing services to patients. Facility and general safety also impacts workers, visitors, and contractors; a good facility safety effort should stress the safety of those maintaining the facilities and the physical environment of the campus:

- Develop a written plan to address the management of the care environment.
- Designate a person to coordinate safety functions.
- Identify a person to intervene in events threatening life and health or property.
- Review general safety policies as often as necessary but at least every 3 years.
- Respond to product safety recalls by taking appropriate actions.
- Ensure proper maintenance of all facility grounds and equipment.
- Conduct periodic environmental tours to assess safety program effectiveness.
- Assess staff knowledge behaviors during periodic environmental tours.
- Identify new or altered tasks that could pose risks in construction areas.
- Evaluate areas with changes in services to identify improvement opportunities.
- Conduct environmental tours or surveys to identify hazards and unsafe practices.
- Conduct inspections every 6 months in all patient areas and annually in nonpatient areas.

Maintaining a Suitable Physical Environment — A functional physical environment promotes healing and caring. Certain key physical elements can positively influence patient outcomes and satisfaction while improving patient safety. These elements contribute to creating a positive atmosphere for patients, families, visitors, and staff; therefore, it is important to:
• Provide appropriate spaces for the care, treatment, and services provided; spaces must meet the needs of the patients with regard to age and other characteristics.
• Provide closet and drawer space for patients to store personal property and other items.
• Provide lockers, drawers, or closet space for patients doing their own personal grooming or those wearing street clothes (e.g., psychiatric patients).
• Consider personal preferences, and accommodate equipment such as wheelchairs (for hospitals offering long-term care of more than 30 days).
• Provide equipment for rehabilitation and activities without compromising the safety of the environment (for hospitals offering long-term care of more than 30 days).
• Maintain furnishings that reflect the patient’s level of ability and needs.

Facility Safety Considerations — The facility or plant operations department performs a variety of functions to support all healthcare operations. The size of the department depends on the size of the facility and type of medical services provided. The department of a medium-sized healthcare facility could be responsible for the following activities:

• Normal and preventive maintenance of facilities and equipment
• Equipment procurement and installation
• Maintenance of heating, ventilation, and air conditioning systems, as well as utility and energy systems
• Interior maintenance, including painting and floor replacement
• Maintenance of facility grounds
• Plant, technology, and safety management compliance
• Monitoring contractors and coordinating renovation activities
• Fire protection, disaster planning, and emergency power
• Handling, storing, and managing facility waste
• Communications and security
• Maintenance of parking facilities

B. OFFICE SAFETY

Healthcare organizations many times overlook administrative areas during safety and health surveys, but these areas have their share of hazardous activities, including lifting, climbing, repetitive motions, and tripping, as well as the risk of electrical shock. Healthcare office areas are vulnerable to workplace violence in locations such as admissions, emergency department, gift shop, patient affairs, and business offices. This section of the text addresses many of the most common office hazards (see Table 6.1). Consider including the following activities in the office safety program:

• Be sure desks and countertops are free of sharp, square corners.
• Distribute materials evenly in filing cabinets to avoid tipping.
• Open a single file drawer at a time and close it immediately after use.
• Properly store office materials or stack them on top of filing cabinets.
• Keep aisles and passageways clear at all times.
• Be sure temporary electrical cords and telephone cables do not cross aisles.
• Tape cords to the floor or cover them with a specially designed anchor.
• Fix carpets with bulges or broken seams to prevent tripping hazards.
• Store heavy materials on lower shelves.
Carbonless Paper — This type of paper can release microgranules of dyes when the sheets are pressed together. Workers can absorb these hazardous materials through the skin or inhale them from the air. Symptoms of exposure include mild to moderate skin irritation and irritation of the mucous membranes of the eyes and upper respiratory tract. Some workers have reported headaches, sinus infections, bronchitis, and contact dermatitis. Controls include maintaining adequate ventilation, humidity, and temperature. Employees should practice good housekeeping and wash their hands regularly to minimize hand-to-mouth and hand-to-eye contact. (For more information, refer to NIOSH Publication No. 2001-107, Carbonless Paper."

Avoid Hazards

- Be aware of open doors and drawers, sharp desk corners, and filing cabinets.
- Be careful not to run into open file drawers when bending down or straightening up.
- Be aware of sharp objects such as office machines, staples, and pins.
- Pay attention to where you are walking at all times.
- Properly store materials in your work area.
- Never carry anything that blocks your vision.
- Avoid getting fingers or hands caught in a drawer, door, or window, and be aware that fingers, hair, clothing, and jewelry can get caught in office machines.
- Be careful when using knives, scissors, or paper cutters.
- Always be alert when working with any office machinery.

Office Storage Practices

- Never store boxes, papers, and other materials on top of lockers or file cabinets.
- Stack boxes and cartons of a uniform size.
- Store heavy objects on lower shelves.
- Whenever possible, put materials inside cabinets, files, and lockers.
- Never place office equipment on the edge of a desk, filing cabinet, or table.
- Keep aisles, corners, and passageways clear at all times by using designated authorized storage areas.
- Store heavy materials in such a way as to prevent over-reaching to retrieve them.
- Keep fire extinguishers and emergency equipment unobstructed, and do not store materials closer than 18 inches from fire sprinkler heads (see Table 6.2).
TABLE 6.2  Office Fire Prevention Strategies

- Keep heat-producing equipment away from combustible materials.
- Turn off all appliances at the end of the day.
- Use only grounded appliances plugged into grounded outlets.
- Disconnect equipment that malfunctions or gives off a strange odor.
- Report the condition or equipment to the maintenance department.
- Disconnect equipment to replace cracked, frayed, or broken electrical cords.
- Keep extension cords clear of areas where they could be damaged by shoes.
- Never plug an extension cord into another extension cord.
- Do not allow combustible material to build up in inappropriate storage locations.
- Store all flammable materials in a metal cabinet.
- Keep flammable and combustible materials away from ignition sources.

Lighting — The best lighting system supports the tasks to be done and minimizes glare from ceilings, walls, and floors. A number of measures can be taken to prevent and control poor lighting conditions in the work environment:

- Provide regular maintenance of lighting systems.
- Replace old bulbs and faulty lamp circuits.
- Use a light-colored matte finish on walls, ceilings, and floors to reduce glare.
- Do not face workstations toward windows, unshielded lamps, or sources of glare.
- Provide adjustable shades or window coverings for workers facing a window.
- Use diffuse light to help reduce shadows; indirect lighting and task lighting are recommended.

Administrative Area Noise — Video display terminals, high-speed copiers, telephones, fax machines, hallways, break areas, and humans can be noisy and distracting. The following tips might prove helpful in reducing the noise level in offices:

- Maintain equipment properly.
- Lubricate and tighten loose parts.
- Place loud equipment in designated areas.
- Provide barrier walls or dividers to isolate noises.
- Use buffers or acoustically treated materials to absorb noise.
- Insulate vibrating equipment with rubber pads.
- Enclose equipment (e.g., printers) with acoustical covers or housings.
- Schedule noisy tasks to minimize the effect on others.

Office Electrical Safety — Electrical accidents usually occur as a result of faulty or defective equipment, unsafe installation, or misuse of equipment, so it is advisable to take the following precautions:

- Be sure fixed equipment, such as large, stationary machines, is grounded.
- Use grounded cords and plugs in areas located near hazardous or wet locations.
- Have a sufficient number of electrical outlets to eliminate the need for extension cords and to avoid overloading circuits.
- Position floor-mounted outlets carefully to prevent tripping hazards.
- Do not use poorly maintained or unsafe coffee makers, radios, or lamps.
• Inspect equipment and cords regularly.
• Repair or replace defective, frayed, or improperly installed cords.
• Examine electrical cords on a routine basis, looking for fraying and exposed wiring.
• Never pull a cord over nails, hooks, or other objects that may cause damage.
• Inspect connections behind furniture that could damage the cord or plug.
• Never use extension cords in situations where fixed wiring is not feasible.
• Never run an extension cord across walkways or aisles.
• Always tape down cords or use a cord runner in walkways.
• Be sure wall receptacles and outlet plates remain tight and have no cracks.
• Never pull a plug by the cord to turn off equipment.
• Disconnect machines before cleaning, adjusting, or applying flammable solutions.
• Keep electrical panel doors closed to prevent flashover during a malfunction.
• Do not store materials in front of electrical panels.

C. ERGONOMICS

The word “ergonomics” is derived from the Greek words ergo (work) and nomos (law). It can also be referred to as the science or art of fitting the job to a worker. A mismatch between the physical requirements of a task and the physical capacity of the worker can result in musculoskeletal disorders. Ergonomics focuses on designing equipment and integrating work tasks to benefit the abilities of workers. Healthcare facility work environments expose patient and resident caregivers to ergonomic stressors. Successful ergonomic interventions must deal with personal issues instead of attempting to solve problems with universal solutions. (See Chapter 9 for a detailed discussion of ergonomics for patient and resident care tasks.) Healthcare organizations should address ergonomics issues, risks, and injuries by developing a written ergonomics safety management plan with the following elements:

• Senior leadership participation
• Maximum worker involvement
• Effective ongoing workplace analysis
• Accurate recording and documentation
• Emphasis on hazard prevention and implementing effective controls
• A medical management program that supports ergonomic objectives
• Realistic training and education that focuses on competencies and personal responsibilities

Risk Factor Definitions

• Force — The amount of physical effort required to perform a task (such as heavy lifting) or to maintain control of equipment or tools (see Table 6.3).
• Repetition — Performing the same motion or series of motions continually or frequently.
• Awkward postures — Assuming positions that place stress on the body, such as reaching above shoulder height, kneeling, squatting, leaning over a bed, or twisting the torso while lifting.

Musculoskeletal Disorders — Musculoskeletal disorders (MSDs) include conditions such as low back pain, sciatica, rotator cuff injuries, and carpal tunnel syndrome. Early indications of MSDs can include persistent pain, restriction of joint movement, or soft-tissue swelling. While some MSDs develop gradually over time, others may result from instantaneous
events such as a single heavy lift. Activities outside of the workplace that involve substantial physical demands may also cause or contribute to MSDs. In addition, development of MSDs may be related to genetic causes, gender, age, and other factors. Finally, evidence suggests that reports of MSDs may be linked to certain psychosocial factors such as job dissatisfaction, monotonous work, and limited job control.

A Process for Protecting Workers — The number and severity of injuries resulting from physical demands in nursing homes — and the associated costs — can be substantially reduced. Providing an alternative to manual resident lifting is the primary goal of ergonomics processes in nursing homes. The Occupational Safety and Health Administration (OSHA) recommends that manual lifting of residents be minimized in all cases and eliminated when feasible. OSHA further recommends that employers develop a process for systematically addressing ergonomics issues in their facilities and incorporate this process into an overall program to recognize and prevent occupational safety and health hazards. An effective process should be tailored to the characteristics of a particular nursing home, but OSHA generally recommends the following steps.

Provide Management Support — Strong support by management creates the best opportunity for success. OSHA recommends that employers develop clear goals, assign responsibilities to designated staff members to achieve those goals, provide necessary resources, and ensure that assigned responsibilities are fulfilled. Providing a safe and healthful workplace requires a sustained effort, allocation of resources, and frequent follow-up that can only be achieved through the active support of management.

Involve Employees and Identify Problems — Employees are a vital source of information about hazards in their workplace. Their involvement adds problem-solving capabilities and hazard identification assistance, enhances worker motivation and job satisfaction, and leads to greater acceptance when changes are made in the workplace. For these reasons, employers should:

- Encourage workers to submit suggestions or concerns.
- Take time to discuss the workplace and work methods.

### TABLE 6.3 Lifting Tips

- Use a balanced stance with feet shoulder-width apart.
- Squat close to the load when lifting something from the floor.
- Keep your back in the neutral position.
- Tuck in your chin to maintain your head and neck in a straight line.
- Grip the object with your entire hand, not just the fingers.
- Hold your elbows close to your body while keeping your body weight centered.
- Use your leg muscles to lift, not your back muscles.
- Tighten your stomach muscles to better support your back.
- Maintain a neutral back position as you lift, and avoid twisting.
- Turn the load using your entire body; move your feet first.
- Never carry a load that blocks your vision.
- Use the same body mechanics for putting down a load.
• Encourage workers to participate in the design of tasks, equipment, procedures, and training.
• Evaluate equipment regularly and respond to employee surveys.
• Create a task group with responsibility for ergonomics.

Organizations can more successfully recognize problems by establishing systematic methods for identifying ergonomics concerns in their workplace. Information about where problems or potential problems may occur in nursing homes can be obtained from a variety of sources, including OSHA 300 and 301 injury and illness forms, reports of worker’s compensation claims, accident and near-miss investigation reports, insurance company reports, employee interviews, employee surveys, and reviews and observations of workplace conditions.

**Implement Solutions** — When problems related to ergonomics are identified, suitable options can then be selected and implemented to eliminate hazards. Effective solutions usually involve workplace modifications that eliminate hazards and improve the work environment. These changes can affect the use of both equipment and work practices. When choosing methods for lifting and repositioning residents, individual factors should be taken into account. Such factors include the resident’s rehabilitation plan, the need to restore the resident’s functional abilities, medical contraindications, emergency situations, and the resident’s dignity and rights.

**Provide Training** — Training is necessary to ensure that employees and managers can recognize potential ergonomics issues in the workplace and understand the measures that are available to minimize the risk of injury. Ergonomics training can be integrated into general training regarding performance requirements and job practices. Training programs can go a long way toward increasing safety awareness among both managers and employees. Training and education can ensure that employees are sufficiently informed about workplace hazards. Soliciting suggestions from workers about ergonomic hazards can help improve work practices. A good ergonomics training program can teach employees how to properly use equipment, tools, and machine controls.

**Address Reports of Injuries** — Even in establishments with effective safety and health programs, injuries and illnesses may occur. Work-related MSDs should be managed in the same manner and under the same processes as any other occupational injury or illness. Like many injuries and illnesses, employers and employees can benefit from early reporting of MSDs. Early diagnosis and intervention, including alternative-duty programs, are particularly important in order to limit the severity of injury, improve the effectiveness of treatment, minimize the likelihood of disability or permanent damage, and reduce the amount of associated worker’s compensation claims and costs. OSHA’s injury and illness recording and reporting regulation (29 CFR 1904) requires employers to keep records of work-related injuries and illnesses. These reports can help nursing homes identify problem areas and evaluate ergonomic efforts.

**Evaluate Ergonomics Efforts** — Healthcare leaders should evaluate the effectiveness of their ergonomics efforts and follow-up on unresolved problems. Evaluation helps sustain the effort to reduce injuries and illnesses, track whether or not ergonomic solutions are working, identify new problems, and reveal areas where further improvement is needed. Evaluation and follow-up are central to continuous improvement and long-term success. Once solutions are introduced, OSHA recommends that employers monitor whether or not they are effective. OSHA 300 logs and workers’ data provide useful empirical data at this stage, as can other techniques such as employee interviews.
Medical Management — Medical management programs may help eliminate or reduce the development of ergonomic-related problems (see Table 6.4). The goal should be early identification, evaluation, and treatment of problems. Elements of a medical management program include:

- Accurate recording of occupational illnesses and injuries to identify trends and address problems.
- Establishing procedures for managing work-related illnesses and injuries, including guidelines for evaluating and responding to employee symptoms.
- Educating employees to ensure early identification and reporting of cumulative trauma.
- Using annual surveys to determine employee work-related disorders and the location, frequency, and duration of discomfort.
- Putting into place a surveillance program where workers are given a baseline health assessment against which subsequent periodic health evaluations are compared in order to identify and correct hazards in the workplace.
- Establishing a health surveillance program that focuses on musculoskeletal problems relating to the back, hands or wrists, or other body parts, depending upon the worker’s exposure, to help employees identify changes in health status.

Workstation Evaluations — Workstation evaluations should assess prolonged work in any posture that may result in injury. Organizations should assess offices, computer usage areas, and nursing stations with regard to the factors of force, duration, position, frequency, and metabolic expenditure. The most significant factor in the ergonomic equation is usually
position. Work area dimensions should take into consideration whether a tall person has enough room and whether an extremely short person can reach everything to accomplish the work. Work should be within normal arm or leg reaches. Workers should be provided with good chairs that have arm and leg rests if required. Workers should be at workstations where their posture can be varied and they have sufficient space for their knees and feet.

Computer Workstations — Workers involved in such functions as admissions, appointment desks, transcription, medical coding, and other data entry who work on computers for 4 or more hours per day can be at risk for developing hand, arm, shoulder, neck, or back maladies (see Table 6.5). Consider the following when evaluating or implementing controls:

- Design of the workstation
- Nature of the task
- Repetitiveness of the job
- Degree of postural constraint
- Work pace
- Work and rest schedules.
- Personal attributes of individual workers

Symptoms of Ergonomic Problems — Signs of ergonomic problems include pain, tingling, numbness, swelling, and other body discomforts. The affected areas could be the back, shoulders, and neck, although hand, wrist, and arm problems are the most common ergonomic complaint. Employers should analyze trends, absenteeism, and turnover rates. Tasks that require awkward positions or excessive grasping or reaching cause complaints (see Table 6.6). A standing workstation should have an antifatigue mat, work surface below the elbows, and a footrest so the worker can elevate one foot. A sitting station should have a seating surface 18 inches wide and rounded in the front. The upholstery should be firm and made of woven fabric. Chairs should allow unrestricted movement, allow for the knees to

### TABLE 6.5 Computer Workstation Interventions

| Workers should take frequent short breaks to allow the eye muscles to relax. |
| Employees should take two to three short breaks for every hour of continuous work to allow the hands, neck, and arms to relax. |
| Glancing at an object at least 20 feet away can be of great help. |
| Some workers get relief by blinking or shutting their eyes for a few seconds. |
| The workstation should have a padded keyboard, adjustable table, and tilt screen. |
| Workers should experiment to find positions that are comfortable. |
| Light should be adequate to help alleviate eyestrain and glare; glare control devices should be used as necessary. |
| Chairs should be adjustable to meet an individual worker’s needs. |
| Chair height is correct when the sole of the foot can rest on the floor or footrest so the back of the knee is slightly higher than the seat of the chair. |
| Seat backrests should support the entire back. |
| Seat design preference will vary with individual workers. |
| Workers should do conditioning exercises for the hands, neck, and shoulders. |
| Printers and other accessories should be arranged to prevent workers from twisting and turning. |
bend, be adjustable, have support for the lower back, and be equipped with footrests. The worker’s body should be relaxed with arms loose, wrists straight, elbows close to the body, and neck and spine straight.

**Reducing Video Display Terminal Discomforts with Rest Breaks** — Short, strategically spaced rest breaks can reduce eyestrain and musculoskeletal discomforts for video display terminal (VDT) operators without decreasing productivity according to a National Institute for Occupational Safety and Health (NIOSH) study published in the May 2000 issue of the journal *Ergonomics*. The study focused on VDT operators working a regular daily schedule that included two 15-minute rest breaks. The workers surveyed consistently reported less eye soreness, visual blurring, and upper-body discomfort when the regular break schedule was supplemented by four 5-minute breaks spaced throughout the work shift.

**Screen Adjustment and Chair Placement**

- Adjust contrast or screen brightness as necessary throughout the day.
- Position the screen to reduce glare and reflections from other light sources.
- Position the screen even with the eyes when sitting normally at the keyboard (some operators prefer it lower and some higher). Provide anti-glare filters as necessary to deal with reflection or glare.
- Adjust chair height to maintain thighs in a horizontal position with the feet resting flat on the floor or a footrest.
- Maintain arms and hands comfortably positioned at the keyboard.
- Armrests should be padded and adjustable for the up/down and in/out positions.
- Seat cushions should be firm but comfortable.
- Mats should be used to increase mobility on carpeted surfaces.

**Back Pain** — The most common causes of back pain are poor physical condition, being unaccustomed to the task, poor posture, and lifting weight that approaches the limit of a worker’s strength (see Table 6.7). Contributing factors include understaffing, inadequate training, poor body mechanics, and inadequate safety precautions. Food service workers hurt themselves by pushing or pulling carts, lifting heavy food trays, moving dishes, and storing supplies. Environmental service workers bend repeatedly while cleaning, lifting

<table>
<thead>
<tr>
<th>TABLE 6.6 Correct Posture and Lighting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Keep the head straight and balanced when looking at the screen.</td>
</tr>
<tr>
<td>Maintain elbows in a bent position (90° angle) when hands are on the keyboard.</td>
</tr>
<tr>
<td>Maintain wrists in a neutral position.</td>
</tr>
<tr>
<td>Use comfortable wrist rests to help alleviate discomfort.</td>
</tr>
<tr>
<td>Keep feet positioned flat on the floor or a footrest.</td>
</tr>
<tr>
<td>Use other supports as necessary to keep the lumbar region comfortable.</td>
</tr>
<tr>
<td>Adjust drapes, blinds, or shades to reduce glare on the work area and screen.</td>
</tr>
<tr>
<td>Position lighting and lamps to reduce reflection on the screen (multiple low-wattage lights provide better lighting than a single, more powerful light source).</td>
</tr>
<tr>
<td>Avoid the use of direct overhead lighting; instead, use indirect or shielded light sources whenever possible.</td>
</tr>
<tr>
<td>Paint walls a color that does not produce glare.</td>
</tr>
</tbody>
</table>
supplies and equipment, operating floor cleaning equipment, and using brooms or mops. Administrative personnel use chairs that are not designed for desk work and do not provide the proper support. Maintenance workers hurt themselves by lifting, moving, and handling large packages, boxes, or equipment. Patient care providers hurt themselves by moving, lifting, and transporting patients or residents.

**TABLE 6.7  Understanding Back Pain**

<table>
<thead>
<tr>
<th>Factor</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Back muscles</td>
<td>Back curves are held in place and supported by the muscles of the back and abdomen. These muscles must be strong and healthy so they can keep the back curves in their normal, balanced position.</td>
</tr>
<tr>
<td>Posture</td>
<td>Slouching, rounded shoulders, one hip higher than the other, and a swayback look with too much forward curve in the lower back are examples of poor posture. Not only does such posture look bad but it feels even worse and causes muscle tension, stiffness, backaches, neck aches, and fatigue.</td>
</tr>
<tr>
<td>Standing</td>
<td>Stand tall, with the back flat and knees relaxed. If standing for a prolonged period, one foot should rest on a low stool to support the lower back.</td>
</tr>
<tr>
<td>Walking</td>
<td>Walk tall. Keep head up and chest lifted.</td>
</tr>
<tr>
<td>Sitting</td>
<td>Sit smart. Pick a chair that supports the lower back and is not too high. Tuck the buttocks and keep feet flat on the floor or on a stool so that knees are bent. If nothing is available for the feet, cross the legs, changing leg position periodically. When driving, position the seat close to the steering wheel and pedals. (Lap belt and shoulder harness should always be worn.)</td>
</tr>
<tr>
<td>Sleeping</td>
<td>Sleep on your back, with a small pillow under the knees, or sleep on your side with knees bent. Never sleep on your stomach or on your back with legs straight out. Mattress should be firm with no sag in the middle. A bed board can be placed between the mattress and box spring if necessary.</td>
</tr>
<tr>
<td>Exercise</td>
<td>The muscles that support the back require regular exercise to stretch them and keep them strong. A program of aerobic exercise and back exercises helps; just 20 minutes at least three times a week can keep the back fit. Choose an exercise program that feels right.</td>
</tr>
</tbody>
</table>

**Lumbar Support Belts** — The use of lumbar support belts to reduce the risk of injury remains unproven, according to NIOSH, which based its conclusion on a 2-year study that consisted of reviewing previously published laboratory-based research. NIOSH concluded that these supports do not reduce spinal compression during heavy-lifting tasks. NIOSH expressed concern that the belts might give workers a false sense of security and result in persons lifting more than normal. Belt manufacturers and some other groups claimed that the study was incomplete and flawed because no new research was conducted. The verdict is still out concerning the effectiveness of industrial-type lumbar belts. Several recent scientific studies conducted at leading universities indicate that correctly fitted lumbar support belts can help alleviate pressure on the soft tissue of the back and spine. Some associations and insurance groups claim that the use of support belts has resulted in a significant reduction in worker’s compensation costs. Back support belts should only be used in facilities with effective back care management programs. Workers must be properly trained, fitted, and supervised.
Lumbar Belt Usage Tips — Many healthcare facilities require workers to wear support belts. The following are common-sense safety tips regarding the use of lumbar supports:

- Workers should be medically screened before being issued belts.
- The back belt should be properly fitted to the worker by a qualified person.
- Workers should not wear back belt supports fastened unless they are involved in planned lifting activities.
- Back belts do not prevent all back injuries or enable a worker to lift more weight.
- Lumbar supports should not be issued unless they are part of a total back management and education program.
- Regular training should be provided for all workers involved in lifting activities, and participation in an off-the-job exercise program should be encouraged.

D. SLIP, TRIP, AND FALL PREVENTION

It is important to identify, evaluate, and correct safety hazards that could contribute to employees, patients, or visitors slipping, tripping, or falling. Slips, trips, and falls are some of the most common accidents in healthcare facilities. Slips are a loss of balance caused by too little friction between the feet and the surface and can be caused by wet surfaces, spills, or weather hazards such as ice and snow. Slip, trip, and fall prevention programs must be continuously monitored to be effective in preventing such accidents and reducing losses. Safety directors should manage such programs under the guidance and direction of their safety committees. Trends and problem areas should be determined by analyzing data supplied by risk management and quality improvement personnel. Worker’s compensation data should also be reviewed to determine worker fall problem areas. All staff members should receive training with regard to the physical hazards and behavioral aspects of slip, trip, and fall prevention (see Table 6.8).

Avoiding Trips

- Make sure hallways, stairs, and work areas are properly lit.
- Keep work areas well lit and never require workers to grope in the dark.
- Use a flashlight or extension light to make your walking area visible in dark areas.
General and Physical Plant Safety

211

• Keep work areas clean and do not clutter aisles or stairs.
• Store materials and tools in closets, cabinets, or specially assigned storage areas.
• Arrange furniture so it does not interfere with walkways or pedestrian traffic.
• Report loose carpeting, stair treads, or hand rails; broken pavement and floor boards or loose floor tiles can also catch a foot and cause a fall.
• Report stairs or hand rails that are loose or broken.
• Be aware that most falls, slips, or trips occur at ground level, but falls from greater heights pose a much higher risk of serious injury.
• Always use proper equipment when working above floor level.
• Do not use makeshift ladders or scaffolding, and do not misuse ladders.
• Never stand on chairs or any other unstable equipment.
• Do not jump from docks, trucks, or workstations.
• Do not store items on stairs or in aisles.
• Be aware of the presence of ice or snow.
• Remove ice and snow from sidewalks and parking lots before heavy traffic use.
• Practice safe walking skills by moving slowly and observing the surface.
• Clean up spills right away.
• Wear shoes with nonskid soles.
• Remember that high heels provide less stability than flat shoes.
• Be cautious on floors that have been waxed and on other very slippery surfaces.

Static Coefficient of Friction (SCOF) — The traction between a person’s foot or shoe sole and the walking surface can be defined as “relative force that resists the tendency of the shoe or foot to slide along a walkway surface.” The Americans with Disabilities Act (ADA) recommends a minimum SCOF of 0.6 in level areas and 0.8 on ramps (OSHA requires 0.5 in all areas). Slip resistance is related to a combination of factors, including type of surface, care and maintenance procedures, and the presence of foreign materials between the foot or sole and the walking surface. The American Institute of Architects (AIA) Academy for Architecture for Healthcare states: “Floor materials shall be readily cleanable and appropriate for each location. Floors in food preparations areas shall be water resistant. Areas such as baths, showers, and similar areas shall have a slip-resistant surface.”

Negligence and Cause of Actions Factors — Facilities have a duty or obligation to conform to a certain standard of care for flooring to protect against unreasonable risks; otherwise, they can be cited for:

• Failure to conform to a reasonable standard of care
• Creating a reasonable close or contributing causal factor between the conduct and the injury known as “proximate cause” or “contributor negligence”
• Actual loss or damages resulting in the interest of another

Facilities must strive to maintain all walking surfaces through proper maintenance, installation of proper flooring (see Table 6.9), and appropriate cleaning and care. Allowing water or other debris to remain on flooring increases liability risks.

E. PLANT OPERATIONS SAFETY

Directors, managers, and supervisors must identify unsafe conditions and behaviors with the potential to contribute to workplace accidents:
Identify hazards and causal factors by conducting periodic inspections throughout the facility.

Permit only qualified personnel to operate equipment and machinery.

Conduct thorough job safety training for all workers, emphasizing personal responsibility, correct use of personal protective equipment, and tool and equipment safety.

Provide workers with the correct tools and ensure proper use.

Correct unsafe acts and note failure to follow safe job procedures.

Require facility and maintenance personnel to report or correct unsafe conditions immediately.

Teach personnel to be safety observers when conducting their daily activities.

Train workers that personal protective equipment should not be an engineering or work practice control.

Be sure all personal protective equipment meets appropriate standards for design and safety performance.

General Personal Protective Equipment Requirements

- Require workers to use proper eye and face protection in situations that generate hazards such as chipping, grinding, or drilling.
- Provide and require the use of eye protection for tasks such as bricking, plastering, welding, or using compressed air.
- Provide and require the use of appropriate hearing protection in noisy areas and when operating loud equipment.
- Require employees to wear gloves when working with chemicals, doing electrical work, or handling sharp materials.
- Require employees to wear the proper footwear with nonskid soles.
- Fit test and train any workers expected to wear respiratory protection in the course of their job duties including those on response or spill teams.
- Be sure workers wear hard hats or bump hats, depending on the hazards encountered.

General Safety Requirements

- Do not permit consumption of food or beverages in areas with toxic chemicals or other contaminant hazards.
- Do not allow workers to wear rings or other jewelry when working on or near dangerous machinery.

TABLE 6.9 Considerations When Selecting Flooring

| Performance factors in wet and dry conditions |
| Durability (important in high-traffic areas) |
| Abrasion resistance (how long the surface will retain its slip resistance) |
| Maintenance and care procedures (per manufacturer's specifications) |
| Impact resistance (weight of heavy loads) |
| Appearance (important but not as crucial as safety; most modern flooring will retain a good appearance if maintained properly) |
| Life-cycle costs (expenses beyond the cost of flooring, installation, and maintenance) |
| Safety of patients, residents, and visitors |
• Arrange equipment, walkways, and storage to permit safe work and flow of materials.
• Be sure walkways provide for the free movement of employees delivering material to and removing it from the operations area.
• Properly illuminate all work areas.
• Be sure portable lighting has Underwriters Laboratories (UL)-approved plugs, handles, and cords for normal working conditions.
• Require the use of low-voltage lighting for work in boilers or grounded wet locations.
• Require the use of insulated flashlights near energized equipment.
• Provide a minimum of at least 50 foot-candles of illumination in all work areas.

Fire Prevention — All plant operations and facility engineering personnel must receive fire prevention training. Supervisors must stress the importance of correctly using and storing fuels, solvents, or other flammable liquids, and encourage the use of low flashpoint solvents. Element heaters, improperly grounded equipment, and nonexplosion-proof electrical equipment must not be used in areas containing flammable or combustible liquids. Fire extinguishers with at least a 20-B/C or greater rating should be available in all plant operation areas; the number of extinguishers would depend on the size and layout of the facility. Fire extinguishers must meet OSHA and NFPA requirements. (Refer to Chapter 5 for more information.)

Proper Material Storage
• Do not allow unnecessary accumulations of materials and supplies in work areas.
• Store materials in designated locations or material holding areas.
• Do not block, hide, or obstruct access to fire extinguishers, alarm boxes, sprinkler controls, electrical switch boxes, emergency lighting, first-aid equipment, or exits.
• Store heavy materials and equipment close to the floor to reduce the possibility of injury during handling.
• Keep all passageways and storerooms clean, dry, and unobstructed.
• Remember that the storage of material involves operations that can include moving bags, boxes, and materials.

Ladder Safety — Standards for ladders are found in OSHA standards 29 CFR 1910.21 and 29 CFR 1926.1053 for construction. These procedures are designed to prevent the injury of personnel due to falls or slips any time personnel are working on portable stairs, ladders, or scaffolding or are at elevations more than 4 feet above grade. Falls are the primary hazard associated with the use of ladders. Personnel must not use defective ladders with broken rails or rungs missing hardware. These hazards can be minimized if workers adhere to proper ladder safety practices and if supervisors ensure equipment is used properly, regularly inspected, and maintained in good condition (see Table 6.10). Tasks that require the frequent use of ladders and involve significant climbing effort must be accomplished by workers capable of the physical exertion required under these conditions. Falls result from a number of unsafe acts and conditions, such as:
• Ladders being set on unstable surfaces
• Personnel reaching too far out to the sides
• Personnel standing too high to maintain balance

Ladder Specification Recommendations — Portable ladders must meet the design and construction specification of OSHA 29 CFR 1910.25 for wood ladders and 29 CFR 1910.26 for metal ladders. Portable ladders constructed of reinforced plastic must meet the specifications of ANSI A14.5. The maximum allowable lengths of portable ladders are:
TABLE 6.10  Ladder Usage and Safety Tips

Be sure portable ladders have nonslip bases.
Visually inspect ladders before each use.
Inspect all ladders every 3 months.
Maintain ladder inspection records.
Remove damaged or unsafe ladders from service.
Identify defective ladders with a tag: DANGEROUS. DO NOT USE.
Never use a ladder as a horizontal surface for runways or scaffolding.
Never place a ladder in front of a door unless the door is locked, blocked, or guarded.
Never lean a ladder against unsecured backing such as loose boxes or against a window.
Do not place ladders near electrical wiring, piping, or sprinkler systems.
Mark metal ladders with the notice: CAUTION. DO NOT USE NEAR ELECTRICAL EQUIPMENT.
Keep ladder rungs, cleats, and steps parallel, level, and uniformly spaced.
Be sure the spacing of rungs of an extension ladder is not less than 6 inches or more than 12 inches.
Never apply an opaque coating to wood ladders.
Be sure the ladder can extend at least 3 feet above the point of support, eave, gutter, or roof line.
Always raise extension ladders so the upper section overlaps and rests on the bottom.
Never stand higher that the third rung or step from the top of the ladder.
Do not attempt to reach beyond a normal arm’s length while on a ladder.

- Stepladders — 8 feet
- Platform stepladders — 12 feet
- Straight ladders — 20 feet
- Extension ladders — 36 feet, with minimum overlap of 3 feet

Wooden Ladders — Wooden parts used in the construction of ladders should have a straight grain and should be thoroughly seasoned, smoothly dressed, and free of sharp edges, splinters, checks, decay, and other defects. Rungs must be parallel, level, and uniformly spaced (no more than 12 inches). Wooden ladders should be coated with a suitable protective coating such as boiled linseed oil, clear varnish, or clear lacquer. Wooden ladders should not be painted with an opaque coating, as possible defects may be covered up. Portable ladders should be equipped with nonslip bases such as safety feet or spikes, depending on the type of usage.

Electrical Equipment and Ladder Safety — Personnel should not use portable metal ladders when performing work on or near electrical equipment. The side rails of metal ladders should be stenciled in red letters, 2 inches high (smaller, if necessary, to fit on the side rails): DANGER. DO NOT USE AROUND ELECTRICAL EQUIPMENT. Wood or reinforced plastic ladders should be used for work on or near electrical equipment. They should be kept clean, with regular removal of all surface buildup of dirt, grease, or oils to avoid creating a ready path for an electrical current.
Care of Ladders

- Maintain ladders in good usable condition.
- Inspect ladders prior to use.
- Ladders with defects that cannot be repaired immediately should be removed from service for repair or destruction and tagged with a “danger” tag.
- Replace frayed or badly worn rope.
- Keep safety feet and other parts in good condition to ensure they work properly.
- Handle ladders with care.
- Do not drop, jar, or misuse them.
- Store ladders in a manner that will provide easy access for inspection, permit safe withdrawal for use, and prevent sagging.
- Do not store them in a manner that presents a tripping hazard or where they can fall on someone.
- Lubricate metal bearings of locks, wheels, pulleys, etc., as required, to keep them working.
- Do not attempt to straighten or use a bent ladder made of reinforced plastic.
- Apply skid-resistant materials to rungs or steps on metal ladders that are not corrugated, knurled, or dimpled.

Proper Use of Ladders

- When using portable non-self-supporting ladders, be sure the pitch at the base of the ladder meets the one-fourth working length of the ladder rule.
- Position the ladder to prevent slipping or have someone manually hold it in position.
- Do not allow more than one person to use a ladder at a time.
- Place portable ladders so the side rails have a secure footing.
- Be sure the top rest for portable rung and cleat ladders is reasonably rigid and has adequate strength to support the applied load.
- Do not place ladders in front of doors opening toward the ladder unless the door is blocked open, locked, or guarded.
- Do not place ladders on boxes, barrels, or other unstable bases to obtain additional height.

Scaffolding and Elevated Platforms — Erect scaffolding according to OSHA standards (29 CFR 1910.22, 23, and 28). All platforms or scaffolds must be inspected by supervisors before use. All elevated platforms should be surrounded by a standard guardrail, securely fastened to a stationary object, and have a floor capable of withstanding a working load of 75 pounds per square foot. Scaffolds with wheels constructed on the base (bottom) section should not be used unless all wheels are intact and at least one wheel on each side is locked to prevent movement. General scaffolding rules include the following:

- Follow scaffolding safety rules during set up and operations and when dismantling.
- Adhere to the manufacturer’s instructions and safety warnings.
- Inspect the equipment before use for damage or deterioration.
- Inspect erected scaffolds regularly to ensure safe conditions.
- Provide adequate sills and posts.
- Use base plates.
- Anchor wall scaffolds securely between structure and scaffold.
- Use caution when working near power lines.
- Never work closer than 10 feet to electrical power lines.
- Use adjusting screws instead of blocking to adjust for uneven grades.
- Equip all planked areas with proper guard rails and toe boards.
- Do not ride rolling scaffolding or leave materials on the platform when moving it.
• Never try to move rolling scaffolding without help.
• Do not extend adjusting screws over 12 inches.
• Do not allow the working platform height to exceed four times the smallest base dimension unless guyed or stabilized.
• Never overload a scaffold, and do not use ladders or makeshift devices on top of scaffolds.
• Ensure that the footing and anchorage for scaffolds are sound, rigid, and capable of carrying the maximum intended load.
• Never use unstable objects such as barrels, boxes, or bricks to support scaffolds or planks.

Working on Rooftops — When working on roofs without an adequate guardrail, never get within 10 feet of the edge of the roof without wearing a life belt or harness securely attached to an anchored rope or line. The entire system must be capable of supporting a minimum dead weight of 5,400 pounds. No one should work on a roof when wind speed exceeds 20 miles per hour.

Vaults, Manholes, and Tanks

• All enclosed areas should be considered hazardous until tested with oxygen-deficiency and combustible-gas indicators prior to entry.
• Atmospheres containing 19.5% or less of oxygen by volume should not be entered without the use of an air-supplied respirator.
• Only manhole cover hooks or other methods approved for this purpose shall be used when removing or replacing manhole covers. When replaced, the covers must be properly seated. The bearing surfaces should be free from dirt or ice that might prevent proper seating of the cover.
• Personnel should enter and leave manholes or vaults only by means of a ladder; they should not step on cables, cable hangers, or pipes.
• Personnel should not throw tools or materials into or out of manholes or vaults; they must use canvas buckets, hand lines, or other approved methods for lowering and removing tools and equipment.
• Working on energized equipment is especially hazardous in subsurface structures and should be performed by an electrician.
• When a manhole or vault is open, at least one member of the crew should be stationed at the surface to act as a safety observer and take appropriate actions in case of emergency.
• Cool vests or other heat-reducing equipment should be made available to workers who enter vaults or manholes under high heat conditions (e.g., steam leak repair).

F. TOOL SAFETY

Tool Safety — Employees must be trained in the proper use of all tools, recognizing hazards associated with different types of tools, and the safety precautions necessary to prevent accidents. Basic tools safety rules include the following:

• Keep all tools in good condition with regular maintenance.
• Use the appropriate tool for the job.
• Examine each tool for defects before use.
• Operate according to the manufacturer's instructions.
• Use any necessary protective equipment.
Hand Tools — Preventing accidents involving hand tools on the job site is a matter of good instruction, adequate training, and proper use. Hand tool safety requires that the tools be of good quality and adequate for the job. All tools should be kept in good repair, maintained by qualified personnel, and stored in racks, shelves, or tool boxes when not in use. Workers should wear tool belts when working on ladders, scaffolds, or platforms. Supervisors should periodically inspect all hand tools used in any operations under their supervision. They should immediately remove defective tools from service. Workers should wear the appropriate personal protective equipment for the hand tools being used (e.g., safety glasses or goggles for most tasks). Workers should protect their hands from cuts, abrasions, and repeated impact and should wear the proper shoes for the task and work site.

Wrenches — Wrenches come in an endless variety of styles such as socket, open-end, combination, adjustable, and torque, just to name a few. Following are some tips for using them safely:

- Choose a wrench that properly fits the fastener to be turned.
- Use the proper wrench for the type of bolt being turned (metric or American) to help prevent slippage.
- Never use an extension to improve the leverage of a wrench.
- Never use open-end or adjustable wrenches for final tightening or to loosen frozen fasteners.
- Always try to pull on a wrench (instead of pushing), in case the fastener loosens suddenly.
- Turn power off and use electrically insulated wrenches when working on or around electrical components.

Pliers — Pliers come in all shapes and sizes, such as lineman, diagonal cutting, needle nose, slip joint, and locking tongue and groove. Following are some safety tips for their use:

- Use them as intended.
- Do not substitute pliers for a wrench when turning nuts and bolts.
- Never attempt to increase the handle length of pliers to gain more leverage.
- Cut hardened wire only with pliers designed for that purpose.
- Be sure the pliers being used can properly grasp the wire when bending rigid wire.
- Cut wire at right angles without bending wire back and forth against the cutting edge of a pliers.
- Never use pliers as a hammer.
- Always use nonsparking pliers when in the presence of flammable vapors or dusts.

Hammers — Hammers are the most abused of all hand tools. They come in many types for specific tasks or industries. The head of a hammer is tailored to work best for particular applications. Manufacturers now design hammers to be stronger and ergonomically shaped and to transmit less shock to the user. The following tips are important for safe hammer use:

- Match the hammer to the task; always use a hammer of the proper weight and size.
- Never strike the surface at an angle.
- Never use a hammer with a damaged or loose handle.
- Select a hammer face that is 3/8 inch larger in diameter than the object to be struck.
- Never weld, heat, or regrind a hammer head.
- Remove from service any hammer exhibiting signs of excessive wear, cracks, or mushrooming.
Screwdrivers — The many types of screwdrivers include the common flat and cross-point varieties. Following are some safety tips for their use:

- Match the screwdriver to the type of job.
- Always use a screwdriver tip that properly fits the slot of the screw.
- Never use a screwdriver as a pry bar, chisel, punch, stirrer, or scraper.
- Throw away screwdrivers with broken or worn handles.
- Turn power off and use electrically insulated screwdrivers when working on or around electrical components.
- Straighten tips or redress rounded edges with a file.
- Never use pliers on a screwdriver for extra leverage.
- Use magnetic or screw-holding screwdrivers to start fasteners in tight areas.
- Use both hands when using a screwdriver — one to guide the tip and the other to turn the handle.
- Use both hands on the screwdriver handle for final tightening.

Portable Power Tools — Workers must follow these safety rules when using power tools (see Table 6.11):

- Understand that each tool presents unique hazards.
- Read the tool manual to understand applications, limitations, operation, and hazards.
- Never use electric power tools in the proximity of flammable vapors, dusts, or construction materials.
- Avoid using electric power tools in wet environments.
- Be sure tools are properly grounded and use a ground fault circuit interrupter for corded tools.
- Check for hidden wires that may contact bladed tools.
- Select a tool based on the task being accomplished.
General and Physical Plant Safety

219

• Inspect tool cords before use.
• Check for damage, presence of guards, correct alignment, binding of components, or any condition that would affect the operation of the tool.
• Keep control by maintaining a tight grip on the tool.
• Maintain your balance and never over reach.
• Secure the work in a vise or clamp for increased stability.
• Verify that all tools are unplugged or that the power source is removed when changing blades or performing maintenance or when tools are not in use.
• Be sure adjustment knobs are tightened, and remove any adjustment keys before use.
• Keep tools in a secure location when not in use.
• Avoid unintentional tool start-up by keeping your finger off of the power switch.

G. MACHINERY SAFETY AND GUARDING

Many accidents result from improperly guarded machinery (see Table 6.12). Motion hazards that create risks for workers include rotating devices, cutting or shearing blades, in-running nip points, reciprocating parts, linear moving belts, pulleys, meshing gears, and uncontrolled movement of failing parts. Workers in areas with machine exposures must maintain awareness and know how to operate the machines safely. Workers must be able to recognize potential accident situations and know how to correct the hazards. Unqualified or untrained workers must not operate machinery. When working with machinery, workers must use personal protective equipment, including eye or face protection. They should not wear loose-fitting clothing, rings, bracelets, or other apparel that may become entangled in moving machinery. They also should not wear gloves when they could be caught in machinery. Ear plugs or muffs should be worn around noisy machinery.

Powered Abrasive Wheel Tools — (See Table 6.13 and Table 6.14.)

• Before mounting an abrasive wheel, inspect it closely and test it to be sure it is free of cracks.
• To prevent the wheel from cracking, be sure it fits properly on the spindle.
• Be sure the spindle does not exceed the abrasive wheel specifications, which can cause wheels to disintegrate or explode when the machine is started up.
• Never stand directly in front of the wheel while it accelerates to operating speed.
• Equip the wheel with proper guards.
• Always use eye protection and always turn off the power when not in use.
• Never clamp a handheld grinder in a vise.

TABLE 6.12 Machine Guarding Basics

Guard all point-of-operation exposures, such as blades, knives, and cutting heads.
Cover or guard power transmission exposures such as belts, pulleys, shaft, or gears.
Guard top, bottom, and backside exposures such as the underside of table saws.
When removing a guard, shut down the control switch, lock, and tag in the “OFF” position.
Affix guards to the machine.
If possible use a hinged type of guard to make maintenance or adjustments easier to perform.

• Inspect tool cords before use.
• Check for damage, presence of guards, correct alignment, binding of components, or any condition that would affect the operation of the tool.
• Keep control by maintaining a tight grip on the tool.
• Maintain your balance and never over reach.
• Secure the work in a vise or clamp for increased stability.
• Verify that all tools are unplugged or that the power source is removed when changing blades or performing maintenance or when tools are not in use.
• Be sure adjustment knobs are tightened, and remove any adjustment keys before use.
• Keep tools in a secure location when not in use.
• Avoid unintentional tool start-up by keeping your finger off of the power switch.
TABLE 6.13  Grider Safety Tips

Never grind the side of the wheel unless it is designed for that purpose.
Never jam work onto the wheel.
Never stand in front of the wheel when the grinder is started.
Hold material with hands away from the wheel and work rest.
Wear eye protection and/or a face shield.
Never wear gloves or hold material with a rag.
Use jigs or fixtures to hold frequently ground pieces.
Use vise grips or channel locks to hold pieces not frequently ground.
Use a file or portable grinder to dress very small pieces.

TABLE 6.14  Pedestal Grinder Tips

Glass shields must be in place, undamaged, and clear.
All guards should be attached correctly and securely.
Wheel face should be clean, with no foreign material, chips, or nicks.
Grinder should not have excessive vibration.
Adjustable tongue must be 1/4 inch or less from the wheel and secure.
Work rest must be 1/8 inch or less from the wheel.
Work rest should be securely attached at the center of the wheel or above.

H. COMPRESSED AIR

Compressed air has the appearance of a relatively harmless gas; however, to avoid accidents compressed air must be used correctly. The improper or inadvertent connection of items not designed for shop air pressure (i.e., equipment, storage vessels, or containers) to a shop air supply may cause serious personal injury and more than likely will damage the item being connected. The maximum air pressure approved for general use in shops and laboratories is 30 pounds per square inch (psi). This pressure is sufficient for most shop and laboratory operations and is not significantly hazardous. Exercise discretion and good judgment when using compressed air, even at this low pressure. The following rules and practices will help prevent personal injury, equipment damage, and potential environmental impact:

- All personnel assigned to shops with air compressors should be familiar with compressor operating and maintenance instructions.
- Compressed air is not to be used to blow dirt, chips, or dust from clothing.
- Air compressors must be maintained strictly in accordance with the manufacturer's instructions.
- Compressed air should not be used to transfer materials from containers when the safe maximum allowable working pressure of the container could be exceeded; do not use compressed air to transfer materials from standard 55-gallon drums.
- The maximum working pressure of compressed air lines should be identified in psi.
- Pipeline outlets should be tagged or marked showing maximum working pressure immediately adjacent to the outlet.
- A siphon should be used with a bulk aspirator on a pump.
Safety Rules

- Know that it is dangerous to pressurize any container not designed for that purpose.
- Never use compressed air where particles can be accelerated by the air stream.
- Do not use compressed air to clean machinery or parts unless absolutely necessary; whenever possible, use a brush instead. If the use of compressed air is necessary, use a minimum pressure and provide protective barriers or clear the area of personnel. Wear goggles to protect your eyes.
- Never apply compressed air to any part of a person’s body.
- Do not use a compressed air line that does not have a pressure regulator for reducing the line pressure.
- Keep the hose length between the tool housing and air source as short as possible.
- Where possible, attach a short length of light chain between the hose and the housing on air-operated tools. This keeps the hose from whipping should the hose-tool coupling separate.
- Inspect air supply and tool hoses before using; label and discard unfit hoses or repair hoses where applicable.
- Turn valve off and vent pressure from a line before connecting or disconnecting it; never work on a pressurized line.
- Do not connect air-supply respirators or supplied-air suits to the compressed air supply system of any building; such compressed air is unsafe to breathe.
- Do not attach pneumatic tools, process, or control instruments to breathing air lines; the potential contamination to personnel and systems is hazardous.

I. SAFETY SIGNS AND COLOR SCHEMES

Color Codes for Safety (29 CFR 1910.144)

- Red (Danger) — Red is used for fire protection equipment and fire apparatus. Red indicates STOP. Safety cans for flammable liquids with a flash point of 80°F or below must be painted red with other visible markings. Red lights should be provided at barricades and temporary obstructions as specified in ANSI Standard A10.2-1944.
- Yellow (Caution) — Yellow is used to designate physical hazards and for marking physical hazards such as those that could cause stumbling, falling, or tripping.

Other Color Codes

- Blue is used to warn against moving, starting, or using equipment being repaired; blue is also used for informational signs and handicap access.
- Green is used for safety and first-aid equipment.
- Magenta/yellow is used to designate alpha, beta, gamma, neutron, proton, and x-ray radiation hazards (black and yellow can also be used).
- Black, white, or a combination of the two is used for traffic, boundary, and housekeeping markings.
- Orange is used to mark dangerous parts of machines or equipment.
- Fluorescent orange and orange-red are used to designate biohazardous materials.

Accident Prevention Signs and Tags (29 CFR 1910.145)

- Wording should be easy to read and concise.
- The wording should make a positive rather than negative suggestion.
- Accident prevention tags are used to identify hazardous conditions and provide a message to employees regarding the condition.
- Tags must contain a signal word and a major message.
• Danger signs and tags are required to warn workers of immediate danger and alert them to the fact that special precautions apply (standard colors are red, black, and white).
• Caution signs/tags warn against potential hazards or unsafe work practices (standard color is yellow with black lettering).
• General safety signs provide information about safe working practices (standard color is green with black or white letters or a white background with black or green letters).
• Warning signs should be orange or predominantly orange, with letters or symbols in a contrasting color.
• Fire and emergency information is designated with white letters on a red background.
• Informational signs have a white background with blue letters.

ANSI Standards on Color Codes and Signs
• Z353.1 — Color Codes for Safety Signs
• Z353.2 — Environmental and Facility Safety Signs
• Z353.3 — Safety Symbols
• Z353.4 — Product Safety Signs and Labels
• Z353.5 — Temporary Hazard Signs

Identification of Piping Systems (ANSI A13.1)
• Safety red indicates fire protection.
• Safety yellow indicates danger.
• Safety green indicates safety.
• Safety blue indicates protective materials.

J. WELDING SAFETY

Gas Welding — In gas welding, two metals are joined by melting or fusing their adjoining surfaces by directing a gas flame over the metals until a molten puddle is formed. The energy for gas welding comes from the combustion of a fuel with oxygen or air. A few of the most popular fuels are acetylene and hydrogen. Because gas welding is slower and easier to control than electric arc welding, it is often used in applications such as general maintenance work, brazing, and soldering.

Arc Welding — Arc welding involves a different process. Two metals are joined by generating an electric arc between a covered metal electrode and the base metals. Heat produced by the arc melts the metal and mixes the molten deposits of the coated electrode. The arc energy is provided by a power supply unit that furnishes direct or alternating current. The electrodes carry the current to form the arc, producing a gas that shields the arc from the atmosphere, and metal is added to control the weld shape. When an arc is struck using a coated electrode, the intense heat melts the top of the electrode. The drops of metal from the electrode enter the arc stream and are deposited on the base metal. The equipment needed for electric arc welding includes a power supply, electrode holder, ground clamp, protective shield, and welder’s protective clothing.

Oxygen and Arc Cutting — Metal cutting in welding is the severing or removal of metal by a flame or arc. During oxygen cutting, the metal is heated by gas flame and an oxygen jet does the cutting. During arc cutting, the intense heat of electric arc melts away the metal.
Welding Personal Protective Equipment

**Eye and Face Protection** — Proper eye and face protection varies depending on the particular task being performed. Helmets, hand shields, goggles, and safety glasses or combinations of these provide acceptable protection in various applications. All filter lenses and plates must meet the test for transmission of radiant energy prescribed in ANSI standard Z87 (Practice for Occupational and Educational Eye and Face Protection).

**OSHA Requirements** — According to OSHA 29 CFR 1910.252, helmets and hand shields must protect the face, forehead, neck, and ears to a vertical line in back of the ears, from the arc direct radiant energy and weld splatter. Welding helmets with filter plates are intended to protect users from arc rays and from weld sparks and spatters that strike directly against the helmet. They are not intended to protect against slag chips, grinding fragments, wire wheel bristles, and similar hazards that can ricochet under the helmet. Spectacles, goggles or other appropriate eye protection must also be worn to protect against these impact hazards.

For arc cutting and arc welding with open arcs, helmets or hand shields with filter lenses and cover plates must be used by operators, and nearby personnel viewing the arc must also wear proper protection. Spectacles with a shade 2 lens are recommended for general purpose protection for viewers. Operators of resistance welding must use face shields, spectacles, or goggles, depending on the particular job, to protect their faces and eyes from welding hazards. Refer to NFPA 51B (Welding, Cutting, and Brazing) for additional guidance.

**Welding Fire Prevention and Protection** — The welding operation environment must be free of flammable liquids and vapors. Combustible materials within a radius of 35 feet of the operation must be protected from activity residue such as flame, heat, sparks, or slag. Fire watcher procedures should be implemented whenever welding activities are conducted within 35 feet of combustible materials, regardless of the protection provided. A qualified individual proficient in the operation of available fire extinguishing equipment and knowledgeable of fire reporting procedures should observe welding or cutting activities. Fire extinguishing equipment should be maintained, ready for use, while welding or cutting operations are being performed. Equipment may consist of pails of water, buckets of sand, a hose, or portable extinguishers, depending on the nature and quantity of the combustible material exposed. If welding or cutting is to be done within three feet of automatic sprinkler heads, noncombustible sheet material or damp cloth guards must be used to temporarily shield the individual heads. For more information, refer to NFPA 51B.

**Welding in Confined Spaces** — “Confined space” means a relatively small or restricted space such as a tank, boiler, pressure vessel, mixing vat, sump, or pit. Ventilation is a prerequisite to working in confined spaces. During welding and cutting operations, confined spaces should be adequately ventilated to prevent the accumulation of toxic materials, possible oxygen deficiency, or creation of an explosive atmosphere. All air replacing the air that is withdrawn should be clear and respirable. Oxygen must never be used as makeup air.

**Portable Gas Units** — Portable gas welding, cutting, and brazing equipment must be of a type approved for the intended use. Cylinders of compressed gas must have pressure-reducing regulators installed. Cylinders in use or in transport must be stored in an upright position and secured to prevent them from falling. Pressure hoses must be secured to prevent whipping. Oxygen cylinders and fittings should be kept free of grease and oil at all times. Cylinders should be kept away from external sources of heat at all times and should not be dropped or handled roughly. Cylinders or welding sets in excess of 40 pounds total weight should be transported to and from work sites by push cart or motorized vehicle.
Portable Electric Units — Circuits should be de-energized before testing, checking, or transporting. Motor-generator sets and other electrical welding equipment should be grounded prior to use. Rotary and polarity switches should not be operated while the equipment is under an electrical load. Arc welding equipment should be inspected periodically and prior to use following relocation. Power cables and electrode holders should be inspected prior to every use.

K. ELECTRICAL SAFETY

Electrical equipment can cause shock, electrocution, and catastrophic property damage due to its potential for causing fire or explosion. Electrical fires in healthcare facilities many times result from short circuits, overheated equipment, and failure of current safety devices. Explosions may occur when flammable liquids, gases, and dusts are exposed to ignition sources generated by electrical equipment. Electrical installations and utilization equipment must follow the requirements of the NFPA/ANSI 70 (National Electrical Code). This code applies to every replacement, installation, or utilization of electrical equipment. Supervisors must inspect work areas for possible electrical hazards and provide adequate space around electric equipment to permit safe operation and maintenance of such equipment.

About Electricity — Electrical safety requires some knowledge about how electricity works and the hazards it presents. Electrical current travels through electrical conductors. Its pressure is measured in volts. Resistance to the flow of electricity is measured in ohms and can vary widely. Resistance is determined by the nature of the substance itself, the length and area of the substance, and the temperature of the substance. Some materials, such as metal, offer very little resistance and become conductors very easily. Other substances, such as porcelain and dry wood, offer high resistance. Materials that prevent the flow of electricity are referred to as insulators. Water that contains impurities such as salts and acids makes a ready conductor. Electricity travels in closed circuits and its normal route is through a conductor. Electrical shock occurs when the body becomes part of the circuit. Shock normally occurs when a person:

- Contacts both wires of an electrical circuit
- Contacts one wire of an energized circuit and the ground
- Contacts a "hot" metallic part that has become energized and the ground

Shock Severity — The severity of shock is affected by several factors, including:

- Amount of current (amperes) flowing through the body
- Path of the current through the body
- Length of time the person is in the circuit
- Phase of the heart cycle when the shock occurs
- General health of the person involved

Electrical Burns and Other Injuries — Severe shock can cause falls, cuts, burns, and broken bones. Three types of burns can result from shocks:

- Electrical burns result from current flowing through tissue or bone, which are damaged by the intense heat.
- Thermal burns occur when the skin comes into contact with the hot surfaces of overheated conductors or other energized parts.
- Arc burns are caused by high temperatures near the body and are produced by an electrical arc or explosion.
Protecting Workers — Proper insulation protects workers from electrically energized wires and parts. Insulation should always be checked before working with electrical equipment. Insulation requirements are regulated by 29 CFR 1910, Subpart S, which requires insulation to be suitable for the voltage and existing conditions. Conductors and cable are marked by the manufacturer to show maximum voltage, American Wire Gage size, type of insulation, and manufacturer’s name or trademark. Insulation is often color coded. Grounding conductors are green or green with yellow stripes. Grounded conductors that complete a circuit are usually white or natural gray. Hot wires are colors other than these, often black or red. Live parts of electrical equipment operating at 50 volts or higher must be guarded against accidental contact.

Guarding — Guarding can be accomplished by:

- Locating the equipment in a room, vault, or enclosure that has limited access
- Use of permanent partitions or screens
- Locating the equipment on a suitable balcony or elevated platform to limit access
- Elevating the equipment 8 feet or higher above the floor
- Using warning signs to mark entrances to locations with exposed live parts
- Containing indoor electric installations over 600 volts in metal enclosures or in vaults or areas controlled by locks
- Marking high-voltage equipment with caution signs

Grounding — “Grounding” refers to creating a conductive connection. This low-resistance path prevents a buildup of voltage that results in shock. The frames of all electrical equipment should be grounded regardless of voltage. Exposed non-current-carrying metal parts of electrical equipment that may be come energized under abnormal conditions must also be grounded in accordance with the National Electrical Code. Outlets, switches, and junction boxes should be covered. Equipment connected by flexible extension cords should be grounded either by a three-wire cord or by a separate ground wire (except double-insulated equipment). All 120-volt, single-phase, 15- and 20-ampere receptacle outlets should be equipped with ground-fault circuit interrupters (GFCIs) at job sites when the receptacles are not a part of the permanent wiring. For grounding requirements in patient areas, refer to NFPA 99. 29 CFR 1910, Subpart S, which covers two types of grounds:

- **Neutral conductor** — The neutral conductor (normally a white or gray wire) is grounded at the generator or transformer and again at the service entrance to a building. This ground protects machines, tools, and insulation against damage.
- **Equipment ground** — This additional ground offers enhanced protection for the worker by providing another path from the machine or tool through which the current flows into the ground. This protects the worker should the metal frame of the tool become accidentally energized. The resulting heavy surge of current will activate the circuit protection devices and open the circuit.

Circuit Protection Devices — Circuit protection devices are designed to limit or shut off the flow of electricity in the event of a ground-fault overload or short circuit in the wiring system. Fuses and circuit breakers are over-current devices that automatically open or break when the amount of current becomes excessive. Fuses and circuit breakers primarily protect equipment and conductors. Ground-fault circuit interrupters are designed to shut off electrical power immediately by comparing the amount of current going to the equipment and the amount returning along the circuit conductors. They should be used in wet locations and construction areas.
Safe Work Practices — Electrical safety-related work practice requirements are contained in 29 CFR 1910.331–335 and NFPA 70E:

- Employers must ensure that workers are trained in safety-related work practices.
- Maintenance employees should be qualified electricians who also have been instructed in lockout/tagout procedures.
- Workers whose jobs require them to work constantly and directly with electricity must use the required personal protective equipment.
- Equipment may consist of rubber insulating gloves, hood, sleeves, line hose, and protective helmet. Workers should always use tools that are designed to withstand voltage and stresses of electricity.

Electrical Equipment Safety — Electrical malfunction is the second leading cause (after matches and smoking) of fires in hospitals. Violations of standards governing the use of electrical equipment are the most frequently cited causes of fires. Hospital personnel use a wide variety of electrical equipment in all areas, including general patient care, intensive care units, emergency rooms, maintenance, housekeeping service, food preparation, and research. Thorough electrical maintenance records should be kept, and considerable effort should be devoted to electrical safety, particularly in areas where patient care is involved. Personal electrical appliances, such as radios, coffeepots, fans, power tools, and electric heaters, that are not grounded, have frayed cords or poor insulation, or are otherwise in poor repair should not be used. Equipment and appliances that are frequently ungrounded or incorrectly grounded include:

- Three-wire plugs attached to two-wire cords
- Grounding prongs that are bent or cut off
- Ungrounded appliances resting on metal surfaces
- Extension cords
- Cords molded into plugs that are not properly wired
- Ungrounded multiple-plug strips often found in office areas and nurse stations

National Electrical Code (ANSI/NFPA 70) — The National Electrical Code (NEC), found in NFPA 70, is a national consensus standard. The NEC is designed to safeguard persons and property from the hazards of using electricity. Article 517 of NFPA 70 and NFPA 99 both contain special electrical requirements for healthcare facilities. Refer to 29 CFR 1926.401–449 for OSHA construction electrical requirements. In addition, state and local laws and regulations may be applicable. Electricians and maintenance personnel should consult OSHA’s electrical safety standards found in 29 CFR 1910.301–399 and refer to NFPA 99 for information on special hazards. Each circuit breaker or fuse box to be disconnected should be legibly marked to indicate its purpose unless the purpose is evident. Frames of electrical motors should be grounded regardless of voltage. Other requirements include the following:

- Outlets, switches, junction boxes, etc. should be covered.
- Flexible cords should not be used as a substitute for fixed wiring.
- Flexible cords should be connected without any tension on joints or terminal screws.
- Frayed cords or cords with deteriorated insulation should be replaced.
- Splices in flexible cords should be brazed, welded, soldered, or joined with suitable splicing devices; splices, joints, or free ends of conductors must be properly insulated.

Healthcare Electrical Safety Requirements — Healthcare facilities contain many damp or wet areas, thus electrical safety requirements, such as the following, are especially important:
• A switch or circuit breaker in a wet area or outside a building should be protected by a weatherproof enclosure.
• Cabinets and surface-type cutout boxes in damp or wet areas should be weatherproofed and located in such a way as to prevent moisture from entering and accumulating in the cabinet or box.
• The boxes should be mounted with at least 0.25 inch of air space between the enclosure and the wall or supporting surface.
• Non-metallic-sheathed cable and boxes made of nonconductive material are recommended.
• In areas where walls are washed frequently or where surfaces consist of absorbent materials, the entire wiring system, including all boxes, fittings, conduit, and cable, should be mounted with at least 0.25 inch of air space between the electrical device and the wall or support surface.
• Specific NEC recommendations apply in areas where flammable materials are stored or handled, in operating rooms, and in patient care areas.
• Orientation and continuing in-service training programs are necessary to maintain worker awareness of electrical hazards.

Healthcare Electrical Standards

• NFPA 37 (Standard for Installation and Use of Stationary Combustion Engines and Gas Turbines).
• NFPA 70 (National Electric Code) — Addresses many of the electrical requirements for healthcare facilities including installation requirements, incoming power lines, voltage, noise, and frequency; transformers, distribution lines, conduit, wiring systems, junction boxes, and panel boards; generator requirements, battery systems, and emergency systems. Article 517 provides healthcare-specific requirements.
• NFPA 70B (Recommended Practice for Electrical Equipment Maintenance).
• NFPA 70E (Standard on Electrical Safety Requirements for Workplaces) — Provides safety guidance for those working with electrical systems within the facility; OSHA recently announced that the agency plans to adopt the standard in the 29 CFR 1910.
• NFPA 72 (Fire Alarm Code) — This standard provides power supply requirements for fire alarm systems.
• NFPA 99 (Healthcare Facilities) — Covers a number of topics, including grounding, receptacles, fixed equipment, portable equipment, and extension cords in patient areas, as well as essential electrical system requirements, testing requirements, performance criteria, isolated power system requirements, and wet location requirements.
• NFPA 110 (Emergency and Standby Power Systems) — Addresses general topics regarding installation, lighting, testing, and transfer switches.
• NFPA 111 (Stored Electrical Energy Emergency and Standby Power Systems) — Like NFPA 110, covers general topics such as installation requirements, light, acceptance testing, and transfer switches.
• OSHA 29 CFR 1910, Subpart S (Electrical/Safeguarding Employees in Their Workplaces) — OSHA continues to write citations for healthcare facilities failing to comply with Sections 303, 304, and 305 of the standard (wiring designs and methods).
• OSHA 29 CFR 1926 (Electrical/Safeguarding Employees Involved in Electrical Work).

Preventing Shock — The following work practices can help prevent shocks to hospital workers (see Table 6.15):
Develop a policy for using extension cords.

Use a sign-out system to list the number and location of all extension cords currently in use.

Do not work near electrical equipment or outlets when hands, counters, floors, or pieces of equipment are wet.

Consider any device to be defective that blows a fuse or trips a circuit breaker, and prohibit its use until it has been inspected.

Do not use any electrical equipment, appliance, or receptacle that appears to be damaged or in poor repair.

Report all shocks immediately; even small tingles may indicate trouble and precede major shocks. Do not use the equipment again until it has been inspected and repaired if necessary.

L. PAINTING OPERATIONS

Painting and paint removal present hazards requiring effective controls. Hazards include exposure to toxic materials and flammable or explosive mists, particulates, and vapors. Inhalation of mists and vapors from nearly all paints, solvents, thinners, cleaning chemicals, strippers, and epoxies can be injurious, depending on the toxic characteristics of the agent and the amount and method of exposure. Further, many of these agents can injure the skin and eyes or be absorbed through the skin. Potential physical and health hazards can be effectively controlled by appropriate work procedures, controls, facility design, protective clothing, and equipment.
Pressure Equipment — The use of pressure equipment in painting operations is hazardous because of the compressed air component; therefore, supervisors should ensure that the spray painting equipment is in serviceable condition. On all air-type spraying equipment, a pressure regulator valve should be installed in the air line between the compressor and painting equipment. A pressure-relief valve and a pressure gauge should be installed between the pressure regulator and pressurized paint containers or spray guns. Pressure-relief valves should be set to open at pressures of not more than 10 pounds above the required working pressure.

Other Concerns — Painters’ ladders, scaffolds, and other equipment should be inspected prior to use to be certain they are in safe condition. Paint mixing should be done in designated, adequately ventilated rooms constructed of fire-resistant materials. All sources of ignition should be prohibited in mixing areas. All electrical fixtures or equipment within 20 feet of designated paint preparation areas should meet the requirements of the National Electrical Code (NFPA 70) for class I, division 2, locations. Good housekeeping is essential to safe operations in paint shops. Paint rooms, booths, etc., must be kept clean, with equipment stored in a proper and orderly manner. All solvent- or paint-soiled rags should be placed in approved, self-closing metal containers plainly marked to indicate the contents. At the end of each day, these containers should be emptied or removed to an approved location for pickup and disposal.

Health and Safety Concerns — All organic solvents have some effect on the central nervous system and the skin. The principal modes of personnel exposure are inhalation of vapors, skin contact, and absorption. Personnel engaged in painting operations should review relevant Material Safety Data Sheets (MSDS) in order to acquaint themselves with the properties and hazards of the solvents that will be using. Skin contact with solvents may cause dermatitis, ranging in severity from a simple irritation to actual damage to the skin. Personnel engaged in painting and paint removal should wear protective clothing, respiratory devices if required, and appropriate face, eye, and hand protection. Eye or face protection is required during scraping or paint preparation (abrasive techniques). Clothing should be changed, as needed, to minimize body contamination. The hands and face should be kept clean, clothes should be changed when contaminated, and hands and soiled objects should be kept out of the mouth. No food or drink should be brought into, or consumed, in paint shops. Personnel should wash their hands prior to smoking or consuming food.

Spill Prevention — Painting and paint removal operations can cause air and water pollution which can impact the local community. Liquid, solid, and gaseous waste products from painting and paint removal operations should be disposed of in accordance with federal and state air, water, and solid-waste pollution control laws and as specified and approved by the Office of Health and Safety. All spills of flammable or combustible liquids should be cleaned up promptly. For major spills, remove ignition sources, evacuate and ventilate the area, and provide appropriate protective equipment to clean-up personnel. These liquids should not be allowed to enter a confined space, such as a sewer, because of the possibility of an explosion.

Painting Fire Prevention and Protection — Painting operations of particular concern are those that have the potential to ignite a fire: paint removal, solvent wipe, and paint application by means of spray apparatus. Certain paints, lacquers, varnishes, shellacs, solvents, and thinners are very flammable. Others, under certain conditions, can burn violently. These materials, for the purpose of control, are classified as being flammable. Solvent materials selected to perform residual clean up after initial paint removal should have a flash
point of 140°F or above. Spray painting presents varying degrees of fire hazards, depending on the materials used. Any material having a flash point below 140°F should be handled very carefully, and precautions are in order even when using materials with a flash point higher than this. Fire suppression sprinklers installed in spray finishing areas should conform to NFPA 13 provisions for extra-hazardous occupancy. Dry chemical or carbon dioxide extinguisher systems may be installed where automatic sprinkler protection is not available. Portable fire extinguishers should be installed near all paint spraying areas.

Safe Removal and Disposal of Lead-Based Paints — Due to the potential exposure of personnel to lead released during removal of lead-based paint, proposed Environmental Protection Agency (EPA) regulatory authority over lead abatement activities in federal buildings, and existing regulatory mandates governing the disposal of hazardous wastes, the following procedures should be adopted in order to reduce the possibility of human exposure and contamination of the environment. First, painters, maintenance personnel, or contractors must have knowledge of the specific paint being applied where the manufacturer’s Material Safety Data Sheet documents that the paint contains greater than 1% lead. Second, all red, rust-colored, and gray primer coats are assumed to contain lead. Third, the presence of lead must be determined by lead swabs or any other direct reading procedure or instrument. Fourth, analysis should be performed by an analytical laboratory accredited by the American Industrial Hygiene Association (AIHA) Environmental Lead Laboratory Accreditation Program.

M. LOCKOUT/TAGOUT (29 CFR 1910.147)

The purpose of any lockout procedure is to render inoperative electrical systems, pumps, pipelines, valves, and any other systems that could be energized while employees are working. The OSHA standard in 29 CFR 1910.147 places four basic requirements on employers whose workers are engaged in service and/or maintenance functions:

- Written procedures for lockout/tagout
- Training of employees
- Accountability of engaged employees
- Administrative controls

Basic Lockout Steps — Before beginning service or maintenance, the following steps must be accomplished in sequence and according to the specific provisions of the employer’s energy-control procedure:

- Prepare for shutdown.
- Shut down the machine.
- Disconnect or isolate the machine from the energy sources.
- Apply the lockout or tagout devices to the energy-isolating devices.
- Release, restrain, or otherwise render safe all potential hazardous stored or residual energy.
- If a possibility exists for re-accumulation of hazardous energy, regularly verify during the service and maintenance that such energy has not re-accumulated to hazardous levels.
- Verify the isolation and degeneration of the machine.

Lockout Employees — Those who work on de-energized machinery may be seriously injured or killed if someone removes lockout/tagout devices and re-energizes machinery without their knowledge; thus, it is extremely important for all employees to respect lockout
and tagout devices, and only personnel who applied these devices should remove them. Training must ensure that employees understand the purpose, function, and restrictions of the energy-control program. Employers must provide training specific to the needs of authorized, affected, and other employees. Authorized employees are those responsible for implementing the energy-control procedures or performing the service or maintenance activities. They need the knowledge and skills necessary for the safe application, use, and removal of energy-isolating devices. They also need training in the following:

- Hazardous energy source recognition
- Types and magnitude of hazardous energy sources in the workplace
- Energy-control procedures, including the methods and means to isolate and control those energy sources

**Affected Employees** — Affected employees are usually machine operators or users who operate the relevant machinery or whose jobs require them to be in the area where service or maintenance is performed. These employees do not service or maintain machinery or perform lockout/tagout activities. Affected employees must receive training in the purpose and use of energy-control procedures. They also need to be able to do the following:

- Recognize when the energy-control procedure is being used.
- Understand the purpose of the procedure.
- Understand the importance of not tampering with lockout or tagout devices and not starting or using equipment that has been locked out or tagged out.

**All Other Employees** — Employees whose work operations are or may be in an area where energy-control procedures are used must receive instruction regarding the energy-control procedure and the prohibition against removing a lockout or tagout device and attempting to restart, re-energize, or operate the machinery. In addition, if tagout devices are used, all employees must receive training regarding the limitations of tags. The employer must provide initial training before starting service and maintenance activities and must provide training as necessary. In addition, the employer must certify that the training has been given to all employees covered by the standard. The certification must contain each employee’s name and dates of training. Employers must provide retraining for all authorized and affected employees whenever a change in the following occurs:

- Job assignments
- Introduction of machinery or processes that present a new hazard
- Energy-control procedures

**Periodic Inspection** — This inspection ensures that employees are familiar with their responsibilities under the procedure and continue to implement energy-control procedures properly. The inspector, who must be an authorized person not involved in using the particular control procedure being inspected, must be able to determine the following:

- Employees are following steps in the energy-control procedure.
- Employees involved know their responsibilities under the procedure.
- The procedure is adequate to provide the necessary protection, and what changes, if any, are needed.

**Periodic Reviews** — For a lockout procedure, the periodic inspection must include a review of each authorized employee’s responsibilities under the energy-control procedure being inspected. Where tagout is used, the inspector’s review also extends to affected employees because of the increased importance of their role in avoiding accidental or
inadvertent activation of the machinery. Also, the employer must certify that the designated inspectors perform periodic inspections. The certification must specify the following:

- Machine or equipment on which the energy-control procedure was used
- Date of the inspection
- Names of employees included in the inspection
- Name of the person who performed the inspection

**Maintenance** — The issues of servicing and maintenance require further clarification with regard to the unexpected release of hazardous energy (see Table 6.16):

- Production equipment and machines are safeguarded under the requirements of 29 CFR, Subpart O.
- The OSHA lockout/tagout standard applies only during those associated functions when the normal machine or process equipment safeguards are bypassed or are rendered ineffective.
- OSHA requires the employer to conduct a periodic inspection to ensure that the procedures and requirements are being followed. This periodic inspection includes a review of each authorized worker's responsibilities under the energy control program.
- The inspections and reviews are intended to be a representative sample of compliance with the requirements of the standard and not a 100% inspection.

**General Lockout Guidelines** — If energy-isolating devices cannot be locked out, they must be modified so that they are capable of being locked out whenever major replacement, repair, renovation, or modification of the machine or equipment takes place. Whenever new machines or equipment are installed, energy-isolating devices for such machines or equipment must be designed to accept a lockout device. If an isolating device cannot be locked out for any reason, then additional steps must be taken to ensure full employee protection such as removing fuses, blocking switches, blanking off lines, etc. If the machine or equipment is not capable of being locked out, a tagout procedure must be documented and utilized. The tagout procedure must provide full employee protection equivalent to a lockout system. For full employee protection, when a tagout device is used on an energy-isolating device, the device must be attached at the same location that the lockout device would have been attached and must demonstrate that the tagout device will provide a level of safety that is equivalent to that of a lockout system. In complex situations, it may be necessary for more than one technician to attach tags and locks to the disconnect switch. Lockout procedures are for everyone's safety, and the procedures must always be applied when working on machines and equipment:

<table>
<thead>
<tr>
<th>TABLE 6.16 Lockout and Tagout Definitions</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Maintenance” is the act of maintaining or the state of being maintained.</td>
</tr>
<tr>
<td>“To maintain” means keeping in an existing state or preserving from failure.</td>
</tr>
<tr>
<td>“To service” is to repair or provide maintenance.</td>
</tr>
<tr>
<td>“To refurbish” means to brighten up, freshen up, or renovate.</td>
</tr>
<tr>
<td>“To renovate” is to restore to a former better state.</td>
</tr>
<tr>
<td>“To modify” is to make a fundamental change or to give a new orientation.</td>
</tr>
</tbody>
</table>
• Open the main switch, which is usually a side arm switch located on the main electrical panel, and pull down.
• Insert the lock into the slotted hole, which should prevent the side arm switch from moving upward to close the main switch.
• Insert a DANGER tag through the slotted hole next to the lock.
• Never trade assigned lock, tags, or duplicate keys with other employees.
• Be sure the tagout devices include information such as the following: DO NOT START, DO NOT OPEN, DO NOT CLOSE, DO NOT OPERATE, or DO NOT ENERGIZE.
• Check areas around the equipment when maintenance is complete and normal operation is ready to begin.
• Remove all lockout or tagout devices when all tools have been removed from the equipment, guards have been reinstalled, and employees are in the clear.
• Operate the energy-isolating devices to restore energy to the machine or equipment.

Tagout Devices — Tags affixed to energy-isolating devices do not provide the physical restraint on those devices that a lock would provide. No tag attached to an energy-isolating device should be removed without authorization of the person who attached it, and it must never be bypassed, ignored, or otherwise defeated. Tags must be legible and understandable in order to be effective. Tags must be made of materials that will withstand environmental conditions encountered in the workplace. When utilized, tags must be securely attached to energy-isolating devices so they cannot be inadvertently or accidentally detached during use. Tagout devices must be substantial enough to prevent inadvertent or accidental removal. Tagout devices must warn against hazardous conditions if the machine or equipment is energized and must include appropriate warnings such as:
• DO NOT START.
• DO NOT ENERGIZE.
• DO NOT OPEN.
• DO NOT OPERATE.
• DO NOT CLOSE.

Lockout Devices — Lockout devices and practices vary by nature and function. The use of key-operated padlocks that have been assigned individually is recommended. Multiple lock adapters will allow more than one worker to place their own padlocks on the isolating device to guarantee that the machine or equipment will remain deactivated until all employees have completed their tasks; only then will the last padlock be removed. Chains or other commercially available devices should be used to prevent valves from being opened or, in some cases, closed. The principle of multiple lock adapters still applies even when chains or other devices are used on operations requiring more than one employee.

Plug–Cord and Hose-Connected Equipment — When servicing or installing plug-cord or hose-connected electrical, pneumatic, or hydraulically powered equipment, the cord or hose should be disconnected from the equipment to be worked on prior to beginning the work. A tag warning against reconnecting the plug or hose should be affixed to the plug or hose end. Any stored energy should be safely released prior to the start of maintenance or installation work.

Electrically Powered Equipment — Electrically powered equipment should be de-energized and the source of electricity manually disconnected from them prior to removal of protective covers or initiation of other maintenance or installation work. It is important to recognize that locking and tagging on/off switches is often not sufficient to prevent accidental start up or prevent voltage from being present in the equipment.
Chemical or Pressurized Lines — The line to be serviced must have two block valves upstream of the work area or device to be serviced or installed, placed in the closed position and tagged. The bleed valve (between the two block valves) should be opened and tagged so that leakage of the valve upstream is readily obvious. The line should be depressurized or drained in a safe manner. Lines should be broken in such a manner as to release pressure away from the employee. All solids or liquids drained should be safely collected.

Stored Mechanical Energy — In situations where equipment to be worked on has stored mechanical energy, such as in a flywheel, the stored energy must be released or blocked in a safe manner before beginning maintenance or installation work. Effective blocking practices include the installation of safety blocks or adequate supports. Under no circumstances will bumper jacks or scissor jacks be considered to be adequate blocks.

Training — The purpose in providing training to employees is to ensure that they understand the purpose and function of the lockout/tagout program and procedures and that they possess the knowledge and skills required for the safe application, usage, and removal of energy controls. Personnel who work around electrical equipment but who do not perform a primary duty of electrical system installation or maintenance should be briefed by their supervisor on the hazards of electricity and proper precautions to observe. Each authorized employee who will be using a lockout/tagout procedure must receive training in recognition of applicable hazardous energy sources, the types and magnitude of energy available in the workplace, and the methods and means necessary for isolation and control.

Retraining — Retraining is necessary whenever a periodic inspection reveals, or an employer has reason to believe, that shortcomings exist in an employee’s knowledge or use of the energy-control procedure. Employers are required to review their procedures at least once a year to ensure that they provide adequate worker protection. As part of the review, employers must correct any deviations and inadequacies identified in the energy-control procedure or its application. Employees must be retrained whenever a change in their job assignment occurs; a change in machines, equipment, or processes presents a new hazard. Retraining should also be provided when a change in the lockout/tagout procedures is implemented.

N. PERMIT-REQUIRED CONFINED SPACES (29 CFR 1910.146)

In 1998, OSHA revised the standard to provide for enhanced employee participation in the employer’s permit-required confined space program. It authorized representatives to observe any testing or monitoring of permit-required spaces. The revision strengthened and clarified the criteria employers must satisfy when preparing for timely rescue of incapacitated personnel in permit-required spaces. OSHA defines a confined space as one that has limited or restricted means of entry or exit, is large enough for employees to enter and perform their work, and is not designed for continuous occupancy (29 CFR 1910.146(b)). A permit-required confined space is a space that has one or more of the following characteristics (29 CFR 1910.146(b)):

- Contains or could contain a hazardous atmosphere
- Contains material that has the potential for engulfing the entrant
- Has inwardly converging walls
- Is a recognized safety or health hazard
**General Requirements** — A no-permit-required confined space does not contain or, with respect to atmospheric hazards, have the potential to contain any hazard capable of causing death or serious physical harm (29 CFR 1910.146(b)). Employers should follow several steps when undertaking a confined-space program. The first is to evaluate the workplace and determine whether it contains permit-required confined spaces as defined by OSHA in 29 CFR 1910.146(c)(1). If permit-required confined spaces are identified, the employer must inform all exposed employees of the dangers by posting signs or some other equally effective means. Signs should read “DANGER. PERMIT-REQUIRED CONFINED SPACE. DO NOT ENTER” (or similar language). The next decision the employer must make is whether or not the confined space should be entered. If not, then the employer must take effective measures to prevent employees from entering the permit space. If yes, then the employer must develop and implement a written entry program for the permit-required space.

**Written Program Elements** — The written program must require identification and evaluation of all permit-required space hazards before entry. Employers must establish and implement means to prevent unauthorized entry. Employers must also establish and implement means to eliminate or control hazards necessary for safe entry by specifying acceptable entry conditions and isolating the space. Employer must purge, make inert, flush, or continuously ventilate the permit space as necessary to eliminate or control atmospheric hazards. Additionally the employer must provide, maintain, and require the use of personal protective equipment necessary for safe entry. Employers must also require the testing of atmospheric conditions inside the space before entry. Tests must be conducted for:

- O₂ (oxygen, 19.5 to 23.5% acceptable)
- Lower explosive limit (LEL, <10% acceptable)
- Toxins that may be present

In addition, employers must:

- Ensure that at least one attendant is stationed outside during entry.
- Coordinate actions with any contractors used and implement rescue procedures.
- Establish, in writing, the permit system and review the effectiveness of the system annually.

OSHA also requires training to ensure that employees involved in confined space work can perform their job functions safely. This training covers specific items for the authorized entrant, the attendant, and the entry supervisor. Training must cover the following authorized entrant responsibilities:

- Hazards involved in confined space entry
- Use of appropriate personal protective equipment for confined space entry
- Communication policies with the attendant
- Requirement to leave the space immediately when ordered by the attendant
- Alert the attendant immediately if a problem develops

**Attendant Duties**

- Remain outside unless relieved.
- Perform nonentry rescue when specified in the written procedure.
- Be aware of existing and potential hazards of the confined space.
- Maintain communication at all times with entrants.
- Order evacuation of the space when conditions warrant.
- Summon rescue personnel when needed.
- Be sure unauthorized people stay clear of area.
- Perform no other duties that may interfere with attendant duties.
Entry Supervisor Responsibility

- Be aware of the hazards involved with confined space entry.
- Know the company’s permit system to maintain consistency.
- Complete emergency planning.

Employer Rescue Requirements — The employer is responsible for:

- Evaluating a prospective rescuer’s ability to respond to a rescue summons in a timely manner considering the hazards identified
- Evaluating a prospective rescue service’s ability to function appropriately while rescuing entrants from the particular permit space or types of permit spaces that have been identified
- Selecting a rescue team or service from those evaluated that has the capability to reach the victims within a time frame that is appropriate for the hazard identified and is equipped for and proficient in performing the needed rescue service
- Informing each rescue team of the hazards they may confront when called to perform rescue at the site
- Providing the rescue team or service selected with access to all permit spaces from which rescue may be necessary so the rescue service can develop appropriate rescue plans and practice rescue operations

Note: Nonmandatory Appendix F (Rescue Team or Rescue Service Evaluation Criteria) has been added to 29 CFR 1910.146 to assist employers in their evaluation of rescue and emergency services.

Employers Whose Employees Perform Rescue Duties — Employers are responsible for:

- Providing affected employees with the personal protective equipment needed to conduct rescues safely
- Training affected employees so they are proficient in the use of that personal protective equipment
- Training affected employees to perform assigned rescue duties
- Being sure that employees successfully complete the training required to establish proficiency as an authorized entrant as required by 29 CFR 1910.146(g) and (h)
- Training of affected employees in basic first aid and cardiopulmonary resuscitation (CPR)
- Ensuring the availability of at least one member of the rescue team or service who holds a current certification in first aid and CPR.
- Ensuring that affected employees practice permit-required space rescues at least once every 12 months using simulated rescue operations in which they remove dummies, mannequins, or actual persons from the actual permit or representative permit-required spaces.
- Conducting training in representative permit-required spaces that, with respect to opening size, configuration, and accessibility, simulate the types of spaces from which actual rescues may be performed

Retrieval Requirements — To facilitate nonentry rescue, retrieval systems or methods should be used whenever an authorized entrant enters a permit space, unless the retrieval equipment would increase the overall risk of entry or would not contribute to the rescue of the entrant. Each authorized entrant should use a chest or full-body harness with a retrieval
line attached at the center of the entrant’s back near shoulder level, above the entrant’s head, or at another point that presents a profile small enough for successful removal of the entrant. Wristlets may be used in lieu of the chest or full-body harness if the employer can demonstrate that the use of a chest or full-body harness is not feasible or creates a greater hazard and that the use of wristlets is the safest and most effective alternative. The other end of the retrieval line should be attached to a mechanical device or fixed point outside the space so the rescue can begin as soon as the rescuer becomes aware that rescue is necessary. If the space is vertical and more than 5 feet deep, a mechanical device for removing the entrant must be available for use.

**Employee Rights** — Revisions to the standard give employees and their authorized representatives the right to:

- Participate in development and implementation of the permit space program.
- Review all supporting and determination data required under sections.
- Observe pre-entry testing of the internal atmosphere.
- Observe any periodic testing that is required.
- Review certification that all pre-entry measures have been taken.
- Review employer documentation that all hazards in a permit space have been eliminated.
- Request re-evaluation of a permit space if the employee believes previous ones have been inadequate.
- Review immediately the results of any testing conducted in accordance with the standard.
- Review the completed permit.

**OSHA Compliance** — Employers should obtain a copy of 29 CFR 1910.146 to ensure that they are in full compliance with the standard. Several appendices to the standard provide information and nonmandatory guidelines to assist employers and employees in meeting the appropriate requirements. OSHA considers three compliance approaches to be appropriate:

- Preparation of a written permit at the time entry is authorized which contains all of the information needed to document compliance with the proposed standard
- Preparation of a written permit that identifies the place, date, and time of the entry and the personnel who are involved, as well as a checklist that details the hazards potentially present and precautions taken to protect entrants
- Direct supervision of the entry by the person authorizing entry using a checklist-type permit that specifies the hazards potentially present and precautions taken to protect entrants

**Potential Hazards**

- The atmosphere in a confined space may be extremely hazardous due to the lack of natural air movement; this can result in an oxygen-deficient atmosphere of less than 19.5% available oxygen and require an approved self-contained breathing apparatus (SCBA).
- The oxygen level in a confined space can decrease due to work activities such as welding, cutting, or brazing.
- Oxygen levels can also be decreased by certain chemical reactions (rusting) or through bacterial action (fermentation).
- Oxygen can be displaced by other gases such as carbon dioxide or nitrogen.
Flammable Atmospheres

- An oxygen-enriched atmosphere (above 21%) will cause flammable materials such as clothing and hair to burn violently when ignited.
- Pure oxygen should never be used to ventilate a confined space; always ventilate with normal air.
- Different gases have different flammable ranges; if a source of ignition is introduced into a space containing a flammable atmosphere, then an explosion will result.

Hazardous Substances — Most liquids, vapors, gases, mists, solid materials, and dusts should be considered hazardous in a confined space. Toxic substances can come from the following:

- Toxic materials can be absorbed into the walls and give off toxic gases when removed; this includes the cleaned-out residue of a stored product.
- Toxic atmospheres can be generated in various processes; cleaning solvent vapors can be very toxic in a confined space.
- Toxic materials produced by work in a confined space can accumulate and become a hazard to workers.

Other Hazards

- Extremely cold temperatures can present problems.
- Loose, granular material stored in bins and hoppers, such as grain, sand, coal, or similar material, can engulf and suffocate a worker.
- Noise within a confined space can be amplified because of the design and acoustic properties of the space; excessive noise can damage hearing and affect communication.
- Slips and falls can occur on a wet surface, resulting in injury or death to workers.
- Wet surfaces increase the chance of electric shock in areas where electrical circuits, equipment, and tools are used.
- Workers should be mindful of falling objects, particularly in spaces that have topside openings or where work is being done above the worker.

Controlling Hazards

- Identify all confined spaces in the workplace.
- Develop employee awareness through training.
- Place appropriate signs and prevent unauthorized entry.
- Implement a written program.
- Provide workers with appropriate protective equipment.

Entry Permits — All permits should be thoroughly reviewed by the entry supervisor to be sure all safety measures are in place. Each permit must include:

- Specific confined-space identification
- Purpose, date, and expected duration of entry
- Names of those authorized to enter the confined space
- Actual hazards of the specified confined space
- Control and isolation methods to be used
- Results of atmospheric tests
- Rescue, communication, and emergency procedures
Preparation for Entry

- Notify all departments affected.
- Erect signs and barriers as required.
- Lock out hazardous energy.
- Empty the space of hazardous materials.
- Verify that ventilation and air supply are adequate.

Atmospheric Requirements

- Oxygen content must be between 19.5 and 23.5%.
- Flammable gas concentrations must be less than 10% of the lower flammable limit.
- Toxic materials must not exceed permissible exposure limits.
- Provisions must be made to monitor air and heat-stress conditions.
- Ventilation by a blower or fan must be in place to remove harmful gases and vapors.

Entry Equipment

- Provide appropriate personal protective equipment for the space.
- List the equipment available at the site.
- Determine the need for and type of respirators required.
- Test communication systems and review any special procedures.
- List any special lighting or tool requirements.

Emergency Procedures

- Self-rescue is the best option at the first sign of trouble.
- A trained standby person should be assigned to remain outside of the confined space and be in constant contact with the workers inside.
- The standby person should not have any other duties and should know whom to notify in case of emergency.
- Standby personnel should not enter a confined space until help arrives, and then only with proper protective equipment, lifelines, and respirators.

O. OSHA NOISE STANDARD (29 CFR 1910.95)

We can accurately define noise as any unwanted sound. Noise created by sound waves generates rapid vibrations in the air. Healthcare organizations many times overlook this occupational hazard. OSHA requires organizations whose workers are exposed to sound levels exceeding 85 decibels to implement a hearing conservation program. The basic components of an effective hearing conservation program include recognition, evaluation, control, training, and documentation. A 1979 survey of noise levels in hospitals indicated five work areas with noise levels high enough to reduce productivity: food service, laboratory, engineering, business office, and medical records. The ear changes air pressure waves into impulses that the brain interprets as sound. Hair cells in the inner ear stimulate nerves that carry the message to the brain. Loud noise damages these nerves and decreases hearing acuity. Noise may also trigger changes in cardiovascular, endocrine, neurologic, and other physiologic functions and can hinder communication among workers.

OSHA Noise Levels — A safe level of noise exposure, according to OSHA, is 90 A-weighted decibels (dBA) based on an 8-hour time-weighted average (TWA). This 90-dBA concentration is referred to as the OSHA permissible exposure limit (PEL) for noise exposure. Any 8-hour
TWA exceeding 90 dBA requires the employer to implement control measures to reduce the exposure to 90 dBA or below. In addition to the 90-dBA PEL, OSHA also recognizes an 85-dBA TWA as its action level. While employee exposure to the action level does not force the employer to implement measures to reduce employee noise exposure, it does require the employer to establish a hearing conservation program.

Noise Terms

- Frequency or pitch is measured in cycles per second or hertz (Hz).
- Amplitude or intensity is measured in decibels (dB).
- The decibel scale is a logarithmic measure of intensity.
- An increase of 10 dBA is 10 times as intense but is perceived as being twice as loud.
- Perceived loudness is subjective and therefore cannot be measured by an instrument.

Measuring Noise Levels — Instruments used to monitor noise levels include sound-level meters and noise dosimeters. Both measure decibel levels. These readings, however, are not similar to linear measurements such as feet or pounds. A decibel unit expresses a logarithmic ratio to an established reference level. A reading of 20 decibels is 100 times greater ($10 \times 10$) than a reading of 1 decibel. Sound-level meters and noise dosimeters usually measure on two or three different frequency scales. Frequency refers to the number of vibrations per second and is measured in hertz (Hz) using the frequency scales of A, B, or C. OSHA requires that noise measurements be conducted using the A scale, which most closely resembles the human ear. Sound-level meters provide a snapshot or one-time measurement of sound levels. To control noise (see Table 6.17):

- Use sound meters to determine which areas require a dosimeter measurement to determine time-weighted averages.
- Perform an initial measurement and perform additional monitoring when a change may increase noise exposure.
- Document all noise exposure measurements; retain these records for at least 2 years.

<table>
<thead>
<tr>
<th>TABLE 6.17 Noise Control Strategies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mount tabletop equipment on rubber feet or pads.</td>
</tr>
<tr>
<td>Install sound-absorbent floor tiles.</td>
</tr>
<tr>
<td>Use acoustical ceiling tiles and wall hangings where possible.</td>
</tr>
<tr>
<td>Install mufflers where possible on generators, air compressors, etc.</td>
</tr>
<tr>
<td>Lower the volume of intercom speakers, televisions, and radios.</td>
</tr>
<tr>
<td>Keep wheels, hinges, and latches lubricated.</td>
</tr>
<tr>
<td>Adjust door closing mechanisms to prevent slamming.</td>
</tr>
<tr>
<td>Use sound-absorbent materials wherever possible.</td>
</tr>
<tr>
<td>Enclose noisy equipment and reduce metal-to-metal contact.</td>
</tr>
<tr>
<td>Limit worker exposure by implementing administrative controls.</td>
</tr>
<tr>
<td>Use technology to reduce noise levels.</td>
</tr>
<tr>
<td>Keep machinery in good maintenance repair to minimize noise.</td>
</tr>
<tr>
<td>Erect total or partial barriers to confine noise.</td>
</tr>
<tr>
<td>Limit employees’ scheduled work time in noisy areas.</td>
</tr>
<tr>
<td>Limit noisy operations and activities per shift.</td>
</tr>
</tbody>
</table>
• Conduct noise-level monitoring to ensure that worker exposure remains below the action level of 85 dBA; workers exposed to levels above the PEL of 90 dBA must receive audiometric testing.
• Use only measuring instruments that meet ANSI specifications.
• Implement a sampling strategy that will pick up all continuous, intermittent, and impulsive sound levels from 80 to 130 dBA, and include all of these sound levels in the total noise measurement.
• Permit employees or their representatives to observe monitoring.
• Notify employees of noise exposures at or above an 8-hour TWA of 85 dBA.

Hearing Protection Evaluation — Ear protection, in the form of earplugs or earmuffs, can be effective in substantially reducing noise exposure. Employers are required by the standard to evaluate the sound attenuation provided by ear protectors for the specific environment in which the protector will be used. Evaluation methods that must be used, according to 29 CFR 1910.95(j)(1), can be found at Appendix B of the OSHA standard.

Protecting Workers — Hearing protectors have assigned noise reduction ratings (NRRs), which were developed by the EPA as a method of gauging the adequacy or attenuation of a hearing protector, or noise-reducing capacity. In theory, the NRR of a hearing protector is the amount of decibels by which a given device will reduce noise exposure. If a worker exposed to a 100 dB TWA is assigned a pair of earmuffs with an NRR of 26, then 26 dB would be subtracted from 100 dB, leaving the worker with a 74-dBA TWA exposure. It is important to note that this calculation is true only if the original TWA exposure (in this case, the 100-dBA TWA) was arrived at with a noise measuring instrument reading in the C scale. When the A scale is used for the initial noise level monitoring, OSHA requires a slightly different adjustment: 7 dBA must first be subtracted from the hearing protector's NRR; this number is then subtracted from the TWA exposure. If the A scale had been used to record the above 100-dBA TWA exposure, then 7 dBA must be subtracted from the 26-dB NRR of the hearing protector, leaving a 19-dBA NRR. This number is then subtracted from the 100-dBA exposure, leaving the worker with an 81-dBA TWA exposure.

Audiometric Testing — The backbone of the employee evaluation is the audiometric test. An audiometric testing program is comprised of two types of tests, or audiograms: baseline and annual. Audiograms are used to document an employee's hearing level. The baseline audiogram must be conducted within 6 months of confirmation of an exposure equal to or exceeding the 85-dBA action level. It establishes a reference point to which future annual audiograms can be compared. The initial annual audiogram must be conducted within 1 year of the baseline. Subsequent annual audiograms must be performed yearly thereafter. Employers must provide testing free of cost to employees with noise exposure equal to or above an 8-hour TWA of 85 dBA. Audiometers must be calibrated to meet ANSI standards. Only a licensed or certified audiologist, otolaryngologist, physician, or technician certified by the Council of Accreditation in Occupational Hearing Conservation or who has demonstrated competence in performing audiometric testing can perform testing.

Audiometric Test Records — All records must include the name and job classification of the employee, date of the test, examiner's name, date of the last acoustic or exhaustive calibration of the audiometer, and the employee's most recent noise exposure assessment. Audiometric test records should be retained for the duration of the affected employee's employment. Noise exposure measurement records should be retained for 2 years. Access to audiometric test records and noise exposure measurement records should be provided upon request to the employee, former employees, or an employee's designated representative.
Training — A training and education program should be implemented for those employees whose noise exposure equals or exceeds 85 dBA. The training and education program should be repeated annually for employees included in the hearing conservation program. Training should include:

- The effects of noise on hearing and the purpose of hearing protectors
- Advantages, disadvantages, and attenuation of various hearing protectors and instructions on how to select, fit, use, and care for them
- Purpose of audiometric testing and an explanation of the testing procedure

P. UTILITIES MANAGEMENT

The written management program must describe how the organization’s utility systems function to ensure a safe and controlled environment of care. Important consideration include reducing the potential for organizational-acquired illnesses, minimizing the risk of utility system failures, and maintaining the operational reliability of utility systems. The plan should provide for managing pathogenic biological agents in cooling towers, hotwater systems, and other aerosolizing water systems, as well as maintaining ventilation systems to control airborne contaminants. The plan must also map distribution systems and label controls for complete or partial emergency shutdown. Utility systems may include electrical distribution; emergency power; vertical and horizontal transport; heating, ventilating, and air conditioning; plumbing, boiler, and steam; piped gases; vacuum systems; or communication systems including data-exchange systems. Utility systems are essential to the proper operation of the environment of care and significantly contribute to the effective, safe, and reliable provision of care to patients in healthcare organizations. Establishing and maintaining a utility systems management program to promote a safe, controlled, and comfortable environment will:

- Ensure operational reliability of utility systems.
- Reduce the potential for organization-acquired illnesses to be transmitted by utility systems.
- Permit assessment of reliability to minimize potential risks of utility system failures.

Risk Criteria — The organization establishes and uses risk criteria to identify, evaluate, and create an inventory of components of systems to be included in the utility management plan. The plan may, at the organization’s discretion, include all utility systems. Such criteria should address the following:

- Life support
- Infection control
- Support of the environment
- Equipment support
- Communication
- Environmental support systems

Management Strategies and Emergency Procedures — The organization must develop appropriate strategies such as predictive maintenance, interval-based inspections, corrective maintenance, or metered maintenance to ensure reliable performance. The organization must also identify controls for partial or total emergency shutdown and implement emergency procedures for responding to utility system disruptions or failures that address the following:

- Actions to take for a utility system malfunction
- Alternative sources of organization-defined essential utilities
- Actions to take for shutting off the malfunctioning systems
General and Physical Plant Safety

243

• Procedures for notifying staff about utility problems in affected areas
• How and when to perform emergency clinical interventions when utility systems fail
• Procedures for obtaining repair services

Ventilation

• Design, install, and maintain ventilation equipment to provide appropriate pressure relationships, air-exchange rates, and filtration efficiencies for ventilation systems serving areas specially designed to control airborne contaminants such as biological agents, gases, fumes, and dust.
• Ensure proper ventilation in special areas including operating rooms, delivery rooms, holding rooms for patients diagnosed or suspected of having airborne communicable diseases, protective environment rooms, laboratories, pharmacies, and sterile supply rooms.

Emergency Electrical Power Source — Install an emergency power source adequately sized, designed, and fueled to meet the occupancy requirements and the services provided (see Table 6.18). Provide a reliable emergency power system as required by the occupancy requirements to supply electricity for alarm systems, exit route illumination, emergency communication systems, and illumination of exit signs.

Maintaining, Testing, and Inspecting Utility Systems — Organizations providing care, treatment, or services in leased facilities must communicate maintenance expectations for building equipment not under their control to their landlord through contractual language, lease agreements, or memos. These organizations need not possess maintenance documentation but must demonstrate access during a survey. The landlord should communicate to the organization any building equipment problems identified that could negatively affect the safety or health of patients, staff, and others. The leasing organization should obtain information about plans to resolve such issues and should:

• Maintain documentation on the inventory of utility components identified in the plan.
• Document the performance and safety of critical components identified in the plan before initial use.
• Document maintenance of critical life-support utility systems and equipment consistent with strategies identified in the utility management plan.

### TABLE 6.18 Critical Areas Requiring Emergency Power

<table>
<thead>
<tr>
<th>Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blood, bone, and tissue storage units</td>
</tr>
<tr>
<td>Emergency and urgent-care areas</td>
</tr>
<tr>
<td>Elevators (at least one for nonambulatory patients)</td>
</tr>
<tr>
<td>Medical air compressors</td>
</tr>
<tr>
<td>Medical and surgical vacuum systems</td>
</tr>
<tr>
<td>Areas where electrically powered life-support equipment is used</td>
</tr>
<tr>
<td>Operating rooms</td>
</tr>
<tr>
<td>Postoperative recovery rooms</td>
</tr>
<tr>
<td>Obstetrical delivery rooms</td>
</tr>
<tr>
<td>Newborn nurseries</td>
</tr>
</tbody>
</table>
• Document maintenance of infection control in utility systems or equipment used for high-risk patients consistent with established maintenance strategies.
• Document maintenance of critical non-life-support utility systems or equipment consistent with strategies identified in the utility management plan.

Maintaining, Testing, and Inspecting Emergency Power Systems — Organizations must adhere to the listed maintenance, testing, and inspection requirements as follows:

- Test each generator 12 times a year with testing intervals not less than 20 days and not more than 40 days apart.
- Conduct tests for at least 30 continuous minutes under a dynamic load that is at least 30% of the nameplate rating for the generator.
- Test all automatic transfer switches 12 times a year with testing intervals not less than 20 days and not more than 40 days apart.
- Test all battery-powered lights required for egress, including a functional test at 30-day intervals for a minimum of 30 seconds and an annual test for a duration of 1.5 hours.

Organizations Choosing To Test Less Than 30% of Nameplate Rating — These organizations must:

- Perform a test for 30 continuous minutes under operating temperature.
- Revise the existing management plan to conform to current NFPA 99 and NFPA 110 testing and maintenance activities.
- Develop inspection procedures for assessing the prime mover’s exhaust gas temperature against the minimum temperature recommended by the manufacturer.
- If diesel-powered generators do not meet the minimum exhaust gas temperatures as determined during these tests, exercise them for 30 continuous minutes at the intervals described with the available emergency power supply systems (EPSS) load.
- Exercise generators annually with supplemental loads of 25% of nameplate rating for 30 minutes, followed by 50% of nameplate rating for 30 minutes, followed by 75% of nameplate rating for 60 minutes for a total of 2 continuous hours.

Stored Emergency Power Supply Systems — A stored energy power plant supply system (SEPSS) should automatically supply illumination or power to critical areas and equipment essential for safety to human life. Such systems provide emergency power for functions such as illumination for safe exiting, maintaining ventilation essential to maintaining life, fire detection alarm systems, public safety communications systems, and other processes for which current interruption would produce serious threats to life safety or health hazards for patients, staff, or others. All non-SEPSS battery back-up emergency power systems should be properly tested and maintained in accordance with the manufacturer's recommendations. Testing includes quarterly functional testing for 5 minutes or as specified for the class of system, whichever is less. An annual test should be conducted at full load for 60% of the full duration of its class. The term “class” refers to the minimum time for which the SEPSS is designed to operate at its rated load without being recharged. (Refer to NFPA 111-1996, Stored Electrical Energy Emergency and Standby Power Systems.)

The National Electrical Code (NFPA 70 and NFPA 99) — The National Electrical Code establishes standards and practices for maintaining electrical distribution systems. Policies and procedures regarding this code should detail the actions to be taken in the event of an electrical distribution system failure. It is important that facilities develop policies that define the actions to be taken during failure of essential electrical systems, equipment,
or sources of electrical supply. An electrical distribution system is composed of numerous elements, and safety procedures relating to each element should be part of the total safety program. A ungrounded electrical system isolates the area served from the grounding network of the electrical system of the building or a grounded three-wire system. Each type offers protection from electric shock by shunting fault currents to ground.

Medical Gas Systems

- Inspect, test, and maintain critical components of piped medical gas systems, including master signal panels, area alarms, automatic pressure switches, shutoff valves, flexible connectors, and outlets.
- Test piped medical gas and vacuum systems when the systems are installed, modified, or repaired, including cross-connection testing, piping purity testing, and pressure testing.
- Maintain the main supply valve and area shutoff valves of piped medical gas and vacuum systems to be accessible and clearly labeled.

These systems provide oxygen, nitrous oxide, and compressed air throughout a healthcare facility. When such systems are used, heavy and bulky bottles or tanks do not have to be physically transported throughout a building. Refer to the Compressed Gas Association (CGA) pamphlet *Characteristics and Safe Handling of Medical Gases* (No. P2). A major concern in the use of a medical gas system is that the correct gas is connected to the appropriate system lines via special connectors. Also of concern are the purity of the gas provided and maintenance of adequate lines.

Maintenance — A program of preventive maintenance and periodic inspection helps ensure that medical gas systems operate safely and reliably. As part of an effective management and maintenance program, inspections and corrective actions should be documented and any faulty fittings should be repaired or replaced immediately. In the event of a system outage, it is important to notify nursing personnel and medical staff. In addition, labeling shutoff controls and providing signs at outlet locations, as well as identifying piping, will help ensure safety in a facility. System piping is to be kept free from contamination. It is essential that cylinders be protected from the extremes of weather, that empty and full gas cylinders be kept separate from each other, and that empty cylinders be marked. NFPA 99 contains technical information on flammable agents and nonflammable gases. Bulk medical gas systems involving oxygen and nitrous oxide should meet requirements of the CGA pamphlet *Standard for the Installation of Nitrous Oxide Systems* (No. 8.1) or NFPA 50 (Standard for Bulk Oxygen Systems at Consumer Sites). An effective management and maintenance program for medical gas systems should address the following concerns:

- Maintenance and inspection of system components and evaluation of failures
- Responsibility for the effectiveness and safety of the system
- Testing for proper configuration
- Training and education programs

Medical and Surgical Vacuums — Many healthcare facilities have medical/surgical vacuum systems that are used instead of portable units for aspiration during patient treatment and certain surgical procedures and for the evacuation or removal of nonflammable anesthetic waste gas. Laboratories should have a separate vacuum system to prevent contamination of and damage to the vacuum system used for patients. An effective program for medical/surgical vacuum systems addresses maintenance and inspection programs, system failures, testing for correct piping network configuration, and training and education programs. A program of preventive maintenance and periodic inspection will help ensure that medical/
surgical vacuum systems operate safely and reliably. Components such as vacuum pumps, receivers, valves, inlets, terminals, gauges, meters, switches, system vacuum alarms, and protective devices should be inspected regularly. Major valves, inlets, and piping should be tagged or identified and emergency shutoff controls labeled throughout each system.

**Communication Systems** — Communication systems play a useful and vital role in healthcare facilities by assisting patients and staff in obtaining the help they need to deal with both routine and emergency situations as expeditiously as possible. Communication systems include such basic components as telephone systems, internal and external paging systems, the nurse call system, and data exchange systems (computers). As equipment has grown more complex, the Joint Commission has been concerned that the programs developed to monitor such equipment reflect this growing complexity so the basic channels of communication for patient safety are not lost. To address this concern, it is essential that communication systems operate effectively and reliably and that they are designed in accordance with the services provided by the organization. Refer to NFPA 101 and NFPA 99 for information on life safety and emergency communications.

**Vertical/Horizontal Transport** — Multiple-story buildings use transport systems to move people, supplies, food, medicine, and messages. Vertical and horizontal transport systems include passenger and freight elevators, escalators, moving walkways, conveyors, and pneumatic tube systems. NFPA 99 addresses elevator emergency power requirements. The location of a facility’s elevators is crucial to moving people and materials throughout the building. The daily operation of any multiple-story facility can be considerably hampered if one or more elevators becomes inoperable. The loss of any transport system could cause modification of facility operations. (Refer to Chapter 5 for additional information on evacuation procedures.) It is important to establish a comprehensive management and maintenance program to address the following:

- Maintenance and inspection procedures
- System components
- Permits and licenses
- System failures
- Training and education programs

**Q. PLUMBING OPERATIONS AND SAFETY**

Plumbing maintenance normally includes the installation, preventive maintenance, and repair of water supply systems, sewage, water disposal systems, and systems to deliver natural liquefied petroleum gas (LPG) and other gases, including oxygen. These systems and the maintenance of them contribute to the total well-being of facilities. Hazards that may be encountered during plumbing jobs include entry into an oxygen-deficient atmosphere (confined space); fire or explosion due to the introduction of an ignition or flame source into a hazardous environment; falls, strains and sprains; and cuts or bruises. Plumbing maintenance workers need to be knowledgeable of these potential hazards and conditions and take reasonable actions to prevent incidents before they occur. Personal protective equipment worn during plumbing maintenance operations normally consists of eye and face protection, work gloves or chemical-resistant gloves, and safety-toe shoes. A bump cap or hard hat may be required under conditions that could result in head injuries, such as in manholes and spaces with low overhead pipes. Personnel should wear eye or face protection when working with plumbing connections that could contain chemicals, blood, or other hazardous materials.
Plumbing Systems — Plumbing systems may contain pumps, valves, fittings, traps, drains, vacuum breakers, and back-flow prevention devices. At the user end are the fixtures, including lavatories, urinals, water closets, showers, bathtubs, sinks, water fountains, and utility sinks. The plumbing system also provides for the removal of wastewater and storm-water, usually through discharge into a municipal or rural sewer system. Care must be taken when dumping certain chemicals into this system. Unless they are handled and disposed of properly, the various waste systems can be damaged. Design and use of a plumbing system usually require strict adherence to state or local codes and environmental regulations. Maintenance personnel in healthcare facilities must be trained in the hazards of exposure to bloodborne pathogens and explosives in laboratory systems. Plumbing cross-connections that merge potable and nonpotable water sources can spread waterborne diseases.

Back Pressure Prevention — The prevention of back pressure can be attained by removing cross-connections or installing connection control devices. Consider the following possible scenarios:

- Hose submerged in a laboratory sink
- A hazardous materials tank with a submerged inlet
- Water supply to dishwasher without a vacuumbreaker
- Valve connection between potable and nonpotable water supplies

Hot Operations — Only essential fire prevention items pertaining to the operation of blow torches and plumber’s furnaces are included in the discussion here. Work and storage areas for this equipment should be well ventilated. No one should be permitted to use a torch or furnace until the user is trained on its use and is familiar with the operating instructions. Where flammable or explosive vapors or dust may be present, torches and furnaces should not be used until the atmosphere has been vented and the sources of such vapors or dust removed. Gasoline blow torches and furnaces should not be used in small, unventilated spaces as they could cause explosions. Acetylene gas should never be brought in contact with metal powders such as copper or silver, as the combination may produce flashes that could ignite explosive atmospheres. Combustible materials in locations where torches or furnaces are to be used should be protected or kept far enough away to prevent their being subjected to sparks or dangerous temperatures. Appropriate fire extinguishers should be available.

Soldering and Brazing — The process of soldering and brazing joins metal parts by melting a fusible alloy. When the solders used have a melting point above 800°F, the procedure is referred to as brazing. Improper equipment and unsafe practices may cause lead poisoning, irritation from fluxes, burns, electric shock, or fires. The concentration of toxic fumes and irritants at the breathing level of the operation should be checked. Where required because of toxic fumes, a respirator or adequate ventilation should be provided. Lead–tin, zinc, silver, cadmium, and antimony–tin solders can pose moderate to serious health hazards. Soldering, particularly with lead–tin, in a confined space where ventilation is not adequate to remove toxic fumes may require the use of a self-contained breathing device. Electric soldering irons should be grounded unless they are of double insulation construction. All soldering irons should be placed in suitable noncombustible receptacles when not in use. When required, open-flame permits should be obtained for these operations. Appropriate safety eyewear should be worn during all soldering and brazing operations.

Storm Drains and Manhole Covers — Plumbing personnel are not likely to come into contact with hazards associated with sewer systems while working on open storm drains; however, they may encounter certain other hazards associated with that type of drainage
Healthcare Hazard Control and Safety Management

Manhole covers are heavy and closely fitted to the manhole opening. Personnel should never attempt to lift a cover without using proper pry-bar tools, special lifting tools, and additional help where needed. Fingers and toes should be kept away from manhole covers when they are being put down. Insects, animals, and snakes have been known to nest or den in storm drains, and stings from wasps, spiders, and ants could lead to toxic shock. Bites from animals could lead to rabies, and bites from poisonous snakes could be fatal or cause gangrene. Prior to working in storm drains, personnel should clear the drains of dangerous insects, animals, or snakes. They should wear proper protective clothing, hard hats, boots, and gloves while working in storm drains.

**Gas Systems** — Gas systems to be maintained include natural gas, LPG, and oxygen. Shop personnel should be familiar with the properties of the gases in the systems they maintain. Until proved otherwise, all escaping gases should be considered flammable. Prior to personnel entering an area where a gas leak is suspected, the area should be properly vented and purged of existing gas. Personnel entering the area should be suited with proper protective clothing and self-contained breathing devices. For oxygen-deficient atmospheres, air-supply systems with a special emergency escape air supply are required and should be used. Tools used to repair leaks in or perform maintenance on gas lines should be spark free, and protective clothing should be static free. When working on oxygen-dispensing lines, workers should not use tools and equipment that are coated with lubricating substances or grease.

**Tunnels, Pits, and Sumps** — Where shop personnel are required to work in utility tunnels, pits, and sumps, the atmospheric conditions should be checked for an explosive atmosphere or oxygen deficiency before allowing them to enter. Personnel should be suited with proper protective clothing and respiratory protective devices, when required, while performing maintenance to underground utilities. All tunnels, pits, or sumps known to be contaminated should be tagged or identified for the information of work crews. Workers should be assigned in pairs to work on underground utilities, and all known contaminated tunnels, pits, and sumps should be ventilated while work is in progress. When a manhole or vault is open, at least one member of the crew should be stationed at the surface. This person should not, under normal circumstances, leave for any reason. In areas where removal of a victim would be difficult, an approved lifeline, equipped with a wrist harness, should be worn by the person entering the area to facilitate rapid removal in case of an emergency.

**Compressed Air** — Plumbing workers should be trained and authorized to inspect, maintain, or install compressed-air systems. Before opening a compressed-air line, workers should ensure that the line has been completely drained of existing air to prevent a sudden release of air that would cause the line to whip. The reverse is also true; when personnel have installed a new compressed-air system, all parts of the system should be secured together before air is put into the system. Workers should wear eye and face protective equipment while working on compressed-air systems.

**R. BOILER AND HEATING SYSTEMS**

The American Society of Mechanical Engineers (ASME) Boiler and Inspection Code covers the design, fabrication, and inspection of boilers during construction. The National Board of Boiler and Pressure Vessel Inspectors has published an inspection code to be used after installation. Boiler systems should be maintained according to the instructions provided by
the manufacturer. A boiler is simply a closed vessel in which water is heated by a heat source to form steam or hot water under pressure. Most boilers are either water-tube or fire-tube boilers. Boilers utilize a number of different fuels, depending on the design of each particular system. An effective management/maintenance program stresses several elements, including water treatment, maintenance and inspection, system components, permits and licenses, system failure, emergency shutdown, and training and education programs. The water that goes into and through a boiler eventually supplies hot water or steam throughout a healthcare facility; thus, the treatment of the water is of prime importance.

**Boiler Safety Basics** — Water in boilers should be checked and kept at proper levels. Water columns should be monitored to ensure connections are clear and water returns to the proper level in the gauge glass when drain valves are closed. When water is not visible in the gauge glass, all stresses on the boiler should be gradually reduced. Inspect the boiler thoroughly, including a hydrostatic test, before returning it to service. At least once a year, the boiler, the flame safeguard supervisory system, and other safety controls should be inspected during a scheduled shutdown by an authorized boiler inspector. Repair or replace defective parts. Schedule inspections with boilers cool, hand holes and manholes open, and the boiler properly ventilated. Provide proper and convenient drain connections and locate unobstructed floor drains.

**Operation of Central Heating Plants** — Each boiler should be equipped with steam and water gauges, safety and blow-off valves, and low-water cutoff devices. Safety valve inspections should be conducted as outlined in the National Board Inspection Code published by the National Board of Boiler and Pressure Vessel Inspectors. Boiler feed lines should be equipped with check and cutoff valves placed as close as possible to each boiler. Water gauge glasses less than 15 feet from the floor or water tender's platform should be carefully guarded to prevent accidents resulting from breakage or blowouts. High-pressure gauge glasses should be drawn down on each shift. Low-pressure gauge glasses should be checked at least weekly. Pressure gauges should be inspected and tested every 12 months by heating plant personnel. When not in use, all boiler room tools should be stored in suitable racks, Tool racks should be constructed and located so personnel cannot accidentally touch hot surfaces or knock tools from racks while passing by. Adjustments should not be made to valves or valves removed to increase discharge pressure. Hoist ways, driving machinery, conveyors, worm gears, and reciprocating pumps should be properly guarded.

**Operating Pressures** — No boiler should be operated at pressures higher than those determined safe by the most recent boiler inspection. Boilers should not be operated at greater pressures than those specified on the manufacturer's stamped instructions. The lower of these two pressures will govern boiler operation. The instruction stamped by manufacturers on boilers should not be covered or obliterated.

**Safety Valves** — No boiler should be operated unless equipped with a safety valve, calibrated to the boiler manufacturer's recommendations, unless normal boiler operating pressures are changed, in which case the maximum operating pressure then becomes the controlling factor on safety valve selection. No other valves should be placed between the safety valve and the boiler or between the safety valve and the end of its discharge pipe. Safety valves should be manually tested on steam or hotwater systems at least monthly for proper operation. If it is not practical to test safety valves for high-temperature hotwater boilers every month, then the valves should be removed from the boiler, tested, and reset (if required) at a properly equipped safety relief valve testing facility, by the valve manufacturer, or by a certified ASME shop.
Boiler Maintenance — Facilities should establish standardized routine operation procedures for normal start-up and online operation of boilers. They should require the use of interlocks to minimize improper operating sequences and to stop sequences when conditions are not proper for continuation, and they should establish and rigidly enforce purge procedures with necessary interlocks. In an effective maintenance program, water used for boiler operations is treated to protect the boilers and related equipment and system lines from corrosion buildup within the boiler or lines. A corrosion buildup can result in malfunctions, inefficiencies, and eventual breakdowns. In addition, the steam provided must be suitable for its intended end use. A program of preventive maintenance and periodic inspection will help ensure that the boiler and steam systems operate safely and reliably. Periodic inspections of the systems will verify the integrity and safety of the system between preventive maintenance checks and tests. An effective management program provides for the proper maintenance of boiler controls and system safety controls or devices. NFPA 85A–E (Boiler Furnace Standards) also detail minimum design and installation requirements for high-pressure boilers. Other standards that provide guidance are the ASME Boiler and Pressure Vessel Code (1990) and ANSI/ASME PVHO-1A-1990 (Safety Standard for Pressure Vessels for Human Occupancy).

Steam Piping and Valve Maintenance — All 4-inch and larger steam valves or main steam valves to any building should be operated only by qualified heat systems personnel. High-pressure steam valves located in confined areas should not be turned off until the valve controlling the steam is turned off at the main steam plant. After the valve in the confined area has been closed, the valve in the steam plant may be reopened to distribute steam to other areas. When a valve in any confined area is to be opened, the operator should close the main valve at the steam plant before opening the steam valve in the confined area. After ensuring that all pressure has been bled off prior to opening the steam valve in the confined area, the operator should open the steam valve in the confined area and move away from the confined area before the main valve at the steam plant is reopened. Routine operations, maintenance, and repair in steam pits and other confined areas may be accomplished on electric circuits, controls, motors, pumps, receivers, condensate lines, and vent fans while steam pressure is in the steam line, providing conditions and temperatures are acceptable; however, no operational changes, repairs, or maintenance should be accomplished on steam lines while there is steam pressure on the lines.

Operating personnel should open drain valves and remove water from the steam line prior to opening a high-pressure steam valve. They should familiarize themselves with the location of these drain valves to ensure that the water accumulations are drained from the distribution lines. When bypass lines and valves are installed around a high-pressure steam valve, the bypass valve should be opened first. When the steam line becomes heated or the steam pressure equalized on both sides of main steam valve, the main steam valve may then be opened. All high-pressure steam valves should be opened very slowly, and everyone should remain at a safe distance while valve positions are being changed. When dismantling a valve for maintenance, the worker should be sure the pressure has been relieved through all possible means. The valve body should be checked for a removable plug to relieve pressure. Bolts should be carefully removed. Personnel should never position their bodies over the valve or in line with the direction of travel, in case the bonnet blows.

S. REFRIGERATION AND AIR-CONDITIONING MAINTENANCE

Refrigeration and air-conditioning maintenance personnel, as for many other engineering services activities, perform duties in many different locations and environments. These workers must be aware of not only the hazards of the tasks they are performing but also hazards
associated with tasks being performed around them. Potential hazards might involve noise, electricity, refrigerants, lifting, or compressed gases and cylinders. Potential physical and health hazards can be effectively controlled by proper work procedures and controls and by using the required personal protective equipment. Equipment rooms where air-conditioning equipment is installed should be kept free and clear of all trash and clutter that could present tripping or fire hazards. Refrigerant piping should be properly insulated, both to improve operating efficiency and to prevent injury to workers who may accidentally come in contact with it. All belts, pulleys, and rotating shafts should be guarded to prevent accidental contact. Large valve handle stems that could present a bump or trip hazard should be marked (color coded) for easy recognition. Electrical parts of the equipment and controls should have all covers and plates in place. Wiring should be properly secured to the equipment or structure.

**Refrigerant Recycling** — In 1993, the EPA established a comprehensive recycling plan under the Clean Air Act, Section 608, for ozone-depleting refrigerants. The plan addresses the service and disposal of air conditioning and refrigeration equipment. The regulations require persons servicing such equipment to follow certain practices to reduce emissions. The rules also address equipment and reclamation requirements and technician certification requirements. The final rules established leak repair requirements for equipment holding 50 pounds or more of refrigerant. Ozone-depleting compounds contained in appliances must also be removed prior to final disposal of the appliance. The federal standard for purity when reprocessing refrigerants has been updated to incorporate the 1993 edition of the Air Conditioning and Refrigeration Institute’s standard for purity. The 1993 rules established a certification requirement for recycling and recovery equipment to verify that all recycling or recovery equipment and reclaimed refrigerant sold is of known acceptable quality to avoid failure of equipment by contaminated refrigerant. All persons involved in the maintenance, service, and repair of refrigerant equipment must have at least one piece of certified, self-contained recovery equipment on the premises.

**Fluorocarbons** — Fluorocarbons are relatively inert, generally nonflammable, and low in toxicity. Shipped as liquefied compressed gases under their own vapor pressures, they are colorless; as liquids and gases under their own vapor pressures, they are colorless as liquids and freeze to white solids. Fluorocarbons are odorless in concentrations of less than 20% by volume in air but some have a faint and ethereal odor in higher concentrations. Fluorocarbons are unusually stable for organic compounds. Resistance toward thermal decomposition, in general, is high but varies with each product. When decomposition does occur, toxic products are very irritating and usually give adequate warning of their presence in very low concentrations in air. Hot work should never be performed on charged systems.

**Storage and Handling** — Storage and handling of cylinders of compressed gas refrigerants can be sources of injury to workers. Workers should ensure that containers are legibly marked with the type of gas contained and stored with minimum intermingling of types of refrigerant. Cylinders should be stored separately from flammable gases and oxygen. Where caps have been provided for valve protection, they should be kept in place at all times until the cylinder is actually in use. Valves should be kept closed at all times except when the cylinder is in use. Cylinders should not be used as rollers or supports. Their only use is to contain the gas. Nonrefillable containers, such as Department of Transportation (DOT)-2P, DOT-2Q, and DOT-39 containers, should not be refilled with any material after use of the original contents. They should be disposed of in accordance with the container manufacturer’s or filler’s instructions. Cylinders should not be dragged, slid, dropped, or allowed to strike each other or solid objects violently. Whenever possible, a suitable hand truck or roll platform should be used. Containers should never be lifted by the valve. Cylinders should
not be suspended by chains, ropes, or slings unless the manufacturer has provided appropriate attachment points. Storage areas should be legibly marked with the names of the gases being stored. Full cylinders and empty cylinders should be segregated and the full ones arranged so the oldest stock can be removed first with a minimum of handling. The storage area should be kept as dry as possible and away from exposure to salt or other corrosive chemicals or materials. Cylinders should be secured by a metal securing device or rack specifically designed to prevent damage. These rules apply to all refrigeration and air-conditioning maintenance work centers that use and store compressed gases.

**Large Liquid Leaks** — Large liquid leaks in fluorocarbon systems may be detected visually. As the material escapes, moisture in the air surrounding the leak condenses and then freezes around the leak due to the refrigerating effect of the vaporizing fluorocarbons. The frost thus formed is readily apparent. Smaller leaks may be located with the use of a solution of liquid detergent in water applied directly to the area being tested. The formation of bubbles indicates a leak. Electronic leak detectors are capable of sensitivities far greater than the other methods — often in terms of fractions of an ounce of fluorocarbon per year. When the probe of the instrument is placed near a leak, positive identification of the leak is indicated by a flashing light, meter deflection, or audible means.

**T. VENTILATION**

Air enters buildings or spaces by means of mechanical ventilation systems as well as by leaks around windows, doors, etc. Newer, larger buildings which are highly energy efficient due to sealed windows and heavy insulation primarily depend on mechanical ventilation. Older, small, and low-occupancy office buildings can be adequately ventilated through natural sources, which include air leakage through opened windows and doors, as well as through cracks in the windows and walls and other openings. In modern buildings, the heating, ventilation, and air-conditioning system (HVAC) is designed to keep occupants comfortable and healthy by controlling the amount of outside air that is added to the building atmosphere, filtering both incoming and recirculated air to remove particulate matter and controlling the temperature. The HVAC system includes all heating, cooling, and ventilation equipment serving a building: furnaces or boilers, chillers, cooling towers, air-handling units, exhaust fans, duct work, filters, steam (or heating water) piping.

**Ventilation Systems** — A ventilation system consists of a blower to move the air, duct work to deliver air to the room, and vents to distribute the air. A good ventilation design will distribute air uniformly to each area, especially areas with office machines. An effectively designed area will not have the supply and exhaust vents too close together because fresh air may be removed before it is adequately distributed throughout the area. Exhaust fans are often located a significant distance away from supply vents. If a tissue held near a vent moves, air is being circulated and the direction the tissue is blown will determine the type of vent (exhaust or supply). The American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) has established a general guideline of 20 cubic feet of outside air per minute per person for an office environment. This is a sufficient amount of air to dilute building contaminants and maintain a healthy environment. Indoor air quality complaints increase significantly in offices that have an inadequate supply of outside air.

**Mechanical Ventilation** — Mechanical ventilation systems should be designed to bring in outside air and mix it with a percentage of return (inside) air. The air is then cooled,
heated, or humidified and distributed. Over 50% of all indoor air quality problems are the result of insufficient or ineffective ventilation. As noted, ASHRAE has established guidelines on the amount of outside air that must be brought in. General office space requires 20 cubic feet of intake air per minute for each occupant. Carbon dioxide is a good indicator of insufficient intake air; at levels of 1000 ppm, the ventilation is not adequate.

**Correctly Designed and Functioning System** — Temperature and humidity ranges for building occupants are described in ASHRAE Standard 55. A good system provides thermal comfort to all building occupants, distributes and blends the proper amounts of outdoor and recirculated air to meet ventilation requirements in ASHRAE 62, and isolates and removes odors and contaminants through pressure control, filtration, and exhaust systems. Positive-pressure rooms have more air supplied than is exhausted, whereas negative-pressure rooms have less air supplied than is exhausted. The maintenance plan should describe the equipment covered, maintenance procedures, and frequency schedule. HVAC systems must be operated in accordance with their original design or that applied when the facility was constructed or renovated, whichever is the most recent. Employers must implement controls for specific contaminants and their sources within indoor work environments. Employees must be notified at least 24 hours prior to the use of any cleaning or other chemical substance in the facility. Buildings that are not already smoke free must provide a separate enclosed room that is vented directly outside as a smoking area. The room must be maintained under negative pressure. Smoking is not permitted during the cleaning of the room, and employees should not have to enter under normal working conditions. Signs must be posted that clearly inform all persons entering the workplace about the smoking restrictions.

**Healthcare Ventilation Standards** — The design and installation of air-handling and ventilation systems must address pressure relationships, air exchange rates, and efficiency of filtration. Ventilation in areas housing patients with suppressed immune systems — such as surgical suites, isolation areas, special procedures rooms, delivery rooms, nurseries, and intensive care units — must be designed correctly. Refer to the *AIA Guidelines for Design and Construction of Hospitals and Healthcare Facilities* (Table 2 and Table 3) for new construction or renovation guidance. ASHRAE recently published ASHRAE SP91, *HVAC Design Manual for Hospitals and Clinics* (2003). This manual was developed over several years and received input from healthcare professionals in several organizations, including the American Institute of Architects, American Society of Hospital Engineers, and American College of Surgeons. The guide contains 16 chapters organized into technical sections related to hospital and clinic design and operation. The nine appendices provide in-depth information in specific areas such as infection control issues and managing during construction activities. Appendix F summarizes air flows, temperatures, humidities and controls for all areas covered by the guide. The manual contains design requirements for critical function areas throughout the facility.

**ASHRAE SP91-2003 (HVAC Design Manual for Hospitals and Clinics)** — This newly designed manual contain information on:

- Infection control measures for reducing airborne contaminants
- Air quality and distribution effectiveness
- Temperature and humidity controls
- Ventilation requirements, including outdoor air
- Room pressure relationships and filtration practices
- Ventilation system selection, including reliability issues
- Installation, commissioning, and maintenance procedures
Other ASHRAE Standards and Guidelines

ASHRAE 62 (Ventilation for Acceptable Air Quality) — This standard can assist professionals in the proper design of building ventilation systems. Important aspects of the standard include:

- A definition of acceptable air quality
- Information regarding ventilation effectiveness
- Recommendations on using source control through isolation and local exhaust
- Information on the use of heat-recovery ventilation
- A guideline for allowable carbon dioxide levels
- Appendices listing guidelines to control common indoor pollutants

ASHRAE 12-2000 — This publication provides guidance on water-based utility systems, which must be properly designed, installed correctly, and effectively maintained to control pathogenic biological agents that pose a risk to those with impaired autoimmune systems.

ASHRAE 55 (Thermal Environmental Conditions for Human Occupancy) — This standard covers several areas, including temperature, humidity, and air movement. Important aspects of the standard include:

- A definition of acceptable thermal comfort
- Information on environmental parameters that must be considered
- Recommendations for summer and winter comfort zones for humidity and temperature
- Guidelines for making measurements

ASHRAE 52 (Method of Testing Air-Cleaning Devices in General Ventilation for Removing Particulate Matter) — This standard can assist professionals in the evaluation of air-cleaning systems for particle removal. Highlights of the standard include:

- Definitions of arrestance and efficiency
- Information about the uniform comparative testing procedure
- Establishment of a standard reporting method for performance
- Methods of assessing resistance to airflow and dust-holding capacity

Other Standards — Healthcare facilities should refer to NFPA 90A (Standard for the Installation of Air Conditioning and Ventilation Systems). Local exhaust ventilation systems must conform to the construction, installation, and maintenance requirements found in ANSI Z9.2 (Fundamentals Governing the Design and Operation of Local Exhaust Systems) and ANSI Z33.1. Information on local exhaust duct systems, independent exhaust, and room intakes is provided in 29 CFR 1910.107d. Ventilation requirements for inside storage rooms with flammable materials are provided in 29 CFR 1910.106. OSHA also covers a number of air contaminants in 29 CFR, Subpart Z. Laboratory ventilation is referenced in 29 CFR 1910.1450. Hospitals must also be concerned about ventilation and respiratory protection areas that have hazardous materials such as anesthetic gases and formaldehyde. Refer to NFPA 99 for additional guidance. OSHA standards cover ventilation requirements for a variety of operations including abrasive blasting, grinding/polishing operations, and spray finishing operations.

Engineering Controls — “Local exhaust” refers to the method designed to capture airborne contaminants near the point of generation or release. The system should draw contaminants away from a person’s breathing zone. “Mechanical exhaust” refers to the continuous introduction of fresh air into the workplace to dilute contaminated air and lower the concentration of a hazardous substance. The effectiveness depends on the number of air changes per hour.
Fume Hoods and Ventilation — A fume hood or fume removal system is a device used to capture hazardous air contaminants such as vapors, dusts, mists, gases, and metal fumes. A fume removal system consists of a blower to remove the contaminant. They are sized or rated by the amount of cubic feet of air moved at a given resistance. This resistance or static pressure can be influenced by the type of collection mechanism and length of duct work. Blower flywheels are available in a number of materials, depending on the contaminant being removed. Some are designed to be explosion proof or nonsparking. Duct materials are normally galvanized steel, stainless steel, or polyvinylchloride (PVC)-type materials. Air-purification devices include chemical adsorption and mechanical filters that remove particulate matter.

Collection Devices — A cabinet hood is often used in laboratories because it is effective against a variety of chemicals. This three-sided enclosure is normally made of chemically resistant materials. Air is pulled through the front and away from the worker. Canopy hoods are mounted on walls or hung from ceilings over the work area. Cabinet hoods are effective for contaminants that rise. Local collection hoods are directly attached to the duct and are designed for operations where a contaminant is generated at a specific place. Refer to NFPA 45 (Standard on Fire Protection for Laboratories Using Chemicals) for guidance on fume hood requirements (see also Table 6.19).

General Requirements — The NFPA 90A standard (Installation of Air Conditioning and Ventilating Systems) details specific suggestions for maintaining systems. Proper temperature, humidity, and air flow will provide a comfortable environment inside a building regardless of climatic conditions outside. Ventilation must be provided in accordance with guidelines established in ASHRAE Standard 62. The initial design of a facility’s HVAC system is the first step in providing a comfortable environment. During design stages, system loads and building capacities are estimated and calculated according to the intended occupant load of the building. Future expansion possibilities and potential load requirements should be considered at that time. To ensure safety in the event of an emergency shutdown, a current and complete set of documents indicating the distribution of the HVAC system and controls for partial or complete shutdown should be maintained. Equipment failures often result in system outages, which may result in the loss of heating or cooling, special environmental support such as hood exhaust systems, and particular temperature conditions required to maintain the operating status of equipment. Training programs can help provide maintenance and operating personnel with appropriate information on HVAC systems and equipment. Training should focus on the technical aspects of maintaining the systems and on the role the systems play in specific areas of buildings.

TABLE 6.19 Ventilation Terms

An anemometer measures air velocity, normally in feet per minute. Capture velocity refers to the velocity of air produced by a hood to capture contaminants outside the hood area. Dilution ventilation is an exposure control method that uses an air-purification device and returns the exhaust to work area air. A manometer measures pressure differences, usually in inches of a water gauge. Static pressure is developed in a duct by a fan.
U. INDOOR AIR QUALITY

Many times odors are associated with chemical contaminants from inside or outside the office space or from the building fabric. This is particularly noticeable following building renovation or installation of new carpeting. Out-gassing from such things as paints, adhesives, sealants, office furniture, carpeting, and vinyl wall coverings can be a source of a variety of irritant compounds. In most cases, these chemical contaminants can be measured at levels above ambient (normal background) but far below any existing occupational evaluation criteria. Indoor air quality (IAQ) is an increasingly important issue in the work environment. IAQ and pollutant levels within office environments are complex problems. The complexity of studying and measuring the quality of office environments arises from various factors, including:

- Building floor plans are frequently changing to accommodate increasing numbers of employees and for reorganization.
- Buildings frequently undergo building renovations such as installation of new carpet, modular office partitions, and free-standing offices, as well as painting.
- Many of the health symptoms reported are vague and common both to the office and home environment.
- Guidelines or standards for permissible personal exposure limits to pollutants within office buildings are very limited.

Indoor Air Pollution — An inadequately ventilated office environment or a poorly designed ventilation system can lead to the build-up of a variety of indoor air pollutants. Air pollutants can originate within the building or be drawn in from outdoors. Examples of those that originate outside a building include: (1) pollen, dust, and fungal spores; (2) general vehicle exhaust; (3) odors from garbage dumpsters; and (4) re-entrained exhaust from the building itself or from neighboring buildings. Sources of pollutants that originate within the building include: (1) building components and furnishings; (2) smoking; (3) maintenance or remodeling activities; (4) housekeeping activities; (5) unsanitary conditions (standing water from clogged drains or dry traps) and water damage; and (6) emissions from office equipment or special-use areas such as print shops, paint shops, laboratories, and food preparation areas.

Controls To Prevent Indoor Air Pollution — The following recommendations and guidelines are useful in preventing indoor air quality problems:

- HVAC systems should receive periodic cleaning, and filters should be changed on a regular basis on all ventilation systems.
- The ventilation system should introduce an adequate supply of fresh outside air into the interior and capture and vent point air pollutant sources to the outside.
- Office machinery should be operated in well-ventilated areas. Most office machinery does not require local exhaust ventilation in areas that are already provided with 7 to 10 air changes per hour. Photocopiers should be placed away from workers’ desks. Workers should vary work tasks to avoid using machines excessively.
- Office equipment should be cleaned/maintained according to the manufacturer’s recommendations. Properly maintained equipment will not generate unhealthy levels of pollutants.
- Special attention should be given to special operations that may generate air contaminants (such as painting, pesticide spraying, and heavy cleaning). Provisions for adequate ventilation must be made during these operations, or other procedures, such as performing work off-hours or removing employees from the immediate area, should be utilized.
Indoor Air Quality — The quality of air inside healthcare buildings should be monitored because many infectious agents can be spread through the ventilation systems. Healthcare facilities also use a number of chemical substances that can contaminate the air. Because the poor air quality in many modern buildings can be attributed to ventilation systems that bring in an insufficient volume of outside air (see Table 6.20, Table 6.21, and Table 6.22), ASHRAE increased outside air requirements by four times in its revised 1989 standard.

Chemical Contaminants — The term “air contaminants” generally refers to substances contained in vapors from paint, cleaning substances, pesticides, solvents, particulate materials, outdoor air pollutants, and other airborne substances. Refer to Chapter 7 for information on some of the most common healthcare air contaminants. Healthcare facilities must be aware that new carpet and particleboard can release volatile organic compounds such as formaldehyde. Healthcare facilities must also contend with a number of other potential contaminants such as antibiotics and antineoplastic drugs.

Microbial Contamination — Healthcare facilities must also be concerned with microbiological contamination. A microbe is a small living organism that can contaminate ventilation systems. Microbes such as *Legionella bacilli* have been discovered in the cooling towers of healthcare facilities. Wet, moist, and damp areas can be breeding grounds for microbes that can become airborne and cause problems for workers.
Other Sources of Contaminants — Air contaminants can include pollen, dust, fungal spores, and industrial pollutants; emissions from nearby sources such as vehicle exhaust from roadways or parking garages; and odors from dumpsters. Pollutants can arise from the building itself or from other sources, such as unsanitary conditions or debris near the outdoor air intake. Soil gases such as radon, leakage from underground storage tanks, contaminants from landfills, and pesticide usage also provide sources of contamination. Moisture or standing water promotes excess microbial growth in cooling towers, on flat roofs, and in some crawlspaces. HVAC systems can contain contaminants in ducts, including microbiological growth in drip pans, humidifiers, and coils. Other sources include improper use of pesticides, sealants, and cleaning materials; improper venting of combustion products; refrigerant leaks; emissions from office equipment; volatile organic compounds; and elevator motor exhaust or other mechanical systems. Carpets, curtains, and other furnishings can also contain or emit pollutants.

Preventing IAQ Problems — Healthcare facilities should consider establishing a written IAQ program to help manage their ventilation systems. The written program should cover a number of areas, including maintenance, testing, monitoring, and training. The program should establish protocols for dealing with IAQ complaints. Some basic things can help prevent IAQ problems:

- Preventive maintenance should include effective building care, HVAC maintenance, and intelligently designed renovations.
- Ventilation systems should be analyzed with regard to comfort, ventilation, and sanitation. This can be accomplished by inspecting accessible areas for obvious problems, poor design, or signs of contamination. Inspections should determine air flow, temperature, humidity, carbon dioxide concentration, and air pressure differentials.
- HVAC systems should be periodically inspected and serviced as necessary. Many buildings have been designed to be energy efficient, and the result is an inadequate or contaminated supply of outside air.

Building-Related Illness — A building-related illness (BRI) is a specific medical condition that can be determined by physical signs and laboratory findings (see Table 6.23 and Table 6.24). BRI includes any medical condition that prompts an evaluation of the building to determine whether HVAC systems are operating correctly. The following can be classified as BRIs caused by indoor contaminants:

- Respiratory allergies and asthma
- Humidifier fever and hypersensitivity pneumonitis
- Legionnaires' disease
- Carbon monoxide poisoning or formaldehyde poisoning
- Pesticide exposure

Concerns During Complaint Investigations

- Safety risks — Potential safety issues include electrical hazards and possible injuries from fans, belts, and dampers. Other risks include burns from steam or water lines. Take precautions to prevent falls from ventilation shafts, ladders, or roofs.
- Microbiological — Use extreme care when serious illnesses are under investigation. People prone to allergy problems should be cautious. Minimize exposure to air ducts
or when contaminants are suspected to be growing. Use respiratory protection if visible contamination exists.

- **Chemical** — Use caution if severe chemical contamination is suspected. Follow precautions for exposure to the suspected substances. A pesticide spill in a confined space would require appropriate protective equipment, including a respirator.

- **Asbestos** — When conducting an IAQ investigation, contact with asbestos is likely. Take appropriate precautions, including wearing overalls and a respirator.

### Ventilation System Evaluations

- Compare the original design to the current system.
- Evaluate changes in ventilation and temperature control zones.
- Note changes in HVAC equipment.
- Review operating procedures for unoccupied and occupied periods.
- Evaluate the condition of the system and look for unsanitary conditions such as moisture, standing water, debris, mold growth, or excessive dust.
- Consider the following HVAC malfunctions:
  - Equipment breakdown
  - Obstructed grilles or diffusers
  - Air distribution and mixing problems

### TABLE 6.23  Illnesses Associated with Indoor Air Quality

<table>
<thead>
<tr>
<th>Illness</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sick-building syndrome (SBS)</td>
<td>A situation in which a building is believed to be contaminated and but no specific illness can be identified.</td>
</tr>
<tr>
<td>Building-related illness (BRI)</td>
<td>An illness brought on by exposure to contaminants in a building; Legionnaires’ disease and hypersensitivity pneumonia are two examples of BRIs that can have serious consequences.</td>
</tr>
<tr>
<td>Multiple chemical sensitivity (MCS)</td>
<td>A controversial term that is not recognized by many medical organizations; MCS involves exposures to a number of substances at small concentrations that produce health problems.</td>
</tr>
</tbody>
</table>

### TABLE 6.24  Building-Related Illness (BRI) Assessment Tips

- Designate a person to implement the program.
- Prepare a written narrative describing all building systems.
- Refer to schematic drawings to illustrate systems.
- Establish normal operating procedures for all building systems.
- Describe building functions, activities, and systems.
- Document known releases of air contaminants.
- Establish a preventive maintenance program
- Prepare a checklist for visual inspection of all systems
• Condition of air bypass filters
• Leaks in the distribution system
• Adjustments in ventilation-affected areas

Pollutant Pathways — Attempt to identify all pathways that could allow contaminants to enter and consider:

• Doors and operable windows
• Stairways
• Elevator shafts
• Utility chases
• Duct work and plenums

V. MOLD IN THE WORKPLACE

About 1000 known species of mold exist in the United States. Outdoor molds play an important role in nature by breaking down organic matter such as toppled trees, fallen leaves, and dead animals, and food and medicine production depends on molds. Molds reproduce by creating tiny spores (viable seeds) that usually cannot be seen without magnification. Mold spores continually float through indoor and outdoor air. When excessive moisture or water accumulates indoors, the result can be mold growth. Preventing indoor mold growth can be difficult, as molds can grow on virtually any substance with sufficient moisture or water, oxygen, and an organic source of food (see Table 6.25).

<table>
<thead>
<tr>
<th>TABLE 6.25 Mold Prevention Tips</th>
</tr>
</thead>
<tbody>
<tr>
<td>Repair plumbing leaks and leaks in the building structure as soon as possible.</td>
</tr>
<tr>
<td>Look for condensation and wet spots.</td>
</tr>
<tr>
<td>Fix sources of moisture incursion problems as soon as possible.</td>
</tr>
<tr>
<td>Prevent moisture from condensing by increasing surface temperature or reducing the moisture level in the air (humidity).</td>
</tr>
<tr>
<td>Increase surface temperature or insulate or increase air circulation.</td>
</tr>
<tr>
<td>Reduce the moisture level in the air, repair leaks, increase ventilation (if outside air is cold and dry), or dehumidify (if outdoor air is warm and humid).</td>
</tr>
<tr>
<td>Keep HVAC drip pans clean, flowing properly, and unobstructed.</td>
</tr>
<tr>
<td>Perform regularly scheduled building and HVAC inspections and maintenance, including filter changes.</td>
</tr>
<tr>
<td>Maintain indoor relative humidity below 70% (25 to 60%, if possible).</td>
</tr>
<tr>
<td>Vent moisture-generating appliances, such as dryers, to the outside where possible.</td>
</tr>
<tr>
<td>Vent kitchens (cooking areas) and bathrooms according to local code requirements.</td>
</tr>
<tr>
<td>Clean and dry wet and damp spots as soon as possible but no later than 48 hours after discovery.</td>
</tr>
<tr>
<td>Provide adequate drainage around buildings and slope the ground away from building foundations.</td>
</tr>
<tr>
<td>Be sure to adhere to local building codes.</td>
</tr>
</tbody>
</table>
Health Effects — This section provides a brief overview but does not describe all the potential health effects related to mold exposure; for more detailed information, the reader should consult a health professional or state or local health department. Currently, no federal standards regulate the airborne concentrations of mold or mold spores, but research on the relationship between mold exposures and health effects is ongoing. Most typical indoor air exposures to mold do not present a risk of adverse health effects; however, molds can cause adverse effects by producing allergens. The onset of allergic reactions to mold can be either immediate or delayed. Allergic responses include hay-fever-type symptoms such as a runny nose and red eyes. Molds may cause localized skin or mucous infections. They do not cause systemic infections in humans except for persons with impaired immunity or other underlying medical conditions. Molds can also cause asthma attacks in individuals allergic to mold. Exposure can irritate the eyes, skin, nose, and throat in certain individuals. Symptoms other than allergic or irritant are not commonly reported as a result of inhaling mold in the indoor environment. Eating, drinking, and using cosmetics in remediation areas should be avoided. Refer to Chapter 8 for additional information on other biohazards.

Remediation Plans — Remediation includes the identification and correction of conditions that permit mold growth, as well as the steps necessary to safely and effectively remove mold-damaged materials. Before planning any remediation, it is important to assess the extent of the mold or moisture problem and the type of damaged materials. If an outside contractor is hired to do the cleanup, that contractor must have experience with mold remediation. It is advisable to check references and ask the contractor to follow the recommendations in the EPA publication Mold Remediation in Schools and Commercial Buildings.

Wet Vacuums
- Use wet vacuums to remove water from floors, carpets, and hard surfaces where water has accumulated.
- Never use wet vacuums on porous materials such as gypsum board.
- Use wet vacuums only on wet materials as spores may be exhausted into indoor environments when insufficient liquid is present.
- The tanks, hoses, and attachments of these vacuums should be thoroughly cleaned and dried after use as mold and mold spores may adhere to equipment surfaces.

Damp Wipe — Mold can generally be removed from nonporous surfaces by wiping or scrubbing with water and detergent. It is important to dry these surfaces quickly and thoroughly to discourage further mold growth. Instructions for cleaning surfaces, as listed on product labels, should always be read and followed.

HEPA Vacuums — High-efficiency particulate air (HEPA) vacuums should be used for the final cleanup of remediation areas after materials have been thoroughly dried and contamination removed. HEPA vacuums are also recommended for cleaning up dust that may have settled on surfaces outside the remediation area.

Disposal of Damaged Materials — Building materials and furnishings contaminated with mold growth should be placed in sealed, impermeable bags or closed containers while in the remediation area. It is important to package mold-contaminated materials in this fashion to minimize the dispersion of mold spores. Large items with heavy mold growth should be covered with polyethylene sheeting and sealed with duct tape before being removed from the remediation area.
Use of Biocides

- Do not use a biocide such as chlorine bleach during routine mold remediation.
- When using disinfectants or biocides, ventilate the area with outside air, if possible.
- Exhaust the air to the outdoors.
- Do not extend the zone of contamination by using fans.
- Be aware that some biocides may be regulated pesticides.
- Do not use fungicides developed for outdoor use in any indoor application; fungicides commonly applied to outdoor plants, soil, and grains come in powder or spray forms.
- Use proper PPE, including respirators, when using biocides.
- Read and follow all label precautions.
- Be aware that it is a violation of federal (EPA) law to use a biocide in any manner inconsistent with the label information.

Level I — For small isolated areas (10 square feet or less, such as ceiling tiles or small areas on walls), remediation can be conducted by the regular building maintenance staff as long as they are trained on proper cleanup methods, personal protection, and potential health hazards. This training can be performed as part of a program to comply with the requirements of the OSHA Hazard Communication standard (29 CFR 1910.1200).

Level II — For mid-sized isolated areas (10 to 30 square feet, such as individual wallboard panels), remediation can be conducted by the regular building maintenance staff as long as they are trained on proper cleanup methods, personal protection, and potential health hazards. This training can be performed as part of a program to comply with the requirements of the OSHA Hazard Communication standard (29 CFR 1910.1200).

Level III — For large isolated areas (30 to 100 square feet, such as several wallboard panels), it is recommended that the facility consult an industrial hygienist or other environmental health and safety professional with experience performing microbial investigations or mold remediation prior to beginning remediation activities to provide oversight for the project.

Level IV — For extensive contamination (greater than 100 contiguous square feet), it is recommended that the facility consult an industrial hygienist or other environmental health and safety professional with experience performing microbial investigations and/or mold remediation prior to beginning remediation activities to provide oversight for the project.

Personal Protective Equipment — Any remediation work that disturbs mold and causes mold spores to become airborne increases the degree of respiratory exposure. Actions that tend to disperse mold include breaking apart moldy porous materials such as wallboard; destructive invasive procedures to examine or remediate mold growth in a wall cavity; removal of contaminated wallpaper by stripping or peeling; or using fans to dry items or ventilate areas. The primary function of personal protective equipment is to prevent the inhalation and ingestion of mold and mold spores and to avoid mold contact with the skin or eyes.

Skin and Eye Protection — Gloves protect the skin from contact with mold, as well as from potentially irritating cleaning solutions. Long gloves that extend to the middle of the forearm are recommended. The glove material should be selected based on the type of substance being handled. When using a biocide, such as chlorine bleach, or a strong cleaning solution, workers should wear gloves made from natural rubber, neoprene, nitrile, polyurethane, or PVC. To protect their eyes, they should use properly fitted goggles or a full face piece respirator. Goggles must be designed to prevent the entry of dust and small particles. Safety glasses or goggles with open vent holes are not appropriate for mold remediation.
Respiratory Protection — Respirators protect cleanup workers from inhaling airborne mold, contaminated dust, and other particulate materials that are released during the remediation process. Either a half mask or full face piece air-purifying respirator can be used. A full face piece respirator provides both respiratory and eye protection. The type of respiratory protection recommended depends on the level of remediation (see discussion above). Respirators used to provide protection from mold and mold spores must be certified by the National Institute for Occupational Safety and Health (NIOSH). More protective respirators may have to be selected and used if toxic contaminants such as asbestos or lead are encountered during remediation. As specified in OSHA 29 CFR 1910.134, individuals who use respirators must be properly trained, have medical clearance, and be properly fit tested before they begin using a respirator. In addition, the use of respirators requires the employer to develop and implement a written respiratory protection program, with worksite-specific procedures and elements.

Protective Clothing — When conducting building inspections and remediation work, individuals may encounter hazardous biological agents as well as chemical and physical hazards. Wearing appropriate personal protective clothing is recommended to minimize cross-contamination between work areas and clean areas, to prevent the transfer and spread of mold and other contaminants to street clothing, and to eliminate skin contact with mold and potential chemical exposure. Disposable PPE should be discarded after it is used. It should be placed in impermeable bags and usually can be discarded as ordinary construction waste. Appropriate precautions and protective equipment for biocide applicators should be selected based on the product manufacturer’s warnings and recommendations. Such equipment could include goggles or face shields, aprons or other protective clothing, gloves, and respiratory protection.

NIOSH Suggestions — The National Institute for Occupational Safety and Health provides practical suggestions on preventing, identifying, and resolving indoor air quality problems in public and commercial buildings. This guidance provides information on factors affecting indoor air quality; describes how to develop an IAQ profile of building conditions and create an IAQ management plan; describes investigative strategies to identify causes of IAQ problems; and provides criteria for assessing alternative mitigation strategies, determining if a problem has been resolved, and deciding whether or not to consult outside technical specialists. Other topics included in the guide are key problem-causing factors; air quality sampling; heating, ventilation, and air-conditioning systems; moisture problems; and additional sources of information.

W. VEHICLE AND FORKLIFT SAFETY

- Permit only those employees who are specifically authorized and possess a valid license or permit according to regulations to operate vehicles on organizational business; drivers should know and obey all federal, state, and local motor vehicle laws applicable to the operation of their vehicle and should drive at safe speeds no greater than those allowed by law.
- Advise drivers to give consideration to traffic, road, and weather conditions when deciding the safe speed within the legal limit at which a vehicle should be operated.
- Require drivers to complete a defensive driving course and attend annual refresher training.
- Obtain permission from all drivers to check their driving records with the state Department of Motor Vehicles as often as necessary.
Driver Safety — Drivers should determine that the brakes are in proper working condition before operating any equipment. If they are not working properly, they must be repaired before the vehicle is used, and drivers must report any defects. The use of seat belts must be mandatory. Seat belts protect the driver and passengers by absorbing the forces of a crash and help the driver stay in control of the vehicle. Those operating a motor vehicle should clearly signal their intentions when turning, passing, or stopping. Drivers should be courteous toward other operators and pedestrians. Drivers should yield the right of way in all instances necessary to avoid an accident and should stay a safe distance behind when following another vehicle so they can safely stop the vehicle. Drivers should exercise added caution when driving through residential and school zones. They should stay alert and drive defensively.

Powered Industrial Trucks (Forklifts) — Some healthcare facilities use powered industrial trucks (forklifts) in their receiving and materials management departments. OSHA regulates forklifts under 29 CFR 1910.178 (Powered Industrial Trucks), and organizations regulated by OSHA must comply with this standard, which incorporates by reference a number of other OSHA standards as well as industry standards describing truck design, approval, and labeling. Preventing forklift incidents requires comprehensive worker training, systematic traffic management, a safe work environment, a safe forklift, and safe work practices. NIOSH investigations of forklift-related deaths indicate that many workers and employers may not be aware of the risks of operating or working near forklifts. Many individuals are not following the procedures set forth in the OSHA standards, consensus standards, or equipment manufacturer’s guidelines.

General OSHA Requirements — Forklifts must bear a label or some other identifying mark indicating approval by a testing laboratory as required by the OSHA standard and ANSI B56.1-1969, which is incorporated by reference in the OSHA standard. An approved truck is listed or approved for fire safety purposes for the intended use by a nationally recognized testing laboratory. The storage and handling of liquid fuels such as gasoline and diesel fuel should be in accordance with NFPA 30 (Flammable and Combustible Liquids Code). The storage and handling of liquefied petroleum gas fuel should be in accordance with NFPA 58-1969 (Storage and Handling of Liquefied Petroleum Gases). Concentration levels of carbon monoxide gas created by powered industrial truck operations should not exceed the levels specified in 29 CFR 1910.1000. Dock boards or bridge plates must meet the requirements of 29 CFR 1910.30(a).

OSHA Training Requirements — The training requirement found in 29 CFR 1910.178 specifies that employers must develop a complete training program. OSHA requires that operators of powered industrial trucks be trained in the operation of such vehicles before they are allowed to operate them independently. The training must consist of classroom-type and practical training in proper vehicle operation, the hazards of operating the vehicle in the workplace, and requirements of the OSHA standard for powered industrial trucks. Operators who have completed training must then be evaluated while they operate vehicles in the workplace. Operators must be periodically evaluated (at least once every 3 years) to ensure that their skills remain at a high level, and they must receive refresher training whenever a need is demonstrated. To maximize the effectiveness of the training, OSHA does not require training that duplicates training previously received by operators, but such operators must be evaluated and found competent to operate trucks safely. Finally, the training provisions require that the employer certify that the training and evaluations have been conducted.

Recommended Training Policy — Operators must receive training from a certified instructor. All operational training should be conducted under close supervision. All training and evaluation must be completed before an operator is permitted to use a powered industrial
Training consists of a combination of formal instruction, practical training exercises, and evaluation of the operator’s performance in the workplace. Refresher training should be provided to the operator when observation reveals operation of the truck in an unsafe manner, and retraining is required when an operator is involved in an incident or near-miss event. Training should be provided on new types of trucks or when conditions change in the workplace. Refresher training is necessary every 3 years.

**Basic Safety Rules** — Only authorized and trained personnel should operate such trucks. All forklifts should be equipped with an overhead carriage, fire extinguisher, rotating beacon, face plate, horn, and back-up alarm. The operator should perform daily preinspections before use and report any safety defects such as hydraulic fluid leaks, defective brakes, defective steering, missing face plate, horn that does not work, or missing fire extinguisher. Trucks with such defects should be taken out of service. Operators should follow proper recharging or refueling safety procedures. Loads should be tilted back and carried no more than 6 inches from the ground. Loads that restrict operator vision must be transported backwards. Operators should sound the horn and use extreme caution when encountering pedestrians, making turns, or cornering. Passengers may not ride at any time. Trucks used as a man lift must have an appropriate platform or cage with standard rails and toe boards. Material storage area aisles must be kept free of obstructions and properly marked. Aisle width should be a minimum of 6 feet. The lift capacity should be marked on all trucks, and operators should be sure a load does not exceed the rated limits. Operators must report all incidents regardless of cause or seriousness to the safety department.

**Changing, Charging, and Storing Batteries** — Battery charging installations should be located in well-ventilated areas designated for that purpose. Facilities should be provided for flushing and neutralizing spilled electrolyte, for fire protection, for protecting charging apparatus from damage by trucks, and for adequate ventilation for dispersal of fumes from gassing batteries. When batteries are being charged, the acid should be poured into the water; water should not be poured into the acid. The truck should be properly positioned and brake applied before batteries are changed or charged. Care should be taken to ensure that vent caps are functioning. The battery (or compartment) cover should be open to dissipate heat. Smoking is prohibited in the charging area, and precautions should be taken to prevent open flames, sparks, or electric arcs in such areas. Storage of combustibles is also prohibited in charging locations. Tools and other metallic objects should be kept away from the top of uncovered batteries.

**Truck and Trailer Beds**
- Check the floors of all trucks and trailers for breaks or floor weakness before entering to deliver or retrieve a load.
- Set the delivery truck brakes and place a wheel under the rear wheels to prevent the truck from rolling while being boarded.
- Use dock plates when loading trucks or trailers.
- Keep dock plates in good condition and store them properly when not in use.

**Operational Safety**
- Tag and remove from service any forklift in need of repair or with defects (see Table 6.26).
- Never drive forklifts up to anyone standing in front of a bench or other fixed object.
- Do not allow anyone to stand or pass under the elevated portion of any truck, whether loaded or empty.
• Do not place arms or legs between the uprights of the mast or outside the running lines of the truck.
• Block wheels when parking on an incline.
• Maintain a safe distance from the edge of ramps or platforms while on any elevated dock or platform or freight car.
• Never use trucks for opening or closing freight doors.
• Maintain sufficient headroom under overhead installations, lights, pipes, and sprinkler systems.
• Use an overhead guard as protection against falling objects.
• Use a load backrest extension whenever necessary to minimize the possibility of the load or part of it falling rearward.
• Never allow parked trucks to block fire aisles or access to stairways or fire equipment.
• Obey all traffic regulations and speed limits.
• When ascending or descending grades in excess of 10%, drive loaded trucks with the load upgrade.
• Refrain from stunt driving and horseplay.

**Fueling Safety** — Fueling operations should be located in well-ventilated areas designated for that purpose. Fuel tanks should not be filled while the engine is running, and spillage should be avoided. Spilled oil or fuel should be carefully washed away or completely evaporated in a well-ventilated area. The fuel tank cap should be replaced before restarting the engine. No trucks should be operated with a leak in the fuel system until the leak has been corrected. Open flames should not be used for checking the electrolyte level in storage batteries or gasoline level in fuel tanks.
X. OSHA HELICOPTER STANDARDS (29 CFR 1910.183)

Buildings that house healthcare occupancies and have rooftop heliports are regulated by NFPA 418 (Standard for Heliports). Good housekeeping should be maintained in all helicopter loading and unloading areas. Prior to each day’s operation a briefing should be conducted to review the plan of operation for the pilot and ground personnel. Personal protective equipment should consist of complete eye protection and hard hats secured by chin straps, and the employer should require its use by employees receiving loads. Loose-fitting clothing likely to flap in rotor downwash and thus be snagged on the hoist line must not be worn. The employer should take all necessary precautions to protect employees from flying objects in the rotor downwash. All loose gear within 100 feet of lifting or depositing the load, or within all other areas susceptible to rotor downwash, should be secured or removed. Open fires should not be permitted in areas where they could be spread by the rotor downwash.

Loads should be properly slung, and tag lines should be of a length that will not permit their being drawn up into the rotors. The size and weight of loads and the manner in which the loads are connected to the helicopter should be checked. A lift may not be made if the helicopter operator believes the lift cannot be made safely. Static charge on suspended loads should be dissipated with a grounding device before ground personnel touch the load, unless protective rubber gloves are worn by all ground personnel who may be required to touch the load. The weight of an external load should not exceed the helicopter manufacturer’s rating. Hoist wires or other gear, except for pulling lines or conductors that are allowed to play out from a container or roll of a reel, should not be attached to any fixed ground structure or allowed to foul on any fixed structure. Ground personnel should understand that, when visibility is reduced by dust or other conditions, they should exercise special caution to keep clear of the main and stabilizing rotors. Precautions should also be taken by the employer to eliminate, as far as practical, the dust or other conditions that reduce visibility.

The employer should instruct the aircrew and ground personnel on the signal systems to be used and should review the system with the employees in advance of hoisting the load. This applies to both radio and hand signal systems. No employees should be permitted to approach within 50 feet of the helicopter when the rotor blades are turning, unless their work duties require their presence in the area. Employees should understand that, whenever approaching or leaving a helicopter which has its blades rotating, all employees should remain in full view of the pilot and stay in a crouched position. No employees should be permitted to work in the area from the cockpit or cabin rearward while blades are rotating, unless they have been authorized by the helicopter operator to work there.

Sufficient ground personnel should be provided to ensure that helicopter loading and unloading operations can be performed safely. Constant reliable communication should be maintained between the pilot and a designated employee of the ground crew who acts as a signalman during the period of loading and unloading. The signalman should be clearly distinguishable from other ground personnel. The FAA recently announced an education program to improve healthcare helicopter flight safety.

Y. LANDSCAPE/GROUNDS MAINTENANCE

Maintenance of grounds involves the use of various sizes and types of lawnmowers. The most significant dangers include being struck by the blade or a foreign object thrown by the high speed blades and noise-induced hearing loss. Workers should wear face shields or safety goggles or glasses with side shields, safety-toe boots, and hearing protection during the operation of all lawn mowers. Gloves may be worn when using walk-behind mowers. Bump caps should be worn when using a riding or towed mower around tall brush and low-hanging
Healthcare Hazard Control and Safety Management

tree limbs. All mower discharge chutes should be guarded with shields or approved grass catchers to deflect foreign objects during operation. Operators should be trained and qualified to operate the different types of mowers available. The manufacturer's instructions and operating procedures should be followed. Prior to mowing, operators should clear the area to be mowed of all people and inspect for foreign objects, raised sprinkler heads, holes, soft ground, and obstructions. The mower should not be left running unattended. For riding mowers, the engine should be shut off and all drives disengaged prior to getting off of the mower. The engines on push and self-propelled mowers should be turned off when moving the equipment to another job location or when passing over curbs, loose gravel, or other similar obstructions. Power to attachments should be disengaged on riding or towed mowers while passing over similar obstructions and when traveling over unobstructed areas and roads on the way to the next job site or when returning to the shop. The cutting height of mower blades should normally be set as close to 2 inches as possible; blades should never be set lower than 1-1/2 inches. When mowing hills and slopes, operators should know the special precautions to follow. Slopes, hills, or banks exceeding a 30° angle should be mowed with a push or self-propelled walk-behind mower in a horizontal (across) direction.

Electric hedge clippers should be inspected, cleaned, oiled, and sharpened as required. A grounded power cord should be used if the tool is not double insulated. The cord should be inspected before use and daily. The cord should be kept away from the cutting surface and out from under the feet of the operator. The cutting teeth of the clipper should not be pointed toward the body of the operator. The unit should be shut off and unplugged during transit from job to job. Gloves should be worn when operating hedge clippers. No electric power tool should be operated in rain, sprinklers, or any kind of precipitation.

Maintaining Grounds Equipment

- Always fuel with engines off and allow the engine to cool first.
- Do not permit smoking in the area.
- Refuel mowers prior to use vs. refueling prior to storing inside a building.
- Complete refueling outside, at least 10 feet away from the building or any open flame.
- Use boards or ramps to load and unload mowers from vehicles, making sure the engine is off and the spark plug wire is disconnected.
- Always shut off the fuel supply line when parking mowers inside or outside at the end of the day.
- As storage space permits, leave a 1- to 3-foot space between parked gasoline-operated riding mowers.
- Clean mowers or perform other maintenance on mowers only after turning the engine off and disconnecting the spark plug wire.
- Follow the manufacturer's guidelines for operation and use of mowers.

Personnel Safety — Hearing protection and safety-toe shoes should be worn by operators, as required. Workers should wear clothing and gloves that will protect their hands and arms from thorns and leaves that could cut or puncture the skin. Dust masks may be required to prevent reactions to fine dust or pollen. Personnel should not work on flower or shrub beds within 24 hours after application of herbicides. Shovels, hoes, and cultivators should be kept sharp, used in moist soil, and placed so stepping on the cutting surface will not cause the handle to strike a person.

Chemical Handling and Storage — Fertilizer can be a very combustible material, and, at temperatures in excess of 130°F, it can explode. When fertilizers become wet and start to decompose, they give off a gas that will burn. Some fertilizers give off a very toxic gas when burning. No more than 2500 tons of fertilizer should be stored in a building unless
that building is equipped with an automatic sprinkler system. When spreading fertilizer, pellets should not be directed toward other personnel. If personnel enter the area, the spreader should be turned off. Fertilizer spreaders should be cleaned and lubricated daily. Safety glasses and gloves should be worn during fertilizing spreading operations. The use of herbicides for weed control poses significant potential safety and health hazards. Herbicides should be applied per the manufacturer’s instructions and used only by certified personnel. Due to the absorption properties of herbicides, coveralls should be worn during application, in addition to safety goggles and appropriate respiratory protection, as required.

Z. CONSTRUCTION SAFETY (29 CFR 1926)

The Construction Industry standards specify the conditions to be followed by all employers involved in construction industries. The standards are revised annually and cover a variety of areas of construction work and processes, from residential to commercial. Construction Industry employers are legally bound to comply with these standards, as well as any related 29 CFR Part 1910 (General Industry) standards that may also apply. Many of the General Industry standards mentioned here have long been applied to construction employment. As part of the revision process, OSHA is making every effort to identify and incorporate the General Industry standards that are most likely to apply to construction work, but these have not been completely incorporated and OSHA does note that other Part 1910 standards may be applicable under some circumstances. Although 29 CFR 1910 and 1926 are separate standards, they have notable differences. Some standards are covered in duplicate, while some are covered in more detail in one than the other. What follows is an outline of the differences between standards covering fall protection, confined space, GFCI requirements, personal protective equipment, stairways and ladders, fire extinguishers, accident prevention signs and tags, eyewash stations, and illumination.

Fall Protection — Although both 1926 and 1910 have versions of the fall protection standard, the Construction Industry standard is far more detailed than the General Industry standard. The Construction Industry standard, 1926 Subpart M, states that fall protection is required when an employee is working at a height greater than or equal to 6 feet. The General Industry standard (1910.66(j) and Appendix C) does not give a specific height for when fall protection is required.

Permit-Required Confined Spaces — The Confined Space standard for the Construction Industry (29 CFR 1926.21) is not as specific as the General Industry standard (29 CFR 1910.146). In areas where confined space entry may be required, employers should refer to the General Industry standards for guidance.

GFCI Requirements (29 CFR 1926.404(b)(1)(ii)) — The Construction Industry standards require the use of a ground-fault circuit interrupter (GFCI) on all 120-volt outlets at construction sites which are used by employees and are not part of permanent wiring.

Personal Protective Equipment — Although the standards for personal protective equipment are fairly similar between the Construction and General Industry standards, they do cover different types of PPE. The Construction Industry standards address safety belts, lifelines and lanyards, safety nets, and work that takes place on or over water. Construction Industry standards on basic PPE are typically not as specific as the General Industry standards. Construction employers should refer to the General Industry standards for additional requirements.
Stairways and Ladders (29 CFR 1926.1060) — The Construction Industry standard requires training for each employee using stairways and ladders; the General Industry standard does not specifically require a user of ladders or stairways to be trained.

Fire Extinguishers (29 CFR 1926.15) — The Construction Industry standard requires that fire extinguishers with at least a 2-A rating must be provided every 3000 square feet; 29 CFR 1910.157 specifies the ratings of the required fire extinguishers. Travel distance to a fire extinguisher is also not specifically stated.

Accident Prevention Signs and Tags (29 CFR 1926.200) — The Construction Industry standard requires that an accident prevention sign or tag be visible at all times when work is performed; signs must be removed or covered as soon as the hazard no longer exists. The General Industry standard does not require that employers cover signs as soon as the hazard no longer exists.

Eyewash Stations (29 CFR 1926.441) — The Construction Industry standard requires that an eyewash and body flushing facility be located within 25 feet of a battery changing area. The General Industry standard follows the ANSI recommendation that the eye wash be reachable within 10 seconds and located on the same level as the hazard.

Other Topics

Shoring and Trenching — When workers could be exposed to danger, the walls and faces of excavations and trenches over 5 feet should be guarded by a shoring system, sloping of the ground, or some other equivalent means. Trenches less than 5 feet deep with hazardous soil conditions should also be effectively protected. The following guidelines are provided:

- Appropriate trench boxes or shields may be used in lieu of shoring or sloping.
- Tools, equipment, and excavated material should be kept 2 feet or more from the lip of the trench. Where employees are required to be in or work in trenches 4 feet deep or more, an adequate means of exit such as ladders or steps should be provided within 25 feet of travel.
- Daily inspections should be made of trenches and excavations by the supervisor in charge to ensure adequate slopes, shoring, and bracing and to check for evidence of possible slides or cave-ins. More frequent inspections may be necessary as work progresses or after inclement weather conditions, such as rain, or where loose compacted or unstable materials are present.
- Workers should take extra care when hand excavating in close proximity to utilities to preclude interruption of services and personnel injury or equipment damage resulting from breaking electrical, gas, or steam lines.

Barricades — Whenever a common area is disturbed by maintenance, repair, or construction operations and presents a hazard to personnel working in or near or traveling through the area, care should be taken to warn these personnel and other engineering services personnel of the potential hazard. Appropriate barriers should be erected around excavations, open manholes, open electrical panels, etc., whenever they are to be left unattended.

Heat Hazards — Heat-related conditions can become major occupational hazards when not handled correctly. OSHA provides excellent information on worker exposure to heat on its website. NIOSH also addresses heat hazards in a 1986 publication. Another excellent source for information about heat stress is an OSHA/EPA booklet, *A Guide to Heat Stress in Agriculture*. One of the most common methods of measuring heat exposure is the wet-bulb globe temperature (WBGT) index. This method combines the effects of radiant heat and humidity with the dry-bulb temperature.
**Heat Stroke** — Heat stroke is a serious condition caused by the body’s inability to cool itself. The condition is characterized by hot dry skin, dizziness, headache, thirst, nausea, cramps, mental confusion, and even loss of consciousness. A victim's body temperature can exceed 105°F. Quick action is required: Move the victim to a cool area and work to lower the body temperature by soaking the victim with water and fanning vigorously. Get medical treatment immediately.

**Heat Exhaustion** — Heat exhaustion occurs when a person becomes dehydrated. The symptoms are similar to heat stroke but are much milder. The victim should be moved to a cool area and given large amounts of liquids. Severe cases may require the attention of a physician. Some other heat-related conditions include heat cramps, fainting, and heat rashes.

**Heat Control Tips** — Basic heat control suggestions include:

- Schedule heavy work early in the day.
- Require workers to take frequent breaks in cool areas.
- Provide liquids at the worksite to keep workers hydrated.
- Isolate, enclose, or insulate hot equipment.
- Remove heat from work areas by mechanical means.
- Install reflective shielding materials where appropriate.
- Provide fans in hot areas to promote sweat evaporation.
- Be sure break areas and lunchrooms are cool.
- Train workers to recognize heat-related symptoms.

**Protecting Workers in Cold Environments** — When winter arrives, workers who must brave outdoor conditions face the occupational hazard of exposure to the cold. Prolonged exposure to freezing temperatures can result in health problems as serious as trench foot, frostbite, and hypothermia. An individual gains body heat from food and muscular activity and loses it through convection, conduction, radiation, and sweating to maintain a constant body temperature. When body temperature drops even a few degrees below its normal temperature of 98.6°F (37°C), the blood vessels constrict, decreasing peripheral blood flow to reduce heat loss from the surface of the skin. Shivering generates heat by increasing the body’s metabolic rate. The four environmental conditions that cause cold-related stress are low temperatures, high/cool winds, dampness, and cold water. Wind chill, a combination of temperature and velocity, is a crucial factor to consider when working outside. For example, when the actual air temperature of the wind is 40°F (4°C) and its velocity is 35 mph, the effect on the skin is equivalent to a still-air temperature of 11°F (–11°C). A dangerous situation of rapid heat loss may arise for any individual exposed to high winds and cold temperatures.

**Major Risk Factors for Cold-Related Stresses** — Wearing inadequate or wet clothing increases the effects of cold on the body. Taking certain drugs or medications such as alcohol, nicotine, caffeine, or medication that inhibits the body’s response to the cold or impairs judgment can be dangerous. Having a cold or certain diseases, such as diabetes, heart, vascular, and thyroid problems, may make a person more susceptible to the winter elements. Becoming exhausted or immobilized, especially due to injury or entrapment, may speed up the effects of cold weather. The elderly are more vulnerable to the effects of harsh winter weather.

**Preventing Cold-Related Disorders** — It is important to pay particular attention to protecting the feet, hands, face, and head; in fact, about 40% of body heat is lost when the head is exposed. Footgear should be insulated to protect against cold and dampness, and a change of clothing should be available in case work garments become wet. Personal protective clothing is perhaps the most important step in fighting the elements. It is recommended that workers wear at least three layers of clothing:
• An outer layer to break the wind and allow some ventilation
• A middle layer of wool or synthetic fabric to absorb sweat and retain insulation
• An inner layer of cotton or synthetic weave to allow ventilation

Cold-Weather Work Practices — Cold-weather work practices include changes in work schedules and practices that are necessary to combat the effects of exceedingly cold weather. Employees should be allowed a period of adjustment to the cold before embarking on a full work schedule. They should also be allowed to set their own pace and take extra work breaks when needed. When employees must brave the cold, they should do so during the warmest hours of the day and minimize activities that reduce circulation. Employees must remain hydrated. A buddy system should be instituted for outdoor work, and employees should be taught to recognize the symptoms of cold-related stresses: heavy shivering, uncomfortable coldness, severe fatigue, drowsiness, or euphoria. The quiet symptoms of potentially deadly cold-related ailments often go undetected until the victim’s health is endangered; knowing the facts on cold exposure and following a few simple guidelines can make the winter season a safer one.

Contractor Safety — Each healthcare facility should provide contractors with warnings of hazards and information about programs for abating these hazards, and contractors should inform the facility about any safety, health, and environmental requirements they might have. Contractors must make sure the performance of all work is in compliance with applicable regulations and facility requirements.

Contracting Office Responsibilities — Contracts must use appropriate language and require the contractor to meet applicable federal, state, and local environmental, health, and safety regulations. Contractors must provide workers with the proper training, necessary health screening, medical examinations, and safety equipment to safely complete contract requirements. Contractors must submit a written safety and health plan for the specific contract requirements. The organization and the contractor should sign a reciprocal safety agreement as part of the work contract. Contractors must comply with all applicable federal, state, and local regulations, and the facility should identify the violations that could void the contract. The organization should provide the contractor with documentation reflecting the necessary statutory, environmental, health, and safety requirements prior to the start of the contract. The contractor safety contract should be part of the bid proposal. Contractors must respond immediately to any unsafe conditions, standard violations, or hazardous situations and should correct such safety deviations immediately.

Safety Department Responsibilities — The healthcare facility construction safety coordinator should inform the contractor and site management team of all the environmental, health, and safety provisions specified in the contract or required by statutes or regulations. The safety or engineering department should monitor the contractor’s work performance to ensure compliance with the health and safety provisions. Any concerns about compliance should be referred to the safety director for resolution. The safety director must make sure the contractor obtains the required permits, completes a safety report on a weekly basis, communicates life safety issues daily, and coordinates safety issues as required. The safety director should conduct a pre-solicitation project review of the contract to ensure that all appropriate health and safety regulations and requirements and pertinent worksite hazard information have been incorporated, where necessary.

Contractor Responsibilities — The contracting company or individual contracted to the organization must meet all contractual requirements for providing a safe and healthy workplace for all employees. The contractor should conduct regular safety inspections of all work
areas, materials, and equipment and should notify the facility’s safety construction coordinator of all accidents in a timely manner. The contractor should alert the safety department to any OSHA complaints or worksite inspections. The contractor and the safety department should discuss provisions of the Multi-Employer Worksite Citation Policy requirements.

**Preconstruction Meeting** — Prior to initiating construction, representatives of the contractor should meet with the contracting officer, project officer, and appropriate safety department personnel for the purpose of reviewing safety requirements and discussing implementation of all health and safety provisions pertinent to the work under contract. The facility should be sure that dust and infection control measures will be implemented as required by the infection control department.

**Safety Department Review** — The safety department should review the contractor’s site-specific safety and health plan and verify the availability of all required Material Safety Data Sheets (MSDSs). The facility should make the contractor aware of any hazards present at the worksite that are not controlled by the contractor. The facility should make available to the contractor copies of written procedures for lockout/tagout, welding or brazing, permit-required confined space entry, other permit processes, fire safety, emergency procedures, bloodborne pathogen exposure, smoking policies, security, and other pertinent written policies.

**SUMMARY**

This chapter covered a number of safety issues and hazards that impact maintaining a suitable physical environment. The chapter should be very informative to maintenance and facility management personnel. The chapter also provided timely information on a number of general safety topics such as office safety, ergonomics, and slip and fall prevention, as well as information for facility personnel on such topics as selecting flooring, safe ladder usage, tool safety, guarding machinery, safety signs, and safety color schemes. The chapter presented guidance on welding, electrical safety, painting operations, lockout procedures, working in confined spaces, and noise control. It also offered valuable information regarding utilities management, medical gas systems, plumbing operations, ventilation, and indoor air quality. The material addressing mold prevention, vehicle safety, helicopter operations, grounds maintenance, and construction safety should prove helpful to readers.

**FOR REVIEW AND DISCUSSION**

1. List and define four major color codes for safety signs.
2. What is building-related illness? Give two examples.
3. What is sick building syndrome?
4. List three key factors that determine the severity of shock.
5. Explain the use of a GFCI.
6. List five measures that can help to prevent slips and trips.
7. What is a permit-required confined space?
8. List four agencies that publish ventilation standards.
10. What color should be used to warn against a tripping or fall hazard?

11. What is the risk associated with using carbonless paper?

12. Define **ergonomics** and describe at least three key exposures affecting healthcare workers.

13. List and describe at least four ergonomics-related disorders.

14. Define **static coefficient of friction** and discuss its importance to effective fall reduction programs.

15. What is the maximum air pressure that can be used in maintenance shops and laboratories? Why?

16. List and describe at least seven safety and health concerns involving painting operations.

17. What is the maximum OSHA-mandated safe noise level allowed in a workplace as determined by an 8-hour time-weighted average? At what noise level must employers offer hearing protection to workers? Can you identify some locations in a healthcare facility that could pose a noise hazard to workers?

18. List at least six critical areas of a hospital that would require emergency power sources.

19. Describe the criteria for testing emergency generators in a healthcare setting.

20. What consensus organization publishes ventilation-related standards?

21. List the five factors that affect indoor air quality. What six factors contribute to good indoor air quality?

22. List at least seven mold-prevention techniques that should be used by healthcare organizations.

23. Summarize in your own words the four levels of mold remediation.

24. Define the following:
   - Heat stroke
   - Heat exhaustion
   - Hypothermia
A. INTRODUCTION

Healthcare organizations use or generate a wide variety of hazardous substances, including disinfectants, sterilizing agents, solvents, chemotherapeutic drugs, compressed gases, and hazardous wastes. The Occupational Safety and Health Administration (OSHA), Environmental Protection Agency (EPA), and the Joint Commission (see Table 7.1) require organizations to identify hazardous materials requiring special handling, to minimize risks during use, and to ensure the use of proper disposal methods. Healthcare organizations must implement written programs for proper management and disposal of all hazardous materials. OSHA requires a written hazard communication program (29 CFR 1910.1200) to educate workers about hazardous materials and train them on their use in the workplace. Accredited organizations must work to integrate hazardous management plans with the requirements established by OSHA, Department of Transportation (DOT), Nuclear Regulatory Commission (NRC), and EPA. Other important suggestions include:

- Maintain proper inventory and control of all materials used, stored, or generated.
- Provide adequate space and equipment for handling and storing hazardous materials.
- Monitor and document correct disposal of hazardous gases and vapors.
- Develop work area and emergency response procedures to address specific hazards.
- Use protective equipment when responding to hazardous materials spills or releases.
- Maintain hazardous waste manifests, permits, and licenses.
- Ensure the proper labeling of all hazardous materials and wastes.

<table>
<thead>
<tr>
<th>TABLE 7.1</th>
<th>Joint Commission Hazard Categories</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemicals and disinfectants</td>
<td></td>
</tr>
<tr>
<td>Chemotherapeutic materials</td>
<td></td>
</tr>
<tr>
<td>Radioactive materials</td>
<td></td>
</tr>
<tr>
<td>Infectious and regulated medical wastes including sharps</td>
<td></td>
</tr>
</tbody>
</table>
Characteristics of Hazardous Substances

- **Corrosiveness** — Any substance with the ability to degrade the structure or integrity of another substance, object, or material; examples include acids and alkalis.
- **Ignitability** — Any material that can readily burn or ignite, including some chemicals that can autoignite upon contact with the air.
- **Reactivity** — Any substance with the ability to readily combine with other chemicals to produce a sudden or violent release of heat or energy.
- **Toxicity** — Any material with the capability of causing illness or death in humans, animals, fish, or plants or damage to the environment.

**Exposure Routes** — Toxic substances can enter the body through the skin, respiratory system, mouth, and eyes. Some substances can also damage the skin or eyes directly without being absorbed. Inorganic lead can be inhaled or swallowed, but it does not penetrate the skin. Sometimes a chemical substance can enter through more than one route.

B. HAZARDOUS MATERIALS EXPOSURE RISKS

**Effects of Hazardous Materials** — Exposures to hazardous materials causes stress on the body if inhaled, absorbed, or ingested. Exposure effects depend on concentration, duration of exposure, route of exposure, physical properties, and chemical properties (see Table 7.2). The effects exerted by a hazardous substance can be influenced by other chemicals, physical agents, and the general health of the person exposed. Workers should be trained on how to safely handle, store, use, and segregate hazardous materials and waste products. The Joint Commission standards outline training requirements for workers exposed to hazardous materials. The OSHA Hazard Communication standard found at 29 CFR 1910.1200 specifies training for users of hazardous chemicals.

**Hazardous Material Exposure Terms**

- **Acute effects** — Short-term or high concentrations that can cause irritation, illness, or death
- **Air contaminant standards** — A term used by OSHA for hazardous materials regulated by specific substance standards and exposure tables found in 29 CFR 1910, Subpart Z
- **Air-purifying respirator** — Used to filter contaminants or particulate matters from air
- **Ceiling** — The amount of airborne concentrations that cannot be exceeded

<table>
<thead>
<tr>
<th>TABLE 7.2</th>
<th>Toxic Exposure Considerations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concentration of the chemical</td>
<td></td>
</tr>
<tr>
<td>Duration of exposure</td>
<td></td>
</tr>
<tr>
<td>Available ventilation</td>
<td></td>
</tr>
<tr>
<td>Temperature of the chemical</td>
<td></td>
</tr>
<tr>
<td>Temperature of the surrounding air</td>
<td></td>
</tr>
</tbody>
</table>
- **Chronic effects** — Involve continued exposure to a toxic substance over a period of time
- **OSHA additive formula** — A formula in 29 CFR 1910.1000 used to determine exposure effects when a substance contains two or more hazardous ingredients
- **Permissible exposure limit (PEL)** — Maximum allowed OSHA exposure for workers based on a time-weighted average (TWA) of 8 hours for those working a 40 hour week
- **Short-term exposure limit (STEL)** — Exposure allowed at one time (normally measured in 15-minute periods)
- **Supplied-air respirator** — Used in highly dangerous environments to protect against hazards posing an immediate danger to life or health (IDLH)
- **Threshold limit value (TLV)** — Voluntary TWA exposure limit published by the American Conference of Governmental Industrial Hygienists (ACGIH)
- **Toxicity of exposure** — Harm based on exposure length, level of the hazard, and individual susceptibility

**Identifying Hazardous Substances** — Healthcare facilities must identify all uses of hazardous materials. The identification and evaluation of hazardous materials should consider the following:

- Hazardous properties, including toxicity or health hazards
- Purpose and location of use, including quantity
- Proper storage, including flammable material locations
- Location and quantity kept in storage
- Availability of a current Material Safety Data Sheet (MSDS) on each substance
- Compliance with OSHA and EPA standards
- Required written plans available as required by JCAHO and OSHA
- Personal protective equipment requirements for handling hazardous materials
- The possible use of less hazardous substances
- Development of spill response plans and worker training
- Documentation of personnel and area monitoring as required by standards
- Adequate training for all workers exposed to hazardous chemicals

**Hazardous Chemical Determination** — Consider a substance as hazardous if it is:

- Included in the ACGIH's latest edition of *Documentation of the Threshold Limit Values and Biological Exposure Indices*.
- Found to be a confirmed or suspected carcinogen by the National Toxicology Program in the latest edition of the *Annual Report on Carcinogens*.
- Listed by the International Agency on Research on Cancer in the latest edition of *IARC Monographs*.

**Threshold Limit Values (TLVs)** — The ACGIH publishes TLVs based on determinations made by a voluntary body of independent, knowledgeable individuals. TLVs are health-based values established by committees that review existing published and peer-reviewed literature in various scientific disciplines including, industrial hygiene, toxicology, and occupational medicine. These TLVs represent the opinion of the scientific community that has reviewed the data and determined recommended exposures of hazardous substances at or below the level of the published TLVs. TLVs serve as guidelines (not standards) and are intended for use by industrial hygienists when making decisions regarding safe levels of exposure to various chemical or physical agents found in the workplace. The ACGIH bases TLVs solely on health factors, not economic or technical feasibility.
Hazardous Materials Labeling — Hazardous material labels should follow OSHA, EPA, National Fire Protection Association (NFPA), DOT, NRC, and Joint Commission guidelines. All labels should include:

- Name of substance
- Chemical name, if appropriate
- Hazard classification
- Safeguards to use when handling the substance
- Organs that could be affected by the substance

Chemical Physical Properties — The physical properties of a chemical substance include characteristics such as vapor pressure, solubility in water, boiling point, melting point, molecular weight, and specific gravity. Chemical properties describe the reactivity of a substance with other chemicals.

Reactive Substances — These materials can burn, explode, or give off hazardous vapors when mixed with other chemicals or when exposed to air or water. Reactive substances can self-ignite and the chemical reaction itself creates a hazard.

Oxidizers — Oxidizers easily release oxygen that can fuel fires when stored near flammable substances. Oxidizers can cause other materials to burn even though most oxidizers will not burn themselves. It is advisable to store oxidizers separately from flammable or combustible materials; keep storage areas away from heat sources, because warming causes the release of oxygen which can create the perfect environment for a fire.

Corrosives — Corrosive chemicals are materials that can eat through other materials, including human skin. Irritants such as ammonia are corrosive substances that attack the mucous membranes of the nose and mouth.

Flammable/Combustible Liquids — Flammable liquids have a flash point of less than 100°F (38°C); combustible liquids have a flash point of 100°F (38°C) or more.

Vapor — Vapor is the gaseous state of material. Sometimes vapors can be readily detected but not always. Vapors from hazardous materials can combine with the oxygen in the air to form a mixture that will ignite easily and burn rapidly, often with explosive force.

Vapor Density — Vapor density is the ratio of the weight of a volume of vapor or gas to the weight of an equal volume of clean but dry air. Vapor densities are listed in the MSDS for the chemical. Knowing the vapor density can tell you how the vapor will act. If the MSDS says the vapor density is less than 1.0, the vapor will tend to rise and spread out. This means it is less likely to be a hazard. If the vapor density is 1.0 or more, then the vapor is heavier than air and will tend to sink to the lowest point on the ground. These vapors can then travel along the ground, sometimes for long distances, and find ignition sources; thus, chemicals with high vapor densities are particularly dangerous.

Flash Point — The flash point of a liquid is the lowest temperature at which it gives off enough vapors to form an ignitable mixture with the air around it. Combustible liquids are those with a flash point of at least 100°F (38°C). Flammable liquids are those with a flash point of less than 100°F (38°C). The lower the flash point, the more easily the material will burn and the more careful workers must be with that chemical.

Ignition Source — An ignition source is anything that causes something that will burn to start burning. Common ignition sources include sparks from tools and equipment; open flames such as torches, smoking materials, and pilot lights; hot particles and embers generated while grinding or welding; and hot surfaces such as electric coils and overheated bearings.
Grounding — Static electricity can be generated by the flow of liquids. Grounding ensures that an electrical charge goes to the ground rather than building up on the drum of a flammable or combustible material.

Bonding — This process equalizes the electrical charge between the drum and the transfer container so there is no buildup of electrical charges on one or the other container.

Ignition Temperature — Ignition temperature is the minimum temperature at which a chemical will burn and continue burning without the need for an ignition source.

Explosive — The main difference between flammable and explosive is the rate of combustion, or the speed at which a material burns. A fire is a rapid release of energy, and its rate of combustion is fast. An explosion is the instantaneous release of energy and involves an extremely rapid rate of combustion.

Airborne Exposure — The concentration exposure is the per unit volume of air to which a worker is exposed. Airborne concentrations are usually expressed in terms of milligrams of a substance per cubic meter of air (mg/m$^3$) or parts of a substance per million parts of air (ppm).

- **Measuring fibers** — The amount of fibers (e.g., asbestos) is expressed as fibers per cubic centimeter (f/cc) or fibers per cubic meter (f/m$^3$) of air.
- **Dose** — The dose is the amount of substance that actually enters the body during the period of exposure.
- **Elimination of substances** — Substances ingested are present in the body until they are metabolized or eliminated; some chemicals are rapidly metabolized, while others are not and may be excreted unchanged or stored in the fatty tissues.
- **Interactions** — Possible interactions may occur as a result of the multiple exposures that exist in a hospital environment; these interactions may increase exposures to chemicals through an individual’s use of tobacco, alcohol, or drugs.
- **Other considerations** — The physiological or psychological state of the worker can also affect exposure potentials.

Air Contaminants (29 CFR 1910.1000) — To achieve compliance with the provisions of the air contaminants standard, employers must consider and implement feasible administrative or engineering controls, if possible. When it is not possible to achieve full compliance through the use of such controls, protective equipment or any other protective measures should be used to keep the exposure of employees to air contaminants within the limits prescribed in this section. Any equipment or technical measures used for this purpose must be approved for each particular use by a competent industrial hygienist or other technically qualified person. Whenever respirators are used, their use should comply with 1910.134. Subpart Z contains exposure limits for substances listed in Tables Z-1, Z-2, and Z-3.

**OSHA Exposure Limitations**

- Exposure to any substance in Table Z-1, the exposure limit of which is preceded by a C, should at no time exceed the exposure limit given for that substance. If instantaneous monitoring is not feasible, then the ceiling should be assessed as a 15-minute TWA exposure which should not be exceeded at any time during the working day.
- Exposure to any substance listed in Table Z-1 not preceded by a C, should not exceed the 8-hour TWA given for that substance for an 8-hour work shift of a 40-hour work week.
Exposure to any substance listed in Table Z-2 during any 8-hour work shift of a 40-hour work week should not exceed the 8-hour TWA limit given for that substance in Table Z-2.

Exposure to a substance listed in Table Z-2 should not exceed, at any time during an 8-hour shift, the acceptable ceiling concentration limit given for the substance in the table. (Note: Refer to the OSHA text for the exception relating to maximum peaks).

Exposure to any substance listed in Table Z-3 during any 8-hour work shift of a 40-hour work week should not exceed the 8-hour TWA limit given for that substance in the table.

**Exposure to Substances Containing More Than One Hazardous Ingredient** — An additive formula in 29 CFR 1910.1000 computes exposures to a mixture of air contaminants. An employer must monitor and then compute the equivalent exposure using the following additive formula:

\[
E(m) = \left( \frac{C}{L} \right) + \left( \frac{C}{L} \right) \ldots
\]

where:

- \(E(m)\) is the equivalent exposure for the mixture; the value of \(E(m)\) should not exceed unity (1).
- \(C\) is the concentration of a particular contaminant.
- \(L\) is the exposure limit for that substance specified in Subpart Z.

**Formula Illustration**

To illustrate the formula prescribed in paragraph (d)(2)(i) of this section, consider the following exposures:

- Substance A — Actual exposure at 500 ppm (\(C\)) with a PEL of 1000 ppm (\(L\))
- Substance B — Actual exposure at 45 ppm (\(C\)) with a PEL of 200 ppm (\(L\))
- Substance C — Actual exposure at 40 ppm (\(C\)) with a PEL of 200 ppm (\(L\))

Substituting the above values into the formula in 29 CFR 1910.1000 gives us:

\[
E(m) = \left( \frac{500}{1000} \right) + \left( \frac{45}{200} \right) + \left( \frac{40}{200} \right)
\]

\[
E(m) = 0.500 + 0.225 + 0.200
\]

\[
E(m) = 0.925
\]

Because \(E(m)\) is less than the unity (1), the exposure combination is within acceptable limits. Had the value exceeded 1, the exposure would have been above acceptable limits.

**Olfactory Warning** — Some hazardous materials can be perceived by their scent, which serves as warning of exposure. The warning depends on a person’s ability to detect odors of a substance. Hazardous substances provide either good or poor warnings of their presence. The lowest concentration at which the odor of a chemical can be detected is called the *odor threshold*.

**Absorption** — Hazardous substances can quickly enter the body through broken skin. Examples of substances that can be absorbed by skin contact include:

- Phenolic compounds
- Mercury
- Arsenic
- Nitrobenzene
Chemical Sensitization — Some people exposed to chemicals become sensitized to the substance; some can develop allergic dermatitis. Common allergens include:

- Plastic resins such as epoxies, phenolic substances, and acrylics
- Rubber accelerators and antioxidants
- Organic dyes such as those in color-developing solutions
- First aid preparations such as neomycin and benzocaine
- Laboratory agents such as formaldehyde and phenol

Latex Skin Disorders — Chemicals can irritate the skin and cause allergic reactions. Occupational dermatitis remains the most common and often the most preventable of all job-related problems. The skin is the natural defense system of the body. It has a rough and waxy coating called keratin. This layer of protein and the outer layer of dead cells help prevent chemicals from penetrating the tissues. Many substances cause irritation on contact with the skin, a condition referred to as contact dermatitis in which the substance dissolves the protective fats and causes the skin to dehydrate, thereby killing the skin cells.

Examples of Hazardous Material Work Exposures

- Food service workers are exposed to heat, moisture, yeast, bacteria, detergents, acids, spices, soaps, and fruit juices.
- Environmental service workers come into contact with bacteria, disinfecting chemicals, houseplants, soaps, solvents, synthetic gloves, polishes, bowl cleaners, floor strippers, and waxes.
- Laundry workers are exposed to alkalis, bleaches, enzymes, bacteria, fungicides, heat, moisture, bio-hazards, and soaps.
- Nurses and nursing assistants are exposed to local anesthetics, latex, antibiotics, antiseptics, bacteria, bio-hazards, ethylene oxide, synthetic gloves, soaps, drugs, fungi, and moisture.

C. EMERGENCY SHOWER AND EYEWASH STATIONS
(OSHA REQUIREMENTS 29 CFR 1910.151)

OSHA Requirements (29 CFR 1910.151) — The Occupational Safety and Health Administration requires suitable facilities to be available in the work area for quick drenching of the eyes and body when workers are exposed to injurious corrosive materials. This general regulation is applicable to all facilities that must install emergency eyewash and shower equipment as a form of first aid. OSHA does not specify minimum operating requirements or installation setup requirements, instead referring to ANSI Standard Z-358.1. In 2004, ANSI published Z-358.1-2004, which replaced ANSI 358.1-1990. The new standard revised the requirements placed on users including defining tepid temperatures and various installation changes.

General Safety Requirements — (See Table 7.3 and Table 7.4.) Flushing fluid should be clear and visibly free from foreign particles. The presence of off colors or contaminants indicates poor fluid quality in the supply line or water source. Contaminants can enter self-contained units through a biofilm on the inside of the station or through openings in the unit. The presence of bacteria, fungi, and amoebae in flushing fluid can pose an added health risk to an injured eye. Tears generally have a pH of 7.4 and possess some buffer capacity. Ideally, the flushing fluid in an emergency eyewash device should have a pH close to 7.4, as well as a saline content similar to the fluid in the eye. If the pH is too low or too high, the water may not be suitable for use as a flushing fluid. Most manufacturers provide
suggested fluid replacement guidelines. Preservatives can control bacteria levels in flushing fluids but are not effective against all bacteria. The performance of a preservative depends on several factors, including the initial bacterial load of the water and potential biofilm in the station. It is important to:

- Drain self-contained eyewash stations completely, disinfect them, and rinse them prior to refilling.
- Always inspect and test the unit if you have any doubt about its dependability.
- Identify problems or concerns and establish a regular maintenance program.
- Consult the manufacturer’s operating manual and ANSI Z358.1 for assistance in performing test procedures, maintenance operations, and training.

### Plumbed Shower Specifications

- **Heads** — Position heads 82 to 96 inches from the floor. Spray pattern should have a minimum diameter of 20 to 60 inches above the floor. Flow rate should be 20 gallons per minute (gpm) at 30 pounds per square inch (PSI). The center of the spray pattern should be located at least 16 inches from any obstruction.
- **Valves** — Valves should activate in 1 second or less. Stay-open valve (no use of hands): valve remains on until user shuts it off.
- **Installation** — Locate showers in areas that require no more than 10 seconds to reach. Consult a medical professional to determine the appropriate distance for harsh acids and caustics (high hazard = closer distance). Locate showers in a well-lit area and identify them with signs. Install showers on the same level as the hazard.
• **Maintenance and training** — Activate plumbed showers weekly to verify correct operation. Train all employees who might be exposed to a chemical splash in the use of the equipment. Inspect all showers annually to make sure they meet ANSI Z358.1 requirements.

**Eyewash Specifications for Plumbed and Gravity-Feed Units**

• **Heads** — Position heads 33 to 45 inches from the floor and 6 inches from the wall or nearest obstruction. Flow rate should be 0.4 gpm for 15 minutes for plumbed units flushing fluid at 30 PSI; 0.4 gpm for 15 minutes for gravity-fed units.

• **Valves** — Valves should activate in 1 second or less. Stay-open valve (no use of hands): valve remains on until user shuts it off.

• **Installation** — Locate eyewash equipment in areas that require no more than 10 seconds to reach. Consult a medical professional to determine the appropriate distance for harsh acids and caustics (high hazard = closer distance). Locate eyewash units in well-lit areas and identify them with signs. Install eyewash equipment on the same level as the hazard.

• **Maintenance and training** — Activate plumbed eyewash units weekly to verify proper operation. Maintain gravity-fed units according to the manufacturer’s instructions. Train all employees who might be exposed to a chemical splash in the use of the equipment. Inspect all eyewash units annually to make sure they meet ANSI Z358.1 requirements. The standard was updated in April 2004.

**Hand-Held Drench Hoses** — A hand-held drench hose is a flexible hose connected to a water supply that is used to irrigate and flush eyes, face, and body areas:

• **Heads** — Heads should have a flow rate of 3 gpm.

• **Valve** — Valves should activate in 1 second or less.

• **Installation** — Assemble hoses per the manufacturer’s instructions. Locate drench hoses in well-lit areas and identify them with signs.

• **Maintenance and training** — Activate hoses weekly to verify proper operation. Train all employees who might be exposed to a chemical splash in the use of the equipment. Inspect all drench hoses annually to make sure they meet ANSI Z358.1 requirements.

Hand-held drench hoses support shower and eyewash units but should not replace them.

**Personal Eyewash Bottles** — Personal eyewash bottles can provide immediate flushing when they are located near the workstations. Personal eyewash equipment does not meet the requirements of plumbed or gravity-fed eyewash equipment. Personal eyewash units can support plumbed or gravity-fed eyewash units but are not a substitute.

**D. HAZARDOUS MATERIALS STORAGE**

**Chemical Storing Considerations** — Material Safety Data Sheets (MSDSs), labels, or other chemical reference materials provide proper storage information. As required by 29 CFR 1910.1200, an MSDS must be on hand for every hazardous substance. The MSDS can answer such questions as:

• Is the chemical flammable or combustible?

• Is the chemical corrosive?

• Should the chemical be stored at other than ambient temperature?
Is the chemical an oxidizer or reducer?
Is the chemical light sensitive?
Does the chemical require any special handling procedures?

Typical storage considerations include temperature, ignition control, ventilation, segregation, and identification (see Table 7.5). Proper segregation is necessary to prevent incompatible materials from inadvertently coming into contact. If incompatible materials come into contact, then fire, explosion, violent reactions, or toxic gases could result. When segregating chemicals, do not store acids with bases nor oxidizers with organic materials or reducing agents. A physical barrier or distance is effective for proper segregation. If cabinets are used to segregate chemicals, consider the compatibility of the chemicals with the cabinet; for example, corrosives such as strong acids and caustics will corrode most metal cabinets. Nonmetallic or epoxy-painted cabinets provide a better service life with these types of chemicals. It is important to be aware of the maximum allowable container size and maximum quantities for storage in cabinets based on the class of the flammable chemical. The class of a flammable or combustible chemical is determined by its flash point and boiling point.

Remember,
• Store chemicals according to compatibilities.
• Never store acids with bases.
• Store oxidizers away from organic materials or reducing agents.
• Use appropriate cabinets and shelves, as corrosives and acids will corrode most metal surfaces.
• Store flammable or combustible liquids in a proper fire-safe area or cabinet.

**Outside Storage Requirements** — When storing flammable or combustible liquids, the storage area must be graded to divert spills from buildings or should be surrounded by a curb at least 6 inches or 152.4 mm high. Storage areas, including those for liquid propane gas tanks, should be posted “NO SMOKING” and kept free of weeds, debris, and other combustible materials. An appropriate fire extinguisher should be available at the storage area.

**Secondary Containment Storage Requirements** — The Resource Conservation and Recovery Act (RCRA) addresses the need for stationary containers, tanks, and portable 55-gallon drums to protect the environment from leaks or spills. Facilities storing hazardous materials may also be required to meet the containment standards of the Uniform Fire Codes (UFCs). The EPA recognizes two containment approaches:

1. Large stationary system containment, as addressed in RCRA, Subpart J, Tank Systems (40 CFR 264.193)
2. Portable containers, as addressed in RCRA, Subpart I, Use and Management of Containers (40 CFR 264.175)
The EPA defines “secondary containment” under 40 CFR 264.193(b), Containment and Detection of Releases. Secondary containment systems are usually constructed and designed by a facility to meet the size requirements of a stationary tank located on the premises. The following provisions apply for portable container storage areas under 40 CFR 254.175:

- The storage area should be sloped or otherwise designed and operated to drain and remove liquid resulting from precipitation.
- Containers are elevated or otherwise protected from contact with accumulated liquid.
- Such containers are to be used for certain wastes for which a storage area alone will not suffice.
- Waste streams listed in 40 CFR 264.174(d) require a containment system.
- Rooms or areas where hazardous material liquids are dispensed into containers exceeding a 1-gallon capacity or used in open containers or systems exceeding a 5-gallon capacity should be provided with a means to control spills.
- Secondary containment should be provided when the capacity of an individual container exceeds 55 gallons or the aggregate capacity of multiple containers exceeds 100 gallons.

Note: The EPA has set federal guidelines addressing containment and secondary containment; however, localities or regions are allowed to enforce more stringent codes. Depending on the size and type of primary container, a customized secondary container may be needed.

E. OSHA HAZARD COMMUNICATION

OSHA Hazard Communication Standard (29 CFR 1910.1200) — The OSHA Hazard Communication standard requires employers to develop, implement, and maintain at the workplace a written, comprehensive hazard communication program that includes provisions for container labeling, collection and availability of Material Safety Data Sheets, and an employee training program. The purpose of the standard is to ensure that chemical hazards in the workplace are identified and evaluated and that information concerning these hazards is communicated to employers and employees. This transfer of information should be accomplished by means of a comprehensive hazard communication program that addresses container labeling and other forms of warning, MSDSs, and employee training. The standard is comprised of six major parts:

- Hazard determination
- The written program
- Employee training
- Chemical labeling
- Material Safety Data Sheets
- Trade secrets

Hazard Determination — Hazard materials are specified by OSHA as physical or health hazards, such as combustible liquids, oxidizers, corrosives, reproductive toxins and non-toxins. Chemicals exempt from the standard include wood and wood products (except wood dust), regulated hazardous waste, tobacco products, food, drugs, cosmetics, alcoholic beverages, agricultural or vegetable seed treated with pesticides, various types of pesticides, and nuisance particulates. These are exempt because they are all regulated by other government standards.
The Written Program (29 CFR 1910.1200(e)) — The written program requires employers to fully document actions taken to comply with all of the provision of the standard and to list the responsible persons for each area of the program. Employers must provide, upon request, a copy of the written program to all employees and OSHA officials, and the written program must be available to employees on all work shifts. Employers must communicate hazard information to all affected or exposed employees. Chemical manufacturers and distributors must provide hazard information on their products to customers by means of container labels and MSDSs.

Hazardous Materials Listing — A list of hazardous materials can be compiled and maintained by:

- Conducting a thorough workplace inventory to determine all chemicals currently in use and hazards created by such use (example: welding fumes)
- Coordinating the list with the purchasing or materials department to be sure all purchased hazardous materials are included
- Developing procedures to keep the chemical list current

Hazardous Material Evaluation — The quality of any hazard communication program relies on the accuracy of the hazard assessment:

- Chemical manufacturers and distributors are required to review available scientific evidence concerning the hazards of the chemicals produced and report this information to those who use the products.
- Most employers rely on the evaluations performed by the chemical manufacturers to determine the hazards.
- Each chemical must be evaluated for its potential to cause adverse health effects and its potential to pose physical hazards (e.g., flammability).
- Criteria used to determine whether a chemical is hazardous can be found in 29 CFR 1910.1200, Appendix B.

Hazard Rating Information — Hazard rating information can be obtained from such publications as the Fire Protection Guide to Hazardous Materials and the National Fire Rating Guide. OSHA does not require labels on portable transfer containers of less than 10 gallons as long as the chemical is used or returned to the original container by the end of the work shift. Mixed solutions should be labeled as full-strength solutions.

Nonroutine Tasks — Employers must inform employees of the hazards of nonroutine tasks and the hazards associated with chemicals in unlabeled pipes.

Employee Training (29 CFR 1910.1200(h)) — Employers must provide employees with effective information and training on hazardous chemicals in their work area at the time of their initial assignment and whenever a new physical or health hazard is introduced into the area. The training should include methods and observations used to detect the presence or release of the chemical, physical and health hazards, protective measures, labeling, and explanation of the MSDS. Training may be done on each individual substances or by categories of hazards (e.g., flammability or carcinogenicity). Required training topics include:

- Existence and requirements of the OSHA Hazard Communication standard
- Components of the local hazard communication program
- Work areas and operations using hazardous materials
Hazardous Material Labeling (29 CFR 1910.1200(f)) — All chemicals in the workplace must have labels. The label should contain the identity of the material, appropriate hazard warnings, and the name and address of the manufacturer, importer, or other responsible party. Other appropriate warning information (such as pictures and symbols) may be used in conjunction with the hazard information. Labels must be legible and in English. Labels in a second language may be added as long as the English label is present.

Proper Labeling of Materials Received

- Check incoming shipments to be sure that all information is contained on the label.
- Be sure labels indicate the name of the chemical and carry the appropriate hazard warning.
- Instruct workers never to deface or remove existing labels.
- Label small containers used by more than one worker with the chemical name and hazard warnings.
- Be aware that minimum labeling requirements specify that all labels must be in English, must contain the chemical identification name, and must identify the appropriate hazard.

Material Safety Data Sheets (29 CFR 1910.1200(g)) — When employers have evaluated and identified all the hazardous chemicals in the workplace, they must document them and obtain an MSDS for each item (see Table 7.6). MSDSs are available from the chemical supplier or manufacturer. These sheets contain specific chemical hazard information, such as physical hazards, health hazards, routes of entry, exposure limits (if any), precautions for safe handling and use (if known), spill clean-up procedures, personal protective equipment.
to be used, emergency and first aid procedures, and the name, address, and telephone number of the chemical manufacturer. All of the information on the MSDS must be in English and available to employees working with or near the hazardous chemical. Chemical manufacturers, distributors, and importers are required to obtain or develop an MSDS for each hazardous chemical they produce, import, or distribute. OSHA specifies the minimum information to be included on a MSDS but does not prescribe the format. MSDSs must be included with the shipment of any hazardous chemical. Distributors must ensure that employers are given MSDSs, and employers must locate the MSDS information close to workers and make it readily available to them during each work shift.

**Hazard Label Warning Systems** — The Occupational Safety and Health Administration addresses physical hazards such as flammability, compressed gases, explosives, organic peroxides, oxidizers, unstable reactive agents, and water-reactive chemicals in the Hazard Communication standard, which requires the labeling of all chemicals in the workplace in a manner that warns of any hazards the chemical may present. The actual format and method of labeling are not specified by the standard, but several formats are in use today, including:

- Hazardous Material Identification Guide (HMIG)
- Hazardous Material Information System (HMIS®)

**Overview of the Systems** — These systems comply with the labeling requirement of the OSHA Hazard Communication standard. The systems use three color-coded fields to indicate the flammability (red), health (blue), and reactivity (yellow) hazards associated with the material. The systems also use a rating of five numbers ranging from 0 to 4 (where 0 represents the lowest hazard and 4 indicates the greatest hazard) to indicate the severity of the hazard. The NFPA system uses four diamonds; the other two systems, vertically stacked bars. The systems differ in the purpose of the fourth field (white). NFPA uses it to designate special handling requirements, but the other systems use it to designate the use of personal protective equipment. The NFPA system was designed to alert first responders arriving on the scene of a fire or disaster of the hazards associated with materials present. The other systems function as hazard materials compliance tools to communicate to users and handlers in the workplace. Numbers are assigned in the NFPA system under the assumption that fire is present. The numbers assigned to the flammability, health, and reactivity hazards may differ between the systems.

**NFPA 704, Standard System for the Identification of Hazardous Materials for Emergency Response** — This fire protection hazard warning system is designed to provide rapid, clear information to emergency responders regarding materials under conditions of fire, chemical spill, or other emergency situations. This system uses a hazard rating diamond with colors and codes for ranking the health, ignitability, and reactivity of hazardous materials. The warning systems uses numbers to rate the hazards, with 0 being the lowest and 4 the highest ris):

- Blue (health hazard) — May cause health problems if acute exposure occurs by ingestion, inhalation, or physical contact.
- Red (flammability) — Represents risk of materials to fireburst based on factors relative to the substance and surrounding environment.
- Yellow (reactivity) — Advises that a substance may react violently under certain conditions or exposures.
- White (specific hazard) — Refers to substances with specific hazards or properties such as oxidizers.
The Hazardous Material Identification Guide (HMIG) and Hazardous Material Information System (HMIS®) — The Hazardous Material Identification Guide (HMIG) was developed and marketed by Lab Safety Supply, and the Hazardous Material Information System (HMIS®) was developed by the National Paint and Coatings Association (NPCA). Both systems use a similar label with four color bars and a space at the top where the name of the chemical should be written. The blue, red, and yellow bars indicate the health, flammability, and reactivity hazard, respectively. These three bars use a number scale from 0 to 4, where 0 indicates that the material poses essentially no hazard and 4 indicates extreme danger. The fourth, white bar is labeled “protective equipment” in the HMIG system and “personal protection” in the HMIS® system. The HMIG system places a letter (A, K, or X) in this bar to indicate the kind of personal protective equipment required to handle the material safely. The meanings of the letters are the same in both systems, and both systems augment the letter code with icons or pictograms showing the kinds of PPE to be used.

The HMIS® functions as a complete system designed to aid employers and their employees in day-to-day compliance with OSHA’s Hazard Communication standard. The system stresses hazard evaluations and ratings for acute and chronic health issues. The systems also rates flammability and physical hazards. The labels provide at-a-glance information on the hazards and PPE. The NPCA recently released the HMIS® III system to better serve workers. The system emphasizes informing workers on how to safely handle chemicals exhibiting a variety of physical hazards and provides more information about the physical hazards of a substance. The new system specifically provides criteria for each hazard, permitting workers to assess the degree of risk. It also permits employers to identify the hazard with an icon or symbol.

Pipe Marking Standards (ANSI Z13.1-1981, Scheme for Identification of Piping Systems) — The ANSI pipe marking standard offers a common labeling method for use in all facilities. This method ensures that the labeling of pipes communicates the contents and provides information such as hazards, temperatures, and pressures. Arrows show the direction the material flows. Black characters on a yellow background indicate highly hazardous materials; white characters on a green background indicate low-hazard liquids or liquid mixtures; white characters on a blue background indicate low-hazard gases or gaseous mixtures; and white letters on a red background indicate fire suppression pipes. Labels should be positioned for easy reading; for example, they should be placed on the lower side of the pipe if the worker must look up but on the upper side of the pipe if workers must look down. Labels should be located near valves, branches, areas with direction changes, entry locations, and re-entry points. ANSI classifies above-ground piping systems into three categories:

- **High-hazard materials** — This class includes corrosives, caustic materials, toxic substances and gases, explosive, flammable materials, radioactive agents, and materials deemed dangerous if released.
- **Low-hazard materials** — These materials are not inherently hazardous and have a small chance of harming employees through mild temperatures and low pressures.
- **Fire suppression materials** — Fire protection materials include foam, carbon dioxide (CO₂), and water.

**F. COMPRESSED GAS SAFETY**

A compressed gas is any material or mixture within a container at an absolute pressure exceeding 40 PSI at 130°F. Compressed gas can be any flammable liquid with a vapor pressure exceeding 40 PSI at 100°F. Compressed gases found in healthcare facilities include acetylene, anesthetic gases, ethylene oxide, helium, and oxygen. Flammable gases include acetylene and ethylene oxide. The Compressed Gas Association (CGA) provides leadership in promoting
safe work practices for industrial gases. The CGA develops guidelines to promote the safe handling of compressed gases during manufacture, storage, transportation, distribution, and use. Cylinders are used to contain almost 200 different types of materials, including atmospheric gases, fuel gases, refrigerant gases, and even poisonous gases. OSHA regulates the use and safety of compressed gases in the workplace. Refer to 29 CFR 1910.101 for the OSHA requirements for the inspection of gas cylinders. The Department of Transportation regulates the transportation of compressed gases by rail, highway, aircraft, and waterway.

Safety and Storing of Cylinders
- Store cylinders in a cool, dry, well-ventilated, fire-resistant area that meets federal, state, and local regulations.
- Never store compressed gas cylinders at temperatures higher than 125°F.
- Do not store cylinders near heat, open flames, or ignition sources.
- Properly label all cylinders.
- Never remove valve protection caps until the cylinder is secured for use.
- Refer to CGA publications, fire codes, and applicable state/local regulations.
- Refer to ANSI-Z48.1 and CGA pamphlet C-7 for marking cylinders.
- Never use cylinders as rollers, supports, or for any unauthorized purpose.
- Never place cylinders in area where they might become part of an electric circuit.
- Store cylinders where they will not be knocked over or damaged by falling objects.
- When cylinders are not in use, close valves and properly secure them.
- Use appropriate lifting devices to transport gas cylinders.
- Do not use magnets or slings to lift gas cylinders.
- Never use the valve protection cap for lifting a gas cylinder.
- Do not use a lubricant on a gas cylinder regulator.
- Do not tamper with or attempt to repair a gas cylinder regulator.
- Consult the appropriate MSDS for information on the chemical in the cylinder.
- Never use a flame to detect flammable gas cylinder leaks; always use soapy water.
- Do not store cylinders containing flammable gases with cylinders containing oxygen.
- Inside of buildings, separate stored oxygen and gas cylinders by a minimum of 20 feet or store in areas with a fire-resistible partition between the oxygen and flammable gas cylinders.

G. DEPARTMENT OF TRANSPORTATION HAZARDOUS MATERIAL REGULATIONS

Performance-Oriented Packaging Standard — Checking the hazardous materials table provided in 49 CFR 172.101 is the first step toward understanding how to ship a product. This table provides the proper shipping name, hazard class, UN identification numbers, labels, and required packaging types. The proper shipping names (PSNs) are listed alphabetically in the hazardous materials table, but it is necessary to know the technical name in order to look up a material. Each column of the hazardous materials table is described below:

Column 1. Symbols — This column contains one of six symbols:
- + — fixes the proper shipping name, hazard class, and packaging group
- A — restricts the shipment of that particular material to air transport only
- D — identifies the proper shipping names appropriate for domestic shipments
- G — identifies the proper shipping names (technical names)
- I — identifies the proper shipping names for international transport
Managing Hazardous Materials

- W — denotes that the material is subject to vessel or is used to describe a material for other modes of transportation

**Column 2. Hazardous Materials Descriptions and Proper Shipping Names** — This column lists hazardous materials and their proper shipping names. Refer to 49 CFR 172.101, Subpart B, for further information on column 2.

**Column 3. Hazard Class or Division** — This column provides a numerical designation of the hazard class or division that indicates the hazardous properties of that specific material. This number is located in the bottom point of square-on-point labels or placards.

**Column 4. Identification Number** — This column lists the identification number assigned to each proper shipping name. One of two prefixes — NA (North America) or UN (international) — may be found before an actual number.

**Column 5. Packing Group (PG)** — Packing groups I, II, and III indicate the degree of danger presented by the material as great, medium, or minor, respectively. Refer to 49 CFR 173, Subpart D, when more than one packing group is designated for a proper shipping name.

**Column 6. Labels** — This column indicates which labels by their hazard classes are required for packages containing hazardous materials. If multiple labels are listed, a determination must be made to distinguish the primary hazard from the subsidiary hazards. Refer to the precedence table in 49 CFR 173.2a to make this determination. Other labels listed indicate additional hazards associated with the material that can be found in 49 CFR 172.402.

**Column 7. Special Provisions** — This column consists of package prohibitions, exceptions from requirements, and restrictions on quantities. The numbers and letters in the special provisions column are described in 49 CFR 172.102.

**Column 8. Packaging Authorization**
- Column 8A — Exceptions
- Column 8B — Nonbulk packaging
- Column 8C — Bulk packaging

All numbers that are shown in these columns relate to 49 CFR 173; for example, toluene packaging exceptions are found in 49 CFR 173.150, nonbulk packaging in 49 CFR 173.202, and bulk packaging in 49 CFR 173.242.

**Column 9. Quantity Limitations** — Column 9A indicates passenger-carrying aircraft or passenger-carrying rail car, and column 9B indicates cargo aircraft; for example, the maximum shipping quantities for toluene are 5 L and 6 L, respectively. For further clarification of this column, refer to the International Civil Aviation Organization (ICAO)/International Air Transport Association (IATA) guidelines for shipping by air.

**Column 10. Vessel Stowage Requirements** — Column 10A specifies categories for stowage locations onboard cargo and passenger vessels. Column 10B specifies codes (found in 49 CFR 176.84) for stowage of specific hazardous materials. For further information regarding sea shipment restrictions, refer to the International Maritime Dangerous Goods (IMDG) code.

**Hazard Classes**
- Class 1 — Explosive (1.1–1.6)
- Class 2 — Gases (2.1, flammable; 2.2, nonflammable; 2.3, poison)
- Class 3 — Flammable/combustible liquids
Class 4 — Solids (4.1, flammable; 4.2, spontaneously combustible; 4.3, dangerous when wet)
Class 5 — Oxidizing agents (5.1, oxidizer; 5.2, organic peroxide)
Class 6 — Poisons (6.1, poison, keep away from food; 6.2, infectious substances)
Class 7 — Radioactive (radioactive I, radioactive II, radioactive III)
Class 8 — Corrosive
Class 9 — Miscellaneous

**Markings** — The contents of a shipment must be thoroughly identified through shipping papers and marking, labeling, and placarding of the shipment. The necessity of these three forms of identification depends largely on the size of the shipment; refer to the hazardous materials table in 49 CFR 172.101.) A marking can be handwritten or a preprinted, self-adhesive label containing required information: proper shipping name, the UN/NA identification number, and the consignee’s or consignor’s name and address (49 CFR 172.300). The marking is only regulated by the information to be placed on the package.

**Labels** — Applying a $4 \times 4$-inch, square-on-point label is the second component of visibly identifying a hazardous materials package. Shipping labels are specific to the hazard classes of materials and have strict specifications for setup, including color, size, and wording, as well as placement on a package (49 CFR 172.400–450). The hazardous materials table has a column referencing the label or labels for a specific chemical by the hazard class. A label chart that shows hazard class or division and the associated label plus the section reference can be found in 49 CFR 172.400(b). If two labels are listed in the label column, the least hazardous of the two is a secondary hazard. This secondary hazard must also be labeled per 49 CFR 173.402. Another form of labeling is the use of special precautions labels. These labels have specifications for setup in the CFR and are intended for specific situations. Some examples of these labels are “Up” (arrows), “Empty,” and “Cargo Aircraft Only.”

**Placards** — Depending on the nature and quantity of the shipment, placarding completes the shipment identification process. Placards are larger than labels, measuring $10.5 \times 10.5$ inches, but are similar in their square-on-point design. Placards are also specific to the hazard class of materials. The specifications are equally strict for color, size, and wording, as well as placement on a shipping vehicle (49 CFR 172.500–560). Two tables help determine if placards are necessary (see 49 CFR 172.504). Placarding the secondary hazard is also required (similar to labeling). Secondary hazards must follow the requirements in 49 CFR 172.519(a)(4). New placarding requirements were implemented in 1994, but placards conforming to the pre-HM-181 specifications were allowable for highway transportation until October 1, 2001 (49 CFR 171.14(c)(2)).

**Containers** — Determining which container is applicable for shipping a hazardous material depends on the UN identification code found on the drum. For more information regarding the code number, refer to 49 CFR 178. To find more information on the chemical, refer to the hazardous materials table, MSDSs, the *Merck Index*, or the *CRC Handbook of Chemistry and Physics* or contact the manufacturer of the chemical.

**DOT Hazardous Materials Training**
- General training requirements are provided in 49 CFR 173.1.
- Specific requirements are located in 49 CFR 172.704.
- Requirements for air transport are found in 49 CFR 175.20; vessel, in 49 CFR 176.13; highway, in 49 CFR 177.800–816.
- Training should be consistent in approach, testing, and documentation.
• Employees should understand the regulations and be able to perform assigned functions.
• The hazardous materials table in 49 CFR 172.101 designates what materials are hazardous.
• The hazardous materials table encompasses a wide range of chemicals plus combustible and flammable liquids.

**Hazardous Material Employees** — Hazardous material employees include:

- Anyone directly affecting hazardous materials transportation safety
- Owners or operators of motor vehicles transporting hazardous materials
- Anyone loading, unloading, or handling hazardous materials
- A worker marking or taking other actions to qualify the transport of materials
- A worker responsible for the safety of transporting hazardous materials

**Training** — Training should include:

- General awareness, familiarization, and function specific safety
- Driver training for each hazardous materials employee who will operate a motor vehicle
- Initial training for new employees or workers changing job functions (workers may perform job functions before completing training but must be supervised by properly trained and knowledgeable hazardous materials employees)

Employees must complete training within 90 days of employment or change in job function. Additional training is required at least once every 3 years. The 3-year period begins on the actual date of training. Relevant training from a previous employer may be used to satisfy the requirements.

**Training Records** — Training records should include:

- Employee's name and completion date of most recent training
- Training material content (copy, description, or location)
- Name and address of trainer
- Certification that the employee has been trained and tested

**OSHA DOT Labels** — The OSHA standard 29 CFR 1910.1201 requires that original DOT labels must remain on vehicles, tanks, and containers until the substances are removed or transferred to other containers.

**H. HEALTHCARE HAZARDOUS MATERIALS**

**Isopropyl Alcohol** — Isopropyl alcohol, a widely used antiseptic and disinfectant, is used to disinfect thermometers, needles, anesthesia equipment, and other instruments. The odor of isopropyl alcohol may be detected at concentrations of 40 to 200 ppm. Exposure to isopropyl alcohol can cause irritation of the eyes and mucous membranes. Contact with the liquid may also cause skin rashes. The OSHA PEL is 400 ppm for an 8-hour TWA (29 CFR 1910.1000). Workers should wear appropriate protective clothing such as gloves and face shields to prevent repeated or prolonged skin contact with isopropyl alcohol. Splash-proof safety goggles should also be provided and required for use where isopropyl alcohol may contact the eyes.
Ethyl Alcohol — Many healthcare facilities use 70% ethyl alcohol as a topical application in local skin disinfection. Ethyl alcohol, according to NFPA 325M, is flammable in all dilutions where vapor may come in contact with an ignition source. The flash point of a 70% solution is approximately 70°F; therefore, it is considered a possible fire hazard. When used topically, ethyl alcohol has a drying effect on the skin, so staff should exercise care to avoid dermatitis. Ethyl alcohol is highly miscible in water, so disposal should be made through dilution with water in an area providing adequate ventilation. Ethyl alcohol in volumes over 70% should be maintained in a flammable storage cabinet away from patient care areas. A type B/C fire extinguisher should be used in the case of fire.

Ammonia — Ammonia is used as a liquid cleaning agent and as a refrigerant gas. Concentrated solutions of ammonia can cause severe burns. Workers should avoid skin contact with ammonia by wearing protective clothing. Workers handling concentrated solutions should wear rubber gloves and face protection (goggles or face shields). Adequate ventilation is necessary in areas where ammonia gas is released from concentrated solutions. Ammonia should never be stored with deodorizing chemicals because the reaction can produce harmful byproducts such as chlorine gas. The OSHA PEL for alcohol is 50 ppm for an 8-hour TWA. The ACGIH recommends a TLV of 25 ppm (18 mg/m³) as an 8-hour TWA.

Quaternary Ammonium Compounds — Quaternary ammonium compounds are widely used as disinfectants, but many are not effective against tuberculosis and Gram-negative bacteria. Quaternary ammonium compounds are used in central-supply, housekeeping, patient care, and surgical services areas. Ammonium compounds can cause contact dermatitis but seem to be less irritating to hands than other substances. They can also cause nasal irritation. No OSHA PEL, NIOSH REL, or ACGIH TLV exists for quaternary ammonium compounds.

Sodium Hypochlorite (Bleach) — Household bleach is commonly used as a disinfecting solution (mixed 1/4 cup to a gallon of water). Chlorine should be mixed fresh daily and used for disinfection of noncritical surfaces such as disinfecting water tanks and cleaning bathrooms. It also used as a laundry additive, a sanitizing solution for dishwashing, and a disinfectant for floors. Chlorine-based substances should not be mixed with materials containing ammonia because the reaction will produce a toxic gas. Chlorine is released slowly from cleaning and bleaching solutions as they are used. Repeated exposures may result in runny nose, coughing, wheezing, and other respiratory problems. Mild irritation of the mucous membranes can occur at exposure concentrations of 0.5 PPM. The OSHA PEL for chlorine is a ceiling of 1 ppm, according to 29 CFR 1910.1000, Table Z-1. Chlorine has an odor threshold between 0.02 and 0.2 PPM but a person’s sense of smell is dulled by continued exposure.

Chlorine Compounds — At appropriate concentrations and pH values, chlorine compounds can kill spores within about 1 hour at room temperatures. A 10- to 50-fold dilution of 5% laundry bleach gives 1000 to 5000 parts of available chlorine per million parts of water. If the pH value is about 5 to 7, it will kill spores quickly. Chlorine dioxide (ClO₂) and hydrochlorous acid (HClO₂) are commercially available sterilants. Because chlorine compounds can be rapidly corrosive to some metal, rubber, and plastic materials, their practical use is for sanitizing counter and tabletop surfaces. It is advisable to always test a small sample of material for signs of corrosion, especially when using chlorine compounds.

Peracetic Acid — Peracetic acid, or peroxyacetic acid, is a powerful sterilant; however, it has a sharp, pungent odor, and at higher concentrations (1%) promotes tumors in mouse skin. Peracetic acid is a strong skin, eye, and mucous membrane irritant. Peracetic acid is...
used to sterilize the surfaces of medical instruments and may be found in laboratory, central-supply, and patient care areas. A machine system containing 0.2% peracetic acid heated to about 50°C can sterilize rigid and flexible endoscopes within a 45-minute cycle time, which includes a rinse with water filtered through a 0.2-μm membrane to remove bacteria. The system uses the peracetic acid once only and is relatively expensive. Odor and toxicity concerns are minimized by containing the peracetic acid within the closed machine. Currently, no standards exist for regulating exposures to peracetic acid, and no recommendations have been made by NIOSH, ACGIH, or ANSI.

**Iodine** — Iodine is used as a general disinfectant and can be mixed with alcohol for use as a skin antiseptic or with other substances for general disinfecting purposes. Exposure can cause irritation of the eyes and mucous membranes, headaches, and breathing difficulties. Crystalline iodine or strong solutions of iodine may cause severe skin irritation because the iodine is not easily removed and may cause burns. The OSHA PEL for iodine is a ceiling of 0.1 ppm, according to 29 CFR 1901.1000, Table Z-1.

**Phenolic Substances** — Phenolic substances were among the first disinfectants used in hospitals. They are generally used for a wide range of bacteria. Some phenolic substances may also be used for intermediate-level disinfection if they are effective against TB. They are available as sprays and liquid and may be used for surfaces, equipment, prosthetics, bite registrations, and partial dentures. Contact with skin or mucous membrane should be avoided. Phenol may be detected by odor at a concentration of about 0.05 ppm. Serious health effects may follow exposure to phenol through skin adsorption, inhalation, or ingestion. The OSHA PEL for phenol is 5 PPM for an 8-hour TWA skin exposure. Workers should wash their hands thoroughly before eating, smoking, or using the toilet facility.

**H₂O₂ Plus Peracetic Acid** — Combinations of 0.8% H₂O₂ plus 0.06% peracetic acid have passed the AOAC sporicidal test and are used as sterilants. Their use has been limited to kidney dialysis membranes and piping for cosmetic and pharmaceutical sterile-fill operations.

**Hydrogen Peroxide-6% (H₂O₂)** — A formulation containing stabilized 6% H₂O₂ plus detergents and 0.85% phosphoric acid has passed the Association of Official Analytical Chemists (AOAC) sporicidal test within 6 hours at 20°C and is therefore a sterilant. This formulation is compatible with quality stainless steel instruments and plastic, rubber, and glass. H₂O₂ produces no unpleasant odor, but it is a strong acidic oxidizing solution; skin and eyes should be shielded by protective gloves and goggles when it is used.

**Glutaraldehyde** — This cold sterilizing agent possesses toxic characteristics. It is used to disinfect and clean heat-sensitive equipment such as dialysis instruments, surgical instruments, suction bottles, bronchoscopes, and endoscopes. It also works well to disinfect ear, nose, and throat instruments and is the active ingredient in a number of products found in hospitals. Glutaraldehyde solutions serve as a tissue fixative in histology and pathology labs. Glutaraldehyde acts as a hardening agent in the development of x-rays. Absorption may occur by inhalation, dermal contact, or ingestion. Ventilation controls are important, and over-exposure can cause allergic eczema and mucous membrane irritation. It is important to date all solutions to ensure their effectiveness against bactericidal contamination. The substance gives off a pungent odor and is a colorless but oily liquid. Hospital workers use it most often in a diluted form mixed with water or in a commercially prepared product and have reported the following health effects after over-exposure:

- Throat and lung irritation
- Asthma, asthma-like symptoms, and breathing difficulty
• Nose irritation, sneezing, and wheezing
• Nosebleed, burning eyes, and conjunctivitis
• Rash—contact or allergic dermatitis
• Staining of the hands (brownish or tan)
• Hives, headaches, and nausea

**Exposure Situations** — Workers could use glutaraldehyde as a disinfecting agent for respiratory therapy equipment, bronchoscopes, physical therapy whirlpool tubs, surgical instruments, anesthesia equipment parts, x-ray tabletops, and dialysis treatment equipment. NIOSH believes healthcare worker exposures could occur in a number of locations or situations, including:

- Gastroenterology, cardiology, and dialysis departments
- Operating rooms, endoscopy units, and intensive-care units
- Central sterile supply (through its use as a sterilant)
- Histology and pathology labs (e.g., alkaline solutions or fixing tissues)
- Laboratory and research workers (e.g., solutions to disinfect bench tops)
- Workers develop x-rays in radiology

**Health Effects** — Contact with glutaraldehyde liquid and vapor can severely irritate the eyes, and at higher concentrations it burns the skin. Breathing glutaraldehyde can irritate the nose, throat, and respiratory tract, causing coughing and wheezing, nausea, headaches, drowsiness, nosebleeds, and dizziness. Glutaraldehyde acts as a sensitizer. This means some workers will become very sensitive to glutaraldehyde and have strong reactions if they are exposed to even small amounts. Workers may get sudden asthma attacks with difficult breathing, wheezing, coughing, and tightness in the chest. Prolonged exposure can cause a skin allergy and chronic eczema; afterwards, exposure to small amounts produces severe itching and skin rashes. It has been implicated as a possible cause of occupational asthma.

**Exposure Controls**

- Limit exposure through work practice, engineering controls, and PPE.
- Make sure that rooms in which glutaraldehyde is to be used are well ventilated and large enough to ensure adequate dilution of vapor, with a minimum air exchange rate of 10 air changes per hour.
- If possible, use local exhaust ventilation, such as properly functioning chemical fume hoods with a capture velocity of at least 100 feet per minute.
- Keep solution baths under a fume hood where possible.
- Use only enough glutaraldehyde to perform the required disinfecting procedure.
- Store closed containers in well-ventilated areas.
- Seal or cover all containers holding the solution.
- Post signs to remind staff to replace lids after using the product.
- Use specially designed, mobile, compact, disinfectant soaking stations to facilitate sterilization of heat-sensitive equipment, such as endoscopes or GI scopes; these soaking stations provide an enclosed area for sterilizing trays and remove fumes from glutaraldehyde and other disinfectants.
- Be sure employees attend training classes in safety awareness regarding the use of glutaraldehyde and its exposure risks.

**Personal Protective Equipment or Clothing**

- Use appropriate PPE as required by 29 CFR 1910.132(a), including gloves.
- Wear impervious gloves constructed of butyl rubber or nitrile for full-shift protection.
- For shorter exposures, wear gloves made of polyethylene; neoprene or PVC gloves do not provide adequate protection and could aid absorption.
• Never wear latex surgical exam gloves except for short duration or incidental contact.
• Wear lab coats, aprons, or gowns made of appropriate materials, such as polypropylene.
• Wash gloved hands after handling the agents.
• Wear goggles and face shields during handling.

Other Precautions — Workers exposed to levels above the ceiling TLV of 0.05 ppm should use respirators appropriate for glutaraldehyde vapor during routine or emergency work.

Eyewash Stations
• Provide eyewash fountains for immediate emergency use (29 CFR 1910.151(c)).
• Use eyewash fountains and emergency showers if skin comes into contact with glutaraldehyde.
• Flush area with water for at least 15 minutes to remove the chemical.
• Change into clean clothes if clothing becomes contaminated.
• Clean up spills immediately and reference ANSI/AAMI ST58-1996 for further information about emergency procedures in the event of a large spill.
• Train responders for large spills in accordance with the requirements of 29 CFR 1910.120.
• Never eat, drink, or smoke in areas where the agent is handled or stored.
• Use a vacuum or wet method to reduce dust while cleaning up pure glutaraldehyde.
• Automate the transfer of pure glutaraldehyde or pump the liquid from drums or other storage containers to appropriate containers and operations.

Exposure Limits — The Occupational Safety and Health Administration does not currently publish a PEL for glutaraldehyde. The ACGIH recommends a ceiling TLV of 0.05 ppm. NIOSH has established a recommended exposure limit (REL) of 0.2 ppm for glutaraldehyde vapor from either activated or unactivated solutions. Refer to the NIOSH publication, Glutaraldehyde Occupational Hazards in Hospitals (DHHS/NIOSH Publ. No. 2001-115, May 2001).

Formaldehyde Standard (29 CFR 1910.1048) — Formaldehyde is used as a fixative and is commonly found in most laboratories and the morgue. Formaldehyde can cause eye and respiratory irritation, abdominal pains, nausea, and vomiting. High concentrations of vapor inhaled for long periods can cause laryngitis, bronchitis, or bronchial pneumonia. Prolonged exposure may cause conjunctivitis. Nasal tumors have been reported in animals, and studies indicate that formaldehyde is a potential carcinogen. Exposure risk areas include autopsy rooms, pathology laboratories, and dialysis units. Exposure also commonly occurs in endoscopy and surgical facilities. Preplacement and periodic examinations should include baseline and periodic pulmonary, dermal, and hepatic evaluations. PPE (including appropriate gloves) should be available in areas where spills are likely and should include spill absorbent materials and appropriate personal protective equipment. Odor is not a reliable warning for the presence of formaldehyde because the worker’s ability to smell formaldehyde is quickly extinguished. Airborne concentrations above 0.1 ppm can irritate the eyes, nose, and throat. Formaldehyde is often combined with methanol and water to make formalin. In 1992 OSHA, lowered the PEL for formaldehyde to .75 ppm as an 8-hour TWA (see Table 7.7).

Exposure Monitoring — All employers who have any form of formaldehyde in the workplace must monitor employee exposure unless they can objectively document that the presence of airborne formaldehyde will not exceed the action level or STEL under foreseeable conditions (29 CFR 1910.1048(d)(1)). If this cannot be done, the employer must begin initial monitoring. Initial monitoring is accomplished by identifying all employees who potentially
Healthcare Hazard Control and Safety Management

have an exposure at or above the action level or STEL. Each potentially exposed employee can be monitored or a representative sampling plan can be implemented for each job classification and work shift. Monitoring should occur each time a change in equipment, process, production, personnel, or control measures is instituted (29 CFR 1910.1048(d)(2)). If monitoring reveals formaldehyde concentrations at or in excess of the action level, monitoring should be repeated every 6 months; if concentrations are at or above the STEL, annual monitoring is required by 29 CFR 1910.1048(d)(3). Monitoring can be discontinued if, after two consecutive sampling periods taken at least 7 days apart, airborne concentrations are below the action level or STEL (29 CFR 1910.1048(d)(4)).

Regulated Areas — In areas that exceed the PEL or STEL for formaldehyde, all entrances and access ways must post warning signs. Access to these areas must be limited to employees who have been trained to recognize the hazards of formaldehyde per 29 CFR 1910.1048(e).

Methods of Compliance — Employers must implement engineering or work practice controls to decrease employee exposure to formaldehyde below the PEL and STEL (29 CFR 1910.1048(f)). If feasible engineering or work practice controls cannot decrease the airborne exposure below the PEL or STEL, the controls must be applied and supplemented with respirators. Following are some of the various protection methods that can be used. If there is any possibility that an employee’s eyes may be splashed with solutions containing 0.1% or greater formaldehyde, the employer should provide acceptable eyewash facilities within the immediate work area for emergency use as required by 29 CFR 1910.1048(i)(3).

Respiratory Protection — In areas that require respiratory protection, respirators must be provided at no cost to employees, and employers must ensure they are properly used to reduce exposure below the PEL and STEL. Respirators should only be used in the interval necessary to install engineering or work practice controls or for operations in which controls are not feasible, such as maintenance, repair, or emergencies. Employers must use NIOSH-approved respirators and establish a written respiratory protection program in accordance with 29 CFR 1910.134.

Personal Protective Equipment — Employers should select protective clothing and equipment based on the form of formaldehyde, conditions of use, and any hazards to be prevented (29 CFR 1910.1048(h)).

Hygiene Protection — Employers are required to provide drench showers for employees experiencing skin splashes of solutions containing 1% or more of formaldehyde. If an employee’s eyes could be splashed with a 0.1% or greater formaldehyde solution, the employer must provide acceptable eyewash facilities (29 CFR 1910.1048(i)).

### TABLE 7.7 Formaldehyde Exposure Limits

<table>
<thead>
<tr>
<th>Exposure Limit</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Action level</td>
<td>Airborne concentration of 0.5 ppm formaldehyde; if this level is exceeded, the employer must perform periodic air monitoring until levels can be reduced below this point (29 CFR 1910.1048(b))</td>
</tr>
<tr>
<td>Permissible exposure limit (PEL)</td>
<td>Airborne concentration of 0.75 ppm formaldehyde as an 8-hour time-weighted average (29 CFR 1910.1048(c)(1))</td>
</tr>
<tr>
<td>Short-term exposure limit (STEL)</td>
<td>Airborne concentration of 2 ppm formaldehyde over a 15-minute time interval (29 CFR 1910.1048(c)(2))</td>
</tr>
</tbody>
</table>
**Housekeeping and Emergencies** — Operations involving any form of formaldehyde require employers to conduct visual inspections to detect leaks and spills, provide preventative maintenance of equipment at regular intervals, and perform proper repair of leaks (29 CFR 1910.1048(j)). Emergency procedures must be implemented to minimize injury and loss of life (29CFR1910.1048(k)).

**Medical Surveillance** — Employers must implement a medical surveillance program for all employees exposed to formaldehyde at concentrations at or above the action level or exceeding the STEL (29 CFR 1910.1048(l)). This program should consist of medical and physical examinations performed by a physician to detect any symptoms of overexposure and prescribe necessary remedies. Employees should complete a medical disease questionnaire prior to assignment to work areas that could expose them to formaldehyde. Respirator fit testing to verify an employee’s ability to wear a respirator in the work environment must also be completed.

**Summary of Formaldehyde Requirements**

- **Personal protective equipment** — Skin and eye contact with formaldehyde should be avoided. Goggles, face shields, aprons, boots, and NIOSH-certified, positive-pressure, supplied-air respirators should be worn when formaldehyde spills and splashes are likely. Appropriate protective gloves should be worn whenever hand contact is probable.
- **Warning signs** — Employers are required to establish regulated areas where concentrations exceed either the TWA or STEL and should post all entrances and doorways with signs.
- **Exposure monitoring** — Employers must conduct initial monitoring to identify all employees who are exposed at or above the action level and to determine the exposure of each employee.
- **Work practice and engineering controls** — Employers must institute necessary controls to reduce or maintain exposure at or below the TWA or STEL. Employers should supplement controls with respirators where and when necessary to protect workers.
- **Training** — Training is required at least annually for all workers exposed to concentrations of 0.1 ppm or greater. The training should make employees aware of the specific hazards and controls in place to reduce chances of exposure. Employees must learn the signs and symptoms of formaldehyde exposure and how to report them to the employer.

**Acrylic Substances**

**Methyl Methacrylate** — Methyl methacrylate is used in the fields of medicine and dentistry to make prosthetic devices and as a ceramic filler or cement. It is an acrylic, cement-like substance used to secure prostheses to bone during orthopedic surgery. Exposure usually occurs during mixing and preparation and in the operating room. Symptoms from overexposure can include coughing, chest pain, headache, drowsiness, nausea, anorexia, irritability, and narcosis. Very high levels may cause pulmonary edema and death. This material has been linked to cardiac arrest and other cardiovascular problems because of its ability to lower blood pressure. It is harmful if swallowed and may cause diarrhea, nausea, and vomiting. Swallowing produces acute systemic effects paralleling ingestion. Ingestion has been linked to liver and kidney damage. It can be absorbed through the skin. It irritates the skin, producing redness, itching, and pain, and may cause allergic skin reactions. Repeated skin exposures may cause tingling or a prickling sensation of the skin. It can cause irritation, redness, and pain of the eyes. Dental technicians handling methyl methacrylate molding
putty with bare hands develop changes in nerve impulse transmission in the fingers. Persons with pre-existing skin disorders or eye problems or with impaired liver, kidney, or respiratory function may be more susceptible to the effects of the substance.

Safety Precautions

- Wear a NIOSH-approved respirator.
- Wear thick rubber gloves when handling.
- Keep containers tightly closed and away from heat, sparks, and open flame.
- Store in a cool, dry place.
- Wash thoroughly after handling and do not breathe vapor.
- Avoid contact with eyes, skin, and clothing.
- Mix only in a chemical fume hood or a closed system if possible.

Eye Protection

Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eyewash fountains and quick-drench facilities in mixing areas.

Airborne Exposure Limits

- OSHA permissible exposure limit (PEL): 100 ppm (TWA)
- ACGIH threshold limit value (TLV): 50 ppm (TWA)
- Short-term exposure limit (STEL): 100 ppm

Ventilation

Using a system of local and general exhaust is recommended to keep employee exposures below the airborne exposure limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Use of explosion-proof equipment is recommended. Refer to the ACGIH document, *Industrial Ventilation: A Manual of Recommended Practices*, for details.

Acryl Amide — A resin, usually found in research labs, acryl amide is used to make gels for biochemical separations. It can cause eye and skin irritation. Long-term exposure could result in central nervous system disorders. Acryl amide is a suspected carcinogen and mutagen.

Solvents — Chemicals such as methyl ethyl ketone, acetone, and Stoddard solvent may be used to clean parts in maintenance shops. Wearing who come into contact with solvents should wear the recommended personal protective equipment. Many solvents remove the natural fats and oils from the skin and may be absorbed through the skin. Organic solvents are flammable and should be stored in approved safety containers. Local exhaust ventilation and enclosure of solvent vapor sources are the preferred methods of controlling exposures to solvents in laboratories. When selecting engineering and other controls, consideration must be given not only to the toxicity of the solvent but also to its flammability and explosion potential. Factors affecting the hazard severity of solvents include:

- Type of chemical and how the substance is used
- Length and type of worker exposure
- Ventilation effectiveness
- Evaporation rate and concentration of vapor
- Housekeeping and safety practices
- Engineering controls and protective equipment
Acetone — Acetone is used as a chemical intermediate and as a solvent cleaner in fingernail polish remover, paint-related products, and the chemical production of other ketone substances. It evaporates readily from open containers and has a vapor density twice that of air. Inhalation of acetone can result in slight narcosis (exposure to mild concentrations) or respiratory failure (exposure to extremely high concentrations).

- In the event of accidental contact, wash skin and remove affected clothing immediately.
- In case of eye contact, rinse eyes for 15 minutes.
- Store acetone in safety cans and cabinets meeting the requirements of OSHA 29 CFR 1910.106 and NFPA 30.
- Use appropriate safety cans with flame arrestors to prevent a flashback in the event of a spark.
- Be sure containers are bonded and grounded while dispensing.
- Store acetone in flammable liquid cabinets when not in use; local fire codes dictate how much acetone can remain outside of these cabinets throughout the work day.
- Wear splash goggles and chemical protective gloves made of butyl; for more extreme exposures, wear garments that provide a greater than 8-hour breakthrough time.
- For respiratory protection, set air-purifying respirators equipped with organic vapor cartridges to the manufacturer's maximum-use concentration.
- For airborne concentrations above 20,000 ppm, use a self-contained breathing apparatus.

Benzene (29 CFR 1910.1028) — A solvent found in laboratories and maintenance departments, benzene is often used to clean up after painting. Benzene ranks high in the volume of U.S.-produced chemicals. Benzene solvent is used in the production of lubricants, dyes, detergents, drugs, and pesticides. It can be found in crude oil, gasoline, and cigarette smoke. High levels of exposure can cause acute central nervous system depression, with such symptoms as headache, dizziness, and nausea. It can also cause eye, skin, and upper-respiratory irritation. Effects of long-term exposure to benzene include liver and kidney damage, aplastic and hypoplastic anemia, and leukemia. The limit set by the OSHA standard is 10 ppm; by NIOSH, 1 ppm. Whenever possible it is advisable to use a less toxic solvent such as toluene. Breathing high levels of benzene can cause drowsiness, dizziness, rapid heart rate, headache, and unconsciousness. Eating or drinking foods containing high levels of benzene can cause vomiting, convulsions, and even death. Benzene can harm the bone marrow and cause a decrease in red blood cells that leads to anemia. The Department of Health and Human Services has determined that benzene is a known human carcinogen. Benzene must be stored to avoid contact with oxidizers such as nitrates, peroxides, and chlorates. Metal containers used to transfer 5 gallons or more of benzene should be grounded and bonded. Drums must be equipped with self-closing valves, pressure vacuum bungs, and flame arrestors. The ACIGH recommends the use of Viton® gloves for protection during short-period exposure. For respiratory protection from benzene at any exposure level, workers should wear a NIOSH-approved, supplied-air respirator with full face piece.

Toluene and Xylene — Toluene and xylene are used most frequently by lab workers to fix tissue specimens and rinse stains. They are primarily found in histology, hematology, microbiology, and cytology laboratories (29 CFR 1910.1000, Subpart Z). These solvents can cause eye and respiratory irritation resulting from exposure to liquid and vapor forms. Other exposure symptoms include abdominal pains, nausea, vomiting, and possible loss of consciousness if the solvent is ingested in large amounts. High concentrations of vapor inhaled for long periods can cause laryngitis, bronchitis, or bronchial pneumonia. Prolonged exposure may cause conjunctivitis. Nasal tumors have been reported in animals.
**Toluene**

Odor is noticeable at 8 ppm. Inhaling high levels of toluene in a short time can cause light-headed sensations and drowsiness.

- Store toluene in safety cans and cabinets that meet the requirements of 29 CFR 1910.106 and NFPA 30 standards.
- Store toluene in such a way as to avoid contact with strong oxidizers such as chlorine, bromine, and fluorine.
- Wear splash goggles; the ACIGH recommends wearing gloves made of Viton®.
- Wear air-purifying respirators equipped with organic vapor cartridges.

**Xylene**

This solvent can also be found in some maintenance departments. OSHA and NIOSH set exposure limits at 100 ppm. Xylene is used in processors, stainers, and as a cleaning agent that removes paraffin from the tissue. Alternative chemicals have replaced xylene in stainers.

- Use xylene with local exhaust ventilation, such as under an exhaust hood.
- Carefully evaluate citrus-based substitutes that may reduce worker exposure but can produce a hazardous waste due to a flash point of less than 140°F.
- Evaluate hazardous waste and quality issues before using xylene alternatives.
- When using xylene, evaluate the possibility of reducing waste in histology laboratories by distilling xylene.

**Healthcare Metal Hazards**

**Mercury** — Medical waste incinerators are the fourth largest known releasers of mercury to the environment, constituting approximately 10% of all emissions sources, and hospitals are responsible for producing 1% of the total municipal solid waste in the entire country. In 1998, the American Hospital Association (AHA) and EPA, in consultation with Healthcare without Harm, reached a landmark agreement that launched the Hospitals for a Healthy Environment program. Worker exposure to mercury can occur from accidental spills during the repair of broken thermometers and sphygmomanometers or during sterilization and centrifugation of thermometers in maintenance areas. Mercury can also be found in some pressure-sensing instruments such as barometers and sensors in mechanical rooms. It is found in laboratories and some physical plant instruments and switches. It is also present in gastrointestinal equipment and supplies, plumbing systems, batteries, and fluorescent bulbs. Laboratory fixatives and reagents should be certified mercury free. Many chemical analyses report no mercury at the lowest concentration detectable; in these cases, the detection limit should be specified. While many healthcare institutions no longer utilize mercury thermometers or blood pressure devices, physical plant and safety personnel must remain knowledgeable regarding the cleanup of spills.

**Health Effects**

Mercury commonly enters the body through inhalation, skin absorption, or consumption. Symptoms of mercury poisoning can include coughing, chest pain, painful breathing, bronchopneumonia, tremors, insomnia, irritability, headache, fatigue, gastrointestinal distress, and liver and kidney damage. Chronic exposure to low levels over time may cause mental and motor disorders resulting from damage to the central nervous system. If overexposed to mercury vapor:

- Move immediately to fresh air.
- Should mercury contact your skin, remove your clothing immediately and wash the area with mild soap and large amounts of water for 15 minutes.
- In case of eye contact, flush your eyes with water for a full 15 minutes.
- Seek medical attention immediately.
OSHA Requirements

Worker exposure to mercury vapor should not exceed an 8-hour TWA limit of 1 mg/10 m³ (0.1 mg/m³) to meet the requirements of 29 CFR 1910.1000, Table Z-2. Employers must select and provide appropriate PPE, including respirators, for the cleanup of spills. Workers should never consume food or beverages in an area exposed to mercury (29 CFR 1910.141(g)(2)). The ACGIH has set 8-hour workplace exposure limits as low as 0.025 mg/m³.

Good Work Practices

- Prevent the spill in the first place by replacing outdated glass thermometers and sphygmomanometers with mercury-free devices.
- Use mercury spill kits to help clean up small spills of 25 mL or less.
- Assemble kits containing gloves, protective glasses, mercury-absorbent powder, mercury sponges, and a disposal bag.
- Be sure to isolate the contaminated area.
- Instruct personnel that mercury can go anywhere — on a person’s clothing, skin, or hair.

Spill and Emergency Response

- Use a mercury vapor analyzer to verify that the area is safe to reenter.
- Clean up spills promptly with special mercury vacuum cleaners and a water-soluble mercury decontamination substance.
- Be sure that spills are cleaned up safely by workers or a team trained in proper procedures.
- Use disposable protective equipment, including protective gloves and footwear, special mercury vapor respirators, gowns, and hoods while cleaning up mercury spills.
- Dispose of spills according to EPA regulations found in 40 CFR 261.24.
- Avoid using carpeting or porous surfaces on floors that would make cleanup difficult.
- Clearly post all spill areas until adequate cleanup has been accomplished.
- Medically monitor the respiratory track, nervous system, kidneys, and skin of any worker who may be exposed to mercury.

Resource Conservation and Recovery Act (RCRA)

The RCRA requires waste material that exhibits the characteristic of toxicity for mercury to be managed as hazardous waste (see 40 CFR 261.24). Additionally, discarded commercial chemical products containing mercury must be managed as hazardous waste (see 40 CFR 261.33). Under EPA’s Universal Waste Rules (see 40 CFR 273 et seq.), states may provide alternative options for management of mercury thermostats and mercury-containing lamps. Check with state regulations to see how RCRA and Universal Waste Rules apply.

Clean Air Act (CAA)

Clean Air Act regulations contain national emission standards for mercury from a limited number of specific stationary sources that process or use mercury-containing substances and emit mercury to the air (see 40 CFR 61.50). Additionally, the CAA requires municipal waste combustible materials and medical waste incinerators to limit their mercury emissions (see 40 CFR 60.50b).

Emergency Planning and Community Right-To-Know Act (EPCRA)

These regulations require facilities that manufacture, process, or otherwise use mercury compounds in excess of 10 pounds during a calendar year to report the quantities released to EPA (see 40 CFR 372.22). The 10-pound reporting threshold for mercury was recently changed from the original minimum reporting threshold of 10,000 pounds.
Clean Water Act (CWA)

The Clean Water Act requires that any discharge to a surface water cannot negatively impact the water quality standards established. With EPA approval, a state establishes the water quality standards for each of its surface waters. Each state must establish minimum water quality standards for certain priority pollutants such as mercury. The regulations establish an acute and chronic mercury concentration for surface waters (see 40 CFR 131.36).

Safe Drinking Water Act (SDWA)

Safe Drinking Water Act regulations require a public water system to provide drinking water with a maximum contaminant level of 2 micrograms per liter (or ppb) mercury (see 40 CFR 141.51); therefore, the concentration of mercury should not exceed 2 ppb for water supplies to homes.

Lead and Cadmium — Alloys containing lead and cadmium are frequently encountered in cancer radiation therapy centers. Although these compounds generally have low melting points and present little in the way of fume hazards, processes such as grinding and filing may introduce lead and cadmium dust into the working environment. Proper work hygiene is essential to minimize the potential hazards. Extensive OSHA medical surveillance guidelines cover lead and cadmium exposures. OSHA requires employers to provide initial and annual training to all employees exposed to an airborne concentration of lead of 30 μg/m³ averaged over an 8-hour period (29 CFR 1910.1025). In some very old facilities, exposure can come from lead-based paint or lead-soldered pipe connections. Construction and renovation projects can release lead particles into the air. Employers should provide respiratory protection and protective clothing. Organizations must also confine lead to a specific area. Decontamination and shower facilities should be available to keep lead from being tracked to other areas. OSHA regulates cadmium under 29 CFR 1910.1027 and 29 CFR 1926.1127 (for construction). The standards include biological monitoring (29 CFR 1910.1027, App. F). If cadmium in urine exceeds 3 μg/g creatinine, if beta-2 microglobulin (indicating excessive protein excretion) exceeds 300 μg/g creatinine, or if cadmium in whole blood exceeds 5 μg/L, a reassessment of the employee’s exposure and follow-up medical surveillance is required. (Note: The medical action/removal levels were reduced as of January 1, 1999.)

Ethylene Oxide (EtO) — Ethylene oxide is regulated by OSHA under the provisions of 29 CFR 1910.1047. Exposure most commonly occurs by dermal absorption or inhalation. Ethylene oxide is a colorless liquid below 51.7°F. As a gas, it produces an ether-like odor at concentrations above 700 ppm. It is both flammable and highly reactive. The current OSHA PEL for ethylene oxide is 1 ppm for an 8-hour TWA with a 5-ppm excursion level. Ethylene oxide is used within central-supply areas to sterilize items that cannot be exposed to steam sterilization. Exposure usually results from improper aeration of the ethylene oxide chamber after the sterilizing process. Exposure can also happen during off-gassing of sterilized items or poor gasline connections. Ethylene oxide can be found in outpatient surgery clinics, cardiac catheter labs, operating rooms, dental labs, and autopsy labs.

Exposure Levels — The limit on workplace EtO exposure is 1 ppm averaged over an 8-hour TWA. The action level is 0.5 ppm. The STEL is 5.0 ppm averaged over a sampling period of 15 minutes. Employee rotation is prohibited as a way of complying with the excursion limit. Workers in central supply who use ethylene oxide are at risk of potential exposure. Employers must provide information through signs and labels clearly indicating carcinogenic and reproductive hazards. Initial and annual training should be given to workers who may be exposed at the action level.
Health Hazards — In liquid form, EtO can cause eye irritation and injury to the cornea, frostbite, and severe irritation and blistering of the skin upon prolonged or confined contact. Ingesting EtO can cause gastric irritation and liver injury. Acute effects from inhaling EtO vapors include respiratory irritation and lung injury, headache, nausea, vomiting, diarrhea, shortness of breath, and cyanosis. Exposure has also been associated with the occurrence of cancer, reproductive effects, mutagenic changes, neurotoxicity, and sensitization. Ethylene oxide has been shown to cause cancer in laboratory animals and has been associated with higher incidences of cancer in humans. Adverse reproductive effects and chromosome damage may also occur from EtO exposure.

Exposure Controls — Operations that could cause worker exposure to EtO include removing sterilized items from the EtO sterilizer, moving items from the EtO sterilizer to the aerator unit, and changing bottles of EtO gas. Airborne concentrations of EtO are controlled most effectively at the source of contamination by enclosing the operation and using local exhaust ventilation. It is advisable to reduce exposure to EtO during the sterilization process and never allow personnel to be in the sterilizer loading and mechanical rooms during sterilizer unit operation. A ventilated exhaust hood should be installed above the sterilizer door. Operators should avoid close contact with newly sterilized unaerated loads. Ethylene oxide should be vented through a nonrecycled or dedicated ventilation system. For a discussion of ventilation of aeration units, sterilizer door areas, sterilizer relief valves, and ventilation during cylinder changes, see the appendix of 29 CFR 1910.1047 (Ethylene Oxide). Machine alarms should be installed to detect inadequate ventilation and cause automatic shutdown. The air pressure in laboratories and isolation rooms should be negative so contaminated air is drawn through the exhaust vents rather than circulating throughout the rest of the building.

Personal Protective Equipment

- When changing cylinders, use appropriate PPE, including a butyl apron, gloves, and a canister respirator.
- Use EtO detector systems and room monitors to signal any leakage of gas and passive dosimeters for personal exposure monitoring.
- Use specialized gasline connections to minimize EtO leakage during use and during change-out of EtO cylinders.

Monitoring

- Conduct periodic personal monitoring, as well as monitoring for leaks at gasline connectors.
- Keep a written log for any detected leaks and any service done on an EtO chamber.
- Replace sterilizer/aerator door gaskets, valves, and fittings when necessary.
- Use a passive dosimeter for personal exposure monitoring.

Asbestos — This widely used mineral-based material appears as a whitish, fibrous material. Fibers released may range in texture from coarse to silky. Airborne fibers that cause health damage may be too small to see with the eye. Inhaling these airborne asbestos fibers can cause asbestosis, mesothelioma, lung cancer, and cancers of the esophagus, stomach, colon, and rectum. OSHA regulations require surveillance and recordkeeping for workers significantly exposed to asbestos (present or past). Asbestos is still encountered during routine maintenance activities, renovation projects, and demolition for new construction. Workers should work in a sealed environment using appropriate PPE. Periodic air sampling is required to document the level of exposure. Medical surveillance activities should include reinforcement of good work habits. Smoking cessation should be emphasized. Federal laws give workers the right to know about possible asbestos hazards in their workplaces. Maintenance
workers and facility engineers can unknowingly be exposed to asbestos from many possible areas and sources. Maintenance personnel may be unaware of these hazards and may not know how to handle them. Engineers can be exposed while working in furnace rooms where boilers are insulated with asbestos, or when making repairs to old piping or doing minor renovations. Significant asbestos exposures can occur during removal of insulation in old buildings. Asbestos exposure is often associated with areas or items that might not be expected to contain asbestos. Asbestos can be found in many items, such as:

- Duct insulation
- Boiler insulation
- Pipe insulation
- Cooling towers
- Floor and ceiling tile
- Electrical wiring insulation
- Wall board or spackling compounds
- Sprayed or troweled-on surfacing material such as fireproofing

**Informing Workers and Occupants**

- Post signs at the entrance of rooms or areas with asbestos-containing material (ACM) and where asbestos work is being performed.
- Attach labels to ACM products and containers of asbestos, including waste containers.
- Train custodial and maintenance workers with regard to health hazards, locations of asbestos, signs of damage to ACM and presumed ACM (PACM), and what to do if asbestos fibers are released; construction and maintenance workers who disturb asbestos must receive additional training on proper work practices, respirators, protective clothing, and other topics.
- Notify those who work in or near an area where asbestos will be disturbed and explain the methods that will be put into place before the job begins to contain asbestos fibers.

**OSHA Asbestos General Industry Standard (29 CFR 1910.1001)** — Asbestos must only be removed by fully trained personnel using methods and protective equipment mandated by OSHA (29 CFR 1910.1001). The OSHA asbestos standard should be consulted along with the appropriate NIOSH and EPA publications. Only workers fully trained in asbestos handling should be allowed in areas where asbestos is exposed. The work practices appropriate for handling asbestos are set out in detail in 29 CFR 1910.1001. A facility's asbestos policy must outline specific OSHA requirements for the following:

- Reports of each asbestos use or exposure along with a list of jobs that pose exposure risk to workers
- Work practices for handling asbestos, such as wet handling, development of cleanup protocols, use of plastic sheeting to seal off work areas, and bagging of removed insulation during routine operations, maintenance, and repair
- Asbestos waste collection, labeling, and disposal
- Respiratory protective equipment (types of respirators, maintenance, training programs, use, and recordkeeping)
- Dressing rooms and special clothing
- Air monitoring
- Recordkeeping and maintenance of records (30 years)
- Medical surveillance (requirements set according to level of asbestos exposure)
- Training

*Note:* The EPA's worker protection standard for asbestos covers state, county, parish, and municipal organizations not regulated by a federal or state OSHA program.
OSHA Asbestos Construction Standard (29 CFR 1926.1101) — The OSHA construction standard covers activities such as demolition, removal, repair, or encapsulation of ACM. It also covers building maintenance and custodial tasks. The construction standard divides asbestos work into four types, each with its own set of requirements:

- Class I asbestos work involves activities in which thermal system insulation (pipe and boiler covering) or surfacing material such as sprayed on fireproofing is removed.
- Class II asbestos work involves the removal of asbestos-containing wallboard, floor tile and sheeting, roofing and siding shingles, and construction mastics.
- Class III asbestos work involves repair and maintenance jobs where ACM (including thermal system insulation or surfacing materials) is likely to be disturbed.
- Class IV asbestos work involves maintenance and custodial activities during which employees contact ACM or PACM and must clean up waste containing ACM and PACM.

Measuring Worker Exposure — In general, employers must determine how much asbestos workers might be exposed to before the work begins. Unless they have reliable information that workers will not be exposed above the PEL for class I and II work, employers must conduct daily or periodic monitoring of each employee who works within the regulated area, unless a negative exposure assessment has been made. For class III or IV work, the employer must monitor all work where exposures are expected to exceed the PEL unless workers are wearing supplied-air respirators operated in the positive-pressure mode. Employers must also perform clearance sampling after class I jobs to make sure that the area is safe to re-enter. Before the plastic sheeting around an asbestos job is taken down, air measurements must be taken after stirring up the air with a leaf blower.

Required Work Practices

- Conduct all class I, II, and III asbestos work within regulated areas; these are marked areas that only trained and authorized personnel wearing respirators and other protective equipment may enter.
- Conduct other work, such as emergency cleanup, in a regulated area when airborne asbestos levels are over or are likely to exceed the PEL.
- Use ventilation and other methods to keep asbestos fibers from getting airborne.
- Equip power tools such as drills, saws, and abrasive wheels with ventilation systems in order to capture the fibers.
- Whenever possible, use wet methods to keep the asbestos moist and to keep fibers from getting into the air.
- Use a vacuum cleaner equipped with high-efficiency particulate air (HEPA) filters, or use wet methods such as mopping.
- Strip floor finishes by wet methods or using low abrasion pads at lower than 300 rpm.

Respiratory Protection — The least protective respirator that OSHA allows for asbestos work is a half-mask, air-purifying respirator with HEPA filters. Dust masks are not allowed. The employer must provide a powered, air-purifying respirator whenever an employee chooses to use this type of respirator and the respirator will provide adequate protection. Prohibited OSHA and EPA practices include:

- Dry sweeping, dusting, shoveling, or normal vacuuming of asbestos of PACM material, debris, waste, or dust
- Using compressed air to clean surfaces contaminated with asbestos or to remove asbestos unless used with a ventilation system that can capture the dust cloud
- Sanding of asbestos-containing flooring material
Other Requirements — The OSHA and EPA rules also contain requirements for protective clothing, laundering work clothes, medical tests, and keeping records:

- EPA Asbestos in Schools rule (40 CFR 763, Subpart E) requires schools to inspect buildings for asbestos and prevent worker and occupant exposure.
- EPA National Emission Standards for Hazardous Air Pollutants (NESHAP 40 CFR 61, Subpart M) provides requirements for removal of asbestos before demolition, notification of the EPA before removal, preventing the release of fibers into the air, and waste disposal.

I. OTHER HAZARDOUS MATERIALS AND PESTICIDES

Drain Cleaning Chemicals, Paints, and Adhesives — Drain-cleaning chemicals can burn the skin and damage the eyes. Workers should wear rubber gloves and goggles or face shields when they use drain cleaners and splashing is possible. Product information sheets or Material Safety Data Sheets contain additional information. Paints and adhesives contain a wide variety of solvents and should be used only in areas with adequate ventilation. If ventilation is inadequate, workers should wear respirators approved for use with organic vapors. Wearing gloves and other personal protective clothing can prevent skin contact with epoxy paints and adhesives. Workers should never use gasoline for cleaning floors, tools, clothing, or hands. It is advisable to store gasoline in approved, labeled, closed containers in outbuilding or flammable storage areas and to clean gasoline spills immediately.

Pesticides — Insecticides, herbicides, fungicides, disinfectants, rodenticides, and animal repellents are all classified as pesticides. They are considered to be hazardous substances under the OSHA Hazard Communication standard. Pesticides are regulated by the EPA under Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) regulations. Responsibility for the safe use of these toxic materials begins with purchase and continues until the empty container is properly discarded. All pesticides sold in the United States carry an EPA regulation number that shows they have been deemed safe and effective when used according to directions. Pesticides labeled “DANGER: POISON” are highly toxic. If inhaled, ingested, or left on the skin, they may be lethal. Poisons marked “WARNING” are moderately toxic and can be very hazardous. “CAUTION” labels denote low toxicity but the substance can be harmful if ingested or grossly misused.

Precautions

- Use pesticides only for purposes listed on the label.
- Keep pesticide poisons in the original container.
- Mix pesticides carefully, outdoors if possible.
- Use protective clothing and equipment as required.
- Control traffic in pesticides application areas.
- Avoid spills and wash hands at once with soap and water.
- Never smoke or eat while spraying or dusting.
- Stay out of spray drift and do not use on windy days.
- Do not smoke, eat, or drink until you have washed.

Worker Protection Standard (40 CFR Parts 156 and 170) — Workers handling, loading, mixing, or applying pesticides or those repairing pesticide-applying equipment fall under the standard. This standard affects all forestry, greenhouse, and nursery workers who perform hand labor in pesticide-treated fields. Some pesticide products require verbal warnings and posted warning signs. When applying pesticides, three types of restrictions are involved:
Pesticides should not be applied in such a manner that they would come into contact with any persons unless they are appropriately trained and equipped handlers.

Only appropriately trained and equipped handlers can be in an area where pesticides are being applied.

Any employer with a pesticides handler using a product with the skull-and-crossbones emblem (poison) must monitor the handler visually or by voice at least every 2 hours.

Labels on containers address the necessary personal protective equipment, explain the route of exposure, and cover situations when respirators are required. The employer is responsible for providing the necessary PPE and requiring workers to wear it. The employer is also responsible for the cleaning and proper maintenance of the PPE and for making sure no worker or handler goes home with contaminated PPE or clothing. Employers must train all workers and handlers on pesticide safety; training should include the use of pesticide safety posters, access to labeling information, and details on where the pesticides have been used. Employers should display a poster showing basic pesticide safety in a central location. Employees must have access to the pesticide product labeling for 30 days after the pesticide has been applied. Warnings may be given verbally or by posted signs, or both; check the pesticide label to see what type of warning is required. Unless the pesticide requires both verbal and written warnings, one or the other is acceptable as long as workers are informed of which method is being used.

### Storage and Disposal

- Store pesticides in well-ventilated and locked areas.
- Be sure pesticide containers are tightly closed and labeled.
- Do not store clothing, equipment, or food near pesticides.
- Keep plenty of soap and water handy.
- Never pour pesticides into a sink or toilet.
- Do not burn pesticide boxes outdoors or in incinerators.
- Wrap empty containers in newspaper before disposal.
- Do not puncture or incinerate pressurized containers.
- Instruct all personnel in emergency actions.
- Post the poison control number by the phone.

### J. HAZARDOUS DRUG SAFETY

Studies indicate that workplace exposures to hazardous drugs can result in health problems such as skin rashes, infertility, spontaneous abortions, congenital malformations, and possibly leukemia or other cancers. The health risk is influenced by the extent of the exposure and the potency and toxicity of the hazardous drug. Potential health effects can be minimized through sound procedures for handling hazardous drugs, engineering controls, and proper use of protective equipment to protect workers to the greatest degree possible (see Table 7.8). In 2004, the NIOSH Working Group on Hazardous Drugs defined as hazardous any drug exhibiting at least one of the following characteristics in humans or animals:

- Carcinogenic, teratogenic, or other developmental toxicity
- Reproductive toxicity
- Organ toxicity at low doses
- Genotoxicity
- Structure and toxicity profiles of new drugs that mimic existing drugs as determined hazardous by the above criteria
Antineoplastic Drugs

- Develop written policies to address medical surveillance of workers and hazardous drug handling procedures, including:
  - Receipt and storage
  - Preparation and administration
  - Housekeeping
  - Deactivation
  - Cleanup and disposal of unused drugs
  - Contaminated spills
  - Patient wastes
- Get input from workers handling the drugs when developing policies and procedures to prevent exposure.
- Create a written inventory identifying all hazardous drugs used in the workplace.
- Perform periodic reviews and updates of the inventory.
- Collect all guidance documents, Material Safety Data Sheets, and other information to be sure workers have easy access to needed information.
- Train workers on the recognition, evaluation, and control of all hazardous drugs.
- Provide and maintain ventilated cabinets such as biological safety cabinets (BSCs) or containment isolators to protect workers during mixing operations.
- Be sure all exhaust from these cabinets goes through HEPA filters and is exhausted to the outdoors (away from air intake locations) if feasible; closed-system drug-transfer devices, glove bags, and needleless systems can also help provide protection.
- Provide proper personal protective equipment to reduce exposure through inhalation, ingestion, skin absorption, and injection.
- Personal protective equipment should include chemotherapy gloves, low lint/permmeability disposable gowns, sleeve covers, and eye and face protection.
- Use NIOSH-certified respirators when biological safety cabinets do not provide adequate protection against inhalation risks; surgical masks do not provide adequate respiratory protection.

Other safety measures include the following:

### TABLE 7.8 Possible Hazardous Drug Exposure Situations

- During reconstitution or further dilution of powdered or lyophilized drugs
- When exposed to aerosols generated during the administration of drugs
- When individually counting uncoated oral doses (residue can create an inhalation hazard)
- When crushing tablets to make oral liquid doses
- When exposed to aerosols generated during direct IV push or IV infusion
- When priming an IV set with a drug-containing solution at the bedside
- When handling body fluids, clothing, dressings, linens, and other contaminated materials
- When handling contaminated waste generated at any step in the process
- When performing specialized procedures
- When handling hazardous drug waste or decontaminating preparation/clinical areas
- When transporting infectious, chemical, or hazardous waste containers
- When removing and disposing of PPE used during the handling of hazardous drugs
• Provide syringes and intravenous (IV) sets with lock-type fittings for use when preparing and administering hazardous drugs.
• Consider the use of closed-system drug transfer devices and needleless systems to protect personnel during administration.
• Conduct periodic evaluations of workplace hazardous drugs, equipment, training effectiveness, and policies and procedures to reduce exposures as much as possible.
• Take measures to be compliant with RCRA regulations related to the handling, storage, and transportation of hazardous waste.
• Be aware that contaminated materials present a hazard to support and housekeeping personnel.
• Use properly labeled, sealed, and covered disposal containers.
• Consider unused drugs to be commercial chemical products and dispose of them in accordance with 40 CFR 261.
• Refer to Chapter 10 for additional safety information relating to hazardous drugs.

Hazardous Drug Worker Safety
• Give workers standardized training on the hazardous drugs and equipment and procedures used to prevent exposure.
• Prepare all agents within a ventilated cabinet designed to protect workers and adjacent personnel from exposure.
• Develop procedures to protect all drugs that require aseptic handling.
• Use two pairs of powder-free, disposable chemotherapy gloves, with the outer one covering the gown cuff when mixing drugs.
• Avoid skin contact by using a disposable gown made of a low-lint and low-permeability fabric; the gown should have a closed front, long sleeves, and elastic or knit closed cuffs and should not be reused.
• Wear a face shield to avoid splash incidents involving eyes, nose, or mouth when adequate engineering controls are not available.
• Wash hands with soap and water immediately before using and after removing personal protective clothing, such as disposable gloves and gowns.
• Use syringes and IV sets with lock-type fittings when preparing and administering hazardous drugs.
• Decontaminate work areas before and after each mixing activity.
• Clean up small spills immediately using appropriate safety precautions and PPE.
• Implement the facility spill response plan for large spills.

Standards and Guidelines — The OSHA standards and guidelines that address hazardous drugs include the Hazard Communication standard (29 CFR 1910.1200) and Occupational Exposure to Hazardous Chemicals in Laboratories standard (29 CFR 1910.1450), as well as guidelines found in Controlling Occupational Exposure to Hazardous Drugs (1999). Some key topics of the 1999 guidelines include:
• Categorization of drugs as hazardous
• Hazardous drugs as occupational risks
• Work areas
• Prevention of employee exposure
• Medical surveillance
• Hazard communication
• Training and information dissemination
• Recordkeeping

Note: NIOSH recently published Preventing Occupational Exposures to Antineoplastic and Other Hazardous Drugs in Healthcare Settings (Publ. No. 2004-165).
K. ANESTHETIC AND OTHER GASES

Possible adverse effects of anesthetic agents include reproductive hazards and perceptual, cognitive, and motor skill impairment. Medical surveillance for workers exposed to anesthetic gases should include liver function testing. Meticulous attention to safe work practices and proper use and maintenance of mandated anesthetic gas scavenging systems will greatly reduce potential for exposure. Area and personal monitoring is necessary to ensure adequate control; anesthesia personnel should not identify gases by smell. Room ventilation turnover and local exhaust ventilation should meet mandated guidelines. Equipment should be routinely checked for leak sites, and trace anesthetic gas levels periodically evaluated. Improved packaging of volatile anesthetic liquids decreases the likelihood of anesthetic spills.

Nitric Oxide — Nitric oxide was approved by the FDA in 1999 for use as a vasodilator in the treatment of hypoxic respiratory failure in full- and near-term infants. It is a colorless, essentially odorless gas with a very narrow therapeutic window for patients. Acute exposure effects include mucous membrane irritation and drowsiness. More serious effects include delayed pulmonary toxicity and damage to the central nervous system. Exposed employees may be relatively asymptomatic at the time of exposure and take as long as 72 hours to manifest clinical symptoms. OSHA classifies nitric oxide as a highly hazardous substance.

Nitrous Oxide — Nitrous oxide (N₂O) is a clear, colorless, oxidizing liquefied gas with a slightly sweet odor. The product is stable and inert at room temperature. Although classified by the DOT as a nonflammable gas, nitrous oxide will support combustion and can deteriorate at temperatures in excess of 650°C or 1202°F. Nitrous oxide is blended with oxygen when used in anesthesia applications. Pure nitrous oxide will cause asphyxiation, resulting ultimately in respiratory arrest. The pain-killing and numbing qualities of inhaled nitrous oxide begin to take effect when the gas is at concentrations of 10%. The Compressed Gas Association (CGA) and National Welding Supply Association (NWSA) have identified initiatives to address N₂O abuse issues.

Carbon Monoxide — Carbon monoxide (CO) is a colorless, odorless and tasteless gas that is slightly lighter than air. It is sometimes referred to as carbonic oxide, exhaust gas, or flue gas. Carbon monoxide is produced by the incomplete combustion of any fuel that contains carbon such as gasoline, natural gas, oil, and propane, as well as coal and wood products. Sources include laboratories, equipment rooms, boilers, and emergency rooms. Carbon monoxide is a chemical asphyxiant and the leading cause of death in fires. When CO is inhaled into the lungs, it bonds with hemoglobin in the blood; hemoglobin is responsible for carrying oxygen throughout the body. The CO replaces the oxygen molecules in hemoglobin and deprives the heart, brain, and body of the oxygen they need to function. High concentrations of CO will displace enough oxygen in the body to result in oxygen starvation. The symptoms of low-level CO poisoning include headaches, nausea, weakness, dizziness, and confusion. Carbon monoxide exposure causes a victim’s blood pressure to rise in an attempt to deliver more oxygen throughout the body. As a result, the skin may take on a reddish color. The symptoms at low levels are very similar to what a person might exhibit if affected by the flu or other common illnesses; therefore, carbon monoxide is sometimes referred to as the “great imitator.” If someone is exposed to carbon monoxide long enough, coma and death can occur. A concentration of 1200 ppm CO is considered immediately dangerous to life or health.

Waste Anesthetic Gases — Waste gases result from poor work practices during the anesthetization of patients, improper or inadequate maintenance of the machine, or patient exhalation after the surgical procedure. Over-exposure can cause drowsiness, irritability, depression, headaches, nausea, and problems with coordination and judgment. Chronic
health issues include embryo toxicity, liver and kidney disease, and cancer. Workplace exposures to anesthetic gases occur in hospitals, surgery centers, recovery rooms, dental operations, and veterinary facilities. Inhaled anesthetic agents include nitrous oxide and halogenated agents. Halogenated agents currently used include halothane, enflurane, isofluorane, desflurane, and sevoflurane. Methoxyflurane is used only infrequently and primarily in veterinary procedures.

**Exposure Limits** — No PELs regulating anesthetic gases have been established by OSHA. NIOSH published RELs in 1977 for nitrous oxide and halogenated agents. The NIOSH REL for nitrous oxide, when used as the sole inhaled anesthetic agent, is 25 ppm for a TWA. NIOSH also recommends that no worker should be exposed at ceiling concentrations greater than 2 ppm of any halogenated anesthetic agent over a sampling period not to exceed 1 hour. The ACGIH TLV for halothane is 50 ppm; for enflurane, it is 75 ppm.

**General Workplace Controls** — Occupational exposures can be controlled by the application of a number of well-known principles including engineering and work practice controls, administrative controls, personal protective equipment, and monitoring. These principles may be applied at or near the hazard source, at the general workplace environment, or at the point of occupational exposure to individuals. Controls applied at the source of the hazard, including engineering and work practice controls, are generally the preferred and most effective means of control.

**Scavenging System Components (ASTM, F 1343-91)**

- A gas collection assembly, such as a collection manifold or a distensible bag (e.g., Jackson–Rees pediatric circuit), which captures excess anesthetic gases at the site of emission and delivers it to the transfer tubing
- Transfer tubing, which conveys the excess anesthetic gases to the interface
- The interface, which provides positive and sometimes negative pressure relief and may provide reservoir capacity (designed to protect the patient’s lungs from excessive positive or negative scavenging system pressure)
- Gas disposal assembly tubing, which conducts the excess anesthetic gases from the interface to the gas disposal assembly
- Gas disposal assembly, which conveys the excess gases to a point where they can be discharged safely into the atmosphere (e.g., nonrecirculating or recirculating ventilation system, central vacuum system, dedicated waste gas exhaust system, passive duct system)

**Active Systems** — Excess anesthetic gases may be removed by a central vacuum system or an exhaust system dedicated to the disposal of excess gases. When the waste anesthetic gas scavenging system is connected to the central vacuum system, exposure levels may be effectively controlled. The central vacuum system must be specifically designed to handle the large volumes of continuous suction from operating room scavenging units. If a central vacuum system is used, a separate, dedicated gas disposal assembly tubing should be used for the scavenging system.

**Passive Systems** — Heating, ventilation, and air-conditioning systems used in healthcare facilities are either nonrecirculating or recirculating. Nonrecirculating systems, also termed one-pass or single-pass systems, take in fresh air from the outside and circulate filtered and conditioned air (i.e., controlled for temperature and humidity) through the room. Whatever volumes of fresh air are introduced into the room are ultimately exhausted to the outside. Waste anesthetic gases can be efficiently disposed of via this nonrecirculating system.
General or Dilution Ventilation — An effective room ventilation system when used in combination with an anesthetic gas scavenging system should reduce contamination from anesthetic gases. If excessive concentrations of anesthetic gases are present, then airflow should be increased in the room to allow for air mixing and further dilution of the anesthetic gases. Supply register louvers located in the ceiling should be designed to direct the fresh air toward the floor and toward the healthcare workers to provide dilution and removal of the contaminated air. Exhaust register louvers should be located low on the wall near floor level to provide adequate air distribution. They should not be located near the supply air vents because such an arrangement would interfere with the necessary airflow and prevent proper air mixing and flushing of the contaminants from the room.

Administrative Controls — Administrative controls represent another approach for reducing worker exposure to waste gases other than through the use of engineering controls, work practices, or personal protective equipment. Administrative controls may be thought of as any administrative decision that results in decreased exposure to anesthetic gases.

- Institute a program of routine inspection and regular maintenance of equipment in order to reduce anesthetic gases and achieve the best performance of scavenging equipment and room ventilation.
- Implement a monitoring program to measure airborne levels of waste gases in the breathing zone or immediate work area of those most heavily exposed in each anesthetizing location.
- Schedule periodic monitoring (at least semiannual) of waste gas concentrations to be sure the anesthesia delivery equipment and engineering and environmental controls work properly and the maintenance program is effective.
- Perform effective monitoring using conventional TWA air sampling or real-time air sampling techniques.
- Encourage or promote the use of scavenging systems in all anesthetizing locations where inhaled agents are used, recognizing that a waste gas scavenging system is the most effective means of controlling waste anesthetic gases.
- Implement an information and training program for employees exposed to anesthetic agents that complies with OSHA’s Hazard Communication standard (29 CFR 1910.1200).
- Define and implement appropriate work practices to help reduce employee exposure.
- Implement a medical surveillance program for all workers exposed to waste gases.
- Be sure workers wear appropriate personal protective equipment during cleanup and containment of major spills of liquid anesthetic agents.
- Manage disposal of liquid agents, spill containment, and air monitoring for waste gases following a spill.

Personal Protective Equipment — Personal protective equipment is not a substitute for engineering, work practice, or administrative controls in anesthetizing locations. Exposure to waste gases is not effectively reduced by wearing gloves, goggles, and surgical masks. During cleanup and containment of spills of liquid anesthetic agents, the use of personal protective equipment in conjunction with engineering, work practice, and administrative controls ensures employee safety and health. Employees should wear gloves, goggles, and face shields for proper protection. Respirators, where needed, should be selected based on the anticipated contamination level.
L. WASTE MANAGEMENT

Virtually all healthcare facilities generate hazardous wastes as defined by the Resource Conservation and Recovery Act. The Centers for Disease Control (CDC) estimates that a typical hospital generates more than 10 pounds of solid and hazardous waste per patient each day. These wastes may contain etiologic and chemical agents that could cause injury if improperly handled. Medical wastes found in healthcare facilities include excreta, blood, exudates, secretions, and solid wastes such as linens and paper or plastic materials. Because hazardous chemicals are used throughout healthcare facilities, administrators, hazard control managers, and safety specialists must have controls in place for all potential hazardous waste exposures. Management personnel should develop hazardous waste management procedures to address the generation, use, storage, transportation, and disposal of all hazardous or potentially hazardous materials.

Waste Program Management — Each healthcare facility must operate an effective waste management program. The program should be developed and updated quarterly or as required by the safety committee. The program should address the following:

- Inventory and categorization of infectious substances by department
- Identification of hazards during daily activities
- Purchase of materials and labeling if transferred
- Storage requirements
- Distribution and special handling
- Special cleanup procedures
- Disposal procedures (e.g., identification, transport, pick up, end point)
- Accident or exposure procedures in an exposure control plan
- Coordinating training with the safety committee

Inventory Control for Hazardous Wastes — Effectively managing inventory is an effective way to reduce hazardous waste generation. A good inventory control program includes the following:

- Adopt a first-in, first-out policy for chemicals; for example, chemicals purchased first should be used first. Reduce high-volume chemical inventories to an ideal supply level of 4 weeks or less.
- For inventory control purposes, have chemicals delivered to a central location at the hospital (one common dock area) and distributed throughout the facility by a designated individual. Ideally, this individual would be a shipper/receiver or central-supply/stores staff member.
- Institute chemical standardization to promote sharing of chemicals among common users.
- Develop and implement a program involving the reuse of unwanted but usable chemicals; a computerized, running inventory of unused reagent chemicals for reuse in other departments is helpful.

Tracking Waste Generation

- Develop data using chemical inventories or information by user groups to identify high-volume waste generators.
- Locate caches of unused reagents or chemicals and determine why they are accumulating.
• Monitor reagent and chemical half-life and expiration dates.
• Be sure the identity of all chemicals is clearly marked on all containers; it is illegal to ship unused reagent chemicals, containers, and solution mixtures and unidentified wastes for disposal without proper labeling.

Training Frequency — Training teaches facility personnel about waste disposal procedures relevant to their positions (see Table 7.9). All personnel involved in hazardous waste management should receive adequate training (as outlined above) within 6 months of employment and should undergo an annual review of the initial training as required by the regulations. Training courses should be held annually or as required.

Waste Disposal
• Never discard any hazardous chemical down the drain, into a toilet, or on the ground outside.
• Never burn chemicals to dispose of them.
• Never put hazardous chemicals in trash cans or garbage containers destined for landfills.
• Always read the label, check the MSDSs, and follow established facility procedures.
• Understand that even a small amount of some chemicals left in a container can be dangerous, as they can produce toxic fumes or be ignitable, reactive, or explosive.
• Dispose of all containers according to required procedures.
• Be aware that wastes can react with one another and burn, release toxic vapors, or explode.
• Read the labels on disposal containers.
• If in any doubt, ask before you act.

Hazardous Waste Labels
• Remember that, when handling a container or in case of a spill, workers need to know what is in the container.
• Use hazard warning signs that apply to chemical waste storage and disposal.
• Discuss the importance of obeying these signs.

<table>
<thead>
<tr>
<th>TABLE 7.9 Waste Disposal Training Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification of various waste types</td>
</tr>
<tr>
<td>Segregating and preparing chemicals for transport</td>
</tr>
<tr>
<td>Implementing emergency contingency plans</td>
</tr>
<tr>
<td>Transport and disposal procedures and methods</td>
</tr>
<tr>
<td>Hazardous waste management plan and procedures</td>
</tr>
<tr>
<td>Assignment of roles and responsibilities under the plan</td>
</tr>
<tr>
<td>Methods to protect themselves from exposure to hazardous materials</td>
</tr>
<tr>
<td>Personal protective equipment selection and use</td>
</tr>
<tr>
<td>Purpose of hazardous waste laws and regulations</td>
</tr>
<tr>
<td>Nature of hazardous wastes generated at the facility</td>
</tr>
<tr>
<td>Proper handling procedures for the wastes</td>
</tr>
<tr>
<td>Emergency response procedures and contingency planning</td>
</tr>
</tbody>
</table>
• Never open an unlabeled container because the vapors could be toxic.
• Report leaking disposal containers, missing labels, chemical containers that have been improperly disposed of, fire hazards — anything that you can think of that might cause an accident, injury, or damage to the plant and equipment.
• Be aware that:
  • No one should operate a storage facility without a proper permit.
  • Storage facilities should be fully enclosed.
  • Designated storage facilities should not be used for other purposes.
  • Storage facilities must be identified with signs that contain the universal biohazard symbol or have the words “Medical Waste,” “Infectious Waste,” or “Biohazardous.”
  • Storage facility surfaces should be constructed of easily cleaned materials that are impervious to liquids.
  • Facilities should be adequately secured to prevent entry by unauthorized persons.
  • Facilities that operate storage facilities must take actions to minimize or prevent the migration of odors offsite.
  • Containerized treated medical waste can be mixed with other solid waste for storage prior to transportation to an approved facility. Liquid waste should be placed in appropriately marked and sealed bottles, barrels, or drums.

Documentation — Facilities should maintain the following documents and records:

• Job titles for positions at the facility related to hazardous waste management and names of employees filling those jobs
• Written job description for each position that includes the requisite skill, education, or other qualifications and duties of employees assigned to each position
• Written description of the type and amount of both introductory and continuing training that these employees will receive

Training information must be kept in the personnel office for a period of 3 years.

Cradle to Grave — A hazardous waste program should track all materials from the cradle to the grave to be compliant with all environmental regulations and standards. The program should include:

• Policies and procedures for identifying, handling, storing, using, and disposing of hazardous wastes from generation to final disposal
• Training for and, as appropriate, monitoring of personnel who manage or regularly come into contact with hazardous materials and/or wastes
• Monitoring of compliance with the program’s requirements
• Evaluation of the effectiveness of the program, with reports to the safety committee and those responsible for monitoring activities

Hazardous Waste Regulation — The RCRA addresses the billions of tons of solid wastes that are generated each year and the cradle-to-grave problems associated with the generation, treatment, storage, recycling, and disposal of such waste. Subtitle C of the act focuses on the management of wastes with hazardous properties and directs the EPA and states to protect human health and the environment from mismanagement of hazardous wastes. Generators normally cannot store hazardous waste for more than 90 days. Under the authority vested in Subtitle C, the EPA has established four hazard characteristics: corrosiveness, ignitability, reactivity, and toxicity. Criteria or test methods are available for
determining if a waste possesses any of these hazardous characteristics. Specific wastes and chemical constituents that are known to have one or more of these hazardous characteristics have been identified and listed as hazardous.

**Hazardous Waste Definition** — Congress defined the term “hazardous waste” in Section 1004(5) of the RCRA as a solid waste, or combination of solid wastes, which because of its quantity, concentration, or physical, chemical or infectious characteristics may:

- Cause or significantly contribute to an increase in mortality or an increase in serous irreversible, or incapacitating reversible, illness.
- Pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, or disposed of, or otherwise managed.

**Solid Hazardous Waste** — In 40 CFR 261, a solid waste is defined as hazardous if it is not excluded from regulation as a hazardous waste and it meets any of the following conditions:

- Exhibits any of the characteristics of a hazardous waste
- Has been named as a hazardous waste and listed as such in the regulations
- Is a mixture containing a listed hazardous waste and a nonhazardous solid waste
- Is a waste derived from the treatment, storage, or disposal of a listed hazardous waste

**RCRA Authority** — The RCRA applies to anyone generating, storing, transporting, treating, or disposing of:

- A listed hazardous waste
- A waste containing a known hazardous constituent

When a waste is tested and found to exhibit a hazardous characteristic, the facility must notify the EPA of such activity.

**Compliance** — The EPA and state environmental agencies have the right to inspect a facility and its records at any reasonable time (i.e., during normal operating hours). If an inspector finds that the facility is in violation of the RCRA or its permit, enforcement action in the form of a compliance order (including administratively imposed injunctions) or action in court may follow. Facilities having any of the following characteristics can fall under the umbrella of federal or state regulations:

- The facility is a generator of hazardous waste.
- The facility transports hazardous waste.
- The facility stores hazardous waste.
- The facility treats hazardous waste.
- The facility disposes of hazardous waste.

**Ignitable Solid Waste** — A solid waste that exhibits any of the following properties is considered a hazardous waste due to its ignitability:

- Liquid, except aqueous solutions containing less that 24% alcohol, that has a flash point less than 60°C (140°F)
- Nonliquid capable, under normal conditions, of spontaneous and sustained combustion
- Ignitable compressed gas per DOT regulations
- Oxidizer per DOT regulations
Mixed Waste

- Mixed waste is considered hazardous under the RCRA and radioactive under the Atomic Energy Act. Both the NRC and EPA work together to address the management of these wastes.
- Mixed waste is most often produced by laboratories and nuclear energy producers (source, special nuclear, or byproduct material wastes).
- Laboratories may produce scintillation solvents containing organic reagents and low-level radioactive wastes.
- In nuclear energy production, discarded lead shielding and cooling materials may contain heavy metals and radioactive wastes.
- Generators of mixed waste must comply not only with the minimum technical requirements of the RCRA but also with NRC regulations.

SARA Title III — The Superfund Amendments and Reauthorization Act (SARA) was passed by Congress in 1986. It provided for infrastructure in states and local communities to plan for effective response to hazardous material emergencies. The act provides for public access to information on the presence and release of specified hazardous chemicals in communities. The Emergency Planning and Community Right-to-Know Act (EPCRA) requires each state to establish a State Emergency Response Commission (SERC). Members should have technical expertise in emergency response, environmental management, natural resources, public health, occupational safety, media relations, and transportation. The SERC is responsible for establishing local emergency planning districts (usually on a county level), appointing and overseeing local emergency planning committees (LEPCs), establishing procedures for handling public requests for information, and reviewing LEPC emergency plans. SARA Title III requires local committees to include, at a minimum, representatives from the following groups: state and local officials, law enforcement, civil defense, firefighting, environmental, hospital, media, first aid, health, transportation, and facility owners or operators subject to the emergency planning requirements.

RCRA and Universal Wastes — Universal wastes include commonly discarded products such as batteries, thermostats, lamps, and cathode ray tubes. People and businesses in the United States discard billions of old batteries each year. Many batteries contain toxic substances such as mercury and cadmium. The hazardous substances pose a potential threat to human health and the environment if not disposed of properly. Batteries comprise less than 1% of the municipal solid waste stream; however, batteries account for a disproportionate amount of the heavy metals. Hospitals should consider recycling options as batteries disposed of in municipal landfills and trash incinerators can disperse significant amounts of heavy metals and other toxic substances into the air and water. Universal wastes that are not recycled and exhibit any characteristic of hazardous materials must be managed as hazardous waste. Universal wastes normally pose a relatively low risk to handlers during accumulation and transport. Recycling these wastes by adhering to universal waste guidelines facilitates environmentally sound management practices. Specific state regulations are available at the EPA universal waste website or by contacting state environmental regulatory agencies. Universal waste regulations can streamline hazardous waste management standards for federal universal wastes such as batteries, pesticides, thermostats, and lamps. 40 CFR 273 lists regulations governing the collection and management of these widely generated wastes.

Fluorescent Lights — To reduce the mercury waste generated when lights are disposed of, consider:
• Using T-8 lamps instead of T-12 lamps
• Using timed lights or lights with occupancy switches instead of manual switches
• Implementing the EPA’s Green Lights program
• Recycling fluorescent light bulbs

Batteries — Batteries are used in numerous applications: cameras, pagers, flashlights, exit signs, alarm systems, backup power sources in medical monitors, hearing aids, and smoke detectors. Some common varieties of batteries include alkaline magnesium, nickel–cadmium, silver–cadmium mercuric oxide, lithium, and zinc–air. Facilities should check their state regulations regarding how to handle these spent batteries, as they often must be considered hazardous waste due to the metal content. In some cases, recycling spent batteries may be possible. Zinc–air batteries may be used to replace the more hazardous mercuric oxide batteries in some applications. Rechargeable batteries may not be appropriate in all situations, especially those involving life-saving equipment where a partially recharged battery could result in equipment failure and death. Even rechargeable batteries, such as nickel–cadmium batteries, will require eventual disposal.

Medical Waste — Medical waste is defined in 40 CFR 259.10 and 40 CFR 22 as any solid waste generated in the diagnosis, treatment, or immunization of human beings or animals, as well as in related research, biological production, or testing. Currently, medical waste is regulated by most states (see Chapter 8).

Electronic Waste — The EPA has not set guidelines for electronic waste, but such waste is covered under other, broader EPA categories. Under the category of household hazardous waste, the EPA allows computers to be dumped in the trash, but businesses, including hospitals, are monitored under the RCRA, which requires businesses to determine whether their solid waste (including electronic) is hazardous. An electronic waste generator must know what is — and what isn’t — in the waste. This information comes from the generator’s knowledge of the waste and the process by which it has reached the point of disposal. Determining whether a waste is hazardous can be achieved in two ways: by the waste generator’s knowledge of the raw materials and processes of the waste or by testing the electronic waste to determine whether the criteria of a “listed waste” or a “characteristic waste” has been met. If the hospital staff cannot determine the hazards by applying their knowledge, then the only option left is to test the electronic waste. Disposing of electronic waste can be hazardous to the environment and to human health; some disposal alternatives to consider include the following:

• Eliminate all dangerous or toxic materials in computers. This has begun with the use of lead-free solders and with the use of acrylonitrile butadiene styrene (ABS) plastics to replace the polyvinylchloride (PVC) content.
• Recycle, in a proper manner, obsolete computers that would normally be heading for landfills; such dumping can be hazardous to humans if not controlled properly.
• Landfill the computers; this method should not be counted as a feasible solution because it poses the hazard of leachate of lead and mercury.
• Export the materials to third-world countries, which goes against the Basal Ban, a 1989 agreement that the United States declined to sign, which, in effect, stops the exporting of electronic waste to third-world countries.
• Enforce the extended producer responsibility. Europe has taken a lead in this movement by requiring producers to take back their obsolete products for recycling. Other terms for this movement are “take-back,” “product liability,” or “life-cycle product responsibility.”
M. RESPONDING TO HAZARDOUS MATERIALS SPILLS AND RELEASES

Hazardous Waste Operations and Emergency Response Standard — The Hazardous Waste Operations and Emergency Response (HAZWOPER) standard contains requirements for cleanup operations and emergency response operations for hazardous wastes (see Table 7.10). The HAZWOPER Standard (29 CFR 1910.120) requires the following with regard to spill control:

- Make available DOT-specified salvage drums or containers and suitable quantities of proper absorbent in areas where spill, leaks, or ruptures may occur.
- Develop a spill containment program to contain and isolate the entire volume of the hazardous substance.
- Train responders to meet the requirements of the OSHA standard.

Types of Absorbent Materials

- Universal absorbents — These materials absorb any liquid, including acids, solvents, cleaners, disinfectants, gasoline, and alcohols.
- Petroleum absorbents — These materials absorb oil and petroleum-based liquids; they will not absorb water or water-based liquids.
- Maintenance absorbents — These materials are used for maintenance operations and are designed to absorb coolants, lubricants, oils, and cutting fluids. Maintenance absorbents pick up water-based as well as oil-based fluids.

Note: Acquire the appropriate spill containment tools, such as drain protectors, drain plugs, drum plugs, neutralizers, and sorbent materials.

Spill Response Personal Protective Equipment — The Occupational Safety and Health Administration mandates the use of appropriate personal protective equipment for personnel responding to a spill or supporting decontamination activities. Responders must know the type of chemical, level of exposure risk, physical characteristic of the chemical hazard, and
potential hazards to the body, including the toxic, carcinogenic, asphyxiant, or corrosive nature of the chemical. The EPA’s Office of Emergency and Remedial Response defines four levels of protection for chemical response operations:

- **Level A** — This is the highest level of skin and respiratory protection available. The protective clothing must be gas tight, vapor tight, and splash resistant. This level of protection is appropriate for possible threats to life and health and for operations dealing with an unknown hazard. It requires the highest level of respiratory protection with supplied-air respirators.
- **Level B** — This level offers protection from chemical splash but does not prevent exposure to gases or vapors. Protective clothing may or may not be completely encapsulating. It requires the highest level of respiratory protection.
- **Level C** — This level is the same as Level B but requires the use of an air-purifying respirator. This level is used when the chemical is known and it has been established that an air-purifying respirator is appropriate protection for the hazard.
- **Level D** — This lowest level of protection is used when no potential or actual hazard exists. It offers minimal protection for nuisance exposure.

Refer to OSHA 29 CFR 1910.120, Appendix B, for specific information.

**Chemical Protective Clothing** — The selection of chemical-resistant clothing should take into account the permeation testing methods of ASTM F739. **Breakthrough time** refers to the time it takes the test chemical to pass from the outside surface of a clothing sample until it is detected on the inside surface of the material. **Permeation rate** refers to the speed at which a chemical passes through the clothing once breakthrough has occurred. 29 CFR 1910, Subpart I, Appendix B, recommends that for mixtures and formulated products (unless specific test data are available), personnel should select a glove with the longest breakthrough time. Protective eyewear should match the work application. Goggles provide the most protection as they form a seal around the eye area. Goggles come in vented and nonvented styles; vented goggles offer protection from impact hazards only. Anti-fog lenses can help increase vision. Face shields provide secondary protection against liquid splash, gases, vapors, or flying particles. Whenever a face shield is worn, primary protection (goggles or safety glasses) must also be worn.

**SUMMARY**

This chapter addressed the management of hazardous materials found in healthcare settings and described the categories of hazardous materials as defined by JCAHO. The chapter defined the characteristics of hazardous materials, exposure routes, worker protection, and airborne exposures. It covered the role of OSHA in protecting workers from chemical exposure and explained the OSHA additive formula. The chapter addressed key hazardous material terms, emergency eyewash and shower requirements, and how to properly store hazardous materials. The chapter presented the requirements of the OSHA Hazard Communication standard (29 CFR 1910.1200), including training requirements and how to use a Material Safety Data Sheet (MSDS). The text also provided an overview of hazard warning labeling systems, including the NFPA 704 system. Other topics addressed included compressed gas safety, DOT compliance requirements, safe pesticide usage, and hazardous drug safety. The chapter presented an overview of healthcare hazardous materials that included information on alcohols, chlorine products, quaternary ammonia compounds, phenol products, formaldehyde, methyl methacrylate, and many others. The chapter also addressed mercury, lead, cadmium, and asbestos hazards. The chapter gave readers a brief look at key Environmental Protection Agency (EPA) laws and standards.
FOR REVIEW AND DISCUSSION

1. Name three agencies that regulate the storage or transportation of hazardous materials.
2. Pesticides and disinfectants are regulated under which EPA statute?
3. Which federal agency regulates exposure to aerosol drugs, and what is the greatest concern about overexposure?
4. Define the term \textit{airborne contaminant standards}.
5. List the four routes of chemical exposure.
6. What is the primary consideration when storing chemicals?
7. What two agencies regulate asbestos?
8. What role does the ACGIH play in hazardous material safety?
9. What hazardous substance can cause mesothelioma?
10. Describe the OSHA hazardous materials additive formula found in Subpart Z.
11. What agency now approves most respirators for use?
12. Which agency regulates indoor air contaminants?
13. Define upper flammable limits and lower flammable limits?
14. What are the four routes of chemical exposure?
15. What is a time-weighted average?
16. What is the key consideration when storing chemicals?
17. What does carbon monoxide do to the body?
18. What are the basic training requirement of the Hazard Communication standard?
A. INTRODUCTION

Healthcare-associated infections pose significant risks for patients and healthcare workers. The Centers for Disease Control and Prevention (CDC) estimates that 2 million individuals acquire an infection each year while being treated in hospitals for other illnesses or injuries. Healthcare workers should be trained, retrained, and mandated to follow current CDC guidelines. The safety program must work closely with the infection control staff on issues of joint concern such as compliance with the OSHA Bloodborne Pathogens standard (29 CFR 1910.1030). Safe practices and proper infection control measures involve nearly every area of healthcare operations. The Joint Commission on Accreditation of Healthcare Organizations (JCAHO) recently issued a Sentinel Event Alert about risks associated with healthcare-acquired infections. Healthcare workers must strive to minimize exposure risks to blood, sputum, aerosols, and other body fluids by following proper work practices. The use of appropriate personal protective equipment and relevant education and training provide a foundation for any effective infection control program. Most healthcare organizations have some type of written infection control program. It is recommended that facilities publish procedures for each patient care department, including the pharmacy. At many acute-care facilities, the infection control committee participates in employee safety and health program activities.

B. INFECTION CONTROL REQUIREMENTS

An effective infection control program should stress sound personal hygiene, individual responsibility, monitoring, and investigating infectious diseases that have potentially harmful infectious exposures (see Table 8.1). The program should also stress providing care for work-related illnesses, identifying occupational infection risks, instituting preventive measures, eliminating unnecessary procedures, and preventing infectious diseases.

Joint Commission on Accreditation of Healthcare Organizations — The revised JCAHO standards retain many of the concepts embodied in existing standards but do place new expectations on organizational leadership. The requirements for ambulatory care, behavioral health care, home care, hospital, laboratory, long-term care organizations became effective January 2005. The revised standards emphasize the importance of increasing the awareness that healthcare-acquired infections can occur in any care, treatment, or service setting.
Planning, Prevention, and Control — Facilities should develop and implement plans to prevent and control infections by focusing on the following:

- Integrating infection control into safety and performance improvement efforts
- Assessing risks for the acquisition or transmission of infectious agents within the facility
- Using an epidemiological approach to focus on surveillance and data collection
- Implementing infection prevention and control processes based on sound data
- Coordinating program design and implementation with key leaders

General Joint Commission Infection Control Program Requirements

- Establish a coordinated process to reduce the risks of organization-acquired infections.
- Appoint one or more qualified individuals to manage the program.
- Report information about infections both internally and to public health agencies.
- Design process to reduce rates or trends of epidemiologically significant infections.
- Implement strategies to reduce risks and prevent transmission of infections.
- Adopt strategies that consider scientific knowledge, practice guidelines, and law or regulation.
- Address infection issues that are of epidemiological importance to the organization.
- Design processes to lower the risks and improve the rates or trends of infections.
- Consider endemic rates and epidemic rates when analyzing data.
- Be sure that management systems support infection control objectives.
- Conduct an annual activity to help prevent the transmission of significant infections.
- Conduct an annual activity to help prevent transmission among patients and staff.
- Stress risk identification using surveillance, prevention, and control activities.
- Coordinate with external organization systems to reduce the risk of infection from the environment, including food and water sources.

Program Design — Facilities should implement a program to control epidemiologically important infection issues by developing a program based on sound research and demographic considerations. Some professionals recommend the use of a hazard vulnerability analysis to guide the design process. Consider the following topics when designing the program:

<table>
<thead>
<tr>
<th>TABLE 8.1 Key Infection Control Program Considerations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Placement evaluations</td>
</tr>
<tr>
<td>Personnel health and safety education</td>
</tr>
<tr>
<td>Immunization programs</td>
</tr>
<tr>
<td>Protocols for surveillance</td>
</tr>
<tr>
<td>Management of job-related illnesses</td>
</tr>
<tr>
<td>Exposures to infectious diseases</td>
</tr>
<tr>
<td>Counseling regarding infection risks</td>
</tr>
<tr>
<td>Guidelines for work restrictions due to infections</td>
</tr>
<tr>
<td>Maintenance of health records</td>
</tr>
</tbody>
</table>
TABLE 8.2  CDC Infection Control Guidelines

Hand Hygiene in Healthcare Settings (2002)
Intravascular Device-Related Infections (2002)
Surgical Site Infections (1999)
Healthcare Worker Immunizations (1997)
Isolation Precautions (1994)
Biosafety in Microbiological and Biomedical Laboratories (1993)

- Device-related, intravascular devices, ventilators, and tube feeding infections
- Surgical site infections and nosocomial infections in special care units
- Infections caused by organisms that are antibiotic resistant
- Tuberculosis and other communicable diseases
- Infections in the neonate population
- Geographic location of the facility
- Volume of patient or resident encounters
- Patient populations served
- Clinical focus of the facility
- Number of employees and staff

C. CENTERS FOR DISEASE CONTROL AND PREVENTION

The CDC publishes guidelines, advisories, and recommendations that do not carry the force of law (see Table 8.2). The CDC bases their guidance and recommendations on scientific studies; however, some infection control practices applicable to one setting may not apply in all healthcare situations. The guidance offered by the CDC gives healthcare infection control personnel the information necessary to make informed decisions. Healthcare organizations must provide proper education and training on current infection control practices and keep workers up to date on the latest OSHA requirements and CDC developments through periodic in-service sessions. The continuous evaluation of care practices under the supervision of the infection control staff can help ensure continued adherence to correct practices.

Non-CDC Guidelines — In 1999, the Association for Professionals in Infection Control and Epidemiology (APIC) published their *State-of-the-Art Report: The Role of Infection Control During Construction in Healthcare Facilities.*
Guidelines for Design and Construction of Hospital and Healthcare Facilities —
The American Institute of Architects (AIA) and the Facility Guidelines Institute revised the *Guidelines for Design and Construction of Hospital and Health Care Facilities* in 2001. Considered an industry standard by architects, engineers, and healthcare professionals, these guidelines set minimum program, space, and equipment needs for clinical and support areas of hospitals, nursing homes, freestanding psychiatric facilities, outpatient and rehabilitation facilities, and long-term care facilities. The 2001 edition addresses infection control and the environment of care, including control provisions designed to protect against waterborne bacteria. The guidelines also address infection control risk assessments before and during construction projects. The guidelines are updated every 4 years to keep pace with new concepts and capabilities in the delivery of health care. More than 40 states and the Joint Commission reference these guidelines for licensure or accreditation of healthcare facilities.

D. CDC STANDARD PRECAUTIONS

Handwashing is considered to be the first line of defense in preventing exposures to diseases, bloodborne pathogens, and infections. The CDC's Standard Precautions provide the major features of blood and body fluid precautions designed to reduce the risk of transmission of bloodborne pathogens. The Standard Precautions are designed to reduce the risk of transmission of microorganisms from both recognized and unrecognized sources of infection in hospitals. After using the Standard Precautions, facilities should then apply the appropriate Tiered Precautions for airborne, droplet, and contact routes of infection. Facilities should learn to recognize the pathogenic risk of body fluids, secretions, and excretions and should take precautions against the various routes of transmission by designing processes that eliminate confusion with regard to infection control or isolation requirements. Workers must take transmission-based precautions until a diagnosis can be determined (see the appropriate CDC guidelines for information on various types of precautions). Facilities should refer to the guidelines for information on clinical syndromes and empiric precautions. They should also adhere to specific transmission precautions for patients colonized with pathogens.

Airborne Precautions — Airborne precautions reduce the risk of airborne transmission of infectious agents disseminated by airborne droplet nuclei (small-particle residue 5 μm or smaller), evaporated droplets that may remain suspended in the air for long periods of time, or dust particles containing the infectious agent. Microorganisms carried in this manner can be dispersed widely by air currents and may become inhaled by or deposited on a susceptible host within the same room or over a longer distance from the source patient. Depending on environmental factors, special air handling and ventilation should be used to prevent airborne transmission. Airborne precautions apply to patients known or suspected to be infected with epidemiologically important pathogens that can be transmitted by the airborne route, such as measles, varicella, and tuberculosis.

Droplet Precautions — Droplet precautions reduce the risk of droplet transmission of infectious agents. Droplet transmission involves contact of the conjunctive or mucous membranes of the nose or mouth of a susceptible person with large-particle droplets (larger than 5 μm). The droplets contain microorganisms generated from a person who has a clinical disease or who serves as a carrier of the microorganism. Droplets are generated from the source person primarily during coughing, sneezing, or talking and during the performance of certain procedures such as suctioning and bronchoscopy. Transmission of a disease via large-particle droplets requires close contact between the source and recipient. Droplets do not remain suspended in the air and generally travel only short distances (3 feet or less).
Special air handling and ventilation is not required to prevent droplet transmission. Droplet precautions apply to any patient known or suspected to be infected with epidemiologically important pathogens that can be transmitted by infectious droplets, including meningitis, pneumonia, sepsis, diphtheria (pharyngeal), *Mycoplasma pneumoniae*, pertussis, streptococcal (group A) pharyngitis, scarlet fever, *Rubella*, and pneumonic plague.

**Contact Precautions** — Contact precautions reduce the risk of transmission of epidemiologically important microorganisms by direct or indirect contact. Direct-contact transmission involves skin-to-skin contact or the physical transfer of microorganisms to a susceptible host. This can occur when healthcare workers turn patients, bathe patients, or perform other patient-care activities requiring physical contact. Direct-contact transmission can also occur between two patients. Indirect-contact transmission involves contact of a susceptible host with a contaminated intermediate object, usually inanimate, in the patient’s environment. Contact precautions apply to specific patients known or suspected to be infected or colonized with epidemiologically important microorganisms transmitted by direct or indirect contact via the gastrointestinal tract, the respiratory system, skin, wound infections, or colonies of multidrug-resistant bacteria. Contact precautions are used for hepatitis A, contagious skin infections, herpes simplex virus, scabies, and viral or hemorrhagic conjunctivitis and infections.

**Infection Transmission Routes** — Federal, state, and local health agencies have published rules and guidelines that define isolation procedures. Healthcare organizations should follow these guidelines because infectious agents can be transmitted by several routes:

- Contact — Contamination due to close proximity with a person with a contagious disease
- Indirect contact — Contamination by coming into contact with an object used by an infected person
- Droplet — Contamination caused by a person sneezing, coughing, or talking
- Common vehicle — Disease spread by food, water, drugs, devices, or equipment
- Airborne — Air-suspended infectious nuclei or dust that could be inhaled or digested
- Vector-borne — Organisms carried by animals or insects

**CDC-Recommended Tiered Precautions** — The CDC’s tier precautions provide guidelines with regard to:

- Handwashing, glove use, and patient placement procedures, including transport
- Use of masks, gowns, and other protective apparel
- Procedures for patient care equipment, linen, and laundry
- Cleaning dishes, glasses, cups, and eating utensils

**CDC Guidelines for Hand Hygiene in Healthcare Settings (Alcohol Hand Rubs)** — The CDC guidelines highly recommend the placement of alcohol-based hand rub solutions in convenient locations of patient care areas of healthcare organizations. Clinical studies indicate that the frequency of handwashing or antiseptic handwashing by personnel is affected by the accessibility of hand-hygiene facilities. Installing hand rub dispensers immediately outside patient or resident rooms or within suites of rooms improves the overall efficacy of staff use by over 20%. According to the CDC, more that 88,000 patient deaths per year are attributed to hospital-acquired infections, and one of the principal methodologies for reducing this statistic is by the expanded use of alcohol-based hand rub solutions. The CDC believes that these products are more effective for standard handwashing or hand antisepsis by healthcare workers than soap or antimicrobial solutions.
Guidelines for Environmental Infection Control in Healthcare Facilities —

The CDC guidelines provide excellent information on maintaining a safe healthcare environment and include infection control tips to follow during inspection, construction, or renovation activities in patient care and treatment areas. The guidelines provide a comprehensive review of the relevant literature with a focus on conducting a risk assessment before any undertaking any activities that could generate dust or water aerosols. The guidelines also review infection control measures for catastrophic events such as flooding, sewage spills, and loss of utilities, including ventilation. Environmental infection control procedures must consider disease transmission via surfaces, laundry, plants, animals, medical wastes, cloth furnishings, and carpeting. These guidelines do not apply to sick buildings, terrorism, or food safety. Key suggestions include:

- Evaluating the impact of activities on ventilation and water systems
- Creating a multidisciplinary team to conduct infection control risk assessment
- Using dust-control procedures and barriers during construction activities
- Implementing special control measures in any areas with patients at high risk
- Using air sampling to monitor air filtration and dust-control measures
- Controlling tuberculosis risks in operating rooms when infectious patients require surgery
- Culturing water as part of a control program for *Legionella* if appropriate
- Recovering from water system disruptions, leaks, and natural disasters
- Disinfecting surfaces to control antibiotic-resistant microorganisms
- Developing specific infection-control procedures for laundries
- Establishing control procedures for using animals in activities and therapy
- Managing the use of all service animals in healthcare facilities
- Developing strategies for animals receiving treatment in human facilities
- Measuring water use from main lines for dialysis, ice machines, hydrotherapy, dental water lines, and automated endoscope reprocessing equipment

E. BACTERIA AND VIRUSES

**Bacteria** — Once classified as members of the plant kingdom, bacteria are now considered to be a totally separate kingdom. Bacteria adapt remarkably and survive in diverse environmental conditions. They exist in the bodies of all living organisms and in all parts of the world even in hot springs and the stratosphere. Bacteria normally exhibit one of three typical shapes: (1) rod shaped (*Bacillus*), (2) round (cocci), or (3) spiral (*Spirillum*). An additional group (vibrios) appears as incomplete spirals. Bacteria are also characterized by their growth patterns, such as the chains formed by streptococci. *Bacillus* and *Spirillum* bacteria exhibit motile or swimming motions similar to the whip-like movements of flagella. Other bacteria have rod-like appendages (called pili) that serve as tethers. Aerobic forms of bacteria function only in the presence of free or atmospheric oxygen. Anaerobic bacteria cannot grow in the presence of free oxygen but obtain oxygen from other compounds. Bacteria do not make their own food and must live in the presence of other plant or life. Bacteria grow when they find food and favorable conditions. A cough or sneeze releases millions of bacteria.

**Viruses** — Smaller than bacteria, viruses contain a chemical compound containing protein. They must infect a host to survive for long periods. Viruses depend on the host cells to reproduce. Outside of a host cell, a virus exists as a protein coat or capsid that can be enclosed within a membrane. While outside the cell, a virus remains metabolically inert. A virus can insert genetic material to take over the functions of the host. An infected cell begins to produce more viral protein and genetic material instead of its usual products. Some viruses may remain dormant inside host cells for long periods and cause no obvious
change in the host cells. When stimulated, a dormant virus enters a phase that results in new viruses bursting and infecting other cells. Viruses cause a number of diseases, including smallpox, colds, chickenpox, influenza, shingles, hepatitis, polio, rabies, and AIDS. Disinfectants destroy viruses very easily.

### F. HEALTHCARE WORKER IMMUNIZATIONS

Healthcare organizations should establish a comprehensive written policy regarding immunizing workers, develop a listing of all required and recommended immunizations, and refer workers to the employee health department to receive education and guidance on appropriate immunizations needed for their positions. The employee health department must consider an employee’s medical history and current position to determine that worker’s risk for occupational exposure. Administration of vaccines to healthcare workers falls into three basic categories:

- **Strongly recommended** — Diseases posing special risks to healthcare workers include hepatitis B, influenza, measles, mumps, rubella, and varicella
- **Recommended in some situations** — Active and/or passive immunization of healthcare workers as indicated by certain circumstances such as occurrences of tuberculosis, hepatitis A, meningitis, and typhoid fever
- **Recommended for all adults** — Immunization of all adults for tetanus, diphtheria, and pneumonia disease

#### Guidelines of the Advisory Committee for Immunization Practices

All healthcare workers should meet the Advisory Committee for Immunization Practices (ACIP) guidelines for immunization against mumps, rubella, diphtheria, and measles. Vaccinations should include:

- **Rubella** — Workers considered to be at risk or who have direct contact with pregnant patients should be immune to rubella.
- **Hepatitis B** — Workers exposed to bloodborne pathogens should be offered the vaccine within 10 days of their job assignment; refer to Section E in this chapter for additional information.
- **Measles** — For anyone susceptible by history or serology who are considered to be at risk should be immunized.
- **Influenza** — Healthcare personnel should consider receiving flu immunization to help prevent the spread of influenza from personnel to patients; hospitals should promote such a program and provide vaccines during the fall of each year.

#### Other Vaccination Program Considerations

Healthcare organizations must develop comprehensive policies and protocols for management and control of outbreaks of vaccine-preventable diseases as described in the ACIP Guidelines. Healthcare employees working abroad should consider vaccinations for diseases such as hepatitis A, poliomyelitis, encephalitis, meningitis, plague, rabies, typhoid, and yellow fever. Healthcare organizations should develop written policies regarding work restrictions or exclusion from duty for immunization and infection control reasons. They should also require workers to report any illnesses, medical conditions, or treatments that could make them susceptible to opportunistic infections.

#### Pertussis

The Advisory Committee on Immunization Practices (ACIP) makes no recommendation for routinely vaccinating adults, including healthcare workers, for pertussis. Long-term-care facilities serving children and acute-care facilities with children staying for prolonged periods should follow the recommendations of ACIP for vaccinating children. No recommendation can be made for vaccinating adults, including healthcare workers, during an institutional outbreak of pertussis.
Vaccinia Viruses and Smallpox — The ACIP recommends vaccination for orthopoxviruses in laboratory settings for the few workers directly handling cultures or animals contaminated or infected with vaccinia, recombinant vaccinia viruses, or other orthopoxviruses that replicate readily in humans such as monkey pox and cow pox. Some physicians and nurses with limited exposure to contaminated materials such as dressings experience a lower risk but may be considered for vaccination. When indicated, vaccinia vaccine should be administered every 10 years. Vaccinia vaccine should not be administered to immune-suppressed persons, those with a history of eczema, or pregnant women. Vaccinia vaccine is a highly effective immunizing agent that has brought about the global eradication of smallpox. In 1976, routine vaccinia vaccination of healthcare workers in the United States was discontinued. Recently, the federal government instituted a program to vaccinate first responders and healthcare personnel to protect these groups in a bioterrorism event involving smallpox.

Pneumonia — The ACIP recommends vaccination of all persons 65 years or older. Experts now recommend vaccination of those younger than 65 with certain chronic illnesses: chronic cardiovascular disease, chronic pulmonary disease, emphysema, diabetes, alcoholism, chronic liver disease, cerebrospinal fluid leaks, or sickle cell disease. It is also recommended for those younger than 65 living in special environments or social settings where an increased risk for the disease or its complications exists.

Influenza — The ACIP recommends vaccination for those working in hospitals, nursing homes, walk-in clinics, physicians’ offices, public health clinics, employee health clinics, dialysis centers, outpatient rehabilitation programs, and mobile clinics. Inpatients and outpatients at high risk for complications from influenza should receive the vaccine beginning in September and throughout the influenza season.

G. METHICILLIN-RESISTANT STAPHYLOCOCCUS AUREUS

*Staphylococcus aureus* can live on the skin or in the nose of healthy people. During the past 50 years, these infections have become resistant to various antibiotics, including penicillin-related antibiotics. Infection control personnel refer to these resistant bacteria as methicillin-resistant *Staphylococcus aureus* (MRSA). Colonization can occur when the staph bacteria survive on or in the body without causing illness. Staph bacteria causes a variety of illnesses, including skin infections, bone infections, pneumonia, and severe bloodstream infections. MRSA occurs more commonly among persons in hospitals and healthcare facilities. The infection usually develops in elderly hospitalized patients with serious illnesses or in an open wound such as a bedsore. Factors that place some patients at risk include prolonged hospital stays, receiving broad-spectrum antibiotics, and being kept in an intensive-care or burn unit. It is important to keep cuts and abrasions clean and covered with a proper dressings or bandages and to avoid contact with wounds or material contaminated by wounds. Healthcare workers at risk must wash hands and adhere to other standards. Contact precautions should be implemented when MRSA has been identified by infection control as having special clinical or epidemiologic significance. The contact precautions consist of the following:

- Place a patient with MRSA in a private room if possible.
- Wear gloves when entering the room and change them after contact with infective materials that may contain high concentrations.
- Wear a gown when entering the room if you anticipate substantial contact with the patient, environmental surfaces, or items in the patient’s room.
Biological Hazard Control

333

• Wear a gown if the patient is incontinent, has diarrhea, a colostomy, or wound drainage not contained by a dressing.
• Restrict patient movement or transport to essential reasons only.
• During patient movement, maintain precautions to minimize the risk of transmission.
• Clean patient-care items, bedside equipment, and frequently touched surfaces daily.
• When possible, dedicate use of noncritical patient-care equipment items such as stethoscopes, sphygmomanometers, bedside commodes, or electronic rectal thermometers to a single patient.

Controlling MRSA Outbreaks

• Conduct an epidemiologic assessment if an outbreak occurs to identify acquisition risk factors.
• Save clinical isolates of MRSA strain typing.
• Identify colonized or infected patients or residents as soon as possible.
• Require the use of barrier precautions.
• Enforce handwashing procedures.
• Educate workers on appropriate precautions to take when caring for patients colonized or infected with MRSA.
• Request additional help as needed by consulting with the CDC or local and state health departments.

H. DISINFECTANTS, STERILANTS, AND ANTISEPTICS

Many experts divide chemical germicides into three general categories:

• Sterilizing agents, which were developed to eliminate all microbial life on objects or surfaces, including bacterial spores, that can survive other germicides
• Disinfectants, which are classified as high, medium, or low, depending on the strength required, and which can destroy nearly all microbial life on objects or surfaces except for bacterial spores
• Antiseptics, which are used to inactivate or destroy organisms on skin or living tissue (see Table 8.3)
Germicidal Effectiveness — Bacterial spores exhibit the most resistance to germicides followed by mycobacteria, nonlipid viruses, fungi, and vegetative bacteria. Lipid viruses exhibit the least resistance. Facilities should use FDA- or EPA-approved cleaning agents and should read and follow the manufacturer's instructions to ensure proper use. Their effectiveness depends on:

- Shape and texture of the surface
- Amount of contamination on the surface
- Resistance of contaminants to the germicide
- Amount of soil buildup, including blood, mucous, or tissue
- Chemical composition of the germicide
- Time of exposure to the germicide
- Temperature of the germicide

Regulatory Approval of Disinfectants — The EPA oversees the manufacture, distribution, and use of disinfectants. Manufacturers must use pre-established test procedures to ensure product stability, determine toxicity to humans, and assess microbial activity. If the product passes these requirements, the EPA registers the substance for use. The EPA regulates disinfectants under the authority of the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA).

Classifying the Effectiveness of Sterilants and Disinfectants — The Food and Drug Administration (FDA) regulates liquid chemical sterilants and high-level disinfectants such as hydrogen peroxide and peracetic acid under the authority of the 1976 Medical Devices Amendment to the Food, Drug, and Cosmetic Act. The FDA regulates the chemical germicides if marketed for use on specific medical devices. Regulatory authority requires the manufacturer to provide instructions for the safe and effective use of substances with that device. The FDA uses the same basic terminology and classification scheme as does the CDC, which categorizes medical devices as critical, semi-critical, and noncritical. The scheme classifies antimicrobial effectiveness or sterilization as high, intermediate, and low level. The EPA registers environmental surface disinfectants based on the manufacturer’s microbiological activity claims. The EPA does not use the terms “intermediate level” and “low level” when classifying disinfectants. The CDC designates any EPA-registered hospital disinfectant not claiming a tuberculocidal claim as a low-level disinfectant; however, an EPA-registered hospital disinfectant effective against tuberculosis would be classified as an intermediate-level disinfectant. The EPA also lists disinfectant products according to their labeled use against certain organisms.

OSHA Requirements — The Occupational Safety and Health Administration requires the use of EPA-registered hospital tuberculocidal disinfectants or EPA-registered hospital disinfectants labeled effective against human immunodeficiency virus (HIV) and hepatitis B virus (HBV) for decontaminating work surfaces. Hospital disinfectants with HIV and HBV claims can be used if surfaces are not contaminated with agents requiring the use of a higher level disinfectant. Effectiveness is governed by strict adherence to the label instructions for intended use of the product.

CDC Recommendations — The CDC does not test, evaluate, or otherwise recommend specific brand-name products of chemical germicides. The CDC recommends disinfecting environmental surfaces or sterilizing or disinfecting medical equipment with products approved by the EPA and FDA. When no registered or approved products are available for a specific pathogen or use situation, the CDC suggests following specific guidance regarding unregistered uses for various chemical germicides. For example, no antimicrobial products
are registered for use specifically against certain emerging pathogens such as SARS, Norwalk virus, or Creutzfeldt–Jakob disease agents. The CDC disinfecting levels are:

- High-level disinfection, which can be expected to destroy all microorganisms with the exception of high numbers of bacterial spores
- Intermediate-level disinfection, which inactivates *Mycobacterium tuberculosis*, vegetative bacteria, most viruses, and most fungi but does not necessarily kill bacterial spores
- Low-level disinfection, which can kill most bacteria, some viruses, and some fungi but cannot be relied on to kill resistant microorganisms such as tubercle bacilli or bacterial spores

**Selecting a Disinfectant** — Healthcare facilities use a number of disinfectants, including alcohol, chlorine, chlorine compounds, hydrogen peroxide, iodophors, phenolics, and quaternary ammonium compounds. Disinfectants are not interchangeable. Proper selection and use of disinfectants are key to effective safety and quality control.

**Alcohols** — Alcohols demonstrate variable effectiveness against some bacterial and fungal species. They are good general-use disinfectants that are fast acting, leave no residue, and compatibly combine with other disinfectants (quaternaries, phenolics, and iodine) to form tinctures.

**Aldehydes** — Aldehydes are effective against a wide spectrum of bacteria and viruses. They are also effective against spores when used properly (10-hour contact period) and demonstrate activity against other pathogens, including vegetative bacteria and viruses.

**Chlorine Compounds** — Chlorine works very well for cleaning up blood or body-fluid spills. Chlorine compounds also have a biocidal effect on tuberculosis and vegetative bacteria. They are effective against HIV after 10 to 20 minutes and are also effective at a 1:5 dilution against bacterial spores and mycobacteria. Diluted chlorine neutralizes rapidly in the presence of organic matter. Chlorine compounds are very effective for the decontamination of HBV, HCV, and HIV and the cleanup of biohazardous spills.

**Iodophor Substances** — Iodophor substances show good effective qualities against vegetative bacteria and viruses. They demonstrate poor activity against bacterial spores but are effective against Gram-negative and Gram-positive organisms, some viruses, and tubercle bacilli. They are most effective in acid solutions but can vaporize at 120 to 125°F. They should never be used in hot water, and their effectiveness can be reduced by organic matter.

**Phenolic Compounds** — Phenolic compounds work well against vegetative bacteria, fungi, and lipid-containing viruses. They have low solubility in water, remain stable in storage, and demonstrate germicidal effectiveness against Gram-negative and Gram-positive organisms. They are very effective against tuberculosis but have limited effectiveness against spores. Prolonged contact to phenolic compounds deteriorates rubber and can cause skin and eye irritations. They should never be used on food-contact surfaces.

**Quaternary Ammonium Compounds** — Quaternary ammonium compounds can control vegetative bacteria and nonlipid-containing viruses. They remain stable when stored. The present no odor but can act as deodorizers. They are not considered a skin irritant but it is best to avoid skin or eye contact. They are effective at up to 212°F and work well against Gram-positive organisms. These compounds become bacteriostatic in high dilutions and are ineffective against tubercle bacilli, spores, and viruses. They are more effective in alkaline solutions but can be neutralized by soap or hard water. Organic compounds also reduce their effectiveness.

Hand Hygiene Performance Indicators

- Conduct compliance surveys by unit or department and provide feedback to workers.
- Calculate the volume of alcohol product used per 1000 patient days.
- Monitor artificial nail wearing compliance during outbreaks.
- Assess hand hygiene compliance during infection outbreaks.

OSHA Handwashing References (29 CFR 1910.1030) — In paragraph (d)(2), the OSHA Bloodborne Pathogens standard requires that workers wash their hands immediately or as soon as feasible after the removal of gloves or other personal protective equipment. Paragraph (vi) states that workers should wash their hands and any other skin with soap and water or flush mucous membranes with water immediately or as soon as feasible following contact of such body areas with blood or other potentially infectious materials. Workers removing gloves after exposure to blood or other potentially infectious materials must wash their hands in an appropriate soap and running water. Workers with no access to a readily available sink after an exposure may decontaminate hands with a hand cleanser or towelette; however, workers must wash their hands with soap and running water as soon as feasible. When no exposure or contact occurs with blood or other potentially materials, as defined in 29 CFR 1910.1030(b), the use of alcohol-based hand cleansers described in the CDC’s 2002 guidelines would be appropriate.

I. HEPATITIS AND HIV

Hepatitis A Virus (Infectious Hepatitis) — This disease is primarily transmitted by person-to-person contact. It can also be contracted from contaminated uncooked shellfish, fruits or vegetables, and contaminated water. Occupational exposure generally does not increase healthcare worker risk for hepatitis A (HAV) infection. When proper infection control practices are followed, HAV transmission is rare. Transmission of HAV from adult patients to healthcare workers is usually associated with fecal incontinence in the patients; however, most patients hospitalized with hepatitis A are admitted after the onset of jaundice, when they are beyond the point of peak infectivity. Serologic surveys among many types of healthcare workers have not identified an elevated prevalence of HAV infection compared with other occupational populations.

Hepatitis B Virus — Hepatitis B virus (HBV) remains the world’s most common blood-borne viral infection. The virus that causes HBV is found in blood and other body fluids, including semen, vaginal secretions, urine, and even saliva. Hepatitis B can be very serious and even fatal, but most infected individuals either display no symptoms or have nonspecific flu-like symptoms. About 25% will become ill with jaundice. Most people recover from HBV infection, but up to 10% become chronic carriers. These chronic carriers are capable of spreading the disease to others for an indefinite period of time and are at high risk for long-term complications such as cirrhosis of the liver and primary liver cancer. Although the vehicle for transmission of the virus is often blood and blood products, viral antigen has also been found in tears, saliva, breast milk, urine, semen, and vaginal secretions. The virus is capable of surviving for 7 days or more on environmental surfaces exposed to body fluids containing the virus. Infection may occur when the virus is transmitted by infected body fluids or implanted via mucous surfaces, or when the virus is cutaneously introduced through accidental or deliberate breaks in the skin.
Hepatitis B Virus Transmission

- HBV is transmitted more easily than HIV and is commonly spread through sexual contact, sharing needles among drug abusers, injuries caused by contaminated objects such as needles, and infected blood and blood products that enter through the eyes, mouth, or a break in the skin.
- While virtually anyone can get hepatitis B, some populations are at higher risk for becoming infected.
- High-risk occupations with exposure to blood or other body fluids include physicians, dentists, nurses, law enforcement officers, and firefighters.
- HBV can cause either acute or chronic outcomes. About 6 to 10% of adults cannot clear the virus from their liver cells and become chronic HBV carriers.
- In cases of acute infection, one third show no symptoms, one third have a relatively mild case of flu-like illness, and one third have more severe responses, including jaundice, dark urine, extreme fatigue, anorexia, nausea, abdominal pain, joint pain, rash, and fever.
- Death may occur in 1 to 2% of these cases.

Hepatitis B Vaccination — All healthcare workers with exposure to blood, blood-contaminated body fluids, other body fluids, or sharps should be vaccinated. Hepatitis B vaccine should always be administered by the intramuscular route in the deltoid muscle. The OSHA Bloodborne Pathogens standard requires employers to offer the hepatitis B vaccine free of charge to all potentially exposed employees within 10 days of hire. Pre-vaccination serologic screening for previous infection is not indicated for persons being vaccinated because of occupational risk unless the hospital or health-care organization considers screening cost effective. Post-exposure prophylaxis with hepatitis B immunoglobulin (HBIG) (passive immunization) and/or vaccine (active immunization) should be utilized when indicated after percutaneous or mucous membrane exposure to blood known or suspected to be hepatitis B surface antigen (HBsAg) positive. Needlestick or other percutaneous exposures of unvaccinated persons should lead to initiation of the hepatitis B vaccine series.

Hepatitis B Vaccination Requirements

- OSHA requires employers to offer the HBV vaccination series to all workers with potential occupational exposure to blood or other potentially infectious material within 10 days of hire.
- Employers should always follow U.S. Public Health Service and CDC recommendations for hepatitis B vaccination, serologic testing, follow-up, and booster dosing.
- Employers should test workers for anti-HBs 12 months after completion of the three-dose vaccination series.
- Workers should complete a second three-dose vaccine series or be evaluated to determine if they are HBsAg positive if no antibody response occurs to the primary vaccine series.
- Workers should be retested for anti-HBs at the completion of the second vaccine series. If no response to the second three-dose series occurs, nonresponders should be tested for HBsAg.
- Vaccination nonresponders who are HBsAg negative should be counseled regarding their susceptibility to HBV infection and precautions.
- Employers should provide employees with appropriate education regarding the risks of HBV transmission and availability of the vaccine. Employees who decline the vaccination should sign a declination form to be kept on file with the employer.
- The vaccination must be made available without cost to the employee, at a reasonable time and place for the employee, by a licensed healthcare professional and
according to recommendations of the U.S. Public Health Service, including routine booster doses.

- The healthcare professional designated by the employer to implement this part of the standard must be provided with a copy of the Bloodborne Pathogens standard.
- The healthcare professional must provide the employer with a written opinion stating whether the hepatitis B vaccination is indicated for the employee and whether the employee has received the vaccination.

**When the Hepatitis B Vaccination Is Not Required**

- Employees who have previously completed the hepatitis B vaccination series
- Immunity is confirmed through antibody testing
- Vaccine is contraindicated for medical reasons
- Following participation in a prescreening program
- Employees who decline the vaccination (although these employees may request and obtain it at a later date if they continue to be exposed)

*Note:* Employees who decline to accept the hepatitis B vaccination must sign a declination form indicating that they were offered the vaccination but refused it.

**Hepatitis C Virus** — Hepatitis C virus (HCV) is a viral infection of the liver that is transmitted primarily by exposure to blood. Currently, no vaccine is effective against HCV. Hepatitis C virus is the etiologic agent in most cases of parenterally transmitted non-A, non-B hepatitis in the United States. The CDC estimates that 2 to 4% of infections among healthcare personnel occurred in those occupationally exposed to blood. At least 85% of persons who contract HCV infection become chronically infected. Up to 10% of parenterally transmitted non-A, non-B hepatitis may be caused by other bloodborne viral agents not yet characterized (non-ABCDE hepatitis). Most HCV transmission is associated with direct percutaneous exposure to blood; therefore, healthcare institutions should consider implementing policies and procedures to monitor workers for HCV infection after exposures to blood. Alpha-interferon therapy is safe and effective for the treatment of chronic HCV. Interferon must be administered by injection and may cause side effects. Based on these considerations, antiviral agents are not recommended for post-exposure prophylaxis of HCV infection. In the absence of effective prophylaxis, persons who have been exposed to HCV may benefit from knowing their infection status so they can seek evaluation for chronic liver disease and treatment.

**Human Immunodeficiency Virus** — Human immunodeficiency virus (HIV) affects the immune system, rendering the infected individual vulnerable to a wide range of disorders. Infections typically lead to the death of the patient. Symptoms can occur within a month and can include fever, diarrhea, fatigue, and rash. Exposed persons may develop antibodies and be without symptoms for months to years. The infected person may finally develop a wide range of symptoms, depending on the opportunistic infections against which the person’s immune system cannot defend.

**Exposure and Transmission Routes of Human Immunodeficiency Virus**

- Contact with blood, semen, vaginal secretions, and breast milk
- Sexual intercourse
- Using needles contaminated with the virus
- Contact with HIV-infected blood under the skin, mucous membranes, or broken skin
- Mother to child contact at the time of birth
- Blood transfusions or organ transplants
Workplace Transmission of Human Immunodeficiency Virus

- Body fluids such as saliva, semen, vaginal secretions, cerebrospinal fluid, synovial fluid, pleural fluid, peritoneal fluid, pericardial fluid, amniotic fluid, and any other body fluids visibly contaminated with blood
- Saliva and blood contacted during dental procedures
- Unfixed tissue or organs other than intact skin from living or dead humans
- Organ cultures, culture media, or similar solutions
- Blood, organs, and tissues from experimental animals infected with HIV or HBV

Means of Transmission

- Accidental injury with a sharp object contaminated with infectious material, such as needles, scalpels, broken glass, and anything that can pierce the skin
- Open cuts, nicks, skin abrasions, dermatitis, acne, and mucous membranes
- Indirect transmission, such as touching a contaminated object or surface and transferring the infectious material to the mouth, eyes, nose, or open skin

J. OSHA BLOODBORNE PATHOGENS STANDARD (29 CFR 1910.1030)

Needlestick Safety and Prevention Act of 2000 — On November 6, 2000, President Clinton signed the Needlestick Safety and Prevention Act (Pub. L. 106-430). The Act required OSHA to revise the OSHA Bloodborne Pathogens standard within 6 months of enactment of the Act. To facilitate expeditious completion of this directive, Congress explicitly exempted OSHA from procedural requirements generally required under the rule-making provision of the act (paragraph 6(b)) and from the procedural requirements of the Administrative Procedure Act (5 U.S.C. 500 et seq.).

Bloodborne Pathogens Standard — The Bloodborne Pathogens standard sets forth requirements for employers with workers exposed to blood or other potentially infectious materials. In order to reduce or eliminate the hazards of occupational exposure, an employer must implement an exposure control plan for the worksite with details on employee protection measures. The plan must also describe how an employer will use a combination of engineering and work practice controls, ensure the use of personal protective clothing and equipment, and provide training, medical surveillance, hepatitis B vaccinations, and signs and labels, among other provisions. Engineering controls are the primary means of eliminating or minimizing employee exposure and include the use of safer medical devices, such as needleless devices, shielded needle devices, and plastic capillary tubes. Many different medical devices have been developed to reduce the risk of needlesticks and other sharps injuries. These devices replace sharps with non-needle devices or incorporate safety features designed to reduce injury. Despite these advances in technology, needlesticks and other sharps injuries continue to be of concern due to the high frequency of their occurrence and the severity of the health effects. The CDC estimates that healthcare workers sustain nearly 600,000 percutaneous injuries annually involving contaminated sharps.

In response to both the continued concern over such exposures and the technological developments that can improve employee protection, Congress passed the Needlestick Safety and Prevention Act directing OSHA to revise the Bloodborne Pathogens standard to establish in greater detail requirements that employers identify and make use of effective and safer medical devices. That revision, which became effective April 18, 2001, added new requirements for employers, including additions to the exposure control plan and keeping a sharps
injury log. It did not impose new requirements for employers to protect workers from sharps injuries; the original standard already required employers to adopt engineering and work practice controls that would eliminate or minimize employee exposure from hazards associated with bloodborne pathogens. The revision does, however, specify in greater detail the engineering controls, such as safer medical devices, that must be used to reduce or eliminate worker exposure. The revised exposure control plan requirements make clear that employers must implement safer medical devices that are appropriate, commercially available, and effective and should get input from those responsible for direct patient care. The updated standard also requires employers to maintain a log of injuries from contaminated sharps.

**Exposure Control Plan** — The revision included new requirements regarding the employer’s exposure control plan, including an annual review and update to reflect changes in technology that eliminate or reduce exposures to bloodborne pathogens. The employer must:

- Consider new innovations in medical procedures and technology that reduce the risk of exposure of workers to needlesticks.
- Consider and document the use of appropriate, commercially available, and effective safer needle type.
- Realize that no single medical device can be appropriate or effective for all circumstances.
- Identify devices that were candidates for use, the method used to evaluate those devices, and justification for the eventual selection.
- Select devices that, based on reasonable judgment, will not jeopardize patient or employee safety or be medically inadvisable.
- Select devices that will make an exposure incident involving a contaminated sharp less likely to occur.

**Employee Input** — Employers must solicit input from nonmanagerial employees responsible for direct patient care regarding the identification, evaluation, and selection of effective engineering controls, including safer medical devices. Employees selected should represent the range of exposure situations encountered in the workplace, such as those in geriatric, pediatric, or nuclear medicine and others involved in the direct care of patients. OSHA will check for compliance with this provision during inspections by questioning a representative number of employees to determine if and how their input was requested. Employers are required to document, in the exposure control plan, how they received input from employees. This obligation can be met by listing the employees involved and describing the process by which input was requested. Employers can also present other documentation, including references to the minutes of meetings, copies of documents used to request employee participation, or records of responses received from employees.

**Recordkeeping** — Employers who have employees occupationally exposed to blood or other potentially infectious materials and who are required to maintain a log of occupational injuries and illnesses under existing recordkeeping rules must also maintain a sharps injury log. This log must be maintained in a manner that protects the privacy of employees. The sharps injury log may include additional information as long as an employee’s privacy is protected. The format of the log can be determined by the employer. At a minimum, the log will contain the following:

- Type and brand of device involved in the incident
- Location of the incident (e.g., department or work area)
- Description of the incident
Modification of Definitions — The revision to the Bloodborne Pathogens standard includes modification of definitions relating to engineering controls. Two terms have been added to the standard, while the description of an existing term has been amended.

Engineering Controls — Engineering controls include all control measures that isolate or remove a hazard from the workplace, such as sharps disposal containers and self-sheathing needles. The original Bloodborne Pathogens standard was not specific regarding the applicability of various engineering controls (other than the above examples) in the healthcare setting. The revision now specifies that safer medical devices, such as sharps with engineered sharps injury protections and needleless systems, constitute an effective engineering control.

Sharps with Engineered Sharps Injury Protection — “Sharps with engineered sharps injury protection” is a new term that includes non-needle sharps or needle devices containing built-in safety features that are used for collecting fluids or administering medications or other fluids, or other procedures involving the risk of sharps injury. This description covers a broad array of devices, including:

- Syringes with a sliding sheath that shields the attached needle after use
- Needles that retract into a syringe after use
- Shielded or retracting catheters
- Intravenous medication (IV) delivery systems that use a catheter port with a needle housed in a protective covering

Needleless Systems — “Needleless systems” is a new term defined as devices that provide an alternative to needles for various procedures to reduce the risk of injury involving contaminated sharps. Examples include intravenous medication systems that administer medication or fluids through a catheter port using non-needle connections. Another example would be jet injection systems, which deliver liquid medication beneath the skin or through a muscle.

Exposure Determination — Exposure determination involves listing all job classifications in which employees will be exposed (such as doctors and nurses) or may occasionally be exposed (such as custodians and laundry workers) to potentially infectious materials on the job. Any specific procedures or tasks in which exposure occurs must also be listed without regard to the use of personal protective equipment.

Control Measures — Employers should take appropriate preventative measures against occupational exposure. These include engineering controls and work practice controls. Examples of engineering controls include biohazard hoods, puncture-resistant sharps containers, mechanical pipette devices, and other devices that permanently remove the hazard or help isolate workers from exposure. As new devices become available due to updated technologies, they should be incorporated as engineering controls. These might include needleless devices, needles with sheaths, and blunt suture needles. Work practice controls include handwashing policies, sharps handling procedures, proper waste disposal techniques, and others to reduce the likelihood of exposure by altering the manner in which the task is performed (29 CFR 1910.1030(d)(2)). Employers should provide personal protective equipment to employees with occupational exposure to eliminate or minimize the risk of infectious material entering their bodies. Personal protective equipment is considered to be appropriate only if it does not permit blood or other potentially infectious materials to pass through or reach the employee’s outer clothing, undergarments, skin, eyes, mouth, or other mucous membranes under normal conditions of use.
Personal Protective Equipment — Personal protective equipment is specialized clothing or equipment used by employees to protect against direct exposure to blood or other potentially infectious materials:

- Wear gloves whenever hand contact with blood or other potentially infectious materials is possible.
- Replace disposable (single-use) gloves, such as examination gloves, as soon as possible when they have been contaminated or when their ability to function as a barrier is compromised.
- Do not reuse disposable gloves.
- Decontaminate utility gloves for reuse, but they must be discarded if they become cracked, discolored, or punctured or show any signs of deterioration.
- Wear masks, eye protection, face shields, or a combination of these whenever exposure to splashes, spray, or droplets of infectious materials is possible.
- Wear gowns, aprons, and other protective clothing to protect against exposure to the body, head, feet, or clothing.

The type and characteristics of the covering will depend on the task and exposure anticipated.

Housekeeping, Laundry, and Waste Practices — Employers should create a schedule for periodic cleaning and appropriate disinfecting to ensure that the worksite is kept clean and sanitary. Workers should place and transport contaminated laundry in properly labeled or color-coded bags and containers. They should disinfect contaminated work surfaces upon completion of procedures; when the surfaces have been contaminated by splashes or spills; when surfaces have come into contact with blood or other potentially infectious materials; and at the end of the work shift. All forms of blood or infectious materials, contaminated items that could release infectious materials, or contaminated sharps must be placed in appropriate sharps containers or closable, color-coded, or properly labeled leakproof containers or bags. Infectious waste should be disposed of in accordance with federal, state, and local regulations. Warning labels should be attached to all containers used for the storage or transport of potentially infectious materials. The labels should be orange or red-orange with the biohazard symbol in a contrasting color. Red containers or bags can be substituted for warning labels.

Post-Exposure Evaluation and Follow-Up — Employers should provide a confidential medical evaluation for any employees involved in an exposure incident. The purpose of this evaluation is to document the exposure route and circumstances surrounding the incident, blood testing, HIV/HBV status of source, and appropriate medical and psychological treatment. An exposure incident is the specific eye, mouth, mucous membrane, non-intact-skin, or other parenteral contact with potentially infectious material that results from the performance of an employee’s duties. Employees should immediately report exposure incidents to permit timely medical evaluation and follow-up by a healthcare professional. The employer can request testing of the source individual’s blood for HIV and HBV. A source individual is any patient whose blood or body fluids are the source of an exposure incident to an employee. At the time of the exposure, the exposed employee must report to a healthcare professional. The employer must provide the healthcare professional with a copy of the Bloodborne Pathogens standard and a description of the employee’s job duties as they relate to the incident. The employer also must provide a report of the specific exposure, including route of exposure, relevant employee medical records (including hepatitis B vaccination status), and results of the source individual’s blood tests, if available. A baseline blood sample should be drawn if the employee consents. If the employee elects to delay
HIV testing of the sample, the healthcare professional must preserve the employee's blood sample for at least 90 days. Testing the source individual's blood does not have to be repeated if the source individual is known to be infectious for HIV or HBV. Testing cannot be done in most states without written consent. The results of the source individual's blood test are confidential, but the results must be made available to the exposed employee through consultation with the healthcare professional.

The healthcare professional will provide a written opinion to the employer. This opinion is limited to a statement that the employee has been informed of the results of the evaluation. It also recommends further evaluation or treatment as necessary. The employer must provide a copy of the written opinion to the employee within 15 days. This is the only information shared with the employer following an exposure incident. All other employee medical records are confidential. All evaluations and follow-up visits must be available at no cost to the employee. They must take place at a reasonable time and place. Evaluations and follow-up visits must be performed by or under the supervision of a licensed physician or another licensed healthcare professional. All evaluations must follow the U.S. Public Health Service guidelines current at the time. All laboratory tests must be conducted by an accredited laboratory and at no cost to the employee.

**Recordkeeping and Employee Training Requirements** — The employer should maintain medical and training records for each employee who faces the possibility of being exposed or who has been occupationally exposed to a bloodborne pathogen. Employers are also required to establish and maintain a sharps injury log. Employees should receive annual training to be sure they understand the hazards associated with bloodborne pathogens, the modes of transmission, the exposure control plan, the regulation itself, the use and limitations of engineering controls, new devices that utilize updated technologies, work practices, and personal protective equipment.

**Other Topics**

- Employees should be familiar with what to do when confronted with an emergency involving blood or other potentially infectious materials, post-exposure evaluations, the HBV vaccine, and the use of signs and labels.
- When employees have received their training, vaccinations should be made available to those who run the risk of exposure.
- Employers should establish a medical record for each employee with occupational exposure; this record is confidential and kept separate from other personnel records.
- Employers can keep these records onsite or they may be retained by the healthcare professionals who provides services to the employees.
- The medical record contains the employee's name, Social Security number, HBV vaccination status, date of the HBV vaccination (if applicable), and the written opinion of the healthcare professional regarding the hepatitis B vaccination.
- An occupational exposure must be noted in the medical record to document the incident, and the results of testing following the incident should be included.
- The post-evaluation written opinion of the healthcare professional is also part of the medical record.
- The medical record must document what information has been provided to the healthcare provider.
- Medical records must be maintained 30 years past the last date of employment of the employee.
- Emphasis is on confidentiality of medical records; no medical record or part of a medical record should be disclosed without direct written consent of the employee or as required by law.
• Training records documenting each training session are to be kept for 3 years.
• Training records must include the date, content outline, trainer’s name and qualifications, and names and job titles of all persons attending the training sessions.
• Employers who cease to do business should transfer the medical and training records to the successor employer.
• Upon request, both medical and training records must be made available to the Assistant Secretary of Labor for Occupational Safety and Health.
• Training records must also be available to the employee upon request; medical records can be obtained by the employee or anyone who has the employee’s written consent.

OSHA Bloodborne Pathogens Compliance References

Exposure Control Plan — The plan may be part of a larger document but, because the plan must be accessible to employees, it must be a cohesive entity by itself or the employer must provide a guiding document that states overall policy goals and references the elements of existing, separate policies that comprise the plan. Employers must annually review and update the plan to reflect significant modifications in tasks or procedures required in paragraph (c)(1)(iv). The plan must be available to workers on their shifts. If it is maintained solely on computer, employees must be trained to operate the computer. Paragraph (c)(1)(iv) requires the exposure control plan to be reviewed and updated at least annually (every 12 months) and whenever necessary to reflect new or modified tasks and procedures that affect occupational exposure and to reflect new or revised employee positions with occupational exposure. A periodic review ensures that the exposure control plan remains current with the latest information and scientific knowledge pertaining to bloodborne pathogens. The exposure control plan must document consideration and implementation of appropriate commercially available and effective engineering controls designed to eliminate or minimize exposure. The employer must review and update the plan, as necessary, to reflect changes in technology, such as the use of effective engineering controls, that can eliminate or minimize exposures. If the employer does not review and update its exposure control plan at least annually, paragraph (c)(1)(iv) should be cited (refer to the model exposure control plan in the appendix of this text).

Engineering Controls and Handwashing Facilities — The OSHA compliance officer evaluates the procedures for regular checking and evaluation of engineering controls as required by (d)(2)(ii). Paragraphs (d)(2)(iii) through (d)(2)(vi) require employers to provide handwashing facilities that are readily accessible to employees. Handwashing with soap and at least tepid running water must be performed as soon as feasible, particularly in cases of gross contamination, to adequately flush contaminated material from the skin. Paragraph (d)(2)(iv) allows the use of alternative handwashing methods as an interim measure when soap and water are not a feasible means of washing the hands or other parts of the body. In such cases, the employer must provide either antiseptic hand cleaner and clean cloth/paper towels or antiseptic towelettes. When using alternative methods, workers must wash their hands with soap and running water as soon as feasible thereafter.

Hepatitis B Vaccine — Paragraph (f)(1) refers to both the hepatitis B vaccine and vaccination series. In paragraph (f)(1)(ii)(A), “at no cost to the employee” means the employee should incur no out-of-pocket expense of any kind. The employer may not institute a program in which employees pay the original cost of the vaccine and are reimbursed by the employer if they remain employed for a specified period of time. An “amortization contract” that requires employees to reimburse the employer for the cost of the vaccination should they leave the organization prior to a specified period of time is similarly prohibited. A waiver of liability with respect to acceptance of the vaccine is also prohibited. The term “reasonable time and place” means that the medical procedures and evaluations must be convenient to
the employee. The employer should normally offer the vaccination during the employee's scheduled work hours.

**Labeling of Containers** — The standard’s labeling requirements do not preempt either the U.S. Postal Service labeling requirements (39 CFR Part III) or the DOT’s Hazardous Materials Regulations (49 CFR 171 and 180). DOT labeling is required on some transport containers (i.e., those containing “known infectious substances”). It is not required on all containers for which 29 CFR 1910.1030 requires the biohazard label. Where an overlap occurs between the OSHA-mandated label and the DOT-required label, placement of the DOT label on the outside of the transport container will be considered acceptable, provided the OSHA-mandated label appears on any internal containers that may be present. Containers serving as collection receptacles within a facility must bear the OSHA label because these are not covered by the DOT requirements.

**Information and Training** — Paragraph (g)(2) requires all employees with occupational exposure to receive initial and annual training on the hazards associated with exposure to bloodborne pathogens. The training must also address the protective measures required to minimize the risk of occupational exposure. Training must include instruction in any new techniques and practices. Employers should conduct retraining whenever changes in procedures or tasks occur. The provisions for employee training are performance oriented but offer the flexibility to tailor presentations to the employees’ backgrounds and responsibilities while still covering the topics listed in paragraph (g)(2)(vii). Training requires site-specific information. Annual retraining for employees must be provided within 1 year of their original training. Refresher training must cover topics listed in the standard to the extent needed and must emphasize new information or procedures. Employers must train part-time, temporary employees, workers referred by an agency, or *per diem* employees. Paragraph (g)(2)(vii)(F) requires training to include an explanation of the use and limitations of methods that will prevent or reduce exposure, including appropriate engineering controls, work practices, and personal protective equipment. “Hands-on” training is particularly useful.

**Training Methods and Interactive Question Opportunities** — Training employees solely by means of a film or video without the opportunity for a discussion period would constitute a violation of this paragraph. Similarly, a generic computer program, even an interactive one, is not considered appropriate unless the employer supplements such training with the site-specific information required (e.g., the location of the exposure control plan and the procedures to be followed if an exposure incident occurs) and a person is accessible for interaction. Trainees must have direct access to a qualified trainer during training. OSHA’s requirement can be met if trainees have direct access to a trainer by way of a telephone hotline. The use of an electronic mail system to answer employee questions is not considered direct access to a qualified trainer, unless the trainer is available to answer e-mailed questions at the time the questions arise.

**Trainer Qualifications** — Paragraph (g)(2)(viii) requires persons conducting training to be knowledgeable in the subject matter covered by the elements contained in the training program. The trainer must demonstrate expertise in the area of the occupational hazard of bloodborne pathogens and be familiar with local procedures. Personnel such as infection control practitioners, registered nurses, occupational health professionals, physician’s assistants, emergency medical technicians, industrial hygienists, and professional trainers may conduct the training provided they are knowledgeable in the subject matter covered by the elements of the training program as it relates to the workplace. In dentist and physician offices, the individual employer may conduct the training, provided he or she is familiar with bloodborne pathogen exposure control and the subject matter required by paragraphs (g)(2)(vii)(A) through (N).
Medical Recordkeeping — In 29 CFR 1910.1030(h), employers are required to keep medical and training records for each employee. Medical records required by paragraph (h)(1) are of particular importance to healthcare professionals, as they pertain to vaccination status and recommendations for treatment in the event of an exposure incident. The provisions of 29 CFR 1910.1020(d)(1) state that the medical records of employees working for less than 1 year need not be retained beyond the term of employment if they are provided to the employee upon termination of employment. Paragraph (h)(1) requires that medical records must be kept confidential except for disclosures permitted when required by this standard or other federal, state, or local law. All medical records required to be kept by this standard are also required to be made available to OSHA. The compliance officer must protect the confidentiality of these records. If they are copied for the case file, the provisions of 29 CFR 1913.10 must be followed. Records regarding employee exposure to bloodborne pathogens and documenting HIV/HBV status are medical records within the meaning of 29 CFR 1910.1020.

Training Records — Paragraph (h)(2) requires accurate recordkeeping of training sessions, including titles of the employees who attend. The records are necessary to assist the employer and OSHA in determining whether a training program has adequately addressed the risks involved in each job. Additionally, this information is helpful in tracking the relationship between exposure incidents and the corresponding level of training. Training records may be stored onsite where the actual documents are easily accessible for review, and they must be retained for 3 years from the training date. In order to ensure that the employee training is complete, all the components of the program required by paragraph (g)(2)(vii) must be covered. Training records are not considered to be confidential.

Hazardous Waste Operations and Emergency Response (29 CFR 1910.120) — The Hazardous Waste Operations and Emergency Response (HAZWOPER) standard covers workers expected to respond to emergencies caused by the uncontrolled release of a hazardous substance. The definition of a hazardous substance includes any biological agent or infectious material that may cause disease or death. Potential scenarios where the Bloodborne Pathogens and HAZWOPER standards may interface include healthcare workers responding to an emergency caused by the uncontrolled release of infectious material. Employers of employees engaged in this type of activity must comply with the requirements of 29 CFR 1910.120 as well as the Bloodborne Pathogens standard. In case of a conflict or overlap, the provision that is more protective of employee safety and health applies.

Latex Allergies — The Bloodborne Compliance Directive requires OSHA compliance officers to evaluate potential latex allergy issues when verifying compliance with the Bloodborne Pathogens standard. The FDA now requires labeling statements for medical devices that contain natural rubber and prohibits the use of the word “hypoallergenic” to describe such products (Federal Register, Vol. 62, No. 189, September 30, 1998). A summary is provided in the FDA talk paper Latex Labeling Required for All Medical Devices (September 30, 1997). OSHA’s Bloodborne Pathogens standard requires handwashing after removal of gloves or other personal protective equipment to help minimize the amount of powder or latex remaining in contact with the skin (29 CFR 1910.1030(d)(2)(v)).

Employees can develop latex sensitivity or latex allergy from exposure to latex in products such as latex gloves. It is estimated that 8 to 12% of healthcare workers are latex sensitive and experience reactions ranging from irritant contact dermatitis and allergic contact sensitivity to immediate, possibly life-threatening sensitivity. Many workers who are not traditional healthcare workers, such as housekeepers, laundry workers, and gardeners, are exposed to latex products and latex allergy (see Table 8.4). Among the alternatives are synthetic, low-protein, and powder-free gloves. Powder-free gloves may reduce systemic
TABLE 8.4 Latex Control Recommendations

Use good housekeeping practices to remove latex-containing dust from the workplace:
- Frequently clean areas contaminated with latex dust (upholstery, carpets, ventilation ducts, and plenums).
- Frequently change ventilation filters and vacuum bags used in latex-contaminated areas.

Employ appropriate work practices to reduce the chance of reactions to latex:
- When wearing latex gloves, do not use oil-based hand creams or lotions (which can cause glove deterioration) unless they have been shown to reduce latex-related problems and maintain glove barrier protection.
- After removing latex gloves, wash hands with a mild soap and dry thoroughly.
- Do not use latex gloves when there is no risk of exposure to blood or other potentially infectious materials.

K. TUBERCULOSIS

The 1994 CDC Tuberculosis Guidelines — The CDC describes *Mycobacterium tuberculosis* as a slow-growing bacteria that affects the respiratory tract of humans. The bacteria can be carried in airborne particles or droplet nuclei. Exposure risks occur when generated by infected people through speaking, coughing, sneezing, and during medical procedures. These micron-sized particles remain airborne via ordinary air ventilation that can circulate the particles through a room, building, or vehicle. If a susceptible person inhales an airborne particle containing *M. tuberculosis*, the bacteria begins to grow in the alveoli (small air sacs) of the lungs and then spreads throughout the body. The human immune system can usually control the infection within 2 to 10 weeks; however, in some infected individuals the illness may not develop for years. Infections are dependent on several factors. A risk exists when a concentration of infectious particles in the air is created due to inadequate fresh-air ventilation or by the recirculation of air containing infectious particles. A secondary factor of infection is that certain population segments have a higher incidence of tuberculosis. An infected person is one who has a positive tuberculin skin test but exhibits no symptoms. A person exhibiting the symptoms of tuberculosis is known as active and is highly infectious to others. The CDC guidelines emphasize the importance of control measures, including administrative and engineering controls and personal respiratory protection. The use of risk assessments should be considered when developing a written tuberculosis control plan. The CDC has also redefined a high-risk setting as an outbreak setting in which there is evidence of transmission of tuberculosis.

The risk for exposure to tuberculosis in a given area depends on the prevalence of tuberculosis in the population served and the characteristics of the environment, including the community. Designated personnel at each facility should conduct a formal risk assessment for the entire facility, each area, and each occupational group to determine the risk for occupational transmission of tuberculosis. The CDC defines specific elements that comprise the risk assessment, including review of the community tuberculosis profile from public health department data and an analysis of purified protein derivative skin test results of healthcare workers. Using the results of the risk assessment, one of five categories of risk is
assigned to the facility, the specific area, or the specific occupational group. The facility should then implement an appropriate tuberculosis infection control program, based on the risk classification (minimal, very low, low, intermediate, high). The risk classification should be based on the profile of tuberculosis in the community, the number of infectious tuberculosis patients admitted, or the estimated number of infectious tuberculosis patients to whom healthcare workers may be exposed. Also considered are results and analysis of healthcare workers experiencing test conversions. The CDC recently published a draft update to the 1994 guidelines for public review; expect final guidelines in late 2005 or early 2006.

**OSHA Tuberculosis Exposure Enforcement Guidelines** — These guidelines address patient and worker testing, source control methods, decontamination techniques, and prevention of tuberculosis-contaminated air. This enforcement policy uses the 1994 CDC guidelines and the OSHA general-duty clause. OSHA inspections can be done in response to complaints and during routine compliance visits in the following workplaces:

- Healthcare settings
- Correctional institutions
- Homeless shelters
- Long-term-care facilities
- Drug treatment centers

**OSHA Citations** — Citations can be issued to employers as a result of exposure or potential exposure to the exhaled air of a suspected or confirmed case of tuberculosis. Exposure can occur during high-hazard procedures performed on individuals with suspected or confirmed tuberculosis. OSHA can issue citations under the respirator standard (29 CFR 1910.134) when employers fail to provide respirators and fit testing to potentially exposed employees.

**OSHA Abatement Methods**

- Early identification of persons with active tuberculosis
- Medical surveillance at no cost to the employee, including preplacement evaluation, tuberculosis skin tests, annual evaluations, and twice yearly exams for those who have been exposed
- Evaluation and management of workers with a positive skin test
- Utilization of acid-fast bacilli isolation rooms for those with active or suspected tuberculosis infection, where such rooms are to be maintained under negative pressure and have outside exhaust or HEPA filtered ventilation
- Employee information and training program

**OSHA Tuberculosis Respirator Requirements** — In 2003, OSHA revoked 29 CFR 1910.139 (Respiratory Protection for Tuberculosis). OSHA now requires healthcare organizations to meet the provisions of 29 CFR 1910.134, which covers respiratory protection for general industry. OSHA can enforce all provisions, including annual fit testing with regard to tuberculosis exposures. If disposable respirators are used, their reuse is permitted as long as the functional and structural integrity of the respirator is maintained. Functionality could be maintained for weeks or months, depending on adherence to the manufacturer’s instructions. Facilities should address the conditions under which a disposable respirator is considered contaminated. Whenever reusable or disposable respirators are required, a complete respiratory protection program must be in place according to 29 CFR 1910.134. This entails creating a written respiratory protection program for managing respirator selection and use, employee instruction and training, surveillance of work area conditions, and respirator fit testing. (Note that healthcare and infection control groups have lobbied against the new OSHA requirements, and OSHA has delayed enforcement of the new annual fit test requirement.)
**Fit Testing** — The OSHA standard (29 CFR 1910.134) provides specific guidance on appropriate fit-testing procedures. CDC guidelines, NIOSH recommendations, and selection criteria in the OSHA standard indicate that most facilities should use half-mask, N95, air-purifying, filtering face piece respirators for TB protection. This type of respirator has a securely fitting face piece. Effective protection requires a good seal between the face and the face piece to ensure that the worker is protected. The respiratory protection standard does not require annual medical evaluations; however, annual fit tests are required for all respirator users. Respirator fit testing is not a hazard-specific or industry-specific activity. Annual fit testing provides the opportunity for employees to receive feedback on how well they are donning their respirator. Employees should receive fit testing annually as part of training. Many healthcare organizations are opposed to the annual fit-testing requirement.

**Fundamentals of Tuberculosis Infection Control** — The result of risk assessment should drive the extent of a healthcare facility’s tuberculosis infection control program. The program should be based on a hierarchy of control measures.

**First Level** — Administrative procedures are in place to reduce the risk of exposing uninfected individuals to those with active tuberculosis. These procedures include:

- Developing and implementing written procedures to ensure rapid identification, isolation, evaluation, and treatment of persons likely to be infected
- Implementing effective work practices among healthcare workers
- Educating, training, and counseling workers with regard to tuberculosis
- Screening workers for tuberculosis infection

*Note:* All facilities must implement level 1 measures, regardless of risk.

**Second Level** — Engineering controls are used to prevent the spread and reduce the concentration of droplet nuclei. Controls include:

- Direct source control using local exhaust ventilation
- Controlling the direction of airflow to prevent contamination of adjacent areas
- Diluting and removing contaminated air through the use of general ventilation
- Air cleaning through the use of filtration devices or ultraviolet germicidal irradiation

**Third Level** — The use of personal respiratory protective equipment is required. This control measure is to be used in rooms with patients with known or suspected (active) tuberculosis and in areas in which cough-inducing or aerosol-generating procedures are performed on such patients.

**Tuberculosis Exposure Control Program** — A facility’s tuberculosis exposure control program may range from a simple program that emphasizes administrative controls to a comprehensive program that includes not only administrative controls but also engineering controls and respiratory protection. The CDC guidelines include a chart to assist facilities in defining the specific elements of an infection control program for each risk classification. For the purposes of TB control and prevention, the CDC has retained the following definition of healthcare workers: all paid and unpaid persons working in healthcare facilities, including but not limited to, physicians; nurses; aides; technicians; students; part-time personnel; temporary staff not employed by the facility; volunteers; and dietary, housekeeping, maintenance, and clerical staff. Patients or healthcare workers with suspected or confirmed tuberculosis should be reported immediately to the appropriate public health department so standard procedures for identification and evaluation can be initiated.
Isolation Room Requirements — The CDC specifically clarified that nursing homes do not need tuberculosis isolation rooms if they do not provide care to tuberculosis patients; however, such facilities must have a written protocol for referral and periodic (annual) risk assessments as well as a written infection control plan that is reviewed periodically. Except for those acute-care, inpatient facilities that are determined to be at minimal and very low risk, the CDC recommends that all acute-care facilities have at least one tuberculosis isolation room. This should ease the burden on nursing facilities that do not accept or treat infectious tuberculosis patients and must locate a hospital with which to establish a referral (transfer) protocol specific to infectious tuberculosis patients.

Written Protocols — The guidelines clarify that facilities that do not have isolation rooms for tuberculosis and do not perform cough-inducing procedures on patients who may have tuberculosis may not need to have a respiratory protection program for tuberculosis; however, such facilities should have written protocols for referral and periodic (annual) risk assessments as well as a written infection control plan that is periodically reviewed. The guidelines recommend that these protocols be regularly evaluated and revised as needed.

Patient Status — The CDC recommends that patients who are infectious at the time of discharge should only be discharged to a facility that has isolation capability or to their homes. Facilities accepting and treating tuberculosis patients should have an engineer on staff or on a consulting basis to provide guidance in ventilation.

Performance Criteria — The performance criteria for respiratory protection were not changed in the new guidelines. The CDC did remove details on specific respirators such as dust–mist and dust–fume–mist. The CDC will use the new NIOSH certification process in determining appropriate respiratory protection. This will allow healthcare facilities to choose from a broader range of less-expensive certified masks.

Testing — The CDC recommends that all personnel not employed by a facility but working in the facility should also receive skin testing at appropriate intervals. Healthcare workers with a potential for exposure, including those with a history of Bacillus Calmette-Guerin (BCG) vaccination, should have baseline testing. Those with a negative test should repeat the procedure at regular intervals as determined by the risk assessment. The two-step skin testing procedure is not necessary if a healthcare worker had a documented negative test result in the past 12 months or if the facility determines that boosting is not common in its population.

Worker Training and Education — An effective tuberculosis training program should include the following:

- Basic concepts of transmission, pathogenesis, and diagnosis
- Explanation of the difference between latent and active tuberculosis
- Signs and symptoms of active tuberculosis
- Increased risk for those infected with HIV
- Potential for occupational exposure
- Information about prevalence of tuberculosis in the community
- Situations that increase the risk of exposure
- Principles of infection control
- Importance of skin testing and significance of a positive test
- Principles of preventive therapy for latent tuberculosis
- Drug therapy procedures for active tuberculosis
- Importance of notifying the facility
- Information about medical evaluation for symptoms of active tuberculosis
Engineering Controls — Engineering controls are critical in preventing the spread of tuberculosis within a facility. The CDC guidelines recommend exhausting air from possibly infected areas to the outside. Healthcare facilities should have isolation rooms with negative pressure. A rate of six air changes per hour is recommended, although new construction requires 12 air changes per hour. Some facilities are also using germicidal lights that use ultraviolet irradiation to supplement ventilation and isolation efforts.

I. BIOSAFETY LEVELS

Biosafety Level 1 — This level provides basic containment measures that depend on following standard microbiological practices. This level does not prescribe special primary or secondary barriers except for a sink for washing hands. Safety equipment and facilities must meet requirements for undergraduate and secondary education, including teaching laboratories. This level classifies other work facilities by the characteristics of microorganisms not known to cause disease in healthy adult humans. Many agents not ordinarily associated with disease can become opportunistic pathogens in the young, the aged, those at high medical risk, and persons with suppressed immune systems. Vaccine strains that have undergone multiple in vivo passages should not be considered avirulent simply because they are strains.

Biosafety Level 2 — This level stresses the use of secondary barriers and making waste decontamination available to reduce potential environmental contamination. Use biosafety level 2 protection for work done with human-derived blood, body fluids, or tissues in which the presence of an infectious agent may be unknown. Laboratory personnel working with human-derived materials should refer to Biosafety in Microbiology and Biomedical Laboratories (U.S. Department of Health and Human Services, 1993). Primary hazards to people working with these agents relate to accidental percutaneous events, mucous membrane exposures, or ingestion of infectious materials.

- Use extreme caution when working with contaminated needles or sharp instruments.
- Use caution when performing procedures with a high aerosol spray or splash potential that could increase the risk of such exposure.
- Conduct such work in primary containment equipment or devices such as a biological safety cabinet or safety centrifuge cups.
- Use other primary barriers such as splash shields, face protection, gowns, and gloves.

Biosafety level 2 practices, equipment, and facilities are applicable to clinical, diagnostic, teaching, and other facilities where work is done with a broad spectrum of indigenous, moderate-risk agents present in the community and associated with human disease of varying severity. With good microbiological techniques, these agents can be used safely in activities conducted on the open bench, provided the potential for producing splashes or aerosol spray is low.

Biosafety Level 3 — This level places more emphasis on primary and secondary barriers to protect personnel in contiguous areas. All laboratory manipulations should occur in a biological safety cabinet or other enclosed equipment such as a gas-tight aerosol-generation chamber. Secondary barriers for this level include controlled access to the laboratory and a specialized ventilation system that minimizes the release of infectious aerosols from the laboratory. Biosafety level 3 practices, equipment, and facilities apply to clinical, diagnostic, teaching, research, and production facilities working with indigenous or exotic agents. This
type of work raises the potential for respiratory transmission that may cause serious or potentially lethal infections. Primary hazards to personnel working with these agents relate to automatic inoculation situations, ingestion, and exposure to infectious aerosols.

**Biosafety Level 4** — Complete isolation of aerosolized infectious materials is accomplished primarily by working in a class III biological safety cabinet or a full-body, supplied-air, positive-pressure suit. The biosafety level 4 facility itself is generally a separate building or completely isolated zone with complex, specialized ventilation and waste management systems to prevent the release of viable agents to the environment. The primary hazards to personnel working with level 4 agents are respiratory exposures to infectious aerosols, mucous membrane exposures to infectious droplets, and auto-inoculation. All manipulations of potentially infectious diagnostic materials, isolates, and naturally or experimentally infected animals pose a high risk of exposure and infection to laboratory personnel, the community, and the environment. Biosafety level 4 practices apply to safety equipment and facilities working with dangerous and exotic agents that pose a significant life-threatening risk. Many diseases that can be transmitted via the aerosol route have no available vaccine or therapy. Agents with a close or identical antigen relationship to other biosafety level 4 agents should be handled at the same level.

**Special OSHA Bloodborne Requirement** — In Paragraphs (g)(2)(ix)(A) to (C), “standard microbiological practices” refer to procedures outlined in *Biosafety in Microbiological and Biomedical Laboratories*. The requirement that proficiency be demonstrated means that employees who are experienced laboratory workers may not need to be retrained in accordance with these paragraphs. Education such as a graduate degree in the study of viral diseases or another closely related subject area with a period of related laboratory research experience would also constitute proficiency. The employer is responsible for evaluating the employee’s proficiency and for documenting the mechanism used to determine proficiency.

**Biological Safety Cabinets** — Biological safety cabinets are classified according to airflow velocities, air patterns, exhaust system, and cabinet construction. Workers must never use a biological safety cabinet that contains infectious agents until a qualified safety officer or another professional assesses the potential risks associated with the biohazard material. The appropriate cabinet will protect the operator, the environment, and the biological specimen (if required) from contamination. The CDC and the National Institutes of Health (NIH) established the four biosafety levels, previously described, that consist of a combination of laboratory equipment, laboratory facilities, and laboratory practices and techniques. The following briefly addresses the differences in the three classes of biological safety cabinets:

**BSC Class I** — These open-front cabinets protect personnel and the environment but provide little protection for products. The average face velocity runs between 75 and 100 fpm and draws an unrecirculated air flow away from the operator. Class I cabinets are suitable for biosafety level 1, 2, or 3 containment. If connected to an exhaust duct with a face velocity of 100 fpm, this class of cabinets can be used with volatile toxic chemicals or radionuclides. All exhaust air must be HEPA filtered.

**BSC Class II** — Class II cabinets protect personnel, the environment, and the product or specimen. These cabinets have an open front and an inward airflow of 75 to 100 fpm to protect the operator. The laminar air that comes in contact with the product is first HEPA filtered to protect the product from contamination. The exhaust air then goes through a second HEPA filter to protect the environment. Class II cabinets are suitable for use with products requiring biosafety level 1, 2, or 3 containment.
**BSC Class III** — These ventilated cabinets are gas tight and totally enclosed, offering total containment of the biological hazard. All work performed is accomplished through attached rubber gloves. Supply air is HEPA filtered to protect the product. Exhaust air is HEPA filtered twice to provide environmental protection. Exhaust air can be single HEPA filtered only if HEPA-filtered air is followed by incineration. Class III cabinets must be connected to double-door autoclaves or disinfectant dunk tanks to sterilize and disinfect materials that enter or exit the work area. Class III cabinets are suitable for working with biological agents that require biological level 1, 2, 3, or 4 containment.

**M. HEALTHCARE OPPORTUNISTIC INFECTIONS**

*Aspergillus* — The mold spore produced by *Aspergillus* can create pathogenic infection opportunities. *Aspergillus* exists worldwide and can thrive at elevated temperatures. Ideal growth conditions tend to be damp areas with decaying vegetation. Infection with *Aspergillus fumigatus* is diagnosed in 90% of all infection cases. The threadlike, flat, white growth soon becomes a powdery blue-green mold spore. Most infections result from inhaling spores. Most people are naturally immune and do not develop any disease, but patients with other serious ailments tend to be at a greater risk of infection. The severity of aspergillosis depends on the individual’s immune system. Aspergillosis infection can range from sinusitis conditions to pulmonary infections, including pneumonia. Allergic bronchopulmonary aspergillosis results in allergy to the mold spores. The condition occurs most frequently in patients with asthma.

*Aspergillus Control* — Ventilation plays a key role in maintaining an *Aspergillus*-free environment in healthcare settings. Facilities should replace ventilation system filters at scheduled intervals and take measures during construction activities to reduce the likelihood of introducing *Aspergillus* into the facility. *Aspergillus* can enter a healthcare facility on a person’s clothing, so it is important to maintain a regular housekeeping schedule that includes vacuuming and surface cleaning with appropriate disinfectants in high-risk areas. Facilities experiencing possible *Aspergillus* infections should develop an *Aspergillus* infection control prevention plan. Controlling air pressure in construction areas helps contain dust and combats the spread of *Aspergillus* carried on dust to patients throughout the facility. Other measures include the following:

- Give special attention to delivery of construction materials.
- Limit points of entry and exit.
- Deliver boards, conduits, and fixtures without passing through the facility.
- If possible, assign one elevator for construction use.
- Set up delivery routes that minimize contact with patients, visitors, and staff.
- Use a chute for removing construction debris.
- Control dust when renovations occur near patient areas.
- Consider risks to other floors during a construction project.
- Develop a plan coordinated with clinical departments, infection control, the contractor, and facilities engineering.
- Seal off each room with plastic sheets and create a negative space with fans and filters discharging through a window.

**New Construction Aspergillus Control** — When constructing new specialized-care units with protective environments for hemopoietic stem-cell (HCST) transplant recipients, be sure that patient rooms are equipped to minimize the accumulation of fungal spores. Among the required features for such rooms are:
• HEPA filtration of incoming air
• Directed room airflow
• Positive air pressure with relation to the corridor
• Well-sealed room with 12 or more air changes per hour

Maintaining Existing Facilities
• Place all at-risk patients in protective environments.
• Maintain air-handling systems in protective-environment and other high-risk patient-care areas according to published CDC recommendations.
• Develop a water-damage response plan for immediate execution when water leaks, spills, and moisture accumulation occur to prevent fungal growth in the involved areas.
• Use proper dusting methods for patient-care areas designated for severely at-risk patients.
• Wet-dust horizontal surfaces daily using a cloth that has been moistened with an EPA-registered hospital disinfectant.
• Avoid dusting methods that disperse dust (such as feather dusting).
• Keep vacuums in good repair and equip them with HEPA filters for use in areas with patients at high risk.
• Use vacuum cleaners that are equipped with HEPA filters in patient-care areas.
• Do not use carpeting in hallways and rooms occupied by severely at-risk patients.
• Never use upholstered furniture or furnishings in rooms occupied by severely at-risk patients.
• Minimize the length of time that at-risk patients remain outside their rooms for diagnostic procedures and other activities.
• Instruct severely at-risk patients to wear a high-efficiency respiratory protection device (N95 respirator) when they leave the protected environment during periods when construction, renovation, or other dust-generating activities are ongoing in and around the healthcare facility. No recommendation can be made about the specific type of respiratory-protection device (e.g., surgical mask, N95 respirator) for use by a severely at-risk patient who leaves the protected environment during periods when no construction, renovation, or other dust-generating activity is in progress in or around the healthcare facility.
• Systematically review and coordinate infection control strategies with personnel in charge of the facility’s engineering, maintenance, central supply and distribution, and catering services.
• When planning construction, demolition, or renovation activities in and around the facility, assess whether patients at high-risk for aspergillosis are likely to be exposed to high ambient-air spore counts of Aspergillus from construction, demolition, and renovation sites; if so, develop a plan to prevent such exposures.
• During construction, demolition, or renovation activities, construct impermeable barriers between patient-care and construction areas to prevent dust from entering the patient-care areas.
• Direct pedestrian traffic that comes from construction areas away from patient-care areas to limit the opening and closing of doors or other barriers that might cause dust dispersion, entry of contaminated air, or tracking of dust into patient-care areas.
• Do not allow fresh or dried flowers or potted plants in patient-care areas for severely at-risk patients.

Anthrax — Exposure to the spore-forming bacterium Bacillus anthracis results in black, coal-like skin lesions. In the naturally occurring form of anthrax, the disease is passed on by contact with anthrax-infected or anthrax-contaminated animals and animal products.
Anthrax is not spread from one person to another person. Humans can host three forms of anthrax: inhalation, cutaneous, and gastrointestinal. Inhalation anthrax occurs when the anthrax spore is inhaled. Cutaneous anthrax, the most common naturally occurring form, is contracted by handling contaminated hair, wool, hides, flesh, blood, or excreta of infected animals and from manufactured products such as bone meal. It is introduced through scratches or abrasions of the skin. Gastrointestinal anthrax occurs as a result of ingesting insufficiently cooked infected meat or from flies. The spores enter the lungs, migrate to the lymph nodes, change to the bacterial form, multiply, and produce toxins. According to the CDC, symptoms of the disease vary depending on how the disease was contracted, but they usually become apparent within 7 days after exposure. Initial symptoms of inhalation anthrax infection may resemble a common cold. After several days, the symptoms may progress to severe breathing problems and shock. Inhalation anthrax is often fatal. Cutaneous anthrax occurs following deposition of the organism into the skin with cuts or abrasions, which make the skin especially susceptible to infection. After the spore germinates in skin tissues, toxin production results in local edema. The gastrointestinal form is characterized by an acute inflammation of the intestinal tract. Initial signs of nausea, loss of appetite, vomiting, and fever are followed by abdominal pain, vomiting of blood, and severe diarrhea. Anthrax is diagnosed by isolating the bacteria from blood, other body fluids, or skin lesions or by measuring specific antibodies late in the course of the disease. Toxins produced by anthrax result in bleeding and destruction of structures in the middle of the chest. Anthrax usually is susceptible to penicillin, doxycycline, or fluoroquinolones. An anthrax vaccine also can prevent infection, but vaccination against anthrax is not recommended for, or available to, the general public.

Responding to Potential Exposures — Some facilities around the country have received anthrax threat letters. Most were empty envelopes, but some have contained powdery substances. As noted, anthrax organisms can cause infection in the skin, gastrointestinal system, or lungs. To do so, the organism must be rubbed into abraded skin, swallowed, or inhaled as a fine, aerosolized mist. For anthrax to be effective as a covert agent, it must be aerosolized into very small particles. This is difficult to do and requires a great deal of technical skill and special equipment. If these small particles are inhaled, life-threatening lung infection can occur, but prompt recognition and treatment with appropriate antibiotics are effective.

Handling Suspicious Mail

- Do not try to open the mail piece.
- Do not shake or empty the contents of any suspicious envelope or package.
- If powder spills out of an envelope, do not try to clean up the powder.
- Cover the spilled contents immediately with anything available and do not remove this cover.
- Isolate the mail piece.
- Place the envelope or package in a plastic bag or some other type of container to prevent leakage of contents.
- Evacuate the immediate area.
- Leave the room and close the door, or section off the area to prevent others from entering.
- Wash your hands with soap and water to prevent spreading any powder to your face.
- Contact your local law enforcement agency.
- If you are at work, report the incident to local police and notify your building security official or an available supervisor.
- List all people who were in the room or area when this suspicious letter or package was recognized.
• Give this list to both the local public health authorities and law enforcement officials for follow-up investigations.

**Exposure Actions** — Remove heavily contaminated clothing as soon as possible and place it in a plastic bag or other container that can be sealed. This clothing bag should be given to the emergency responders for proper handling. Shower with soap and water as soon as possible. Do not use bleach or other disinfectant on your skin. List all people who were in the room or area, especially those who had actual contact with the powder, if possible. Give this list to both the local public health authorities so that proper instructions can be given for medical follow-up and to law enforcement officials for further investigation.

**Respiratory Protection** — Because anthrax presents as a biological particulate, an air-purifying respirator (APR) equipped with a mechanical filtering element would be the minimum level of respiratory protection required. According to a study by the Department of Defense, National Institute for Occupational Safety and Health, and Occupational Safety and Health Administration (Chemical and Biological Respiratory Protection Workshop Report), “Currently, NIOSH-approved particulate filters (N, R, and P100 filters) have the capability to filter out biological agents. Although respirators can filter out biological agents, face-seal leakage, which facial structure and face piece models and sizes affect, is a significant problem. Factors such as beard growth, scars, and perspiration also affect fit and leakage.” While N100, R100, or P100 mechanical filtering elements are effective against biological agents such as anthrax, they are only effective if the face piece fits properly. OSHA has established specific guidelines for respirator fit testing. In general, biological agents could potentially be absorbed into the body through mucous membranes. Due to these concerns, respiratory protection that incorporates protection for the face such as a full-face respirator with N100, R100, or P100 filters or full-face powered air-purifying respirator (PAPR) with HEPA filters is recommended.

**Decontamination** — To decontaminate materials exposed to anthrax, use a 0.05% hypochlorite solution (1 tablespoon bleach per gallon of water). Spore destruction requires steam sterilization. Refer to the OSHA and EPA websites for the latest information about anthrax and decontamination procedures.

**Severe Acute Respiratory Syndrome** — Severe acute respiratory syndrome (SARS) is an emerging, sometimes fatal, respiratory illness. The first identified cases occurred in China in late 2002, and the disease has now spread throughout the world. Although SARS is believed to be caused by a virus, the specific agent has not been identified, and no laboratory or other test can definitively identify cases. Suspected SARS cases in the United States have involved individuals returning from travel to Asia and healthcare workers and other contacts of those patients. SARS does not appear to be caused by casual contact; transmission appears to be primarily through close contact with a symptomatic patient. The CDC has defined a suspected case of SARS as an illness of unknown cause that began in February 2003 or later and meets the following criteria:

- Fever of at least 100.5°F
- One or more clinical findings of respiratory illness, such as cough, shortness of breath, difficulty breathing, hypoxia, or x-ray evidence of either pneumonia or acute respiratory distress syndrome
- Onset of symptoms within 10 days of (1) travel to an area with documented or suspected community transmission of SARS, or (2) close contact with either a person with a respiratory illness who traveled to a SARS area or a known suspect SARS case

“Close contact” means having cared for, lived with, or had direct contact with respiratory secretions and/or body fluids. A list of areas with documented or suspected community
transmission of SARS can be found on the updated interim U.S. Case Definition of Severe Acute Respiratory Syndrome (SARS) website. In addition to fever, reports indicate that the majority of SARS patients experience chills and about half have experienced muscle aches and dry cough. Fewer than half have also shown other symptoms such as dizziness. The incubation period is typically 2 to 7 days, although some reports suggest an incubation period as long as 10 to 12 days. Signs of illness include a decreased white blood cell count in most patients as well as below-normal blood platelet counts, increased liver enzymes, and electrolyte disturbances in a number of patients. Most people with SARS are adults. Those age 40 and older and those with certain medical conditions appear to be at increased risk of more severe disease and of death. Treatment consists of antibiotics and steroids; other options are being explored.

Precautions for Healthcare Facilities — The CDC has reported very few cases of occupationally acquired SARS in the United States. The CDC is working in collaboration with state and local health departments to develop a systematic approach to survey SARS exposures and infection in healthcare workers. The CDC has published a number of recommendations for healthcare workers who may have contact with a suspected SARS patient:

- *Interim Domestic Guidance for Management of Exposures to Severe Acute Respiratory Syndrome (SARS) for Healthcare and Other Institutional Settings*
- *Triage of Patients Who May Have Severe Acute Respiratory Syndrome: Interim Guidance for Screening in Ambulatory Care Settings*
- *Updated Interim Domestic Infection Control Guidance in the Healthcare and Community Setting for Patients with Suspected SARS*

The CDC also provides general information on infection control for healthcare workers in their *Guidelines for Infection Control in Healthcare Personnel* (1998).

Standard Precautions and Personal Protective Equipment — Healthcare workers treating patients known to be infected with SARS should take standard precautions, including good work and hygiene practices and the use of personal protective equipment appropriate for bloodborne and airborne exposures. Appropriate PPE includes protective gowns, gloves, and N95 respirators, in addition to eye protection. If workers providing care to a SARS patient have potential exposure to blood or other potentially infectious materials, they must use PPE in accordance with OSHA’s Bloodborne Pathogens standard (29 CFR 1910.1030). Refer to OSHA’s website (http://www.osha.gov/SLTC/bloodbornepathogens/index.html) for more information on the standard.

Engineering Controls — Acute-care facilities already should have appropriate ventilation systems (including appropriate exhaust and filtration) to eliminate the potential for exposure to airborne infectious diseases. If appropriate ventilation systems are in place, any airborne SARS exposures should also be controlled. Individuals with suspected SARS should be placed in an isolation room with negative pressure. If air recirculation is unavoidable, infected individuals should be placed in an area that exhausts room air directly to the outdoors or through HEPA filters. The CDC’s *Guidelines for Isolation Precautions in Hospitals* (1994) provides additional information on isolation rooms.

Laboratory Worker Safety — Laboratory personnel in facilities performing diagnostic tests on patients suspected to be infected with SARS should follow biosafety preventive measures established by the CDC’s *Interim Laboratory Biosafety Guidelines for Handling and Processing Specimens Associated with Severe Acute Respiratory Syndrome (SARS)* (2003). As appropriate, they should also follow OSHA’s Bloodborne Pathogens and Respiratory Protection standards.
Biosafety Precautions — Laboratory workers must wear appropriate personal protective equipment, including disposable gloves, gowns, eye protection, and respiratory protection. N95 or N100 air-purifying respirators or powered air-purifying respirators equipped with HEPA filters are recommended. If exposure to blood or other potentially infectious materials is possible, laboratory workers must use PPE in accordance with OSHA's Bloodborne Pathogens standard (29 CFR 1910.1030). Refer to OSHA's website (http://www.osha.gov/SLTC/bloodbornepathogens/index.html) for more information on the standard. Activities involving the manipulation or testing of specimens from SARS patients should be done at the appropriate biosafety level (e.g., use of a certified biological safety cabinet).

Disinfecting — The CDC advises that no disinfectant products are currently registered by the EPA for newly identified viruses associated with SARS. The CDC recommends the use of EPA-registered chemical germicides that provide low- or intermediate-level disinfection during general use against SARS agents because these products are known to inactivate related viruses with physical and biochemical properties similar to the suspected SARS agents.

Information for Workers Involved in Air Medical Transport of SARS Patients — The CDC has published interim recommendations to protect employees who may be required to transport patients with SARS by air (Interim Guidance: Air Medical Transport for Severe Acute Respiratory Syndrome (SARS) Patients, 2004). Several concerns are addressed in their recommendations, including limiting the number of persons preparing, transporting, and receiving potential SARS-infected patients to minimize potential occupational exposure.

Personal Protective Equipment — The use of respiratory protection is recommended. OSHA requires that employers select and use respiratory protection in accordance with 29 CFR 1910.134. In order for respirators to be effective in protecting employees, they must be properly fit tested and employees must be appropriately trained. Workers providing care to a SARS patient who might be exposed to blood or other potentially infectious materials must wear other protective clothing and use personal protective equipment in accordance with OSHA’s Bloodborne Pathogens standard (29 CFR 1910.1030).

Hygiene Practices — When appropriate, employers must make sure that workers handling the remains of SARS patients comply with the hygiene provisions of OSHA’s bloodborne pathogen standard (29 CFR 1910.1030). In all cases, these workers should use good housekeeping and handwashing practices.

Employee Training — All employees with potential occupational exposure to SARS, as described in this document, should be trained on the hazards associated with that exposure and on the protocols in place in their facilities to isolate and report cases and to reduce exposures. Refer to OSHA’s website (http://www.osha.gov/SLTC/bloodbornepathogens/index.html) for more information on the standard. As information becomes available, updates may be added to the information currently available on the CDC’s website (http://www.cdc.gov/ncidod/sars/).

Pseudomonas — *Pseudomonas* is a motile, Gram-negative, rod-shaped organism that utilizes glucose oxidatively. Members of this genus are classified into five groups based on ribosomal RNA homology. These bacteria are clinically important because they are resistant to most antibiotics and are capable of surviving in conditions that few other organisms can tolerate, aided by their production of a protective slime layer. *Pseudomonas* is often encountered in hospital and clinical work because it is a major cause of hospital-acquired infections. The key targets include immune-suppressed individuals, burn victims, and individuals on
respirators or with indwelling catheters. Additionally, these pathogens colonize the lungs of cystic fibrosis patients, increasing the mortality rate of individuals with the disease. Infection can occur at many sites and can lead to urinary tract infections, sepsis, pneumonia, pharyngitis, and a number of other problems. Rarely will *Pseudomonas* be the cause of infection in healthy individuals; its noninvasive nature limits its pathogenic capabilities. *Pseudomonas* prefers to inhabit moist environments but it can survive in a medium as deficient as distilled water. It will also grow on just about any laboratory medium and is beta-hemolytic on blood agar. The best way to reduce the spread of *Pseudomonas* is to use good aseptic techniques on hospital instruments and when in contact with patients. Its spread can be controlled by observing proper isolation procedures, aseptic techniques, and careful cleaning and monitoring of respirators, catheters, and other instruments.

**Legionella** — *Legionella* is a bacteria that causes an estimated 25,000 cases of Legionnaire’s disease each year in the United States alone. A majority of outbreaks are linked to cooling towers and domestic water systems. Other sources include evaporative condensers, respiratory equipment, showers, faucets, whirlpool baths, humidifiers, and decorative fountains. Hot-water systems are also a perfect breeding habitat as *Legionella* grows best in temperatures ranging from 90 to 120°F. Uncontrollable incidents that can cause *Legionella* problems include surges in water pressure that may disburse dirt into the water system or dislodge *Legionella*-laden scale and sediment from the walls of water pipes. Major excavation work (construction projects) have also been associated with outbreaks of *Legionella*. *Legionella* can enter cooling towers, air intakes, or water pipes; it can also be inhaled. In addition, new or renovated water lines that are not properly flushed prior to opening may be infested with *Legionella*. Idle plumbing may also have heavy contamination due to stagnant water. While some patients present mild symptoms, about 5 to 30% of them die from the *Legionella* infection. An infection generally presents within 2 to 5 days of exposure to the bacterium. Symptoms include fever, chills, and a cough that may be dry or produce sputum, as well as muscle aches, headache, fatigue, loss of appetite, and occasional diarrhea. Chest x-rays often reveal the presence of pneumonia, while laboratory tests may point to kidney malfunctioning. *Legionella* targets middle-aged and older individuals who may have chronic lung disease or whose immune system is suppressed by diseases such as cancer, diabetes, AIDS, or kidney failure that requires dialysis. Current treatment includes the antibiotics erythromycin and rifampin for severe cases.

**N. BIOLOGICAL WASTE MANAGEMENT**

Medical or infectious waste has been defined in 40 CFR 259.10 as any solid waste that is generated in the diagnosis, treatment, or immunization of human beings or animals or in related research, biological production, or testing.

- Segregate infectious waste from other waste at the point of generation within the facility.
- Package infectious waste to protect waste handlers and the public from exposure to the waste.
- Be sure the packaging contains the infectious waste from the point of generation up to the point of proper treatment or disposal.
- Select and utilize packaging for particular types of infectious waste, taking into consideration how it will be handled prior to disposal.
- Put contaminated sharps immediately in rigid, leakproof, puncture-resistant containers.
- Conspicuously identify all containers used for disposal of infectious waste.
- Handle and transport infectious waste in such a way as to ensure integrity of the packaging.
• Do not transport plastic bags containing infectious waste by chute, dumbwaiter, conveyor belt, or similar device.
• Store infectious waste in a manner that inhibits rapid microbial growth and minimizes the exposure potential.

Containing Spills — In the case of a spill, ruptured packaging, or other incident involving potentially infectious materials:
• Isolate the area from the public and all nonessential personnel.
• When practicable, repackage all spilled waste and containment debris.
• Disinfect all containment equipment and surfaces appropriately.
• Complete the appropriate incident report.
• Consult written management procedures to be sure all necessary actions are taken.

Regulated Medical Waste — Regulated medical waste is a subset of all medical wastes and includes several categories, which can vary depending on the state or locality:
• Cultures and stocks of infectious agents
• Human pathological wastes (e.g., tissues, body parts)
• Human blood and blood products
• Sharps (e.g., hypodermic needles and syringes used in animal or human patient care)
• Certain animal wastes
• Certain isolation wastes (e.g., wastes from patients with highly communicable diseases)
• Unused sharps (e.g., suture needles, scalpel blades, hypodermic needles)

Generators of Medical Waste
• Hospitals
• Nursing and convalescent facilities
• Intermediate-care facilities
• Dialysis clinics
• Blood banks
• Home health agencies
• Physician offices
• Laboratories
• Funeral homes
• Veterinary clinics
• Emergency medical services

Blood and Body Fluids — The category of blood and body fluids includes bulk laboratory specimens of blood tissue, semen, vaginal secretions, cerebrospinal fluid, synovial fluid, pleural fluid, peritoneal fluid, pericardial fluid, and amniotic fluid. Precautions do not apply to feces, nasal secretions, sputum, sweat, tears, urine, or vomit unless they contain visible blood. Free-flowing materials or items saturated to the point of dripping liquids containing visible blood or blood components should be handled as bulk blood and bulk blood components.

Pathological Wastes — The category of pathological wastes includes all discarded waste from renal dialysis contaminated with peritoneal fluid or blood visible to the human eye. Solid renal dialysis waste is considered medical waste if it is saturated and has the potential to drip or splash blood or other regulated body fluids.
Capillary Tubes — The Occupational Safety and Health Administration, National Institute for Occupational Safety and Health, and Center for Devices and Radiological Health of the Food and Drug Administration have produced a joint advisory notice on the use of glass capillary tubes. This document, *Glass Capillary Tubes: Joint Safety Alert About Potential Risks*, is designed to inform readers of the potential hazards associated with these devices. Breakage of glass capillary tubes during use may give the user a penetrating wound and blood inoculation.

Waste Sharps — Waste sharps include any used or unused discarded article that may cause punctures or cuts and are intended for use in human medical care, as well as glassware, blood vials, pipettes, and similar items that have been contaminated with blood or body fluids.

Regulated Medical Waste Best Management Practices

- Provide spill cleanup training.
- Train staff to properly identify all nonregulated waste and how to dispose of it.
- Educate local regulators and involve them in the effort to reduce waste and properly handle true regulated medical waste.
- Clearly establish and post guides for identifying regulated medical waste at every site of generation and disposal.
- Weigh each container, log them, and compare totals from each generator; retrain departments with high utilization.
- Provide facilities (e.g., hoppers, slop sinks) and personal protective equipment (e.g., eye shields, gloves) to facilitate alternative disposal methods.
- Date sharps containers when first used (not when placed) and remove them only when 75% full or when a time limit is reached.
- Dispose of lightly soiled dressings and gauze with regular waste.
- Place medical waste receptacles in such a way as to avoid indiscriminate use.

Biological Waste Handling Procedures — Keep the following in mind when packaging untreated waste intended for transport to off-site locations:

- The outermost layer of packaging for medical containers (excluding sharps) should have a red background color or use red lettering with a contrasting color. The container must be clearly labeled with the warnings “Infectious Waste,” “Medical Wastes,” or “Biohazardous.” The container should also bear the universal biohazard symbol.
- The wording should be printed on the container or securely attached to the label on two or more sides. The symbol should be at least 6 inches in diameter and be printed in a contrasting color to the background.
- Containers should be impermeable to moisture and should be strong enough to resist ripping, tearing, or bursting under normal conditions of use.
- Sharps should be placed in rigid, leakproof, puncture-resistant, sealed containers to prevent loss during handling; the containers should be clearly labeled as described above.
- Small containers used to collect untreated medical waste should be placed inside larger containers during storage, transportation, and disposal activities.
Containers — The containers used for collection, storage, and transportation should be constructed of materials compatible with the treatment methods utilized:

- Single-use containers destined for incinerators should be burnable.
- Containers destined for steam sterilizers should allow the waste to be properly treated.
- Reusable containers should be decontaminated after each use by approved methods.
- Reusable containers should not be reused for other purposes until they have been decontaminated and all medical waste labeling has been removed.

Medical Waste Disposal

Medical and Infectious Waste Incinerators (40 CFR 60, Subpart C and E) — New source performance standards and emission guidelines were promulgated in 1997 (62FR 48347) to reduce air emissions from new and existing medical and infectious waste incinerators. These standards are codified in 40 CFR 60, Subparts E and C, for new and existing incinerators. Existing sources are those for which construction was commenced on or before June 20, 1996. Hospitals, clinics, and clinical research laboratories operating a medical incinerator must comply with the New Source Performance Standards (NSPS) requirements if burning any amount of medical or infectious waste as defined in 40 CFR 60, Subpart C(e). Steam sterilization uses saturated steam within a pressure vessel at temperatures high enough to kill infectious agents. Steam sterilization is most effective with low-density materials such as plastics. Containers that can be effectively treated include plastic bags, metal pans, bottles, and flasks. High-density polyethylene and polypropylene containers should not be sterilized using this process because they do not allow steam penetration. Definitions regarding the classification of particular waste streams as hospital waste, medical/infectious waste, or pathological waste are provided in 40 CFR 60.51c.

Alternatives to Incineration

- Shredding or compacting with steam autoclaving
- Microwave irradiation
- Thermal treatment
- Chemical and biological treatment

Onsite Disposal

- Discharge into the sewer system of materials such as suctioned fluids, waste in liquid apparatus, bodily discharges, and dialysis waste
- Sterilization of substances such as cultures, etiologic agents, and other laboratory wastes
- Chemical disinfection of wastes such as dialysis equipment and specimen spills prior to cleaning

Note: Compactors or grinders are not used to process infectious wastes.

Offsite Disposal

- Infectious waste to be disposed of offsite should be collected, transported, and stored in a manner prescribed by the contractor.
- The contractor will pick up wastes in leakproof and fully enclosed containers. The waste will be transported to a site approved to handle and dispose of hazardous medical wastes.
- Contractors will be responsible for maintaining all required permits relevant to medical waste disposal.
• Contractors will maintain all regulatory documentation and records to ensure complete disposal including incineration waste disposal.

**Infectious Waste Disposal Training** — All workers who handle infectious waste should receive infectious waste management training. This training should include information on OSHA’s Bloodborne Pathogens standard (29 CFR 1910.1030) and the Emergency Response standard (29 CFR 1910.120).

### O. DOT INFECTION SUBSTANCES SHIPPING REQUIREMENTS

The Research and Special Programs Administration is the agency within the Department of Transportation responsible for developing and issuing hazardous materials regulations (49 CFR 171–180). The regulations govern the classification, hazard communication, and packaging of hazardous materials for transportation. Infectious substances, including regulated medical waste, are one class (Division 6.2) of hazardous materials regulated under the standards. Infectious substances may not be offered for transportation or transported in interstate or foreign commerce by rail, water, air, or highway unless requirements of the standards are met.

**Infectious Substance Packaging (49 CFR 173.196)**

- Watertight primary and secondary inner containers
- Primary or secondary inner containers capable of withstand internal pressure of 95 kpa at –40 to 131°F
- Smallest external dimension of outer packaging: at least 100 millimeters (3.9 inches)
- Capable of passing 9-meter (30-foot) drop test, penetration test, vibration standard
- Typical infectious substance packaging configuration:
  - Inner layer of absorbent packing material
  - List of contents on first container
  - Labels on outer container

**Exceptions (49 CFR 173.134)** — Regulated medical waste transported by a private or contract carrier is excepted from packaging and labeling requirements if it is:

- Packed in rigid, nonbulk packaging conforming to the general packaging requirements of 49 CFR 173.24 and 173.24a.
- Packaged and marked with the “Biohazard” marking in accordance with DOL regulations (29 CFR 1910.1030).

*Note: Diagnostic specimens and biological products are not subject to the regulations except when transported as regulated medical waste. Certain wastes may be subject to the regulations (see 49 CFR 173.134).*

**Regulated Medical Waste Packaging (49 CFR 173.197)**

- Nonbulk maximum capacity: 450 liters (119 gallons) or less
- Nonbulk maximum net mass: 400 kilograms (882 pounds) or less
- Meets UN packing group II requirements
- Rigid
- Leak resistant
- Impervious to moisture
- Of sufficient strength to prevent tearing or bursting under normal conditions of use and handling
- Sealed to prevent leakage during transport
• Puncture resistant for sharps
• Break resistant
• Tightly lidded or stoppered for fluids in quantities greater than 20 cubic centimeters

Definitions (49 CFR 173.134) — An infectious substance is a viable microorganism, or its toxin, that causes or may cause disease in humans or animals. It includes agents listed in 42 CFR 72.3 of the regulations of the DHHS and any other agent that causes or may cause severe, disabling, or fatal disease. A regulated medical waste is a waste or reusable material that contains an infectious substance and is generated in the diagnosis, treatment, or research of humans or animals. This definition does not include discarded cultures or stocks. A biological product is a material prepared and manufactured in accordance with certain regulations of the Department of Agriculture or the DHHS. A diagnostic specimen is any human or animal material being shipped for purposes of diagnosis. It includes but is not limited to excreta, secreta, blood, blood components, tissue, and tissue fluids.

Training (Subpart H of 49 CFR Part 172)
• All hazardous material employees
• General awareness, function specific, and safety
• Test and maintain record of testing
• Retrain every 2 years

Incident Reporting (49 CFR 171.15)
• Report any infectious substance spill to the CDC.
• For other reportable hazardous material spills, contact the DOT National Response Center.

P. SPECIAL INFECTION CONTROL TOPICS

Dental Infection Control General Recommendations
• Develop a written health program for dental workers that includes policies, procedures, and guidelines for education and training; immunizations; exposure prevention and post-exposure management; medical conditions, work-related illness, and associated work restrictions; contact dermatitis and latex hypersensitivity; and maintenance of records, data management, and confidentiality.
• Establish referral arrangements with qualified healthcare professionals to ensure prompt and appropriate provision of preventive services, occupationally related medical services, and post exposure management with medical follow-up.

Training
• Provide training upon initial employment, when new tasks or procedures affect the employee's occupational exposure, and, at a minimum, annually, with education and training regarding occupational exposure to potentially infectious agents and infection-control procedures/protocols appropriate for and specific to their assigned duties.
• Use standard precautions for all patient encounters.
• Consider sharp items such as needles, burs, lab knives, and wires that are contaminated with patient blood and saliva as potentially infective and establish engineering controls and work practices to prevent injuries.
• Implement a written, comprehensive program designed to minimize and manage exposures to blood and body fluids.
Construction and Renovation Infection Control

- Establish a multidisciplinary team that includes infection control staff to coordinate demolition, construction, and renovation projects and consider proactive preventive measures at the inception; produce and maintain summary statements of the team's activities.
- Educate both construction team and healthcare staff about high-risk patient-care areas with regard to the airborne infection risks associated with construction projects, dispersal of fungal spores during such activities, and methods to control the dissemination of fungal spores.
- Incorporate mandatory adherence agreements for infection control into construction contracts, with penalties for noncompliance and mechanisms to ensure timely correction of problems.
- Establish and maintain surveillance for airborne environmental disease such as aspergillosis during construction, renovation, repair, and demolition activities to ensure the health and safety of high-risk patients.
- For additional information, refer to the model plan provided in the appendix of this text; other sources of information include:
  - The Role of Infection Control During Construction in Health Care Facilities (APIC, 2000)
  - CDC Guidelines for Environmental Infection Control (Centers for Disease Control and Prevention, 2003).

SUMMARY

This chapter presented information on infection control requirements and program considerations. It discussed JCAHO requirements, including program design recommendations. The chapter provided an overview of Centers for Disease Control and Prevention (CDC) guidelines and the CDC's role in working with healthcare organizations to improve infection control effectiveness. CDC standard precautions were presented along with basic information on isolation precautions to use in clinical settings. The chapter also addressed handwashing and hygiene practices such as hand rubs. The chapter explained the differences between bacteria and viruses and presented information about immunization requirements, antibiotic-resistant pathogens, hepatitis, and HIV. The chapter covered the types, classes, and regulation of disinfectants and sterilizing solutions, as well as plan requirements, training of workers, HBV vaccinations, and OSHA enforcement of the Bloodborne Pathogens standard (29 CFR 1910.1030). Other topics discussed in the chapter included latex allergies, tuberculosis, biosafety levels, opportunistic infections, severe acute respiratory syndrome (SARS), dental clinic procedures, and infection control during construction.

FOR REVIEW AND DISCUSSION

1. Describe the best method of managing the infection control process.
2. Which pathogen is of the greatest concern to caregivers?
3. Which agency publishes guidelines on infection control and isolation?
4. Describe basic handwashing procedures to prevent exposure to bloodborne pathogens.
5. What are standard precautions?

6. List and define the three tiers of isolation to be followed for compliance with standard precautions.

7. What is the purpose of the local tuberculosis risk assessment?

8. Describe the OSHA requirements concerning the HBV vaccination series for workers.

9. What is the key factor in latex allergic reactions?

10. Define the following terms and describe how they affect healthcare organizations:
    
    Sanitizing
    
    Disinfecting
    
    Sterilizing

11. Explain the training frequency for workers covered by the Bloodborne Pathogens standard?

12. What category of isolation would be most appropriate for a contagious respiratory disease?

13. Which OSHA standard is cited most often in healthcare facilities?

14. Discuss the importance of an effective control program. How can a good program help improve the environment of care?
A. INTRODUCTION

This chapter addresses a number of patient and clinical subjects, including safety cultures, patient safety initiatives, bed safety, restraints, fall prevention, and a brief overview of clinical safety issues. The chapter also provides safety information on patient care departments such as emergency departments, intensive-care units, physical therapy units, nursing services, radiology, and operating rooms. The chapter also addresses the timely topics of infant abduction, workplace violence, laser safety, MRI safety, and medical equipment management. This chapter must not be considered as a comprehensive treatment of patient safety issues.

B. SAFETY CULTURES

Cultures of Trust — Safety cultures must be established on a foundation of trust. A culture of trust promotes communication, coordination, and involvement. Trust can only be established when the overt or formal culture acknowledges the existence of a covert or hidden culture within the organization. Healthcare leaders can impact patient and organizational safety efforts by promoting a culture of trust. The foundation of a trusting culture consists of coordination, communication, and accountability.

Understanding Organizational Systems — Healthcare leaders and clinical personnel many times do not understand the dynamics of how systems interact to create successes and failures. Addressing patient safety as the sole objective will undermine other trust issues within the organization. Patient safety can best be addressed by first establishing a true safety culture that touches the entire organization. Healthcare leaders must resist the temptation to place patient safety on a pedestal by itself. New studies indicate that patient safety directly relates to the frontline clinical personnel and care givers. To address patient safety as a stand-alone issue will not promote a culture of trust.

Patient Safety Emphasis — Patient safety remains a hot topic nationally. How healthcare will deal with the issue remains to be seen. A healthcare organization must realize that safety impacts the professional staff, employees, visitors, and contractors. Responding to safety issues from a systems view will create a culture of trust and also lead to improving processes that feed these adverse events. Patient safety begins before the patient arrives as the facility. Processes must be developed to make safety inherent to the design and delivery of healthcare.
Patient safety incidents become risk management issues and provide safety personnel an opportunity to improve processes that failed. Healthcare leaders must understand that a hospital functions as an open system that contains some closed subsystems. Much of the response to adverse events during the past 10 years has been based on root cause methodologies used by closed system organizations, such as the space program or nuclear power industry. A lack of understanding of correct methodologies has hampered the development of trusting safety cultures. Healthcare needs to look within its own ranks to find the answers to process problems and improvement challenges.

**Accountability** — Failing to admit that a complex open system such as a hospital must deal with large numbers of clinical, administrative, and support leaders that want things done their way is common. Many systems promote or allow the turf king and queen mentality to undermine the safety system approach promoted by healthcare associations, accrediting bodies, governmental agencies, and corporate leaders. Healthcare organizations tolerate, excuse, or cover up too many poor decisions and actions by those in positions of power. Healthcare professionals will make mistakes despite their best efforts; however, a culture of trust should not be confused with one lacking accountability (see Table 9.1). Clinicians must be accountable for any deliberate actions that may result in patient or worker injury. Clinicians also must be held accountable for their actions if they are reckless in providing care. The nature of medical errors must be understood and error reporting valued. Clinicians and administrators must acknowledge that error-prone situations develop because of the complex nature of healthcare systems.

**Promoting a Culture of Trust** — Medical errors and patient safety incidents must be viewed from a system view. It is not possible to address complex event causal factors by disciplining, counseling, or retraining. Many times nursing personnel do not describe or discuss how systems-related issues contributed to the error or event. Using a systems approach, facilities can enhance their reliability and reduce the potential for error. Decisions made by managers, equipment designers, architects, and others contribute to error-producing or latent conditions. When systems are designed to eliminate or reduce errors, safety is enhanced.
C. PATIENT SAFETY

• Proactively identify and reduce risks to the safety of patients by stressing prevention.
• Eliminate barriers to understanding caused by fear of disclosure, embarrassment, blame, or punishment.
• Consider the following proactive activities to reduce risks to patients:
  • Select and analyze a high-risk process on an annual basis.
  • Consider Joint Commission on Accreditation of Healthcare Organizations (JCAHO) information on frequent sentinel events and risks when selecting the process.
  • Consider a high risk process that poses significant potential for impacting patient safety.
  • Describe the chosen process by using a charting or similar visual tool.
  • Identify ways to break down the process to determine the failure modes.
  • Identify the possible effects of failures and their impact on patients.
  • Prioritize potential process breakdowns or failures.
  • Determine why the prioritized breakdowns or failures could occur.
  • Redesign the process or underlying systems to minimize their effect on patients.
  • Test and implement the redesigned process and monitor its effectiveness.

Improving Performance — Organizations should establish mechanisms to collect data to ensure performance monitoring, with an emphasis on systematically aggregating and analyzing information to determine patterns or trends in care performance. Organizations must also define and implement processes for managing serious adverse patient events. The effective use of performance data should lead to process improvements. A proactive and ongoing program should also help reduce unanticipated adverse events. Performance improvement focuses on outcomes of treatment, care, and services. Leaders must establish planned, systematic, and organization-wide approaches to performance improvement. Reducing unanticipated adverse events requires leaders to identify and manage actual or potential risks to safety. Leaders must promote the desired environment by example. Leadership can implement a proactive program that works to integrate safety priorities into the design and redesign of all relevant organization processes, functions, and services.

Data Collection

• Determine improvement priorities by evaluating data about process stability, risks, sentinel events, and leadership priorities.
• Identify required improvement areas.
• Develop performance measures to determine if changes resulted in desired outcomes.
• Determine the frequency and details of data collection activities.
• Collect data for priorities identified by leaders and consider collecting data from staff personnel in the following areas:
  • Opinions and needs
  • Perceptions of risks to patients
  • Suggestions for improving patient safety
  • Willingness to report all unanticipated adverse events

Perception of Care

• Use the inclusive phrase “perception of care, treatment, and services” to better measure performance.
• Address meeting the needs, expectations, and concerns of patients by collecting data on the perceptions of care, treatment, and services of patients.
• Consider the following as vital to measuring performance:
  • Specific patient needs and expectations
  • The manner in which the organization meets those needs and expectations
  • Ways to improve patient safety
  • Effectiveness of pain management programs as applicable

High-Risk Processes — The improvement process should consider the following high-risk areas (note that each facility must identify its own high-risk procedures):
  • Medication management
  • Blood and blood product use
  • Restraint and seclusion use
  • Behavior management and treatment
  • Operative and other invasive procedures
  • Resuscitation and its outcomes

Sources of Data — Patient safety data can come from a number of sources within the organization, including:
  • Risk management
  • Utilization management
  • Quality control
  • Infection control surveillance and reporting
  • Research as applicable
  • Autopsies when performed

Data Analysis — A solid data analysis program looks at aggregate information at various points in time to determine if a process meets performance standards. To perform this type of analysis, it is necessary to:
  • Evaluate data to assess performance levels, patterns, or trends in a particular area or department.
  • Determine frequency or rates for high-risk areas uncovered during the data collection and evaluation process.
  • Rely on statistical tools and techniques to analyze and display data in a usable format.
  • Validate findings by analyzing and comparing data with external information sources, if available.

Performance analysis personnel must review other information, including recent scientific and clinical studies. Healthcare organizations should refer to events alerts, practice guidelines, and various databases containing helpful information and employ comparative data techniques for situations of variability or unacceptable levels of performance. Addressing the following factors during the analysis is recommended:
  • Patterns or trends impacting performance
  • Data comparisons that might reveal if patterns or trends vary from expectations
  • Topics selected by leaders as performance improvement priorities
  • Variations of performance that could change priorities
  • Confirmed transfusion reactions
  • All serious adverse drug events and significant medication errors
  • Major discrepancies between pre-operative and post-operative diagnoses
  • Adverse events or patterns of adverse events during sedation and anesthesia use
  • Hazardous conditions and staffing issues
Sentinel Events — Organizations accredited by the Joint Commission should adhere to published sentinel events guidance by identifying, reporting, analyzing, and managing these events (see Table 9.2). Senior leaders must define and implement a program to measure, assess, and improve the organization’s performance. The process for identifying and managing sentinel events should include the following steps:

- Defining sentinel events and communicating this definition throughout the organization
- Determining events subject to review under the Joint Commission's sentinel event policy
- Identifying process variations not affecting the outcome or resulting in an adverse event but which carry significant chances of producing a serious adverse event in the future
- Identifying adverse events defined as near misses

Construction Risk Assessments — The Joint Commission requires that organizations undergoing construction, renovation, or demolition conduct a proactive risk assessment to identify potential hazards that could impact the environment of care. The assessment should consider the following:

- Air quality and infection control
- Noise and vibration
- Emergency procedures

Patient Safety-Related Standards — About half of the JCAHO accreditation standards directly relate to such safety issues as medication management, infection control, surgery and anesthesia, transfusions, restraint and seclusion, staffing and staff competence, fire safety, medical equipment, emergency management, and security. Additional patient safety standards went into effect in 2001. These standards address a number of significant patient safety issues, including the implementation of patient safety programs and the organization’s responsibility to inform patients about good and bad outcomes. The JCAHO Sentinel Event Policy, which went into effect in 1996, is designed to help healthcare organizations to identify sentinel events and take actions to prevent their recurrence. A sentinel event is an unexpected occurrence involving death or serious physical or psychological injury. Any time a sentinel event occurs, the healthcare organization is expected to find out the cause of the event and make improvements to prevent it from occurring again. The Sentinel Event Policy also encourages organizations to report to the JCAHO sentinel events that have resulted in death or serious injury, along with their causes and improvements, so the JCAHO can learn about the causes of sentinel events, share “lessons learned” with other healthcare organizations, and reduce the risk of future sentinel events.

<table>
<thead>
<tr>
<th>TABLE 9.2 Causal Factors Identified by the Joint Commission</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication issues</td>
</tr>
<tr>
<td>Orientation and training</td>
</tr>
<tr>
<td>Patient assessment</td>
</tr>
<tr>
<td>Availability of information</td>
</tr>
</tbody>
</table>
Sentinel Event Alert — The Joint Commission publishes a periodic newsletter that identifies specific sentinel events, describes their causes, and suggests steps to prevent similar occurrences. These alerts are generated from the sentinel event database and from other expert sources. The JCAHO database contains information reported by healthcare organizations. The newsletter also provides causal factors of events and strategies to prevent similar occurrences. Topics addressed in past alerts include medication errors, wrong-site surgery, blood transfusion errors, fatal falls, suicides, organizational infections, and surgical/post-operative complications. In 2002, the JCAHO appointed a group of experienced physicians, nurses, pharmacists, and other patient safety experts to advise the organization with regard to establishing National Patient Safety Goals. The Sentinel Event Advisory Group conducts thorough reviews of all alert recommendations and identifies those that are candidates for inclusion in the annual National Safety Patient Goals.

National Patient Safety Goals — In 2002, the JCAHO approved its first set of six National Patient Safety Goals with 11 related specific requirements for improving the safety of patient care in healthcare organizations. Accredited organizations must implement procedures to meet the goals or develop acceptable alternatives. Listed below are the 2004 patient safety goals:

- Improve the accuracy of patient identification by using at least two patient identifiers (neither to be the patient’s room number) whenever taking blood samples or administering medications or blood products. Prior to the start of any surgical or invasive procedure, conduct a final verification process to confirm the correct patient, procedure, and site. Use active, not passive, communication techniques.
- Improve the effectiveness of communication among caregivers by implementing a process for taking verbal or telephone orders or critical test results that requires verification or read-back of the complete order or test result by the person receiving the order or test result. Standardize the list of the abbreviations, acronyms, and symbols used throughout the organization. Develop a “do not use” list of abbreviations, acronyms, and symbols.
- Improve the safety of using high-alert medications by removing concentrated electrolytes such as potassium chloride, potassium phosphate, and sodium chloride (>0.9%) from patient care units. Standardize and limit the number of drug concentrations available in the organization.
- Eliminate wrong-site, wrong-patient, wrong-procedure surgery by creating and using a pre-operative verification process. Use a checklist to confirm availability of medical records and imaging studies. Implement a process to mark the surgical site and involve the patient in the marking process.
- Improve the safety of infusion pumps by ensuring free-flow protection on all general-use and patient-controlled analgesia intravenous pumps.
- Improve the effectiveness of clinical alarm systems by implementing preventive maintenance and testing of all systems. Ensure activation of alarms with appropriate settings. Alarms must be sufficiently audible with respect to distances and competing noise within the unit.
- Reduce the risk of healthcare-acquired infections by adhering to the current CDC hand hygiene guidelines. Manage as a sentinel event any identified cases of unanticipated death or major permanent loss of function associated with a healthcare-acquired infection.

Common Medical Error Causal Factor Categories
- Communication problems are the most common cause of medical errors. Communication failures can be verbal or written. Communication problems can result in
poorly documented or lost information that can lead to medical errors. (See Table 9.3.)

- Critical information must be available when needed to influence decisions; such information can include the timely and reliable communication of critical test results. Many times the necessary information does not follow the patient through the treatment process.
- People fail to follow policies, guidelines, protocols, and processes. These human failures can sometimes be considered knowledge-based errors when caregivers lack the expertise to provide proper care.
- Patient-related issues include improper patient identification, incomplete patient assessment, failure to obtain consent, and inadequate patient education. These issues can work together with other causal factors to create opportunities for errors.
- The organizational transfer of knowledge deals with the level of knowledge required by medical and healthcare workers to perform assigned tasks. The organizational transfer of knowledge addresses how things are done in a particular organization or health care unit.
- Staffing patterns and workflow issues can result in errors when physicians, nurses, and other healthcare workers are too busy because of inadequate staffing or supervision.

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adverse event</td>
<td>An untoward and usually unanticipated outcome that occurs in association with health care</td>
</tr>
<tr>
<td>Harm</td>
<td>Death or impairment of a body function or structure requiring intervention</td>
</tr>
<tr>
<td>Hazard</td>
<td>A setting or technology that has the potential to cause harm</td>
</tr>
<tr>
<td>Healthcare-associated injury</td>
<td>Harm caused to the patient through medical error and not as a result of the natural course of a patient's condition</td>
</tr>
<tr>
<td>Healthcare environment</td>
<td>The structures and processes employed to provide care; reflects the characteristics of the facility (e.g., size, location, specialty, licensure, certification, equipment) and organization (e.g., personnel mix and experience, lines of authority, policies and procedures, governance, leadership, culture)</td>
</tr>
<tr>
<td>Medical errors</td>
<td>Mistakes made in the process of care that result in or have the potential to result in harm to patients; include the failure of a planned action to be completed as intended or the use of a wrong plan to achieve an aim; can be the result of an action that is taken (error of commission) or an action that is not taken (error of omission)</td>
</tr>
<tr>
<td>Medication error</td>
<td>Preventable inappropriate use of medication including prescribing, dispensing, and administering</td>
</tr>
<tr>
<td>Patient safety</td>
<td>The absence of the potential for or occurrence of healthcare-associated injury to patients; created by avoiding medical errors as well as taking action to prevent errors from causing injury</td>
</tr>
<tr>
<td>Preventable injury</td>
<td>Harm that could be avoided through reasonable planning or proper execution of an action</td>
</tr>
</tbody>
</table>

• Technical failures include device or equipment malfunction, as well as complications resulting from the failure of implants or grafts. Many times, technical failures are not recognized as an underlying cause of patient injury.
• The lack of adequate policies and procedures to guide the delivery of care contributes to many medical errors. Care process failures can often be traced back to poorly documented, nonexistent, or clinically inadequate procedures.

The Universal Protocol — In July 2003, the JCAHO Board of Commissioners approved the Universal Protocol for Preventing Wrong Site, Wrong Procedure, and Wrong Person Surgery™. The Universal Protocol was created to address the continuing occurrence of tragic medical errors in JCAHO-accredited organizations. Compliance is now required by all accredited hospitals, ambulatory care, and office-based surgery facilities. It is applicable to all operative and other invasive procedures. The protocol is endorsed by nearly 50 professional healthcare associations and organizations. The principal components of the Universal Protocol include:
  • Pre-operative verification process
  • Marking the operative site
  • Taking a “time out” immediately before starting the procedure
  • Adapting the requirements to nonoperating room settings, including bedside procedures

Strategies for Reducing Medical Errors
Changes in Organizational Culture — Creating a positive safety culture for the entire organizations is a good place to start. Patient safety cultures will thrive only if they are part of a total organizational paradigm shift.

Senior Leadership Involvement — Senior administrative and clinical leaders must actively promote safety culture changes. Senior leaders must learn to observe, listen, and take actions.

Provide Education and Training — Healthcare organizations must offer education and training that focuses on real-world issues. Healthcare traditionally has placed too much emphasis on documenting education rather than focusing on learning.

Change Root-Cause Analysis Methods — Healthcare organizations must realize that it takes a qualified facilitator to conduct meaningful root-cause analysis sessions. Root-cause analysis methods should focus on teamwork, communication, and member expertise to discover causal factors, determine solutions, and implement system improvements. Remember that the real goal of a root-cause analysis is not just to prevent recurrence but to fix or improve the system that created the problem.

Failure Mode and Effect Analysis — Failure mode and effect analysis (FMEA) is a proactive analysis tool that is misunderstood in most healthcare organizations. Some organizations incorrectly try to use the tool to address human or human-related processes. Human behavior cannot be compared to equipment operations, so this approach does not work as well for human-related processes as it does for equipment or technical operations. FMEA does help identify potential failure modes and can address the failure impact on the product or process. The use of team root-cause analysis to deal with human-related issues is recommended.

Patient Safety Committees — Establishing a multidisciplinary patient safety committee should help organizations identify more effective corrective actions and implement safe procedures. These committees can help promote patient safety issues and organizational culture changes.
Other Patient Safety Strategies — Healthcare organizations must evaluate current programs and implement improved policies when safety is not adequately addressed. Many accrediting, governmental, professional, and grass roots organizations offer assistance for developing patient safety protocols. Technology is also a great tool for reducing errors and improving safety. Some examples include the use of computerized physician order entry, programmable infusion pumps, and bar coding medications; however, new technology always provides the opportunity for human error.

Health Insurance Portability and Accountability Act — The Health Insurance Portability and Accountability Act (HIPAA) covers all healthcare organizations, including all healthcare providers, even one-physician offices, health plans, employers, public health authorities, life insurers, clearinghouses, billing agencies, information systems vendors, service organizations, and universities. The goal of the act is to promote administrative simplification of healthcare transactions and to ensure the privacy and security of patient information. The transaction standards of the act call for the use of common electronic claims standards, common code sets, and unique identifiers for all healthcare payers and providers. Implementing a national standard requires the use of a single format. The security regulations of the act prescribe the administrative procedures and physical safeguards for ensuring the confidentiality and integrity of protected health information. The security regulations will provide a uniform level of protection of all health information that is housed or transmitted electronically and that pertains to an individual. The compliance date for security procedures was April 14, 2004, for all entities. Patients have the right to understand and control how their health information is used. Healthcare providers must provide patients with a clear written explanation of how they use, keep, and disclose patient information. Patients also have access to their medical records. The standard restricts the release of certain information without patient consent, and patient consent cannot be coerced. Patients have recourse options if confidentiality has been violated. Protected patient information includes:

- Name and specific dates of birth, admission, discharge, or death
- Telephone numbers, Social Security number, and medical record number
- Photographs, city, Zip Code, and other geographic identifiers

D. BED SAFETY

The Food and Drug Administration (FDA) continues to receive reports of patient deaths and injuries from bed events. The Centers for Medicare and Medicaid Services (CMS) issued guidance in 2000 for surveyors to determine hospital compliance. Even when a side rail is not used as a restraint, patients may become trapped between the mattress and the bed frame or side rail. Disoriented patients may view a raised side rail as a barrier. Any attempt to exit the bed could pose a risk of entrapment, entanglement, or falling. National surveys of patient deaths occurring in the bed environment clearly show the risk of entrapment increases when a patient slips between the mattress and bed rail. Another key risk of bed-related adverse events is bed-related fires. This section addresses both entrapment and the fire hazards of healthcare beds.

General Considerations — The absence of timely toilet activities, position changes, and nursing care can contribute to the risk of entrapment. The risk may also increase due to technical issues such as mattresses of the wrong size, bed rails with winged edges, loose bed rails, or design elements such as wide spaces between vertical bars in the rails themselves. The principles that follow are intended to guide the development of patient care plans. The automatic use of bed rails may pose unwarranted hazards to patient safety.
Bed Height — The bed height is proper when the patient can sit on the edge of the mattress with knees flexed at 90° and both feet planted firmly on the floor. Adjustable-height beds should be used to obtain the desired mattress height. If the bed is still too high, proper height can be achieved by replacing the mattress with one that is thinner. Because the bed height may inadvertently be altered during routine care, it should be checked regularly.

Headboard Safety Tips — For the safety of persons who use the headboard or footboard for assistance when transferring in or out of bed, these surfaces should be slip-resistant and easy to grab. The application of nonslip adhesive tape along the top length of the headboard and footboard will help prevent a person's hands from slipping.

Mattresses and Bed Wheels — The edges of the mattress must be firm enough to securely support a person seated in an upright position. Mattress edges that are rolled offer a good grasping surface and provide stability during transfer. Bed wheels that roll or slide away during transfers are a particular hazard. Beds, even those with adequate wheel-locking systems, can be unsteady. A combination swivel-and-wheel brake provides the most stability. Even properly locked wheels can slide on slippery linoleum or tiled floors. Nonslip adhesive strips or decals placed beneath the wheels can minimize sliding. Beds equipped with immobilizing legs (wheels recess when legs are on the floor) provide the highest level of stability.

Slippery Floors Near Beds — The application of nonslip adhesive strips on the floor along the length of the bed provides a slip-resistant surface. The color of the strips should blend with the floor color so persons with altered depth perception do not misinterpret the strips as hazards to avoid. Additional measures to avoid the hazards of slippery floor surfaces include the application of an antiskid acrylic coating to linoleum tiles and having patients wear traction-soled socks or slippers.

Bed Alarms — A bed alarm allows normal bed activity but sounds by the bedside and nursing station if the patient is about to transfer unsafely from the bed. Nurses who have used bed alarm devices find them to be user friendly. They reduce the risk of falls; are easy to install, operate, and maintain; and are safe for patients.

Safe Bed Environment Suggestions

- Avoid the automatic use of bed rails of any size or shape.
- Restrict the use of physical restraints, including chest, abdominal, wrist, or ankle restraints of any kind on individuals in bed.
- Inspect, evaluate, maintain, and upgrade equipment (beds, mattresses, bed rails) to identify and remove potential fall and entrapment hazards and appropriately match the equipment to patient needs, considering all relevant risk factors.
- Always assess the patient’s needs and re-evaluate the equipment if an episode of entrapment or near entrapment occurs with or without serious injury.

Bed Side Rail Safety — (See Table 9.4 and Table 9.5.)

- Inspect all bed frames, side rails, and mattresses as part of the preventive maintenance program.
- Be sure the bed is properly aligned and that no gap is wide enough to entrap a patient.
- Never replace mattresses and side rails with those of dimensions different than the original equipment supplied by the manufacturer.
When purchasing side rails and mattresses separate from the frame, be sure all components are compatible.

Check bed side rails for proper installation according to the manufacturer's instructions.

Avoid bowing, and make sure that the proper headboard-to-footboard distance is maintained.
• Establish safety rules and procedures for patients considered at high risk for entrapment.
• Use bed side rail protectors to close off open spaces that could lead to entrapment.
• Never use bed side rails as a patient protective restraint.

Note: The use of restraints requires frequent monitoring and compliance with local, state, and federal regulations. The Safe Medical Device Act requires healthcare organizations to report bed-related incidents resulting in death or injury.

Individualized Patient Assessment — Any decision regarding bed rail use or removal from use should be made within the framework of an individual patient assessment. If the use of a bed rail is necessary, then steps should be taken to reduce the known risks associated with its use. It is important to consider the patient’s:

• Medical diagnosis, conditions, and physical and behavioral symptoms
• Sleep habits, medication, and acute medical or surgical interventions
• Underlying medical conditions or presence of delirium
• Ability to toilet alone
• Ability to communicate and an awareness of surroundings
• Mobility in and out of bed
• Risk of falling

Sleeping Environment Assessment — The sleeping environment assessment evaluates conditions that may affect the patient’s ability to sleep. This assessment may be considered when developing a patient’s care plan. Elements of the assessment include:

• Comfort, pain, hypoxia
• Grieving, loneliness
• Hunger, thirst, hydration
• Calorie intake and protein calories
• Boredom and amount of time spent in bed
• Light levels and temperature

Treatment Programs and Care Plans — Treatment programs and care plans:

• Address diagnoses, symptoms, conditions, and any behavioral symptoms that may call for bed rail consideration.
• Identify nursing, medical, and environmental intervention options.
• Only consider the use of side rails if other interventions prove unsuccessful or place the patient at a higher risk.
• Document the risk–benefit assessment on the patient’s medical chart.
• Consider the potential effects of using a low bed, such as restraining desired voluntary movement or creating undesirable psychological feelings.

Low-Risk Patients — Patients are considered to have a low risk for injury if:

• They are able to transfer safely to and from the bed to a wheelchair without assistance.
• They are able to ambulate, without assistance, to and from the toilet without falling.
• They have not fallen or are unlikely to fall out of bed.
• They notify staff appropriately using the call system.
High-Risk Patients — Patients are considered to have a high risk for injury if:

- They are not able to transfer safely to and from the bed to a wheelchair.
- They have experienced a previous entrapment or near-entrapment episode.
- They are not able to ambulate to and from the toilet without falling.
- They have a history of bed-related serious injury.
- They have had episodes of falling out of bed or it is likely that such episodes could occur.
- They are inconsistent in notifying staff of their needs or are unable to access the call system.

Options for Reducing Bed Risks

- Consider placing the patient in an adjustable-height bed that can be lowered for sleeping and raised for transfers and daily activities.
- Consider the use of a high-impact mat next to the bed.

If a patient requires a bed in a low position but has difficulty getting into the low bed from the standing position:

- Consider adding a quarter rail or transfer device to the bed for the patient to hold onto for support while entering the low bed.
- Evaluate the use of a bed alarm to alert nursing personnel.
- Base any decision on the individual patient’s clinical condition and assessment.

Using Bed Rails as Restraints — When bed rails have the effect of keeping a patient from voluntarily getting out of bed, they fall under the definition of a physical restraint. If they are not necessary to treat medical symptoms and if less restrictive interventions have not been attempted and determined to be ineffective, then using bed rails as restraints should be avoided. Bed rails used on the bed of a patient who is completely immobile do not serve as restraints but may not be medically necessary; thus, avoiding their use in these cases is recommended.

Education and Training — Hospitals, long-term-care facilities, and home healthcare providers should provide education and training regarding the use of bed rails and the creation of a safe and comfortable sleeping environment for their patients. It is recommended that the education and training be directed toward the following groups:

- Staff
- Patient and family
- Physicians, including medical directors and physician extenders such as physician assistants and nurse practitioners
- Long-term-care ombudsman
- Regulatory agencies or representatives

Maintenance Tips to Prevent Bed-Related Fires — Maintenance personnel should regularly conduct electrical safety testing per the manufacturer’s recommendations or facility protocols (see Table 9.6). If a bed has a power cord with a three-prong plug, the electrical resistance of the safety ground conductor and the level of leakage current (line conductor to safety ground and neutral conductor to safety ground) must meet applicable standards; refer to the IEC 60601-1 standard, which specifies 0.2 ohms and 500 μA leakage current for these two values. IEC 60601-1 is formally recognized by the FDA. UL 2601-1 is a widely used American version of IEC 60601-1. Beds with two-prong power cord plugs are considered safe if they are approved as a class II (double-insulated) device by a nationally recognized
Healthcare Hazard Control and Safety Management

E. FALL PREVENTION

Slips, trips, and falls are some of the most common patient-related incidents in healthcare facilities. Many healthcare workers also experience slips, trips, and falls. Analyzing appropriate safety and risk data can reveal trends and problem areas. Nursing personnel must be

TABLE 9.6  Tips for Preventing Bed-Related Fires

Connect the power cord directly into a wall-mounted outlet.
Use a power cord that meets the equipment manufacturer’s requirements.
Be sure the outlet will accommodate a hospital-grade plug.
Be sure the plug fits tightly into the wall outlet.
Check for cracks or chips in the outlet or the wall plate.
Be sure the plug blades are securely retained in the plug body.
Be sure ground pins of a plug are intact and secure.
Never connect the power cord to an extension cord or to a multiple-outlet strip.
Avoid the use of extension cords or multiple-outlet strips for any medical equipment.
When authorized, use a hospital-grade extension cord approved by engineering.
Mount multiple-outlet strips on a fixed surface to reduce damage.
Routinely inspect and tag all extension cords and multiple-outlet strips.
Periodically visually inspect the bed’s power cord for damage.
Protect all cords from crushing, pinching, cutting, or shearing.
Do not allow cords to be damaged by cleaning products.
Place furniture in such a way as to prevent cord damage from chairs or rockers.
Look for evidence of bulging, stretching, crimping, cracking, or discoloration of cords.
Never cover the power cord of the bed, or any power cord, with a rug or carpet; rugs and carpets prevent normal air flow which contributes to heat build up.
Place all cords in low- or no-traffic areas.
Inspect the bed frame, motor and hardware, mattress, and floor for excess dust and lint.
Be sure the bed moves freely in both directions.
Be sure the motion of the bed does not interfere with its power cord or plug.
Never thread hand control cables or power cords through mechanical parts of the bed.
Inspect the control panel covering of the bed for cracks or damage; damaged covers allow liquids or other conductive material to penetrate to the switches.
Check patient bed occupancy monitors and all other equipment in the patient’s room.
Report unusual sounds, odors, or movements in the controls, motors, or switch functions.
Respond to all manufacturer recalls and urgent safety notices.

testing laboratory such as Underwriters Laboratories (UL). Major medical device standards include IEC 60601-1, UL 544/UL1097, UL 2601-1, and NFPA-99. The IEEE standard 602-1996, Section 4.2.2, recommends the use of hospital-grade outlets and that they should be mounted with the ground pin or neutral blade up to ensure that any metal that may drop between the plug and the wall will most likely contact an unenergized blade. Refer to specifications for hospital-grade connectors in UL498-2001, Supplement SD.
actively involved in any fall prevention program, and an effective program would strive to increase awareness of fall hazards located in the unit or department. Care plans should contain information on each patient or long-term-care resident to help minimize the risk of a fall. An effective program would:

- Identify, evaluate, and correct all hazards contributing to fall events.
- Educate caregivers on the physical hazards and behavioral aspects of fall prevention.
- Provide all employees with training related to slip, trip, and fall prevention.
- Establish procedures for analyzing trends and problems within the facility.
- Implement a hazard surveillance program for physical hazards.
- Conduct regular inspections of all areas, especially patient and visitor areas.
- Place an emphasis on high-risk areas as determined by a statistical analysis of data.
- Require the safety committee to approve all policies.
- Provide special training for facility maintenance and environmental services personnel.
- Conduct a quarterly assessment of program effectiveness and an annual audit.

**Correcting Environmental Hazards** — Healthcare organizations must maintain a safe environment for patients, visitors, and staff. Switches should be accessible to the patient upon entering the room and from the bed. Lights should be bright enough to compensate for limited vision and for the activities performed in the room. Night-lights should be available in patient rooms, bathrooms, and hallways. Lighting should be adequate on stairs and hallways. Floor-level lighting can reduce glare. Staircases should have secure handrails on both sides. Steps can be painted or outlined for increased visibility and covered with nonslip material. Stairs should clutter free and well maintained. Floors should not be slippery, especially when wet. Floors should have nonglare, nonskid surfaces and throw rugs should have nonslip backings. Carpet edges should be taped or tacked down. Carpet patterns that impair perception may contribute to falls and should be avoided. Doorways between two different flooring surfaces should be level. Bathroom doors should be wide enough to allow easy wheelchair or walker passage. Beds should have the capacity to be lowered to 18 inches and should be adjustable to allow for transfers. Other steps to promote safety include the following:

- Clean up spills and liquids.
- Use visual warnings to alert patients about flooring changes and hallway turns.
- Design unobstructed pathways from bed to bathroom.
- Be sure chairs, tables, nightstands, and over-bed tables are properly located and secure.
- Be sure bed mattresses have firm sides that allow for proper seating.
- Be sure call buttons or bells are easily accessible from the bed.
- Be sure all tubs and showers have nonskid strips or mats.
- Install grab bars securely to the walls and at a height that allows easy access.
- Place grab bars near tubs, showers, and toilets.
- Be sure toilet seats are not elevated.

**Long-Term-Care Falls** — The likelihood of falling increases with the age of the patient for a variety of reasons; for example, slowed reaction times make it difficult to regain balance once it is lost. Changes in balance are caused by:

- Tilting the head back to look up
- Posture changes that shift the center of gravity
- Dizziness caused by medications
- Joint pain or stiffness
- Muscle weakness
Patient and Nursing Home Resident Fall Prevention

- Keep patients’ belongings and call buttons close to beds so patients do not have to reach too far.
- Place call buttons close to commodes and showers.
- Respond to trends in falls with new programs and patient fall prevention in-service education.
- Keep lighting bright in corridors and public areas.
- Encourage patients to go to the bathroom before they go to bed; even this simple measure can reduce nighttime falls.
- Re-evaluate drug treatments that contribute to frequent falls and constant disorientation.
- Where possible, help nursing-home residents improve physical disabilities through physical therapy and walking aids.
- Increase nursing coverage during high-risk activities such as getting out of bed and going to the bathroom.
- Work to subdue hostile patients; anger and resentment have been shown to contribute to falls.
- Introduce softer surfaces for floors or furniture, and provide grab bars and handrails throughout the facility.
- Use safety devices such as non-slip surfaces and footstools with rubber feet.
- Repair torn carpet, and remove other obstructions from patient areas.
- To prevent a fall caused by overreaching, place bedside tables, water pitchers and glasses, toiletries, footstools, the nurse call button, and other often-needed items close enough for the patient to reach without over-extension.
- Remove temptation by placing articles that are to be used only with assistance or supervision out of a patient’s sight to eliminate the possibility of the patient reaching for them from the bed.
- Be sure footstools have non-slip surfaces and rubber feet caps; preferably, attach them to the bed.
- Correctly position the patient in bed and be aware that extended pressure on a certain area of the body may cause various injuries.
- Provide sufficient support to prevent patients from sliding into a vulnerable position.
- Keep beds and bed areas in good repair.
- Promptly repair loose or broken tiles and frayed or loose carpet.
- Repair or replace all worn or poorly functioning self-help appliances.
- Train employees in correct patient carrying, lifting, and moving procedures.
- Make certain all personnel responsible for lifts and carries are trained in the appropriate safety precautions.
- Get patients involved in their own safety; most patients will try to avoid hazards if they understand the possible danger.
- Be sure handrails are sturdy; adequate hand grips and armrests should surround bathtubs.
- Be sure all bathroom floors, tubs, and showers have slip-resistant surfaces.
- Answer patient calls promptly; some patients may be particularly impatient and may attempt activities beyond their capacity.
- Never block doorways or elevator entrances.
- Be sure stair treads have a slip-resistant surface and that risers and treads are correctly sized.
- Keep landings and stairways free of all obstructions; do not use landings as storage areas.
- Do not use throw rugs or mats, which can be very hazardous, especially around wheelchairs.
Reasons for Patient or Resident Falls

- Drop attacks (sudden loss of muscle tone)
- Foot problems and improper shoes
- Fractures that cause falls
- Sensory changes
- Low blood pressure
- Environmental hazards, such as slippery floors and faulty equipment
- Improper use of wheelchairs, walkers, and canes

High-Risk Nursing Home Patients — High-risk nursing home patients:

- Experience high stress and anxiety for any reason
- Are weak or unsteady
- Use assistance devices or take certain medications
- Are known to have low blood pressure
- Experience arthritis or painful joints
- Are not able to see very well or have experienced a change in health status
- Have a history of falls or limited activity due to illness

Lowering the Potential for Falls — Caregivers should understand that:

- Most falls occur between 6 and 9 p.m. near the bed.
- Falls may be a symptom of a developing illness.
- Persons who are restrained fall more than those who are not.
- Carpets decrease the severity of injuries from falls.
- Identification of high risks results in planning appropriate care.
- Appropriate exercises for the patient can increase or maintain strength.
- Decreasing medications to the lowest effective dosage can be beneficial in lowering risks.
- Patients must learn to ask for help and to rise slowly.
- Patients must understand how to use wheelchairs, canes, and walkers properly.
- Keeping necessary items within reach can lower the risk of falls.
- Allowing residents to proceed at their own pace can reduce falls.

Investigating Patient and Resident Falls — When the safety or risk manager reviews incident and accident reports, the following items should be noted to help determine trends:

- Location, time, day, and shift
- Level of nursing staff on duty
- Use and position of bed rails or restraints
- Condition of patient at the time of the fall
- Medications that could have contributed to the fall
- Environmental factors such as floor conditions and lighting
- Whether or not the patient requested nursing assistance
- Availability of physician orders concerning patient activity
- Violation of safety procedures or organizational policies

F. USE OF RESTRAINTS

Due to an increasing number of reports of injuries and deaths associated with the incorrect use of patient restraints, the FDA is warning health professionals to make sure these devices are used safely. These devices include safety vests, lap belts, wheelchair belts, and body
holders. Incorrect use of these devices has included using the wrong size for a patient’s weight, errors in securing restraints, and inadequate patient monitoring (see Table 9.7). Such mistakes have resulted in fractures, burns, and strangulations. Injuries and deaths have been reported in healthcare facilities as well as in patients’ homes.

**Definition of Restraints** — A restraint is any manual method, physical device, mechanical device, material, or equipment attached or adjacent to a patient’s or resident’s body that restricts freedom of movement or normal access to one’s body (see Table 9.8). Under this functional definition, other devices or facility practices may also meet the definition of

| TABLE 9.7  Restraint Safety Recommendations |
|-----------------|---------------------------------------------|
| Follow good nursing and basic patient care practices. |
| Monitor patients frequently and remove restraints often. |
| Apply and adjust devices properly to maintain body alignment and patient comfort. |
| Allow the use of restraints only by prescription and for a strictly defined period. |
| Define and communicate a clear institutional policy on the use of restraints. |
| Display user instructions for restraints in a highly visible location. |
| Keep accurate patient records on the use of restraints. |
| Follow local and state laws regarding these devices. |
| Explain to patients and their families why the restraint is necessary. |
| Select the appropriate size and type of restraint for the patient’s condition. |
| Note the front and back of the device and apply it correctly. |
| Tie knots with easily released hitches. |
| Secure bed restraints to the springs or frame, not the mattress or bed rails. |
| Never use a sheet as a restraint, and visually check the patient every 30 minutes. |
| Remove restraints every 2 hours to allow for exercise and skin care. |
| Never restrain a patient to a toilet or portable commode. |

| TABLE 9.8  Types of Restraints |
|-----------------|---------------------------------------------|
| **Restraint** | **Use** |
| Safety bars | Can be applied to wheelchairs to prevent falls; less restrictive than soft belts |
| Soft belts | Restraints similar to seat belts to prevent falls from beds and wheelchairs; can be applied over clothing and around the waist |
| Safety vests | Provide more support than a belt in preventing falls from a chair or bed; sleeveless restraints should be applied across the front of the body |
| Wrist restraint | A limb-holding restraint that prevents the patient from removing tubes or bandages; applied around the wrists and secured to the bed or chair; must be physically checked every 15 minutes to make sure it is not interfering with circulation |
| Mitt restraint | Looks like a big mitten without the thumb; restricts finger movement but permits movement of the arm and wrist |
a restraint, such as tucking in a bed sheet so tightly that a patient’s movement in or out of bed is restricted or using a specialty bed that does not allow a patient to voluntarily exit from the bed. This definition considers side rails, regardless of size, as restraints if, on a case-by-case basis, they function to prevent a patient from voluntarily transferring in or out of bed and cannot be easily lowered by the patient.

**Patient or Resident Evaluation**

- Use data collection practices to measure and evaluate falls and restraint-related injuries as well as the overall use of restraints.
- Use a continuous quality improvement program to monitor noninjurious falls and root cause analysis to help catalog factors contributing to serious falls.
- Provide staff with continuing education on fall risk assessment, interventions to prevent falls, proper application of restraint, monitoring of the restrained patient, methods to reduce restraint use, and documentation of these care practices.
- Use physical restraints only if a specific medical symptom warrants their use and it is clear how such restraint is used to treat the symptom and how the restraint assists the patient in attaining or maintaining the highest level of physical, mental, and psychosocial well-being.

**Informed Consent** — The decision to restrain requires informed consent except in emergency care situations. Decisional-capable patients, guardians or legal representatives, and family members of decisional-incapable patients have the right to be informed of the risks and benefits of restraint use and possess the right to refuse their use. Further, informed consent requires that restraint alternatives be fully explained. Consistent with CMS regulations, a patient cannot be restrained solely because of a request by a family member, guardian, or legal representative.

**Written Order** — Physical restraint use requires a written order that specifies the type of restraint, when it is to be used, and the rationale for use. This order must be written by a qualified practitioner eligible to write such orders pursuant to medical staff bylaws and state licensing requirements. Orders for restraints via protocol or signed policy statements are limited to the acute-care setting in cases where a physician is not onsite. The order will be time limited to not more than 24 hours in the acute medical–surgical setting and 30 days in the nursing home.

**Staff Training and Education** — Staff applying the physical restraint should be appropriately trained in their use and application. The restraint must be properly applied according to the manufacturer’s instructions, which should be properly maintained and stored by the facility.

**Monitoring the Restrained Patient** — When a patient is restrained, attention to comfort and safety, including nutrition, hydration, elimination, exercise, and social interaction needs, is required. The ongoing monitoring of the restrained patient should include, among other areas, the patient’s behavioral and clinical condition.

**Gradual Process Toward Restraint Reduction** — Frequent attempts to reduce the period of time the patient is restrained or to eliminate the restraint should be conducted with specific criteria for removal of the restraint based on each patient’s situation. Restraint use should trigger ongoing evaluation and treatment aimed at understanding and treatment of the medical symptoms that precipitated its use. The periods of no restraint and the reactions should be documented. If the patient demonstrates a decline in physical or
psychological health status, staff should investigate if the deterioration is due to the restraint or disease progression. If the restraint is the cause or contributing factor, the plan of care should reflect specific interventions designed to regain the patient’s health status and minimize further risk of decline.

**Documentation** — The patient’s medical record should include documentation of the comprehensive assessment, least restrictive alternatives attempted, patient’s specific medical symptoms, rationale for physical restraint use, signed consent form, written order for restraint use, and plan for gradually reducing or eliminating restraint use. The patient’s record should also reflect the use of restraints (type, size, and period of time), care of the patient while restrained, and the patient’s response to restraint application, reduction, or elimination. In a circumstance when a restraint or bed side rail is implicated in an injury or death of a patient, specific reporting requirements include immediate notification of the attending physician, nursing supervisor, and facility risk manager, who will be responsible for reporting the case to the FDA and manufacturer. In cases of death, the attending physician will notify the medical examiner.

### G. HEALTHCARE WORKPLACE VIOLENCE

The Bureau of Labor Statistics (BLS) reported 2637 nonfatal assaults on hospital personnel in 1999. This equates to a rate of 8.3 assaults per 10,000 workers. The rate is four times higher than the rate of nonfatal assaults for all private-sector industries. Assaults can occur when service is denied, when a patient is involuntarily admitted, or when a healthcare worker attempts to set limits on eating, drinking, or tobacco or alcohol use. Workplace violence ranges from offensive or threatening language to homicide. Attacks range from slapping to rape, homicide, and the use of weapons. Violence in hospitals usually results from patients and occasionally from their family members who feel frustrated, vulnerable, and out of control. Anyone working in a hospital or another healthcare facility may become a victim of violence; however, nurses and nursing aides experience the highest risk. Nurses have reluctantly reported violence against them perpetrated by enraged physicians. Some tasks or situations associated with healthcare violence include:

- Transporting patients
- Long waits for service or the perception of poor care
- Overcrowded, uncomfortable waiting rooms
- Working alone in areas with high risks
- Inadequate security
- Patients on drugs or alcohol
- Weapons brought on campus
- Unrestricted access to facilities by the public
- Poorly lit corridors, rooms, parking lots, and other areas

**Prevention Recommendations**

- Develop a comprehensive violence prevention program.
- Be aware that risk factors vary from hospital to hospital and unit to unit.
- Train hospital workers to stay alert and cautious when interacting with patients and visitors.
- Encourage active participation in safety training programs.
- Be sure that workers understand policies and procedures regarding violence prevention.
• Develop a written violence-prevention program that includes management commitment, employee participation, hazard identification, training, prevention activities, control measures, and timely reporting.
• Evaluate the program periodically.
• Develop or install emergency signaling, alarms, and monitoring systems.
• Install security devices such as metal detectors to prevent armed persons from entering the hospital with weapons.
• Install other security devices such as cameras and good lighting in hallways.
• Provide security escorts to the parking lots during late shifts.
• Be sure that waiting areas that accommodate patients waiting for care are safe.
• Design the triage area and other public areas in such a way as to minimize the risk of assault.
• Install bullet-resistant and shatterproof glass enclosures in reception areas.
• Schedule staffing patterns to prevent personnel from working alone and to minimize patient waiting time.
• Restrict the movement of the public in hospitals by card-controlled access.
• Develop a system for alerting security personnel when violence is threatened.
• Be aware of the contributing factors to assaultive behaviors:
  • Inadequate staffing
  • High-activity times of day
  • Invasion of personal space
  • Seclusion or restraint activities
  • Lack of experienced staff

Behavior Modifications — Most healthcare workers admit that aggressive behavior by patients is a major concern. Many employees are injured when patients act out by biting, kicking, scratching, slapping, or punching. It is important to provide all workers with training in recognizing and managing assaults, resolving conflicts, and maintaining hazard awareness (see Table 9.9). Violence may occur in the workplace in spite of preventive measures, so employers should be prepared to offer and encourage counseling whenever a worker is threatened or assaulted. Healthcare personnel must recognize that irritation, aggravation, and rage are the three phases of anger. Because they work closely with patients, nursing personnel are in a good position to observe and evaluate human emotion and to recognize the first signs of anger (see Table 9.10). Personnel should be aware of anyone demonstrating antisocial behavior or with obvious anger control problems. The contributing factors for anger could include feelings of inadequacy, lack of control, or hopelessness. Patients with mental illness pose possible threats due to real or perceived unresolved problems.

Responding to Patients — Patients, when angry, become fidgety, verbally abusive, or withdrawn. Healthcare personnel should attempt to establish a conversation with the person by asking why the patient is angry (see Table 9.11). Showing concern can be a very effective way to prevent an explosion later. Aggravated patients require actions to be taken, such as removing the patient from the aggravating situation or person. Personnel should always speak in reassuring tones and make others aware of the escalating anger, as aggravation can lead to rage and violent consequences. Rage usually builds slowly but can quickly become out of control. Transport or restraint against the patient’s wishes may be necessary. Healthcare workers need to feel confident about intervening during the anxiety stage of the anger cycle, especially when trying to calm the patient by listening and addressing his or her concerns. During verbal attacks, it is advisable to give the patient some well-defined options with enforceable limits. The most important goal during this phase of the aggression cycle is to help the patient return to a state of control. Some organizations require that nursing
personnel call for security assistance before the patient resorts to physical aggression. When evaluating a patient’s mental condition and situation, nonverbal clues are important; pay attention to the eyes, as they can provide clues as to what the patient might do. Personnel should also be prepared for physical aggression if verbal communication stops abruptly.
Control Measures — Healthcare personnel must work with management to make the necessary changes, monitor incidents, and determine if control measures are effective (see Table 9.12). Possible actions include:

- Improve staffing levels.
- Have experienced clinicians on each shift.
- Train staff to deal with escalating violence.
- Install controlled access systems.
- Consider the use of metal detectors.
- Improve lighting and video surveillance.
- Enforce wearing ID badges.
- Install panic buttons.
- Implement working policies on threats, harassment, and physical assault.
- Develop an escort or buddy system.

Know Your Patients — Both physical and psychological contributions may lead patients to behave aggressively. The following factors are known to contribute to assaultive behavior:

- A history of violent behavior
- Diagnosis of dementia
• Intoxication from drugs and alcohol
• The treatment environment itself

Patient Risk Assessment Elements
• Alert colleagues about patients with known histories of assaultive behavior.
• Institute a system that protects confidentiality but alerts staff.
• Change inflexible routines and policies.
• Minimize waiting periods.
• Monitor the flow of visitors.
• Insist that all staff who may encounter violence be trained in detecting agitation and employing verbal de-escalation techniques.
• Be confident in using restraint and seclusion but use them judiciously.
• Know how to activate emergency response systems, especially on shifts with fewer staff.
• Have adequate staffing.

H. LONG-TERM-CARE COMBATIVELY RESIDENT BEHAVIOR

Combative behavior is any physically aggressive act that causes or intends to cause hurt or damage to a person or object. Certain types of brain disorders, health conditions, psycho-social factors, environmental situations, and caregiving interactions can interfere with the ability of residents to mirror reality. In effect, behavior always occurs within a context of people, places, times, and events. Some types of behavior you may encounter in long-term-care settings include:

• Resisting care (e.g., aggressively hampering efforts at bathing or dressing)
• Verbal aggression (e.g., arguing, cursing, accusing, or threatening)
• Fighting (e.g., endangering residents or caregivers with punches, kicks, and other hurtful acts)
• Catastrophic reactions (e.g., sudden mood changes with outbursts that indicate a resident is overwhelmed and unable to control feelings)
• Particular physiological responses (e.g., heart rate increase, central blood flow decrease due to constriction of blood vessels, peripheral flow increase due to dilation, increase in respiration)

Dementia — Dementia is a brain disorder that affects both personality and thinking abilities. It occurs in organic brain diseases, such as Alzheimer’s, and in other disorders. It worsens over time. As Alzheimer’s residents lose touch with reality, combative behavior may result from their inability to understand what is going on in the care setting. Other health-related causes may include hearing or visual impairment, acute illness, multiple illnesses and disabilities, hormonal changes, loss of control over bodily functions, or disturbances in body image. Drug-related conditions, changes in medication, and lack of sleep may induce episodes of combative behavior. Psychosocial causes of combative behavior may stem from a resident’s feeling threatened by life changes and frustrated by a perceived loss of control. Unable to communicate adequately, a patient or resident may misinterpret your efforts to provide care. To manage the behavior, you need to assess and understand the reasons for it or the purpose it serves, develop a care plan based on realistic goals, use strategies to prevent it, and intervene safely when it occurs. Regardless of the circumstances, residents deserve to be treated with respect and have their dignity preserved.
Assessing the Resident — A thorough assessment begins with a review of the patient’s medical, social, and work history and a search for behavior patterns that may repeat. Visits with family members will lead to a better understanding of the resident’s personality, former occupations, hobbies, and life experiences. Keeping the family informed and enlisting their aid in modifying the behavior can be helpful. Talking with the resident can shape a closer, more understanding relationship. It is important to maintain an ongoing, regularly updated assessment of the patient’s type of dementia, its severity, and its progression. Also:

- If a resident resists care, assess and try to understand the cause. Refusing to be bathed, for instance, may mean that an individual's sense of modesty is being offended by the need to undress in your presence. Refusing dinner or medication may mean a resident fears being poisoned. Or, refusing to cooperate may be a way of exerting power and control in order to avoid feeling helpless.
- If a resident becomes verbally aggressive, realize these are signs that the patient is losing impulse control. Anything that causes stress can bring on this behavior — from a change in routine to the notion that a caregiver is being overly familiar.
- If a resident starts a fight, realize that fighting is dangerous and act swiftly. Recognize that fighting happens most often when a resident feels his or her personal space or possessions are threatened. Personality conflicts can also lead to fighting.
- If a resident has a catastrophic reaction, the caregiver most trusted by the resident should intervene. Approach in a way to avoid startling the resident. Be gentle, but firm. A catastrophic reaction cannot be predicted and thus cannot be prevented. An outburst of crying, anger, or fighting is a sudden response to feeling overwhelmed. It occurs most often in the morning, when daily care activity is at its peak.

Formulating a Plan

- Work closely with the entire caregiving team to develop a plan for successful management, containment, and, where possible, prevention of combative incidents.
- Begin with the understanding that you will probably be unable to stop all behavior problems and cannot halt the progression of conditions such as dementia.
- Make your goals realistic; for example:
  - Attend to the safety of the combative resident, other residents, staff, visitors, and the environment.
  - Establish a support system by asking all caregivers to stay alert and be prepared to give aid in combative behavior situations.
  - Increase awareness of behavior that may give clues to the onset of an aggressive act.
  - Strive for containment with efforts to decrease the frequency, intensity, duration, and disruptiveness of combative behavior.

Prevention — Our actions should be motivated by the need to protect and teach, not by a desire to punish:

- Despite a resident’s confusion or cognitive impairment, always try to validate his or her reality and honor the human dignity to which each of us is entitled.
- Give each resident your respect, as shown by words of praise and gestures of support.
- Encourage a resident’s self-care and functional independence to the fullest extent of their capabilities.
Documentation of Resident Abusive Behavior

- On any shift, when a new challenging behavior develops, the staff involved should complete an incident report, notifying the nurse and case manager.
- Incidents of resident abusive or combative behavior should be documented in the resident’s medical record.
- Healthcare workers should be trained on appropriate interventions for the prevention of abuse behavior and the protection of staff and other residents.
- The abusive behavior should be reported to the patient’s physician and family members or legal representatives, as included in the care plan.
- Further incidents should be recorded and reported to determine the effectiveness of any interventions; the success of interventions should be recorded in the progress notes.
- Interventions should be revised as required by the resident’s interdisciplinary team.
- Appropriate staff should be aware of the plan of care and interventions.
- Tracking tools, including the daily behavior log and daily description sheet, as well as 15- to 30-minute tracking forms, may be used when a detailed objective measurement of behavior is needed.
- The nurse is responsible at the end of each shift to chart in the progress notes a summary of behaviors occurring on that shift that specifically addresses the resident’s response to the interventions tried.
- The case manager is responsible for completing the behavior assessment form and making sure that the care plan is accurate and interventions are effective.

Communicating with Alzheimer’s Patients — As a result of physiologic changes caused by Alzheimer’s disease, affected people may not communicate well with others. They are not creating these obstacles on purpose and are probably as frustrated as their friends and family are by the communication problems (see Table 9.13). People with Alzheimer’s disease may:

- Use certain words repeatedly.
- Invent new words to describe familiar objects.
- Have difficulty finding the appropriate words.
- Revert to speaking a native language.
- Use offensive words.
- Frequently lose their train of thought.
- Speak less often.
- Use gestures to communicate instead of words.

I. MEDICATION SAFETY

Medications include prescriptions, samples, herbal remedies, vitamins, over-the-counter drugs, vaccines, diagnostic drugs, and contrast agents used on or administered to persons to diagnose, treat, or prevent disease. The list includes radioactive medications, respiratory therapy treatments, blood derivatives, intravenous solutions, and any product designated by the FDA as a drug. The definition of medication does not include enteral nutrition solutions, oxygen, and other medical gases. Medication management is an important component in the palliative, symptomatic, and curative treatment of many diseases or conditions. A safe medication management system addresses the following:

- Selection and procurement
- Storage
Medication Safety — Medication errors receive widespread publicity. Many of these errors contribute to patient deaths. Organizations accredited by the Joint Commission must have procedures in place to ensure the safe use of medication. Healthcare safety professionals must emphasize medication safety during orientation and training sessions. Nursing personnel must understand the importance of following established procedures when administering medications.

Categories of Medication Errors — Personnel investigating medication errors categorize them in a number of ways. Some of the most common categories are listed below:

- Failure to administer medication when required or as prescribed
- Administering medication at the wrong time or using incorrect route of administration
- Administering the wrong dosage or concentration of a drug
- Administering the wrong medication (some medications having similar names)
- Misunderstanding verbal or written medication orders, including transcription mistakes
- Administering medication to the wrong patient
- Failure to read labels on vials and containers
- Using an improper injection technique

American Hospital Association List of Common Medication Errors

- Incomplete patient information (e.g., not knowing about patients’ allergies, other medicines they are taking, previous diagnoses, and lab results)
- Unavailable drug information (e.g., lack of up-to-date warnings)
• Miscommunication of drug orders, which can involve poor handwriting, confusion between drugs with similar names, misuse of zeroes and decimal points, confusion of metric and other dosing units, and inappropriate abbreviations
• Lack of appropriate labeling as a drug is prepared and repackaged into smaller units
• Environmental factors, such as lighting, heat, noise, and interruptions, that can distract health professionals from their medical tasks.

Investigating Medication Errors — The organization should designated a qualified person or department to conduct a thorough investigation to document all the facts. Investigations should seek to determine:
  • Location and type of unit in which the error or mis-administration occurred
  • Time, date, and shift
  • Staff levels at the time the incident occurred
  • Other departmental or unit events that could have contributed to the incident
  • Legibility and accuracy of physician orders
  • If failure to follow safety precautions or other medication procedures contributed to the event
  • If communication failure among hospital staff or with the physician contributed to the event

Information regarding the incident should be analyzed by nursing, management, and pharmacy personnel. Any trends or patterns in medication errors must be reported to the appropriate committee for discussion and implementation of corrective actions.

Reducing Medication Errors — Many medication errors occur during the communication or transcription of medication orders. A written policy designed to reduce the potential for error or misinterpretation of written or verbal orders should:
  • Address the required elements of a complete medication order.
  • Contain a list of unacceptable abbreviations, symbols, acronyms, and dose designations.
  • Detail acceptability of generic or brand names as part of a medication order.
  • Cover precautions or procedures for ordering drugs with look-alike or sound-alike names.
  • Detail actions to take when medication orders are incomplete, illegible, or unclear.
  • Minimize the use of verbal and telephone orders.
  • Implement a process for taking verbal or telephone orders that requires the person taking the order to read it back aloud to the prescribing professional to verify the order.
  • Review and update preprinted order sheets as needed.
  • Specify that blanket reinstatements of previous orders for medications are not acceptable.
  • Define in writing when weight-based dosing for pediatric populations is required.

Medication Management — A medication management program enhances patient safety by:
  • Reducing practice variation, errors, and misuse
  • Monitoring medication management processes for efficiency, quality, and safety
  • Standardizing equipment and processes across the organization
  • Using evidence-based practices to develop medication management processes
  • Managing critical processes to promote safe medication management
• Handling all medications in the same manner, including samples
• Providing mechanisms for reporting potential and actual errors
• Stressing processes to improve medication management and patient safety
• Realizing that the most effective feedback and improvement occurs in a culture that is not punitive

Medication Administration Safety
• Develop guidelines for staff members administering medications, with or without supervision, consistent with laws, regulations, and the organization’s policies.
• Address an individual’s qualifications to administer by medication, medication class, or route of administration.
• Provide guidelines for prescribing professional notification in the event of an adverse drug reaction or medication error.
• Identify the patient by using at least two individual identifiers, excluding patient location.
• Verify the correct medication by reviewing the medication order and product label.
• Verify stability by conducting a visual examination for particulate matter or discoloration and check the medication expiration date.
• Verify that no contraindication exists before administering the medication.
• Verify medication administration time, prescribed dose, and correct route.
• Advise the patient or, if appropriate, the patient’s family about any potential clinically significant adverse reaction when administering a new medication.
• Discuss significant concerns about the medication with the patient’s physician, the prescribing professional (if different from the physician), and relevant staff involved with the patient’s care, treatment, and services.
• For self-administration, provide guidance about safety and require training, supervision, and administration documentation; self-administration includes any instance when a patient independently uses a medication, including medications that may be held by the organization for the independent use by the patient.
• Require that persons administering medications who are not staff members must receive training and appropriate information about the nature of the medications to be administered; such training should address how to administer medications, frequency, route of administration, and dosages.
• Educate administration personnel on expected actions and side effects of the medications and how to monitor the effects of the medications on the patient.

Patient Monitoring
• Monitor each patient’s response to his or her medication, including the clinical needs of the patient.
• Address the patient’s response to the prescribed medication and actual or potential medication-related problems.
• Be sure to monitor the effect of a medication on a patient, including soliciting the patient’s own perceptions about side effects and perceived efficacy.
• Refer, as necessary, to information in the patient’s medical record, relevant laboratory results, clinical response, and medication profile.
• Monitor a patient’s response to the first dose of a new medication.

Reporting Medication Errors — Each organization must develop procedures to respond appropriately to actual or potential adverse drug events and medication errors. They should take appropriate actions when an actual or potential adverse drug event is identified and comply with internal and external reporting requirements for actual or potential adverse
drug events, including notifying the U.S. Pharmacopeial Convention (USP), FDA, or Institute for Safe Medication Practices (ISMP). The National Coordinating Council for Medication Error Reporting and Prevention defines a medication error as any preventable event that may cause or lead to inappropriate medication use or patient harm while the medication is in the control of the healthcare professional, patient, or consumer. Such events may be related to professional practice, healthcare products, procedures, and systems, including prescribing; order communication; product labeling, packaging, and nomenclature; compounding; dispensing; distribution; administration; education; monitoring; and use.

**FDA Role in Medication Error Reporting** — The FDA receives medication error reports on marketed human drugs, including prescription drugs, generic drugs, and over-the-counter drugs, as well as nonvaccine biological products and devices. In 1992, the FDA began monitoring medication error reports that are forwarded to the FDA from the USP and the ISMP. The FDA also reviews MedWatch reports for possible medication errors. Currently, medication errors are reported to the FDA as manufacturer reports (adverse events resulting in serious injury and for which a medication error may be a component), direct contact reports (MedWatch), or reports from the USP or ISMP. The Division of Medication Errors and Technical Support includes a medication error prevention program staffed with pharmacists and support personnel. Among their many duties, program staff review medication error reports sent to the USP-ISMP Medication Errors Reporting Program and MedWatch, evaluate causality, and analyze the data to provide feedback to others at the FDA.

**USP Medication Errors Reporting Program** — The USP Medication Errors Reporting (MER) program is a nationwide program that makes it possible for health professionals who encounter actual or potential medication errors to report them confidentially and anonymously, if preferred, to the USP. By sharing these experiences, pharmacists, nurses, physicians, and other healthcare practitioners contribute to improved patient safety and to the development of valuable educational services for the prevention of future errors. The program encompasses a wide variety of problems such as misinterpretations, miscalculations, mis-administrations, difficulty interpreting handwritten orders, or misunderstanding verbal orders. The USP reviews each report for health hazards and forwards all information to the FDA and the product manufacturer. The USP acts as a liaison with the FDA and the manufacturer for those who want to submit a report anonymously. The MER program is presented in cooperation with the Institute for Safe Medication Practices.

**National Coordinating Council for Medication Error Reporting and Prevention** — The National Coordinating Council for Medication Error Reporting and Prevention (NCC MERP) is an independent body comprised of 25 national and international organizations. In 1995, the USP spearheaded formation of the NCC MERP. Leading national healthcare organizations are now meeting, collaborating, and cooperating to address the interdisciplinary causes of errors and to promote the safe use of medications. The USP is a founding member and Secretariat for the NCC MERP.

**J. INFANT ABDUCTION PREVENTION**

As a part of their contingency planning, all facilities should develop a written protocol addressing infant abduction (see Table 9.13). This protocol must be communicated to and training signed off by all staff members within the maternal–child care unit. All departments, including plant operations, communications, switchboard operations, plant engineering, accounting, and public relations, should be aware of the protocol. When formulating such a protocol, facilities need to consider a variety of factors; for example, layouts and traffic patterns differ among facilities. Other examples include:
TABLE 9.13  Offender Profile

Female, 12 to 50 years old, often overweight
Most likely compulsive; often relies on manipulation, lying, and deception
Frequently indicates that she has lost a baby or is incapable of having one
Usually married or involved in a cohabitation arrangement; companion’s desire for a child may be motivation for the abduction
Usually lives in the community where the abduction takes place
Frequently visits nursery and maternity units prior to the abduction and asks detailed questions about hospital procedures and the maternity floor layout
Frequently uses a fire exit stairwell for her escape
Usually plans the abduction but does not necessarily target a specific infant, instead seizing on any opportunity present
Frequently impersonates a nurse or other allied health professional
Often becomes familiar with hospital personnel and even with the victim’s parents
Demonstrates a capability to provide good care to the baby after the abduction occurs

Nursing Guidelines for Abduction Response

- Openness of the facility
- Entrance/exit doors
- Alarm systems
- Staffing patterns including number of staff members who are visible on the unit

- Immediately call security or other designated authority per the facility’s protocol.
- Immediately search the entire unit.
- Remember that time is critical.
- Do a head count of all infants.
- Question the mother of the infant suspected to be missing as to other possible locations of the child within the facility.
- Where a facility has no security staff, immediately call the local police department and make a report.
- Protect the area where the abduction occurred to aid in the subsequent collection of any forensic evidence by law enforcement officials.
- Turn over protection of the area to security personnel upon their arrival and to law enforcement upon their arrival (see Table 9.14).

TABLE 9.14  Security Response Actions

Call 911 or the local law enforcement agency.
Immediately and simultaneously activate a search plan for the entire healthcare facility, interior and exterior, as time is critical.
Assume control of abduction scene until law authorities arrive.
Establish a security perimeter around the facility.
Assist nursing staff in establishing and maintaining security within the unit.
Close all parking lots.
• Secure all records and charts of the mother and infant.
• Notify the lab and place a STAT hold on the infant’s cord blood for follow-up testing.
• Have the nurse manager or unit supervisor brief all staff and mothers on the unit; mothers should never hear this news first from the media or law enforcement.
• Move the parents of the abducted child to a private room off of the maternity floor.
• Have the nurse assigned to the mother whose infant was abducted accompany her at all times to protect her from stressful contact with the media and other interference.
• Offer counseling or pastor assistance.
• Consider designating a room for other family members to wait in and which gives them easy access to any updates but gives them some privacy.

Nurse managers or supervisors should be sensitive to the fact that the nursing staff may suffer posttraumatic stress disorder as a result of the abduction. They should make arrangements to hold a group discussion session as soon as possible that all personnel affected by the abduction are required to attend. Such a session will give healthcare facility personnel a forum for expressing their emotions and help them deal with the stress resulting from the abduction. In some cases, it might be a good idea to invite the law enforcement personnel who are handling the case. Certain staff members may require further assistance before returning to their duties on the unit. Facilities should make every effort to assist these staff members with this process.

Information Release
• Ask law enforcement to use crime code numbers to prevent uncontrolled release of the information to the general public.
• Follow the media response plan to control the release of information.
• Have law enforcement or hospital authorities clear the release.
• Be as forthright as possible without invading the privacy of the family.
• Apprise the family of the media plan and seek their cooperation in working through the official spokespersons.
• Notify other units (e.g., newborn nurseries, pediatrics, emergency room), as well as outpatient clinics for postpartum or pediatric care at other healthcare facilities, about the incident.
• Provide a full description of the baby and the suspected or alleged abductor.
• Designate a separate area where friends and family of the parents can gather to receive regular updates on the abduction in order to keep them informed about the case while shielding them from the press.
• Provide switchboard operators with a written response to those inquiring about the situation; outside callers could include anxious parents who are planning to have their babies delivered at the facility.

Preventive Measures
• Implement a policy that requires all hospital personnel, medical staff, and other designated provider groups to wear identification badges (preferably bearing a photograph).
• Consider using further security measures for those working in nurseries, pediatrics, and obstetrics.
• Issue specific badges to employees assigned on a temporary basis, such as housekeeping and volunteer personnel.
• Develop a system to identify the infant, mother, father, or a designated other.
• Apply the system before the baby leaves the birthing area.
• Develop procedures to cover band removal and the mother being discharged prior to the infant.
• Put into place a procedure to be followed in the event that the mother will not be the person ultimately receiving the baby upon discharge.
• Transport infants in their bassinets or cribs at all times during hospitalization.
• Leave identification bracelets in place following discharge to help identify mothers and infants during their departure from the hospital.
• Evaluate the appropriateness of visiting policies by surveying obstetrical patients, postnatal patients, and prenatal patients.
• Prior to hospitalization, solicit the support of families during prenatal classes and doctor’s office visits and by media releases with regard to visiting regulations.
• Post visiting policies in prominent areas in patient rooms and make periodic paging system announcements.
• Identify visitors through the use of color-coded, dated, tags that denote the patient’s room.
• Use a sign-in log at the main entrance or the obstetrical area to better control access.
• Staff assigned to the obstetrical unit should wear distinctive uniforms stamped with an obvious facility logo; maintain the security of these uniforms in laundry and storage.
• Make mothers and families aware of the specific design and color of these uniforms.
• Encourage mothers to notify a staff member if they are unsure of someone.
• Have house security personnel maintain a high-profile throughout the area by making periodic rounds.
• Schedule a security check at the conclusion of visiting hours to ensure that all visitors have exited.
• Be aware that some hospitals no longer make birth announcements to the local media.

Monthly Risk Audits — Conduct monthly audits to assess the following items:

• Newborn, maternal, and family identification
• Staff identification
• Visitor identification
• Staff education and in-service sessions
• Mother and family education and awareness
• Community awareness
• Code response team preparedness

Root Causes — Causal factors fall in six basic categories:

• Security equipment factors, such as security equipment not being available, operational, or used as intended
• Physical environmental factors, such as no line of sight to entry points and unmonitored elevator or stairwell access
• Inadequate patient education
• Staff-related factors such as insufficient orientation or training, competency and credentialing issues, and insufficient staffing levels
• Information-related factors, such as birth information published in local newspapers, delay in notifying security when an abduction is suspected, improper communication of relevant information among caregivers, and improper communication between hospital units
• Organization cultural factors, such as reluctance to confront unidentified visitors/providers
JCAHO-Suggested Strategies for Reducing Abduction Risks

- Develop and implement a proactive infant abduction prevention plan.
- Include information on visitor and provider identification as well as descriptions of potential abductors and abduction situations (during staff orientation and in-service curriculum programs).
- Enhance parent education concerning abduction risks and parent responsibility for reducing risk and then assess the parents' level of understanding.
- Securely attach identically numbered bands to the baby (wrist and ankle bands), mother, and father or significant other immediately after birth.
- Footprint the baby, take a color photograph of the baby, and record the baby's physical examination within 2 hours of birth.
- Require staff to wear up-to-date, conspicuous identification badges bearing color photographs.
- Discontinue publication of birth notices in local newspapers.
- Consider options for controlling access to nursery or postpartum units, such as swipe-card locks, keypad locks, entry point alarms, or video surveillance (any locking systems must comply with fire codes).
- Consider implementing an infant security tag or abduction alarm system.

Other Recommendations — Experts have identified the following as the three key steps to preventing infant abductions.

- Educating staff
- Educating mothers
- Access control

Root-Cause Analysis — The following areas are suggested by the Joint Commission as minimal areas for analysis in a root-cause analysis of an infant abduction or wrong discharge:

- Physical environment
- Security systems and processes
- Staffing levels
- Communication among staff members
- Orientation and training of staff
- Competency assessment
- Credentialing process
- Communication with patient and family
- Factors distracting staff

K. NURSING AND CLINICAL DEPARTMENTAL SAFETY

The work environment of nurses can directly impact patient safety issues. A recent Institute of Medicine report called for changes in methods for determining nurse staffing levels. The report called for changing the work environment in the areas of management, workforce deployment, work design, and organizational culture. U.S. healthcare organizations employ over 2 million registered nurses and another 3 million licensed practical and vocational nurses and nursing assistants. Long working hours pose a risk because the most serious threat to patient safety is simple fatigue. Some states are beginning to look at nursing staffing levels and the ratio of nurses to patients. Nurses serve on the front line and should be consulted when leaders attempt to identify processes that could contribute to errors. Senior leaders must look for ways to better orient and educate nursing staffs on safety-related issues.
TABLE 9.15  Nursing Safety Tips

Follow good hand hygiene practices and use moisturizers to prevent drying of the skin.
Use proper equipment and techniques to prevent needle stick injuries.
Use personal protective equipment (PPE) and other barriers for the task.
Wear appropriate footwear for walking and standing.
Follow safe patient moving and lifting techniques, including the use of assist devices.
Avoid awkward positions and take frequent breaks for repetitive tasks.
Encourage shift workers to learn to follow a shift work pattern that ensures proper sleep and diet.
Learn to watch for the hazards associated with shift and job assignments.
Seek assistance in dealing with job stress.
Keep all hallways and passages clear of clutter and equipment.
Install and maintain adequate ventilation for each area.
Practice good electrical safety in the performance of all duties in and out of patient areas.
If exposed to radiation, wear a monitoring device.
Learn to identify safety hazards including fire prevention.

TABLE 9.16  Nurse Safety Education Topics

Bloodborne pathogens and infection risks
Standard precautions and handwashing requirements
How to select, use, maintain, and store PPE
How to select the proper footwear
Methods and engineering innovations for preventing needlestick injuries
Patient and material handling or lifting techniques
Detailed information about shift work and sleep deprivation
Protections against workplace violence
How to work safely with compressed gases
Importance of following established safety procedures
Emergency response and evacuation procedures
Hazard and injury reporting procedures
Hazard communication about chemicals and waste materials
Location, availability, and use of Material Safety Data Sheets
Medical equipment procedures and event reporting
Patient safety issues

Healthcare organizations recently began promoting the development of patient safety cultures (see Table 9.15 and Table 9.16).

Bloodborne Pathogens — The Bloodborne Pathogens standard specifies precautions to take when dealing with blood and other potentially infectious materials. Engineering and work practice controls must be the primary means of eliminating or minimizing exposure
to bloodborne pathogens. Wherever engineering controls could reduce employee exposure by removing, eliminating, or isolating the hazard, they must be used, and changes to the exposure control plan must include these engineering controls. Employees must wear appropriate personal protective equipment, gloves, gowns, and face masks when anticipating blood or other exposures. They should discard contaminated needles and other sharp instruments immediately or as soon as feasible after use into appropriate containers. (Refer to Chapter 7 for more detailed information about bloodborne pathogens and infection control.)

Universal Precautions — It is important to treat all blood and other potentially infectious body fluids as if they are infected and to take appropriate precautions to avoid contact with these materials. The Bloodborne Pathogens standard allows hospitals to practice acceptable alternatives to universal precautions, such as standard precautions or body substance isolation.

Hazardous Chemicals — Because employees can be exposed to hazardous chemicals or hazardous drugs in healthcare facilities, it is important to have a program in place that maximizes employee safety during decontamination of patients and during the administration, disposal, and preparation of hazardous drugs.

Slips, Trips, and Falls — Potential slip and fall hazards arise when water is spilled on the floor accidentally, electrical cords run across pathways, and emergency equipment or supplies block passageways. Keeping floors clean and dry by cleaning up spills quickly, keeping walkways free of obstructions, and keeping access to exits clear and unobstructed at all times should be top priorities.

Equipment Hazards — Employees can be injured as a result of improper training or use of equipment. Electric shock may also occur as a result of lack of maintenance or misuse of equipment and its controls. Oxygen-enriched atmospheres and water may contribute to hazardous conditions. A program should be in place that routinely monitors the status of equipment and provides proper training in the safe use of equipment. Employees should be encouraged to:

- Always use equipment properly.
- Never use damaged, defective, or improperly working equipment.
- Never use equipment unless properly trained and authorized to do so.
- Always follow safety policies and procedures when using equipment.
- Report defective equipment to the biomedical engineering department.

Electrical Safety — Electricity is now the leading cause of fires in healthcare facilities. Electrical hazards include defective wiring, deteriorated insulation, mechanical abuse, faulty interior components, or irresponsible tampering. Patients are vulnerable to electrical hazards for a number of reasons. Employees should:

- Avoid the use of extension cords.
- Visually check electrical equipment before use.
- Look for broken or bent plugs, frayed cords, bare wires, smoke, sparks from switches or controls, liquids spilled in or on equipment, or erratic operation.

Aerosol-Delivered Drugs

- Use precautions in rooms with patients receiving an aerosol drug (OSHA considers these drugs as dangerous); discourage visitors who are pregnant, breastfeeding, or attempting to become pregnant from visiting while such drugs are in use. The nursing staff should document the medical record if a visitor elects to enter the patient’s room.
• Advise workers who are pregnant, breastfeeding, or attempting to become pregnant of the manufacturer’s guidelines for such drugs; these workers should not be required to render primary care to patients while such drugs are being administered.
• Be aware that aerosol drugs can cause respiratory irritation and can damage contact lenses; individuals who wear contact lenses should consider wearing glasses while caring for these patients.
• Place a warning sign outside the patient’s room while the drug is in use.

Call System Operation — Call systems are safety tools. To promote legitimate use of call systems, patients and nurses must be trained in their use. Nurses must understand that call systems are designed to encourage patients not to do things for which they should seek help. Even though a call for help may seem to be a nuisance, nurses should be encouraged to consider what might happen if a patient attempted a potentially dangerous activity without assistance. Nursing personnel should explain to each patient the proper use of the call system and specify what the patient can do and should not attempt to do without assistance. Responding promptly and courteously to patient calls will encourage patients to use the system rather than attempt a dangerous activity. Call buttons should be placed within easy reach of the patient’s bed. Ensuring that the call button is as close as possible to the patient prevents a major fall.

Accurate Charting — Correct and accurate charting is crucial to patient care and safety. Each nursing action should be recorded as soon as possible in chronological order. All information and education given to the patient, family members, or other care providers should be recorded. Accurate charting actually catalogs the patient’s medical care history. All charting entries should be thorough, accurate, and in clinical terms. Charting also involves documenting all patient-related observations made during care activities. Nursing personnel must keep detailed records of all nursing intervention activities as they occur.

Incident Reporting — Healthcare organizations collect incident data for a number of reasons. Nursing and patient care personnel must follow correct incident reporting procedures. Reports should be completed promptly so all information is accurate. Incident reports protect patients, visitors, and employees. The report should never be used as an evaluation form and should not place blame or point fingers at others. Reports must accurately document information and the facts of an incident. Forms should be designed so they can be completed quickly using ballot boxes. Healthcare incident reports:
• Provide a means to assess organizational problems.
• Uncover areas or topics that require training.
• Reduce patient risks by identifying care-related problems.
• Evaluate the need for policy revisions.
• Provide information on individual healthcare providers.

Smoking Policies — A no-smoking policy reduces the risk of fire and reduces indoor smoke pollution.
• Develop and implement policies to prohibit smoking except in specified circumstances; these policies should strive to reduce the risk of fire and adverse affects for those receiving care or treatment.
• Be sure these policies address smoking in all areas of all buildings under the organization’s control.
• Be sure to take measures to minimize fire risks in situations that permit patient smoking activities.
• Prohibit smoking for all outpatients.
Healthcare Hazard Control and Safety Management

TABLE 9.17  Wheelchair Safety Tips

- Maintain wheelchairs in top mechanical condition.
- Disinfect wheelchairs on a regular basis.
- Always back a wheelchair down a ramp or into an elevator.
- Never allow wheelchairs to block hallways or exits.
- Lock the brakes if the patient or resident will remain seated for a length of time.
- Be sure chair wheels have hand-rims for better control and safer use of the wheelchair.
- Use high-density foam rolls, called lateral stabilizers, which slip easily over the backrest of the wheelchair to help distribute weight evenly over the patient's back.
- Prevent side slumping by using stabilizers slipped over the metal frame of the wheelchair backrest.
- Use a thick foam roll slipped over the armrest of the affected side for rehabilitative positioning of the upper extremity.
- Use wheelchair lap boards, which can provide rehabilitative support and encourage use of the affected upper extremity. (Note: Occupational and physical therapists should be consulted to recommend the optimal positioning device for each patient.)
- Be aware that forward-sliding patients have an increased amount of weight bearing on their sacrum, which can result in pressure sores.
- Place pillows under the buttocks to raise the hips above the knees.
- Secure seat belts around patients’ hips to remind them to keep their buttocks back in the wheelchair.
- Be aware that maximal-assist patients with conditions such as cerebral palsy or traumatic brain injury cannot control their bodies when the trunk suddenly extends; this results in leg crossover, which causes the patient to slide out of the wheelchair. A wedge cushion helps keep the patient in the seat by positioning the hips in abduction and external rotation.
- Instruct nursing personnel in the basic positioning principles, as a critical aspect of nursing care is proper patient positioning in wheelchairs.

- Prohibit smoking for all children or adolescents regardless of patient status.
- Permit smoking by patients residing in long-term care over 30 days.
- Permit patients to smoke only in designated areas environmentally separated from care, treatment, or service areas; designated smoking areas are not required to be a specific distance from care, treatment, or service areas.
- Establish procedures to ensure that smoking rules are followed.
- Post no-smoking signs.
- Locate smoking areas in areas segregated from the rest of the facility.
- Take disciplinary action against employees who violate the no-smoking policy.

Wheelchair Safety — Hospital patients or nursing home residents may require the use of wheelchairs, which can be a source of injury from falls or improper positioning (see Table 9.17). The major considerations when selecting a wheelchair for a patient are patient safety, proper alignment, comfort, and maximum independence. Wheelchairs are of two basic types: one has large wheels in the rear and the other has large wheels in the front. The one that has large rear wheels is better for general use because it makes transfer easy, encourages good positioning, and wheels easily over difficult surfaces.
Safety Around Helicopters — Many acute-care and trauma facilities are serviced by helicopters. Safety is paramount, and all staff involved with use of the helicopter must be trained in heliport safety procedures. The following guidelines should be followed when handling helicopter-transported patients:

- The heliport should be restricted to authorized personnel; personnel should not approach the landing zone until the craft has landed and the crew grants permission to approach.
- Hearing protectors must be worn while aircraft engines are running.
- Smoking is not allowed near the craft.
- Personnel should never shine lights directly in front of the aircraft during landing; heliport landing lights are adequate for landing.
- Personnel should approach the craft from the front or side as required, never from the rear.
- Personnel should assume a crouched stance when approaching the helicopter.
- The wind created by the rotor blades can result in a hazardous situation due to flying dust, litter, and loose clothing.
- Stethoscopes should be placed in pockets, and hats and scarves must be properly secured.
- The sheet must be taped to the stretcher.
- The portable oxygen bottle should be placed so it does not extend beyond the cart and hit the craft when the stretcher is brought out for off-loading.
- The flight crew is responsible for opening and closing the aircraft doors.
- In most situations, the flight crew is responsible for off-loading the patient and will direct the hospital crew with regard to proper placement of the transport stretcher.
- The flight crew will give directions about the departure from the heliport; not following their instructions could result in an intravenous line being pulled out or a change in the patient’s skeletal alignment.
- Off-loading with the rotor blades turning requires great caution; all equipment is to be carried low to the ground.
- Fire extinguishers must be available and all personnel must be properly trained in their use.

Stress in Clinical Settings — Healthcare workers deal with life-threatening injuries and illnesses on a daily basis. Their work is complicated by overwork, understaffing, mountains of paperwork, tight schedules, equipment breakdowns and malfunctions, demanding and dependent patients, and even death. Some healthcare workers feel that the bureaucratic and depersonalized nature of healthcare organizations leaves them feeling alone, isolated, angry, and frustrated. Stress contributes to worker apathy, lack of confidence, and absenteeism. Studies have shown that healthcare workers have a high rate of hospital admission for mental disorders. Suicide rates are also elevated for some healthcare professionals. Stress has been associated with loss of appetite, mental disorders, migraines, sleeping disorders, and emotional instability. It can increase the use of tobacco, alcohol, and drugs. Stress affects attitude, motivation, and behavior. Stress not only affects the worker but also patient care. Employees and management must be informed about the effects of job stress. Programs should be in place to address workplace stress, such as employee assistance programs or organizational change programs. An employee assistance program can improve the ability of workers to cope with difficult work situations. Stress management programs teach workers about the nature and sources of stress, the effects of stress on health, and the personal skills needed to reduce stress (see Table 9.18 and Table 9.19).
Healthcare Hazard Control and Safety Management

Shift Work, Stress, and Sleep Deprivation — Supervisors and safety personnel should realize that shift work and sleep deprivation affect not only task accomplishment but also safety. People are diurnal and function best during daylight hours. Performance is decreased during periods of rapid eye movement (REM). This REM sleep is known as the dream period and normally occurs in the early morning hours. During this period, the body temperature is at its lowest. Humans have what is referred to as a circadian rhythm, or a 24-hour body clock. This body clock can vary with individuals but can also be influenced by environmental factors. Organizations that have around-the-clock operations must realize that shift work can affect the performance of a worker or staff member. Shift work and lack of sleep can contribute to health problems or can increase the risk of health problems. Shift workers are also more prone to stress-related and family problems. Healthcare organizations should strive to make shift work safer and educate workers on adjustment strategies (see Table 9.20). Organizations should be fully staffed and workers should not be required to work double shifts or excessive overtime. Supervisors should be trained to evaluate workers and look for signs of sleep deprivation, stress, and fatigue.

| TABLE 9.18  Common Healthcare Worker Stress Factors |
|-------------|-----------------------------------------------|
| Understaffing and unbearable workload |
| Inadequate resources to accomplish the task |
| Working in an unfamiliar area, job, or role |
| Rotating work shifts or shifts longer than 8 hours |
| Little or no input or participation in schedule planning and decisions |
| No recognition for doing a good job |
| Talents and expertise not being used properly |
| Exposure to biological and chemical hazards |
| Potential for workplace violence |
| Lack of supervision |
| Poor departmental or unit organization |

<table>
<thead>
<tr>
<th>TABLE 9.19  Coping with Stress</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conduct staff meetings and allow open communication.</td>
</tr>
<tr>
<td>Implement a formal stress management program.</td>
</tr>
<tr>
<td>Provide accessible counseling from a nonjudgmental source.</td>
</tr>
<tr>
<td>Promote flexibility and creativity within the department.</td>
</tr>
<tr>
<td>Be sure staffing is adequate and resources are sufficient.</td>
</tr>
<tr>
<td>Organize work areas and departments.</td>
</tr>
<tr>
<td>Provide reasonable and flexible work schedules.</td>
</tr>
<tr>
<td>Schedule the rotation of unit assignments.</td>
</tr>
<tr>
<td>Emphasize the safety and health of workers.</td>
</tr>
<tr>
<td>Conduct regular in-service education and training sessions.</td>
</tr>
<tr>
<td>Provide group therapy on how to deal with patients.</td>
</tr>
<tr>
<td>Implement a complaint and suggestion system.</td>
</tr>
</tbody>
</table>

Shift Work, Stress, and Sleep Deprivation — Supervisors and safety personnel should realize that shift work and sleep deprivation affect not only task accomplishment but also safety. People are diurnal and function best during daylight hours. Performance is decreased during periods of rapid eye movement (REM). This REM sleep is known as the dream period and normally occurs in the early morning hours. During this period, the body temperature is at its lowest. Humans have what is referred to as a circadian rhythm, or a 24-hour body clock. This body clock can vary with individuals but can also be influenced by environmental factors. Organizations that have around-the-clock operations must realize that shift work can affect the performance of a worker or staff member. Shift work and lack of sleep can contribute to health problems or can increase the risk of health problems. Shift workers are also more prone to stress-related and family problems. Healthcare organizations should strive to make shift work safer and educate workers on adjustment strategies (see Table 9.20). Organizations should be fully staffed and workers should not be required to work double shifts or excessive overtime. Supervisors should be trained to evaluate workers and look for signs of sleep deprivation, stress, and fatigue.
Noncompensated Worker Safety — Volunteers work in a variety of capacities in most healthcare organizations. Volunteers must be trained for the work and risks to which they are exposed. Many organizations limit volunteers from patient contact tasks that could expose them to infectious agents, including bloodborne pathogens. Healthcare organizations that use volunteers should provide a comprehensive safety orientation program. Topics to consider include:

- Fire safety and emergency evacuation procedures
- Infection control precautions as necessary
- Universal precautions and patient care safety topics
- Radiation precautions
- Hazard identification and reporting procedures

Home Healthcare Safety — The home healthcare industry continues to grow, and many hospitals now offer home healthcare services. Hazards encountered can differ from those found in traditional healthcare settings. Home healthcare providers spend a great deal of time traveling and enter environments where they have little or no control. Many patients live in unsafe neighborhoods that expose providers to violence. Home healthcare providers are exposed to bloodborne pathogen and patient moving hazards much like their hospital counterparts. Nursing aides, nurses, and therapists often work alone and have no one to call to support them in a time of crisis. Home-based healthcare is unpredictable. The agency is legally responsible for worker safety (see Table 9.21 and Table 9.22).

Emergency Department Hazards — Listed below are some of the common hazards found in emergency departments:

- Bloodborne pathogens
- Hazardous chemicals
- Slips, trips, and falls
- Latex (for those allergic)
- Equipment and electrical hazards
- Workplace violence
- Tuberculosis
- Workplace stress and sleep deprivation
- Terrorism and disaster response dangers
- Carbon monoxide exposure (ambulances)

Emergency Department Violence — Workplace violence can arise due to crowded and emotional situations that can occur with emergencies. Patients could be involved with crimes, carrying weapons, or subject to violence from other people, all of which puts

<table>
<thead>
<tr>
<th>TABLE 9.20  Basic Topics for Shift Worker Education</th>
</tr>
</thead>
<tbody>
<tr>
<td>The importance of getting 6 to 7 hours of uninterrupted sleep</td>
</tr>
<tr>
<td>The necessity of sleeping in a dark room</td>
</tr>
<tr>
<td>Tips on how to deal with noise during sleep periods</td>
</tr>
<tr>
<td>The importance of eating a nutritious meal during a regularly scheduled meal period</td>
</tr>
<tr>
<td>Avoiding caffeine prior to completing a shift because it disrupts sleep patterns</td>
</tr>
<tr>
<td>Exercising on a regular basis</td>
</tr>
</tbody>
</table>
healthcare workers at risk in the workplace. Good work practice recommends a security management program that addresses workplace violence in the emergency department. Such a program would include training staff to be alert for potential violence and suspicious behavior, to report it, and how to recognize and diffuse violent situations and patients. Intervention measures can be verbal, social, physical, or pharmacological. Some warning signs of anger or violence are:

- Pacing and restlessness
- Clenched fist
- Increasingly loud speech
- Excessive insistence
- Threats
- Cursing

### TABLE 9.21 Safety in Home Healthcare Environments

Be sure the care plan identifies hazards and care requirements. Use well-lighted and common walkways when visiting patients. Request security escorts for night visits. Carry a nursing bag but never a purse. Always knock or ring doorbell before entering homes. If threatened, scream, kick, and use chemical spray or a whistle. Keep car in top mechanical condition. Keep car locked and park near the patient’s home. Look for slip, trip, fire, and electrical hazards. Document unsafe behaviors, threats, and menacing pets (never run away from a threatening dog; back away slowly). Schedule joint visits in unsafe neighborhoods or homes. Teach patients and family members about infection control. Know injury and emergency reporting procedures.

### TABLE 9.22 Home Healthcare Worker Training Topics

Understanding the patient’s age, cultural, economic, and social factors
Disease manifestations
Mental, emotional, and spiritual needs
Personal security precautions, including travel safety
How to conduct a hazard assessment during a consultation visit
Protection guidelines for bloodborne pathogens exposure
Sharps and needle safety precautions
Medical waste disposal procedures
Back injury prevention techniques
Safe lifting and transfer techniques
Care plan development to identify risks
Emergency Department Violence Prevention

• Maintain adequate staffing levels with experienced clinicians on each shift.
• Provide counseling and treatment for employees who experience workplace violence.
• Use appropriate engineering controls to provide security, such as installing concealed panic buttons at check-in areas; these buttons can notify hospital security as well as a local law enforcement agency.
• Improve lighting and video surveillance.
• Use an escort or buddy system.
• Limit access to the emergency department.
• Be sure the waiting room provides controlled access to treatment.
• Require all persons to enter at the waiting area.
• Attach furniture and equipment to the floor so patients cannot throw them at employees.
• Use metal detectors.
• Provide a secure room for patients identified to be violent or classified as forensics patients; such a room could include the following controls:
  • Video camera surveillance
  • Visual surveillance (window)
  • Door locks on patient rooms
  • Bed with tie-down straps
  • Locked cabinets

Emergency Department Tuberculosis Exposure — Healthcare personnel risk exposure to tuberculosis and other infectious agents from patients in waiting rooms and treatment areas. Staff treating an emergency may be unaware of other pre-existing infectious conditions. Emergency department personnel should practice early patient screening to identify potentially infectious patients and isolate them to prevent further employee exposures. Proper engineering, work practice, and administrative admission procedures can reduce the risk of exposure. Staff should have patients with productive coughs wear masks to prevent the spread of infection, and signs in the waiting rooms should state, “If you are coughing you may be asked to wear a mask.” Patients with a cough should be isolated until the source of the cough is determined. Some emergency departments provide an isolation room to safely isolate potentially infectious patients.

Emergency Room and Terrorism Response — The emergency department staff risks exposure to biological agents, chemical agents, and mass casualties in the event of terrorist attacks. An emergency response plan should be in place to address necessary actions and safety precautions to be taken in such situations. (Refer to Chapter 5 for additional information about emergency response to terrorist events.)

Physical Therapy Department Safety — Healthcare personnel are exposed to a number of potential hazards in the physical therapy department (e.g., patients with infectious diseases; solutions used to disinfect whirlpools or tubs; prescription medications, creams, or ointments rubbed into the skin of patients). To maintain a safe physical therapy department:

• Use nonslip floor mats in whirlpool areas, which tend to be slippery.
• Keep aisles and passageways clear and in good repair, with no obstruction across or in aisles that may create a hazard.
• Keep electrical equipment from water sources.
• Be sure plugs near sinks are properly grounded and contain GFCIs.
• Provide floor plugs for equipment so power cords do not run across pathways.
• Place a table to the side of the hydroculator.
• Use towels to absorb dripping water from hot packs.
• Follow procedures for the safe administration of medications and creams.
• Be sure staff wears gloves while applying certain medications to patients when contact with the medication is indicated for patients only.
• Provide for worker training and access to Material Safety Data Sheets for all hazardous chemicals or medications used by physical therapists.
• Inspect power cords to detect fraying or other damage.
• Be sure that therapists use the proper technique when administering ultrasound and electrical stimulation treatments to avoid excessive exposure to the therapist’s hand; therapists should use the handle rather than the head of the ultrasound device when administering treatments.
• Be aware of the potential exposure to Legionnaires’ disease by breathing aerosolized water that contains the *Legionella* bacteria; such an exposure could occur in shower or whirlpool areas.
• Be aware that personnel can suffer work-related musculoskeletal disorders (strain and sprain injuries) from constant lifting and reaching for patients during treatment procedures and transfers.
• Provide good engineering controls and work practice techniques to help minimize stressors.
• Emphasize and teach the use of proper lifting techniques using good body mechanics (e.g., avoiding awkward postures, such as twisting while lifting).
• Have mechanical aids available to reduce the need to lift patients (e.g., using mechanical lift equipment for lifting patients who cannot support their own weight into or out of whirlpools or tubs; employing sliding boards under patients to help reduce friction during transfers; using adjustable equipment such as tubs and therapy tables).

**Intensive-Care-Unit Safety** — Workers in the intensive-care unit (ICU) are particularly at risk for exposure to blood, other potentially infectious materials (OPIMs), and bloodborne pathogens because of the immediate, life-threatening nature of treatment. The Bloodborne Pathogens standard requires certain precautions be taken when dealing with blood and OPIM. Intensive-care neonatal units may be designed without walls between patient spaces, which allows employees to be unknowingly exposed to aerosolized chemicals and x-ray radiation that escape from neighboring areas. All rooms should have adequate ventilation to remove contaminants. If air recirculation is required, then adequate filtering should be installed. Staff in adjoining patient spaces may need to be warned and removed if procedures such as x-rays are occurring. Aerosolized chemicals should be administered in such a fashion as not to expose staff or patients in the area to the hazard. The potential for slips and falls arises if water or other fluid is spilled on the floor, electrical cords run across pathways, or emergency equipment or supplies block passage and passageways. Spills should be cleaned up immediately and walkways kept clear. Employees could be injured as a result of improper training or use of equipment such as defibrillators, so it is important to develop a program that routinely monitors the status of equipment and proper training of employees in safe equipment use.

**Dialysis Unit Safety** — Hazards present in the dialysis unit include exposure to sterilizing solutions and bloodborne pathogens, including hepatitis B. During recent years, blood contamination of internal components of dialysis equipment has been reported at a number
of treatment centers. Such cross-contamination could permit the transfer of bloodborne pathogens from patient to patient. Under certain conditions, cross-contamination is possible despite the use of new blood tubing sets and external transducer protectors. Routine maintenance is not adequate for detecting internal machine contamination. For this reason, qualified personnel should inspect all machines, including the internal pressure tubing set and pressure sensing port, for possible blood contamination. Staff should always use an external transducer protector and utilize pressure alarm capabilities as indicated in the manufacturer’s instructions. If contamination occurs, the machine should be taken out of service. Frequent blood line pressure alarms or frequent adjusting of blood drip chamber levels may be an indicator that this problem is occurring. Employees working in dialysis units should be aware of the adverse health effects of glutaraldehyde and should wear proper protective equipment whenever handling sterilizing solutions. Protective equipment should include rubber gloves, protective aprons, and eye and face protection.

**Infection Control** — A dialysis staff member should serve as the safety coordinator, with authority to enforce biological safety policies within the dialysis unit. All personnel should follow the requirements of the OSHA Bloodborne Pathogens standard (29 CFR 1910.1030). Hospital-based dialysis units must coordinate infection control programs and policies with the hospital infection control program. (Refer to the appropriate CDC guidelines for additional information.)

**Patient Actions** — Isolate patients who are HBsAg-positive in a separate room or unit designated for HBsAg-positive patients if possible; otherwise, segregate these patients from hepatitis B sero-negative patients in a separate area. Staff members with the most dialysis experience or best technique should care for HBsAg-positive patients; these staff members should not attend to both HBsAg-positive and sero-negative patients during the same shift.

**Equipment** — Dialysis equipment should not be used for both HBsAg-positive and sero-negative patients. If this is impossible, the staff should be aware that the chances for cross-contamination are significantly greater. All patients should have specific assignments for dialysis chairs or beds and machines. Linens on chairs and beds should be changed for each patient. Chairs and beds should also be cleaned after each use. All patients should be assigned a supply tray including a tourniquet, marking pencils, and antiseptics. Clamps, scissors, and other nondisposable items should not be used for more than one patient unless they have been autoclaved or appropriately disinfected.

**Personal Protective Equipment** — Dialysis unit staff should:

- Wear disposable gloves for their own protection when handling patients or dialysis equipment and accessories.
- Wear gloves at all times including when taking blood pressure, injecting saline or heparin, or touching dialysis machine knobs to adjust flow rates.
- Never touch surfaces with gloved hands that will subsequently be touched with bare hands before being disinfected.
- Wear gloves whenever handling blood specimens and whenever working in the laboratory area.
- Wear protective eye glasses and surgical-type masks during any procedure with the potential for spurting or splattering blood.
- Wear gowns or scrub suits at all times and properly dispose of clothing at the end of each day.
- Follow the housekeeping practices required by the OSHA Bloodborne Pathogens standard.
Surgical and Operating Room Safety

Because safety practices are so important, this section covers some of the situations that are potentially hazardous and discusses what might be done to eliminate the hazards (see Table 9.23). All personnel should know the location of all emergency equipment, including drugs, cardiac arrest equipment, and resuscitators. All electrical equipment and plugs must be explosion proof and bear a label stating such. Written schedules of inspections and maintenance of all electrical equipment should be maintained.

Bloodborne Training — Operating room personnel should receive annual training on bloodborne pathogens and other safety issues, and policies and procedures should be in place for sharps injury reporting. OSHA requires an appropriate sharps safety program that includes the evaluation and selection of safer sharps and needles. Nonmanagement staff is required to be involved in this selection process. Operating rooms must document the evaluation of commercially available safety products such as safe suturing devices, safety needles, safety scalpels, sharps, and passing containers. Hepatitis B vaccination series are offered at no cost to all employees who maybe exposed to blood or other potentially infectious materials. Operating room staff must maintain a sharps injury log that includes the type and brand of device involved in an exposure, the work area where the exposure occurred, and an explanation of how it happened. Hazards in the surgery area can be reduced by promoting the use of:

- Safer needles and other sharps devices
- Blunt suture needles
- Needleless intravenous connectors
- Proper containerization of sharps
- “No-pass zone” for surgical instruments

Hazardous Chemicals — Hazardous chemicals in the surgical area could include peracetic acid, which is used in cold sterilizing machines, and methyl methacrylate, which is used to secure prostheses to bone during orthopedic surgery and should be mixed only in a closed system. Employees should:

- Carefully read and follow instructions and warnings on labels.
- Follow all MSDS instructions regarding safe handling, storage, and disposal of hazardous chemicals.
- Use disinfectants or other products that are not hazardous whenever possible.

### Table 9.23 Operating Room Hazards

<table>
<thead>
<tr>
<th>Hazard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anesthetic gases</td>
</tr>
<tr>
<td>Bloodborne pathogens</td>
</tr>
<tr>
<td>Latex (for those allergic)</td>
</tr>
<tr>
<td>Compressed gases</td>
</tr>
<tr>
<td>Static postures</td>
</tr>
<tr>
<td>Laser plumes</td>
</tr>
<tr>
<td>Chemicals</td>
</tr>
<tr>
<td>Equipment</td>
</tr>
<tr>
<td>Slips, trips, and falls</td>
</tr>
</tbody>
</table>

---

L. SURGICAL AND OPERATING ROOM SAFETY

Because safety practices are so important, this section covers some of the situations that are potentially hazardous and discusses what might be done to eliminate the hazards (see Table 9.23). All personnel should know the location of all emergency equipment, including drugs, cardiac arrest equipment, and resuscitators. All electrical equipment and plugs must be explosion proof and bear a label stating such. Written schedules of inspections and maintenance of all electrical equipment should be maintained.

Bloodborne Training — Operating room personnel should receive annual training on bloodborne pathogens and other safety issues, and policies and procedures should be in place for sharps injury reporting. OSHA requires an appropriate sharps safety program that includes the evaluation and selection of safer sharps and needles. Nonmanagement staff is required to be involved in this selection process. Operating rooms must document the evaluation of commercially available safety products such as safe suturing devices, safety needles, safety scalpels, sharps, and passing containers. Hepatitis B vaccination series are offered at no cost to all employees who maybe exposed to blood or other potentially infectious materials. Operating room staff must maintain a sharps injury log that includes the type and brand of device involved in an exposure, the work area where the exposure occurred, and an explanation of how it happened. Hazards in the surgery area can be reduced by promoting the use of:

- Safer needles and other sharps devices
- Blunt suture needles
- Needleless intravenous connectors
- Proper containerization of sharps
- “No-pass zone” for surgical instruments

Hazardous Chemicals — Hazardous chemicals in the surgical area could include peracetic acid, which is used in cold sterilizing machines, and methyl methacrylate, which is used to secure prostheses to bone during orthopedic surgery and should be mixed only in a closed system. Employees should:

- Carefully read and follow instructions and warnings on labels.
- Follow all MSDS instructions regarding safe handling, storage, and disposal of hazardous chemicals.
- Use disinfectants or other products that are not hazardous whenever possible.
According to the Hazard Communication standard, employers must inform employees of all chemical hazards and have on hand MSDSs for all hazardous chemicals used in their facilities.

**Equipment Hazards** — Surgical area staff could suffer burns or shocks due to poorly maintained equipment or improper training. For this reason, it is important to:

- Be sure all electrical service near sources of water is properly grounded.
- Use appropriate personal protective equipment and safe work practices for assessed hazards.
- Develop procedures to routinely monitor the condition of equipment and address work practices of employees, such as:
  - Training employees to correctly and safely use equipment
  - Maintaining adequate working space and access to equipment
  - Inspecting cords
  - Not permitting the continued use of frayed or damaged cords
  - Making sure all equipment cords are grounded
  - Inspecting all equipment before use

**Slips, Trips, and Falls** — Operating room staff are exposed to slips, trips, and falls, such as tripping over portable equipment that easily blends into the floor or slipping on debris (bandages, tubing, blood, IV fluids) on the floor. Electrical cords crossing pathways may also pose a trip hazard. OSHA requires work areas be kept clean, orderly, and in a sanitary condition. Aisles and passageways must be kept clear and in good repair, with no obstructions across or in aisles that could create a hazard. The use of ceiling or floor plugs eliminates power cords running across pathways.

**Static or Awkward Postures** — Static postures from continuously standing in one position during lengthy surgical procedures can cause muscle fatigue and pooling of blood in the lower extremities. Standing on hard work surfaces such as concrete can cause sore feet. Typical awkward postures include tilting the head downward for long periods of time. To reduce problems caused by these postures:

- Use stools whenever possible.
- Wear shoes with well-cushioned insteps and soles.
- Use a foot rest bar or low stool, which alters a person’s posture by raising one foot.
- Use adjustable-height work surfaces.

**Instrument Passing** — A hands-free technique is recommended for passing instruments. The hands-free technique is a work practice in which a tray or other means is used to reduce handling sharp instruments during surgery. *The Effectiveness of the Hands-Free Technique in Reducing Operating Room Injuries* (NIOSH, 2001) suggests a method for passing equipment safely between surgeon and assistants. Approximately 120,000 suture needlesticks occur in the operating room each year. The use of blunt needles when appropriate and suturing devices with needlestick protection offers the greatest protection against suture needle sticks. Other techniques include:

- Be sharps conscious.
- Avoid unnecessary handling of sharps.
- Never hold any sharp simultaneously with another instrument.
- Contain sharps in designated zones at all times.
- Never cross the room with a sharps instrument in hand.
- Establish a sharps-safe or neutral zone (no-hands area).
• Announce the transfer of sharps into the neutral zone.
• Use safety transfer trays and magnetic drapes to transfer sharps between nurses and surgeons during surgical procedures.
• Consider using a system of trays or basins, where one person places the instrument on the tray and it is then picked up by the second person.
• Keep eyes on sharps until they are placed in designated zones.

Recent studies indicate that more than 60% of scalpel blade injuries are inflicted by the user on assistants, typically during equipment transfer.

Develop No-Touch Techniques — The thumb and index finger of the nondominant hand are commonly injured by scalpels and suture needles, typically because they are used to reposition or hold tissue. Operating room staff should:

• Develop appropriate alternatives to using their hands, including the use of retractors instead of hands, rounded scissors instead of pointed tips, electrocautery instead of standard scissors, and staples for skin closure.
• Dispose of sharps immediately after use.
• Use sharps containers to dispose of potentially dangerous biohazardous sharps devices.
• Be sure puncture-resistant containers are available nearby to hold contaminated sharps.

Sharps Disposal — The OSHA Bloodborne Pathogens standard requires that contaminated needles and other sharp instruments are disposed of immediately or as soon as feasible after use into appropriate containers. Sharps containers must be available and in close proximity to areas where sharps may be found. Contaminated needles and other contaminated sharps must not be bent, recapped, or removed except as noted in 29 CFR 1910.1030(d)(2)(vii)(A) and (d)(2)(vii)(B). Employers must provide readily accessible hand-washing facilities and ensure that employees wash their hands immediately or as soon as feasible after removal of gloves.

Personal Protective Equipment — Operating room staff should wear appropriate protective clothing and equipment that can protect them from unwanted fluid splash or sharps injuries. Personal protective equipment includes gloves, face masks, soakproof gowns, impervious boots or shoe covers, face shields and other eye-protection devices. Surgical staff should utilize the appropriate gloves and double-gloving procedures as required. They should always remove PPE before leaving the operating room. Safety scalpels are available with movable shields or retracting blades that offer surgeons and operating room staff protection without compromising surgical procedures.

Anesthetic Gases — Anesthesiologists, nurse anesthetists, surgical and obstetric nurses, operating room technicians, nurse aides, surgeons, anesthesia technicians, post-operative nurses, dentists, dental assistants, dental hygienists, veterinarians and their assistants, emergency room staff, and radiology department personnel are potentially exposed to waste anesthetic gases and are at risk of occupational illness. Over the years significant improvements have been seen in the control of anesthetic gas pollution in healthcare facilities. These have been accomplished through the use and improved design of scavenging systems, installation of more effective general ventilation systems, and increased attention to equipment maintenance and leak detection, as well as to careful anesthetic practice.

Employees are exposed to waste anesthetic gases during surgical procedures in the operating room and in the recovery room or post-anesthesia care unit during off-gassing of surgery patients. Some potential health effects of exposure to waste anesthetic gases include
nausea, dizziness, headaches, fatigue, irritability, drowsiness, and problems with coordination and judgment, as well as sterility, miscarriages, birth defects, cancer, and liver and kidney disease. (Refer to the OSHA publication, *Anesthetic Gases: Guidelines for Workplace Exposures.*) Appropriate anesthetic gas scavenging systems must be installed in operating rooms. Appropriate waste gas evacuation involves collecting and removing waste gases, detecting and correcting leaks, applying good work practices, and effectively ventilating the room. According to the American Institute of Architects, to minimize waste anesthetic gas concentrations in the operating room, the recommended air exchange rate is a minimum total of 15 air changes per hour with a minimum of three air changes of fresh air per hour. Operating room air containing waste anesthetic gases should not be recirculated to the operating room or other hospital locations.

**Exposures** — Exposure measurements taken in operating rooms during the clinical administration of inhaled anesthetics indicate that waste gases can escape into the room air from various components of the anesthesia delivery system. Potential leak sources include tank valves; high- and low-pressure machine connections; connections in the breathing circuit; and defects in rubber and plastic tubing, hoses, reservoir bags, ventilator bellows, and the Y-connector. In addition, certain anesthesia techniques and improper practices such as leaving gas-flow control valves open and vaporizers on after use, spillage of liquid inhaled anesthetics, and poorly fitting face masks or improperly inflated tracheal tube and laryngeal mask airway cuffs also can contribute to the escape of waste anesthetic gases into the operating room atmosphere.

**OSHA Guidelines for Workplace Exposures to Anesthetic Gases** — These OSHA guidelines provide general information and guidance about anesthetic gases and workplace exposures. Workplace exposures to anesthetic gases occur in hospital-based and stand-alone operating rooms, recovery rooms, dental operations, and veterinary facilities. Engineering, work practice, and administrative controls that help reduce these exposures in all anesthetizing locations, are identified and discussed. Sources of leaks in anesthesia equipment systems, components, and accessories are identified and appropriate methods are described that limit excessive leaks. Inhaled anesthetic agents include two different classes of chemicals: nitrous oxide and halogenated agents. Halogenated agents currently in use include halothane, enflurane isoflurane, desflurane, and sevoflurane.

**Exposure Limits** — Although OSHA currently has no permissible exposure limits regulating these agents, NIOSH has issued recommended exposure limits (RELS) for both nitrous oxide and halogenated agents. The NIOSH REL for nitrous oxide, when nitrous oxide is used as the sole inhaled anesthetic agent, is 25 parts per million (ppm) measured as a time-weighted average (TWA) during the period of anesthetic administration. NIOSH also recommends that no worker should be exposed at ceiling concentrations greater than 2 ppm of any halogenated anesthetic agent over a sampling period not to exceed 1 hour. NIOSH currently has RELs for the three most currently used anesthetics: isoflurane, desflurane, and sevoflurane.

**Ventilation** — A properly designed and operating dilution ventilation system should be relied upon to minimize waste anesthetic gas concentrations in recovery room areas. According to the American Institute of Architects, this system should provide a recommended minimum total of six air changes per hour with a minimum of two air changes of outdoor air per hour to adequately dilute waste anesthetic gases. Room exhaust containing waste anesthetic gases should not be recirculated to other areas of the hospital. Periodic exposure monitoring should focus on peak gas levels in the breathing zone of nursing personnel working in the immediate vicinity of the patient’s head. Methods using random room sampling to assess ambient concentrations of waste anesthetic gases in the recovery room are not accurate indicators of the level of exposure experienced by nurses providing bedside
care. Because of the closeness of the recovery room nurse to the patient, such methods would consistently underestimate the level of waste anesthetic gases in the breathing zone of the bedside nurse.

**Maintenance**

- Utilize a routine ventilation system maintenance program to keep waste gas exposure levels to a minimum.
- Turn off anesthesia machine vaporizers when not in use.
- Use proper face masks, sufficiently inflate endotracheal tubes, and prevent anesthetic spills to decrease the amount of waste anesthetic gases in the operating room.
- Inspect and maintain the anesthesia machine at least every 4 months; this should be done by factory service representatives or other qualified personnel.
- Limit the leakage of gas to less than 100 mL/min during normal operation.
- Check all anesthesia equipment prior to each day’s use (connectors, tubing, etc.).
- Promptly clean up spills of liquid anesthetic agents.

Refer to OSHA’s *Anesthetic Gases: Guidelines for Workplace Exposures* (OSHA Directorate of Technical Support) and *Controlling Exposures to Nitrous Oxide During Anesthetic Administration* (NIOSH Publ. No. 94-100).

**Scavenging** — Scavenging is the process of collecting and disposing of waste anesthetic gases and vapors from breathing systems at the site of overflow. It is carried out to protect operating room personnel by preventing the dispersal of anesthetic gases into the room air. A scavenging system has two major components: (1) a collecting device or scavenging adapter to collect waste gases and (2) a disposal route to carry gases from the room. (Refer to ANSI/Z 79.11-1982, *Anesthesia Gas Scavenging Devices and Disposal Systems*.) The NIOSH publication *Development and Evaluation of Methods for the Elimination of Waste Anesthetic Gases and Vapors in Hospitals* contains information about control methods to establish and maintain low concentrations of waste anesthetic gas in operating rooms. This document includes techniques for scavenging, maintaining equipment, monitoring air, and minimizing leakage while administering anesthesia. Persons responsible for health and safety in the hospital surgical department should be aware of the availability of new products and new information on familiar products. Methyl methacrylate, which is used in bone surgery, has recently been investigated as a potentially hazardous substance.

**Worker Protection** — Applying the following guidelines will help protect workers in surgical service:

- Use separate collection containers for glass, empty ether cans, aerosol cans, disposables, etc. that will not be incinerated.
- Dispose of sharp instruments, blades, and needles in designated puncture-resistant containers.
- Account for all used supplies and instruments in order to prevent their disposal in linens and materials that will be handled by hospital workers.
- Close towel clips and scissors when not in use.
- Be sure suction lines and electrical cords are installed so as to minimize tripping hazards; lines and cords should be suspended from the ceiling or placed under the floor whenever possible.
- Report defective equipment.
- Post warning signs where necessary and enforce proper work practices.
- Teach workers proper lifting practices.
- Discuss safe work practices and health hazards with new workers as part of their orientation and review them periodically.
Electrosurgery Safety — A basic understanding of electricity is needed to safely apply electrosurgical technology in the operating room. Electricity behaves in a consistent and predictable manner. Electrical current is the movement of electrons, and the force that causes this movement is called voltage. An electric current is directly proportional to its voltage; that is, voltage is the force that causes the current to move. To better understand this concept, it helps to think of water running through a kitchen faucet. If the water pressure is low, the water will run slowly; if the pressure is high, the water will shoot out with great force. The two types of current are direct current (DC) and alternating current (AC). Direct current does not change direction; electrons flow from the negative terminal through the circuit to the positive terminal in one direction. A simple battery is an example of direct current. In the operating room, handheld drills are examples of equipment using batteries or DC. Alternating current changes direction. An example of alternating current is the current that comes from an electrical wall outlet. This current powers most electrical equipment in the operating room. The frequency of this AC is measured in cycles per second, or hertz (Hz). Frequency is used to describe the number of times an AC reverses direction in one second. It is important to remember that, in electrosurgery, the patient is an integral part of the electrical circuit. The current must flow through the patient's body, which acts as a conductor. Electrical energy is then released as heat, which produces the desired reaction.

M. LASERS

Eye safety is the number one concern for anyone working with or near a laser (acronym for “light amplification by stimulated emissions of radiation”), which emits electromagnetic radiation in the visible spectrum. As quick as it takes to blink, a laser can severely damage an eye. Though such injuries are rare, they are permanent. Engineering controls are the preferred method of protection but cannot be relied on as the only means of protection; protective eyewear may also be necessary during alignment of a laser beam. Laser use is increasing at a very fast pace in the healthcare environment, and new laser surgery techniques are being developed almost daily; for example, lasers are used in radiology departments to help align patients for treatment. The nature of laser injuries depends on the type, power, and duration of the laser exposure. The most common type of injury results when a laser beam heats the retina and causes a loss of vision in the person’s field of vision. The beam from a pulse laser can cause an explosion in the retina, resulting in severe damage. A laser with enough energy can cause retina cell death. Any damage is permanent but not as severe as thermal or acoustic damage. Lasers striking the skin can result in erythema, blistering, and charring. The extent of the damage depends on wavelength, power, and length of exposure. Lasers also use high voltage and should be considered potential electrical hazards. The performance of lasers is regulated by the FDA’s Bureau of Radiological Health under 21 CFR 1040.

Engineering Controls — Engineering controls, such as protective housings, remote controls, or enclosed laser-beam paths, provide protection for laser operators except when the operator needs to set up, adjust, or maintain the beam, which is when the technicians are most at risk for serious injury. The laser safety officer is responsible for monitoring and enforcing the control of laser hazards, including their operation, maintenance, and service. Tasks necessary to ensure routine performance of lasers include cleaning and replenishing expendables. Lasers and laser systems are classified on the basis of the level of laser radiation accessible during intended use. Maintenance usually does not require beam access, but some tasks that are performed with less frequency do require laser beam access. Examples of this type of task include replacing the laser resonant mirrors and repairing faulty components. Instructions for safe operation should be supplied by the manufacturer, and the laser safety officer must provide any additional safety instructions regarding employee safety.
Laser Safety — The primary responsibility of a perioperative nurse during a laser procedure is to keep the patient safe. Safety hazards are inherent in laser use, but they can be eliminated or significantly reduced with adherence to proper procedures. When perioperative nurses are educated in laser science and safety, they can recognize potential hazards and make sure that safety parameters are followed. Employees are exposed to lasers in operating rooms during excision and cauterization of tissue. Class 3b and class 4 lasers are used most often. Exposure usually occurs from unintentional operation or when proper controls are not in effect. The high electrical energy used to generate the beam is a potential shock hazard. Direct beam exposure can cause burns to the skin and eyes, possibly resulting in blindness. Electric shock and fire are also potential hazards when using lasers.

Laser Hazards — Laser energy is light energy; all class 3 and class 4 lasers are considered to be nonionizing, which means that laser energy does not cause molecular changes to the tissue of the operator or others in proximity. A pregnant staff member or physician need not fear that laser energy will cause harm to her fetus. Beam-related safety hazards include eye injuries, fire and thermal injuries, and smoke plume. Electrical hazards are not related to the beam itself. In its Technical Manual (Section VI, Chapter 1: Health Hazards), OSHA recommends that all personnel in the operating room during laser surgery wear goggles to protect the cornea, conjunctive, and other ocular tissue. The wavelength of the laser output is the most important factor in determining the type of eye protection to be used. To minimize laser hazards, it is important to:

- Maintain and service the entire laser system according to the manufacturer’s instructions.
- Allow only qualified personnel from the manufacturer or in-house personnel to maintain the system; maintenance must only be done according to written standard operating procedures and must meet the requirements of the lockout/tagout standard (29 CFR 1910.147).
- Adequately cover laser systems, especially ones with high-voltage capacitance.
- Attach bleeders and proper grounding to the system.
- On all operating room doors to rooms that house lasers, install safety interlocks that shut down the laser system if anyone enters the room.
- Cover or black out all windows in laser surgical areas to protect employees outside the surgical area.
- Check the laser system before each procedure and during extended procedures (lasers are calibrated by the manufacturer).
- Be sure the classifications of a laser coincides with the actual measurement of output.
- Allow only personnel trained in laser technology to make these measurements.

Laser Safety Guidelines

- Primary worker protection measures include using effective eye protection and properly shielding high-energy beams.
- ANSI Z-136.1 and Z-136.3 require healthcare facilities to appoint a laser control officer.
- Only trained and authorized technicians should move, operate, or repair laser equipment.
- Lasers should be attached to an individual transformer and an emergency power source and should have a safety interlock.
- An approved fire extinguisher should be immediately available.
- Laser use areas should be identified and warning signs posted.
- Personnel should prevent laser beams from coming into contact with combustible, flammable, and reflective materials.
Personnel using or exposed to lasers should be in an eye health medical surveillance program.
Smoke generated during laser usage should be properly removed and filtered before being evacuated from the building.
Laser equipment should be properly maintained and included in a preventive maintenance program.

Laser Safety Officer

- Appoint a laser safety officer (LSO) when class 3 or 4 lasers are used.
- Be sure the LSO has the authority to monitor and enforce the laser safety requirements.

The LSO administers the overall laser safety program, including confirming the classification of lasers and making sure the proper control measures are used. The LSO also approves substitute controls and standard operating procedures. The LSO recommends and approves eyewear and other protective equipment, specifies appropriate signs and labels, provides proper laser safety training, and conducts medical surveillance. The LSO should receive detailed training including laser fundamentals, laser bioeffects, exposure limits, classifications, and necessary control measures, including area controls, eyewear, barriers, and medical surveillance requirements.

Laser Standards — No federal requirements are in place for safety during laser procedures, but a number of recognized national standards do exist. The key safety standards for laser use can be found in ANSI Z136.1 and Z136.3. Hospital operating rooms, surgery centers, and physician-practice-based surgery suites are expected to comply with the recommended safety standards. OSHA is concerned about the safe evacuation of smoke created by lasers. The General Duty Clause permits OSHA to cite employers for not providing a place of employment that is free from recognized hazards. NIOSH has also addressed the potential hazard to personnel from smoke generated by lasers. Studies have isolated formaldehyde, hydrogen cyanide, and benzene in surgical smoke emitted from lasers. NIOSH has issued suggestions for the use of smoke evacuation units, preferably vented to the outside, and protective equipment to be worn by personnel servicing or changing filters on smoke evacuation devices. The FDA’s Center for Devices and Radiological Health regulates lasers approved for the market. These agencies also regulate which procedures can be performed by lasers and which ancillary supplies, including fibers and hand pieces, can be sold.

Laser Regulation Summary

- Laser injury incidents fall under the Safe Medical Device Act reporting requirements.
- 29 CFR 1910.132 specifies requirements for face and eye protection.
- ACGIH has published recommendations to reduce occupational exposure.
- NIOSH recommends that a LSO be appointed in facilities where laser use warrants extra precautions.
- NFPA 99 addresses healthcare laser usage.
- The Laser Institute of America publishes information on laser safety.

AORN Recommendations — The Association of periOperative Registered Nurses (AORN) addresses laser safety in its Recommended Practices for Laser Safety in Practice Settings. Although standard Z136.3 is the recognized national standard for laser safety in healthcare organizations, AORN standards are widely recognized as the optimal standards of perioperative
nursing practice. For the most part, both sets of standards communicate the same information regarding laser safety and strongly promote laser safety education and training for all individuals present during a laser procedure. These individuals must complete their training before being assigned to a laser procedure. Yearly reinforcement of the information and recredentialing are also recommended.

ANSI Laser Categories — Laser manufacturers must classify lasers according to their potential to cause biological damage and the level of hazard inherent in the system. The classification system is based on laser output or power, wavelength, exposure duration, and emergent beam radiant exposure.

Class 1 — These lasers are exempt from the requirements of the laser safety program because the risk of hazard to the operator during normal operation is essentially nonexistent. Lasers in this category include those that operate laser printers and compact disc players.

Class 2 — Lasers in this category emit energy in the visible range. Laser energy produced by these lasers may be viewed for very brief periods of time but may present potential hazards to the eyes if viewed directly for long periods of time. The light emitted generally is so bright that it is difficult to look into the beam for an extended period of time. The helium neon (HeNe) aiming beam used coaxially with invisible lasers is considered a class 2 laser as are some laser pointers used in professional presentations. The human aversion reaction to bright light will protect the person from this low level.

Class 3 — These lasers are medium-powered systems that require measures to prevent eye exposure. Class 3a lasers include systems that normally would not produce a hazard but are dangerous if viewed using collecting optics such as a microscope. Class 3b lasers are hazardous if viewed directly by the naked eye for longer than 25 seconds. Some ophthalmology lasers are class 3b lasers. These lasers are not generally a fire hazard and are not capable of producing a hazardous diffuse reflection, except in instances of intentional staring at distances close to the diffuser. Specific controls are recommended.

Class 4 — Most of the lasers used in surgery are class 4 lasers. These lasers can cause damage not only to eyes but also to skin, and they present a fire hazard. They are hazardous to view under any condition — directly or diffusely scattered. They are also a potential skin hazard. Significant controls are required for class 4 laser facilities.

New Classification System — A new classification scheme, which already has been approved by the FDA and the International Electrotechnical Commission, probably will be introduced when ANSI revises its standards. The new classes (1m, 2m, and 3r) will further delineate the danger potential of medical and industrial lasers.

FDA Laser Incident Reporting Requirements — The FDA Center for Devices and Radiological Health requires equipment producers to report all incidents of death or injury. At the present time, however, a lack of medical injury data related to laser incidents exists. Many experts feel that the greatest injury threat occurs during alignment of the laser beam. Safety glasses are designed for unplanned viewing, and most injuries occur when workers fail to protect their eyes.

Laser Eye Injuries — The major beam-related hazard is laser energy entering the eye. The eye is the organ most sensitive to light and, therefore, the most vulnerable to injury. A 1-W visible laser beam is a greater hazard to the sensitive, vulnerable eye than a 100-W light bulb. The brightness of a laser beam is 1 billion times greater than that of the light bulb.
The ocular lens further complicates the injury. It allows even a low-energy beam to be magnified up to 100,000 times by focusing the beam to a tiny spot and increasing its power or energy density. Lasers in the visible and near-infrared area of the electromagnetic spectrum present the greatest potential for retinal injury, because the cornea and lens are transparent to those laser wavelengths. The red retinal surface acts like a magnet for absorption of the energy. Eye injuries are most commonly caused by either a break in a delivery fiber or the reflection of energy from a shiny surface. If either of these accidents occurs, the eye would be affected in one of two ways. Inadvertent exposure to laser energy would cause an external burn on the corneal surface of the eye. The nerve endings on the surface of the eye would cause the individual to feel the burn and turn his or her head away, reducing the possible extent of the injury. If a laser burn occurs on the cornea, however, there may be scarring with subsequent vision changes. The ocular lens cannot rejuvenate.

**Eye Safety** — The eye is damaged because of the way it focuses, with the cornea and lens focusing the light beam on a small spot on the retina. Eye damage is usually severe and may result in blindness, which is why direct viewing of the laser source and its reflections should be avoided. The reflective beam intensity of the laser may approach its direct beam intensity; therefore, no reflective objects or surfaces should be in the area with the laser. Four main points determine the type of eyewear required for a specific laser:

- Wavelength
- Pulse vs. continuous laser
- Laser type (carbon dioxide, ruby, etc.)
- Wattage

**Laser Plume** — During surgical procedures that use a laser or electrosurgical unit, the thermal destruction of tissue creates a smoke byproduct. An estimated 500,000 workers (surgeons, nurses, anesthesiologists, and surgical technologists) are exposed to laser or electrosurgical smoke each year. According to NIOSH, research studies have confirmed that this smoke plume can contain toxic gases and vapors such as benzene, hydrogen cyanide, and formaldehyde; bioaerosols; dead and live cellular material, including blood fragments; and viruses. At high concentrations, the smoke causes ocular and upper respiratory tract irritation in healthcare personnel and creates visual problems for the surgeon. The smoke has unpleasant odors and has been shown to have mutagenic potential. Although no documented transmission of infectious disease through surgical smoke has been documented, the potential for generating infectious viral fragments, particularly following treatment of venereal warts, may exist. Researchers have suggested that the smoke may act as a vector for cancerous cells that may be inhaled by the surgical team and other exposed individuals.

**Smoke and Plume Control**

- Use portable smoke evacuation devices and room suction systems.
- Keep the smoke evacuation devices or room suction hose nozzle inlet within 2 inches of the surgical site to effectively capture airborne contaminants.
- Keep smoke evacuation devices ON (activated) at all times when airborne particles are produced during all surgical or other procedures.
- Consider all tubing, filter, and absorbers as infectious waste and dispose of them appropriately.
- Install new filters and tubing before each procedure.
- Inspect smoke evacuation systems regularly to prevent possible leaks.
- Use universal precautions as required by the OSHA Bloodborne Pathogens standard.
- For additional information, refer to *Control of Smoke from Laser/Electric Surgical Procedures* (NIOSH Publ. No. 96-128).
Skin Protection — If the potential exists for damaging skin exposure, particularly with ultraviolet lasers (200 to 400 nm), then skin covers and or sunscreen creams are recommended. Most gloves will provide some protection against laser radiation. Tightly woven fabrics and opaque gloves provide the best protection. A laboratory jacket or coat can provide protection for the arms. For class 4 lasers, consideration should be given to flame-resistant materials. Use protective clothing when exposed to levels of radiation that exceed exposure limits for the skin.

Laser Surgery Fire Prevention Tips

- Place the laser in standby mode when it is not in active use.
- Activate the laser only when the tip is under the surgeon’s direct vision.
- Allow only the person using the laser to activate it.
- Deactivate the laser and place it in standby mode before removing it from the site.
- When performing laser surgery through an endoscope, pass the laser fiber through the endoscope before introducing the scope into the patient; this will minimize the risk of damaging the fiber.
- Before inserting the scope in the patient, verify the functionality of the fiber.
- During lower-airway surgery, keep the laser fiber tip in view and make sure it is clear of the end of the bronchoscope or tracheal tube before laser emission.
- Use appropriate laser-resistant tracheal tubes during upper-airway surgery.
- Follow the directions in the product literature and on the labels, which typically include information regarding the laser resistance of the tube, use of dyes in the cuff to indicate a puncture, use of a saline fill to prevent cuff ignition, and immediate replacement of the tube if the cuff becomes punctured.

N. PATIENT AND RESIDENT MOVING AND LIFTING

Lifting or moving patients or residents requires the interaction of the healthcare worker, the individual being moved, the equipment used, and the work environment. To make the process a safer one:

- Identify existing and potential workplace ergonomics hazards.
- Assess work tasks by examining the duration, frequency, and magnitude of exposures to force, repetition, and awkward postures.
- Conduct environmental walk-through tours to ask workers about lifting or stressful tasks.
- Refer to OSHA logs and worker’s compensation injury reports for data related to ergonomic-related hazards.
- Use administrative controls to ensure adequate staffing.
- Understand that proper patient or resident assessment can help determine the level of risk for lifting, moving, or transferring tasks.
- Implement engineering controls to help isolate or remove the hazards by providing proper selection, training, and use of assist devices and equipment.
- Stress the early identification and treatment of injured employees.
- Develop a modified or transitional duty program for workers recovering from injuries.
- Recognize the great variety of activities involved:
  - Manual lifting
  - Laterally transferring between two horizontal surfaces
  - Ambulating
• Repositioning in bed or chair
• Manipulating extremities
• Transporting patients, residents, and equipment
• Performing activities of daily living
• Stopping falls or transfers from the floor
• Assisting in surgery

**Understanding the Body** — Healthcare personnel must understand the body to help prevent musculoskeletal disorders. Failure to teach workers about the body and their personal responsibility to keep it as safe as possible contributes to the epidemic of back and other lifting-related disorders.

**Neck** — The first seven vertebrae (cervical vertebrae) form the neck. Areas of the spine, such as the neck, where flexible and inflexible sections join, are particularly susceptible to strains, sprains, and injuries.

**Shoulder** — The shoulder is an example of a ball-and-socket joint where the ball of one bone fits into the hollow crevice of another. The shoulder joint allows movement and rotation of the arms inward, outward, forward, or backward. Several different tendons are attached to bones in the shoulder. Bursae reduce friction and cushion the tendons as they slide back and forth.

**Spinal Column** — The spine is a column of approximately 30 bones (vertebrae) which run from the neck to the tailbone. These vertebrae are stacked on top of one another in an S-shaped column and form spinal joints that move independently. The healthy spine has three natural curves: forward curve in the neck, backward curve in the chest area, and another forward curve in the lower back.

**Natural Curves of the Back** — The three natural curves of the back are correctly aligned when ears, shoulders, and hips are in a straight line. At the end of the spine, the vertebrae are fused together to form the sacrum and the tailbone. The lower back or lumbar area is the workhorse of the back. It carries most of the weight and load of the body. Aligning and supporting the lumbar curve properly helps prevent injury to vertebrae, discs, and other parts of the spine. The spine also has various types of associated soft tissues, such as the spinal cord, nerves, discs, ligaments, muscles, and blood vessels.

**Discs** — Discs are soft, shock-absorbing cushions located between vertebrae. They allow vertebral joints to move smoothly and absorb shock as the body moves. Each disc has a spongy center and tough outer rings.

**Muscles and Ligaments Affecting the Back** — The vertebrae are connected by a complex system of ligaments that “knit” them together. Strong, flexible muscles maintain the three natural spinal curves and aid movement. The most important muscles that affect the spine are the stomach, hip flexors, hamstrings, buttocks, and back muscles.

**Spinal Cord and Nerves** — The spinal cord is a delicate cylinder of nerve fibers running the length of the spine inside a hollow tunnel formed by the vertebrae. Spinal nerves branch off of the spinal cord and exit through openings between vertebrae. These nerves then travel to all parts of the body.

**Tendons** — Tendons are tough, connective tissue that attach muscles to bones. They help move the hands, arms, legs, and other body parts by acting as pulleys.

**Bursae** — Bursae are small sacs filled with fluid. They serve as soft slippery cushions between bony projections and muscle-tendon units.
**Types of Injuries** — When muscles contract repetitively without sufficient rest they can become sore and painful. This can happen without movement or when the body moves repetitively. A sprain is damage to ligament fibers caused by moving or twisting a joint beyond its normal range. A strain occurs when a muscle or a muscle–tendon unit is overused. Bursitis is an irritation and inflammation of bursae in the shoulders and other areas caused by their rubbing on adjacent tendons. Tendinitis occurs when a tendon is overused and becomes inflamed and irritated. When the tendon sheath is also involved, the condition is known as tenosynovitis. Neck tension syndrome occurs where the last neck vertebra meets the first mid-back vertebra, which is a major site of acute back pain, muscle tension, and other injuries. Common symptoms include muscle tightness, soreness, restricted movement, headaches, and numbness or tingling in the hands, wrists, arms, or upper back. Shoulder tendinitis is common in people who lift continuously or who work at levels above their shoulders. Several different tendons attach to bones in the shoulder region and produce different types of tendinitis, including rotator cuff and bicipital tendinitis. Shoulder bursitis inhibits the free movement of the tendons in the crowded shoulder girdle and limits the mobility of the shoulder. Shoulder impingement occurs when enlarged or inflamed bursae or tendons get caught between structures in the shoulders.

**Disc Problems** — Over time, discs wear out or degenerate from natural aging. The discs dry out and become stiffer and less elastic. The outer fibrous rings can crack, and the disc narrows. They become less able to handle loads put on them. If the inner jelly-like center bulges into the outer rings, it may compress nearby nerves or blood vessels. If the inner jelly-like center breaks through the outer rings, the condition referred to as a ruptured or herniated disc. The discs in the lower back are more susceptible to damage than other discs because they bear most of the load in lifting, bending, and twisting. Sciatica occurs when bulging or ruptured discs constrict the sciatic nerve or nearby blood vessels, causing pain down the hips, buttocks, or legs. Degenerative or osteoarthritis is the wearing out of joints, vertebrae, discs, facets, or other structures over time. Osteoarthritis is associated with loads put on the spine over long time periods. As the discs dry out and narrow, they lose their shock-absorbing ability. The vertebrae move closer together and become irritated; they may even produce bony outgrowths.

**Other Back Problems** — Facet joint syndrome occurs when the facets interlock with the vertebrae above and below to form joints in the spine. The facets can become misaligned from bending, lifting, and twisting while working. Slipped vertebrae or spondylolysis occurs when the vertebrae in the lower back are pushed forward so they do not line up with other vertebrae. This condition disrupts the proper natural curves of the spine, and the joints, ligaments, and muscles become overburdened. Spinal canal narrowing can occur in the canal through which the spinal cord runs or in the gap at the sides of vertebrae where nerves exit. Slips, trips, and falls can generate severe forces on the spine and cause compression fractures of the vertebrae.

**Basic Safe Lifting Tips**
- Never move or lift from side to side.
- Keep items close to the body when reaching, carrying, or lifting.
- Plan the lift and size up the load to better reduce spine movement.
- Keep the patient load as close to the body as possible. (Note: 10 pounds at waist height equates to 100 pounds of force on the back with arms extended away from the body.)
- Bend at the knees when lifting loads from floor level. (Note: 10 pounds at floor height with bent knees is equal to 100 pounds of force when bending at the waist with legs straight.)
Avoid any twisting motion and be sure to pivot the feet to turn.
• Always push rather than pull loads; pushing reduces the force necessary to move an object by 50%.
• Use lifting equipment and devices such as chair lifts, mechanical lifts, transfer boards, and gait belts.
• Keep beds at proper heights.
• Keep the back straight and maintain correct posture with head up and stomach tucked in.

Back Injury Prevention — Management and prevention efforts in the healthcare environment should focus on the following (see Table 9.24):

• Study lifting requirements and eliminate lifts wherever possible.
• Provide patient handling, transfer, and lifting equipment.
• Keep equipment in good repair.
• Be sure wheelchairs and carts can be moved without excess strain.
• Establish patient lift guidelines to help workers safely assess patient handling situations.
• Redesign the workplace to increase efficiency and decrease the potential for injuries.
• Educate workers about back anatomy and personal back care responsibilities.
• Provide recurring education and training on proper body mechanics and patient transfer techniques.
• Require employees to participate in exercise or stretching routines before lifting.
• Establish and train two-person lift and transfer teams.
• Use physical or occupational therapy professionals to instruct workers in patient handling techniques.
• Investigate all accidents and make changes to prevent recurrence.
• Assign a case management worker to oversee medical treatment and return-to-work efforts.

Senior Leadership Involvement — Focus on reducing or eliminating patient handling and other ergonomic hazards by establishing procedures to address the following topics:

• Continued training of employees
• Development of proper transfer and lifting methods for staff use
• Requiring compliance with established transfer and lift procedures
• Establishing procedures for reporting early signs and symptoms of back and other musculoskeletal pain or injuries
Guidelines for Lifting and Moving Patients or Residents

- Assess patients or residents before lifting or moving them.
- Eliminate or reduce manual lifting and moving of patients or residents whenever possible.
- Use assist devices or equipment when available and appropriate for the activity.
- Get patients or residents to help as much as possible by giving them clear, simple instructions with adequate time for response.
- Know your own limits and do not exceed them.
- Get help whenever possible.
- Never transfer patients when off balance.
- Lift loads close to the body.
- Never lift alone, particularly fallen patients; use team lifts or mechanical assistance.
- Limit the number of allowed lifts per worker per day.
- Avoid heavy lifting, especially with the spine rotated.

Nursing Home Lifting — Resident lifting and repositioning tasks can be variable, dynamic, and unpredictable in nature. In addition, factors such as resident dignity, safety, and medical contraindications should be taken into account. As a result, specific techniques are used for assessing resident lifting and repositioning tasks that are not appropriate for assessing the potential for injury associated with other nursing home activities. An analysis of any resident lifting and repositioning task involves an assessment of the needs and abilities of the resident involved. This assessment allows staff members to account for resident characteristics while determining the safest methods for performing the task, within the context of a care plan that provides for appropriate care and services for the resident. Such assessments typically consider the resident’s safety, dignity, and other rights, as well as the need to maintain or restore a resident’s functional abilities. The physical and mental abilities of the resident also play an important role in selecting appropriate solutions. For example, a resident who is able and willing to partially support their own weight may be able to move from his or her bed to a chair using a standing assist device, while a mechanical sling lift may be more appropriate for those residents who are unable to support their own weight. Other factors related to a resident’s condition may have to be taken into account as well. For instance, a resident who has recently undergone hip replacement surgery may require specialized equipment for assistance in order to avoid placing stress on the affected area.

Resident Assessment

- Use the assessment to decide the appropriate type of assist equipment or devices, techniques, and number of people needed and other relevant considerations.
- Always check the condition of the patient or resident each time before beginning and during the activity.
- Encourage employees to systematically review any information relevant to the transfer activity prior to lifting or moving patients or residents; this information should be readily available and clearly state the essential facts.
- Labels or signs can communicate the essential points in a simple manner.
- Consider the following:
  - The level of assistance the resident requires
  - The size and weight of the resident
  - The ability and willingness of the resident to understand and cooperate
  - Any medical conditions that may influence the choice of methods for lifting or repositioning.
Safety in Patient And Clinical Areas

CMS Resident Assessment Instrument — The Centers for Medicare and Medicaid Services (CMS) provides a structured, standardized approach for assessing resident capabilities and needs that results in a care plan for each resident. Caregivers can use this information to help them determine the appropriate method for lifting or repositioning residents. Many nursing homes use this system to comply with CMS requirements for nursing homes.

Injury Factors

- Physical demands of work
- Equipment and facilities
- Work practices or administrative issues
- Personal factors

Forceful Exertions — The type of grips, body posture, and number of repetitions can also affect the amount of force required. Examples of excessive force include:

- Lifting or transferring heavy patients
- Unexpected or abrupt forceful motions
- Trying to keep a patient or resident from falling, or lifting a patient or resident off of the floor after a fall

Awkward Position or Posture — Repeated bending, twisting, reaching, or holding prolonged fixed positions can contribute to injuries of the neck, shoulder, and back. Bending the back forward when lifting places great loads on the muscles, discs, and ligaments of the lower back. One of the most damaging activities is to bend, reach out, lift, and then twist while raising the trunk, which can occur when:

- Attaching gait or transfer belts with handles
- Providing in-bed medical care
- Washing patient’s legs and feet in a shower chair
- Dressing or undressing patients or residents
- Repositioning or turning patients in bed
- Performing stand-pivot transfers

Repetitious Actions — If repetitive motions are frequent or sustained, they can contribute to fatigue and injuries. The number and length of rest periods, the associated force, and unfamiliar work activities can all affect the impact of repetition on the body.

Administrative Measures

- Conduct a review that evaluates if the equipment is appropriate for the specific lifting or moving activity; the review should involve onsite testing of a variety of equipment by the end users.
- Order a sufficient quantity of equipment and attachments; this will allow the equipment to be readily available at all the various locations where it is needed.
- Provide for the convenient storage of assist and institutional equipment to ensure that equipment is easy to find, thus encouraging healthcare workers to use it.
- Use flexible purchasing procedures that allow for the evaluation and purchase of up-to-date equipment with the most appropriate features.
- Administrative issues affect the equipment available to employees, the types of work tasks they perform, and how these activities are accomplished; for example:
Healthcare Hazard Control and Safety Management

- Lifting or moving patients or residents without help from assist equipment and devices or other employees
- Performing unaccustomed physical work (e.g., new hires, employees returning from a long absence, or staff covering for absent employees)
- Using improper work practices (e.g., poor body mechanics)
- Having ineffective equipment repair procedures (e.g., no standard repair tag) or long repair turnaround times
- Not storing, replacing, or distributing equipment so it is readily available
- Not performing systematic patient or resident assessment
- Purchasing equipment when selection is limited or no end-user review is available
- Training that is limited only to proper body mechanics and ignores assist equipment
- No hands-on or reinforced training on a systematic basis
- Training success not demonstrated in a competency test
- Poorly communicating job demands and expectations
- Not establishing physical job demands and essential job functions

Proper Work Practices — Healthcare providers can be injured when manually lifting or moving patients, residents, or equipment. Manual handling can also be uncomfortable for the patients or residents. Whenever manual handling of patients or residents is performed, employees must be thoroughly trained (e.g., hands-on practice sessions under supervision). These issues affect the equipment available to employees, the types of work tasks they perform, and how these activities are accomplished.

Equipment Maintenance — A regular program of maintenance can help make sure sufficient quantities of equipment are available on all units or floors and avoids shortages and breakdowns. Some maintenance related problems include:

- Jammed or worn wheels, which make the equipment more difficult to move and steer
- Faulty brakes, which cause chairs or other equipment to shift during transfers
- Hard-to-reach controls or manual cranks on beds, chairs, or equipment; these can discourage providers from making adjustments and cause them to assume awkward postures or make forceful exertions
- Handles on beds, carts, or other equipment that are either the wrong size or are placed at an inappropriate height
- Missing attachable IV/med poles, which can lead to workers awkwardly pushing gurneys or wheelchairs with one hand while holding freestanding poles with the other
- Older mechanical lift devices, which are difficult to operate, uncomfortable, unstable, or even dangerous
- High or heavy medical, food, or linen carts that require bending, reaching, or twisting to load or unload

Systematic Preventative Maintenance

- Check brakes for their ability to lock and hold.
- Oil and adjust mechanisms to work easily.
- Clean or replace casters or wheels so they roll easily and smoothly.
- Replace and secure attachments.
- Use standardized tags that have the name of the person reporting the problem, that person’s department, the date, and a description of the problem.
• Institute tracking systems to ensure prompt turnaround times.
• Maintain equipment instruction manuals.

Facilities Design Issues — Healthcare workers may be forced to assume awkward postures because rooms, bathrooms, hallways, and other spaces are small in size or crowded or have obstructions. These factors may also prevent getting help from other employees or using assist equipment. Poorly maintained floors can cause slipping, tripping, and abrupt movements when lifting or moving patients, residents, or equipment. Well-designed and maintained institutional equipment and facilities are important in reducing or preventing back injuries. Institutional equipment should be designed to allow the user to maintain neutral body postures and reduce forceful motions. Beds, wheelchairs, cardiac chairs, and other equipment should be easy to adjust and move. Equipment with wheels should roll and steer easily. Such properly functioning equipment can decrease the number of people needed and effort required. Facilities should be designed to allow easy operation and movement of equipment. During lifting or moving activities, enough room should be available for staff to avoid awkward postures and for other employees to help. Patient, resident, shower and bath rooms must have adequate work space. Low thresholds on entryways allow the use of equipment with wheels.

Mechanical Lifting or Assist Devices — Nursing personnel must be trained on lifting equipment and proper procedures before using mechanical lifting devices (see Table 9.25):

• Always explain the lift to the resident or patient before beginning the procedure.
• Be sure the resident or patient is positioned correctly in the sling before continuing the lift procedure.
• Have one person ensure that the patient remains stable during the entire lifting procedure.
• Never allow the sling to swing and never leave a patient or resident suspended in the sling.
• Never use lift devices to transport patients unless the equipment has been designed to do so.
• Understand that mechanical assist devices or lifts can help reduce injury by avoiding unnecessary manual transfers, awkward postures, forceful exertions, and repetitive motions; although these devices may appear to take longer to perform the lift or move, they may save staff time by reducing the number of employees needed for a given transfer.
• Remember that mechanical lifting devices eliminate the need to manually lift or move patients or residents:
  • To and from beds, chairs, or gurneys
  • Off of the floor

<table>
<thead>
<tr>
<th>TABLE 9.25 Categories of Mechanical Lifts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total-body</td>
</tr>
<tr>
<td>Stand-assist</td>
</tr>
<tr>
<td>Compact (total-body or stand-assist)</td>
</tr>
<tr>
<td>Ambulation</td>
</tr>
<tr>
<td>Bath/shower</td>
</tr>
</tbody>
</table>
• To a standing position
• Up or over in bed
• During ambulation
• In and out of vehicles
• Into or out of bathtubs or showers

Major Types of Patient or Resident Moving Tasks

Lateral Transfers — Lateral transfers or sliding can be used to move patients and residents between two horizontal surfaces such as from a bed to a gurney. Helpful equipment and devices include slide boards, transfer mats, slippery sheets, draw sheets, and incontinence pads.

Ambulating, Repositioning, and Manipulating — For help with these types of activities, use equipment and gait belts, transfer belts with handles, slippery sheets, plastic bags, draw sheets, incontinence pads, pivot discs, range of motion machines, fixtures, etc.

Performing Activities of Daily Living — These activities include showering, bathing, toileting, dressing or undressing, and performing personal hygiene and related activities. Equipment devices include shower-toilet combination chairs, extension hand tools, shower carts, gurneys, and pelvic lift devices.

Useful Tips — Healthcare workers should be encouraged to use assist equipment and devices when they are appropriate. To facilitate use, such equipment should be:

• Purchased in sufficient quantities
• Stored so it is visible and readily available
• Evaluated and selected by the users
• Accompanied by effective training
• Equipped with sufficient replacement accessories (e.g., slings)
• Maintained in good working order

Lift Teams — Some organizations choose to create special lift teams dedicated to performing the majority of the lifting or moving patients or residents. Relying on only a few thoroughly trained employees can be an effective way to reduce risks. The team’s policy is to use assist equipment and not to perform manual lifting or moving activities unless necessary. The lift team coordinates with the nurses and other medical personnel responsible for the patient or resident. Some organizations train teams to:

• Eliminate uncoordinated lifts.
• Prevent unprotected personnel from performing lifts.
• Reduce weight or height differences between partners.
• Not allow tired or exhausted workers to perform lifting tasks.
• Prevent personnel recovering from back injuries from performing lifting tasks.
• Prevent untrained personnel from lifting.
• Encourage the use of lifting equipment whenever possible.

Guiding and Slowing Falls — Reviewing patient or resident assessments and watching for signs of weakness are effective ways of preventing falls. If falls do occur, no attempt should be made to stop them abruptly. Stopping falls is a sure way to get hurt. The safest method involves guiding, slowing, and lowering the patient or resident to the floor while trying to maintain a neutral body posture. Regulatory reporting requirements may cause employees to try to stop a fall. Reporting falls should not lead to fault-finding or negative consequences.
Providing Home Healthcare — This is a difficult situation for healthcare workers. Facilities and equipment are not under their control and they cannot get help from other employees. Home healthcare workers should be encouraged to:

- Ask for help from the patient’s family or friends.
- Provide suggestions for the layout of bedrooms and other areas.
- Follow correct body mechanics.
- Maintain clear spaces.
- Avoid trip or slip hazards.

Home healthcare workers should be trained in the use of gait belts, transfer devices, shower-toilet chair combinations, extension hand tools for showering, and adjustable beds.

Task Evaluation Tools — Involve the employees performing the work in evaluating problems and coming up with potential solutions. The following assessment tools can help you conduct your work task evaluations:

- Patient and resident handling checklist
- Task analyzer
- Equipment checklist
- Facility design checklist
- Administrative issues checklist

Safety During Transfers

- Communicate the plan of action to the patient and other workers to ensure that the transfer will be smooth and without unexpected moves.
- Position equipment and furniture effectively.
- Be sure to remove obstacles.
- Make sure everyone involved in the maneuver has good footing.
- Be sure patients are wearing slippers that provide good traction.
- Maintain eye contact, communicate with the patient, and be alert for trouble signs.
- Record any problems on the patient’s chart so other shifts will know how to cope with difficult transfers.
- Note the need for any special equipment.

Administrative Controls — Management should implement measures to reduce or prevent back injuries such as:

- Developing a return-to-work or modified light-duty program
- Writing job descriptions that establish the appropriate physical requirements
- Requiring immediate reporting and treatment of injuries

Personal Factors — Home and recreational activities involving forceful exertions or awkward postures can lead to or aggravate back injuries; some examples include sports and home repair work. Psychological factors, such as stress, may influence the reporting of injuries, pain thresholds, and even the speed or degree of healing. Previous trauma or certain medical conditions involving bones, joints, muscles, tendons, nerves, and blood vessels can also contribute to back-related disorders. Physical fitness, weight, diet, exercise, personal habits and lifestyle may affect the development of back injuries. Individuals who are not in good physical condition tend to have more injuries; excessive body weight can place added stress on the spine and is often associated with a higher rate of back injuries. Physically fit individuals tend to have fewer and less severe injuries. They also recover faster if they are
hurt. A physician or physical therapist should be consulted about which aerobic, strength, and flexibility exercises are appropriate for the injured employee. This is especially important for individuals who have pre-existing injuries or medical conditions. Other potential benefits of a long-term, sensible exercise programs include:

- Increased balance, coordination, strength, and flexibility
- Weight reduction, increased energy, and less stress

Individuals who have suffered back injuries should warm up and stretch before engaging in work activities and should participate in long-term but sensible exercise programs involving aerobic conditioning and other strengthening activities.

**Communication and Feedback** — Open lines of communication reveal whether or not improvements are working and allow quick responses to new problems. It is important to track the progress of any improvements made (e.g., have injuries and symptoms associated with problem work activities decreased over time). When evaluating improvements, it is important to talk to the employees and ask what suggestions they may have to refine the changes. Remember to give the changes time to work and allow employees to get used to them.

**Work Evaluation Tools** — Employees performing the work should be involved in evaluating problems and coming up with potential solutions. Following the simple three-step hazard control process can help reduce lifting-related injuries and complaints. The first step in the process is to identify lifting tasks by observing and evaluating patient or resident needs on the unit. The second step involves analyzing both data and observations; observations should be conducted for a period of time to validate the actual tasks. The analysis step should help managers identify causal factors related to the lifting or moving tasks. The analysis (step two) uses four guides or tools to evaluate a single patient-moving task. When the analysis step is completed, the identification and assessment team can consider appropriate controls to reduce worker risk of injury (step three). The proper controls cannot be selected and implemented unless the identification and analysis steps have been accomplished correctly. The following tools (see Appendix Q of this text) can be used when evaluating tasks:

- Patient or resident handling identification tool (step one)
- Lift or moving task analysis guide (step two)
- Equipment evaluation tool (step two)
- Facility design assessment tool (step two)
- Administrative issues evaluation guide (step two)

**Training and Education**

- Implement a training program to provide education and training with regard to ergonomic hazards and moving tasks.
- Update the training on a regular basis and look for ways not only to teach technique but also to buy workers into the program.
- Provide training at the level of understanding appropriate for those being trained.
- Give workers an opportunity to ask questions.
- Provide an overview of the potential risks, causes, and symptoms of back injury and other injuries.
- Teach workers how to identify existing ergonomic stressors and methods of control.
- Explain the use of engineering, administrative, and work practice controls needed to conduct patient or resident handling tasks.
- Encourage workers and staff to stay physically fit.
• Provide education and hands-on practice that allows feedback.
• Review the work tasks analysis and evaluation information.
• Adapt training programs to reflect improvement options or controls that have been implemented.
• Focus training and education on the nature and causal factors of worker injuries.
• Require that employees demonstrate their skills in a competency evaluation.
• Provide a systematic approach reinforced by retraining.
• Address anatomy and physiology as they relate to back injuries.
• Cover proper work practices and administrative measures.
• Stress patient or resident assessment.
• Teach employees how and when to use assist equipment and devices.
• Require reporting of injuries, equipment, and facility problems.

Special Training Considerations — Employees should be trained before they lift or reposition residents or perform other work that may involve risk of injury. Ergonomics training can be included with other safety and health training or incorporated into general instructions provided to employees. Training is usually most effective when it includes case studies or demonstrations based on the facilities polices and allows enough time to answer any questions that may arise. Charge nurses and supervisors should participate in the education program. They must reinforce the safety program and oversee reporting requirements. Supervisors must ensure the implementation of task-specific procedures and adherence by workers to published policies. Charge nurses and supervisors must receive detailed education and training on all required work practices. Be sure to train staff members who are responsible for planning and managing the ergonomic or back care. These staff members should receive information and training that will allow them to:

• Identify potential problems related to physical activities in the workplace through observation, use of checklists, injury data analysis, or other analytical tools.
• Address problems by selecting proper equipment and work practices.
• Help other workers implement solutions.
• Evaluate the effectiveness of ergonomics efforts.

SUMMARY

This lengthy chapter covered a myriad of safety topics and hazards found in patient or care areas of healthcare organizations. The chapter began with a discussion about organizational safety cultures, promoting trust, and requiring accountability. Patient safety issues, improving performance, and related standards were addressed briefly early in the chapter. The chapter covered the importance of the National Patient Safety Goals and responding to sentinel events. It also addressed common medical error causal factors, patient safety terms, and strategies for reducing errors. The chapter presented information on a number of specific topics, including bed safety, fall prevention, use of restraints, workplace violence, dealing with anger, and nursing home and combative residents. Medication safety was presented in some detail, including such topics as types of medication errors, medication management, investigating errors, and patient monitoring. Other topics covered in the chapter included infant abduction prevention, safety in nursing units, nurse safety education, hazardous drugs, wheelchair safety, stress, and sleep deprivation. In addition, the chapter provided information on home health, emergency department safety, and safety in intensive care units. Also addressed was surgical and operating room safety, including laser usage. One of the most important topics presented was safely moving or lifting patients or nursing home residents.
FOR REVIEW AND DISCUSSION

1. Discuss the elements that provide the foundation of a true safety culture.
2. List at least ten keys vital to creating a culture of trust in the organization.
3. In your opinion, what three important things would contribute to creating a more effective patient safety program?
4. Discuss three high-risk procedures that could create problems for an organization.
5. Why is a good data collection and analysis program necessary to improve patient safety?
6. What is the number one causal factor of medical error or patient adverse events as identified by JCAHO? Why?
7. Identify and discuss the impact of at least four common medical error causal factors as presented in the text.
8. Explain the purpose of the Universal Protocol.
9. Define the purpose of failure mode and effect analysis.
10. List at least five bed safety hazards.
11. Describe five reasons for patient falls.
12. Define the term medical restraint.
13. List at least seven anger warning signs.
14. Describe at least five common medication errors.
15. What is the purpose of a formal medication management program?
16. Describe the profile of the typical infant abductor.
17. Why do most third-shift workers suffer from sleep deprivation?
18. Describe at least five common hazards found in operating rooms.
19. List and describe at least three common hazards associated with laser usage.
20. Explain some ways in which healthcare leaders can get involved in preventing back injuries.
21. What are some basic administrative controls that should be included in a back injury prevention program for healthcare workers?
A. INTRODUCTION

This chapter addresses a number of healthcare clinical and facility support departments, functions, and topics. Sections B through E address the major facility supports areas of environmental services, laundry, food services, and facility security (security management was also covered in Chapter 2 and facility and plant safety were addressed in Chapter 6). Sections F through J cover radiology, nonionizing radiation, laboratories, central sterile supply, and pharmacy safety. Sections K through M address medical equipment safety and hazardous waste training for support personnel and provide an overview of ergonomics.

B. ENVIRONMENTAL SERVICES

The housekeeping or environmental services department provides services to virtually all patient and nonpatient areas in a facility. The department plays an important role in keeping the facility clean, safe, and functional. The major tasks for environmental service workers include:

- Daily tasks such as mopping, dusting, and disinfecting
- Cleaning patient care areas, including rooms
- Maintaining common areas, corridors, and offices
- Cleaning windows and vents and extracting carpets
- Assisting with moving furniture and equipment
- Cleaning patient rooms after discharge
- Moving trash and refuse to containers or pickup points
- Cleaning and disinfecting contaminated areas
- Picking up hazardous and infectious waste materials
- Cleaning up chemical spills and releases

Cleaning for Safety and Health — The environmental services department plays a key role in controlling infection within a facility. Workers must be trained to clean for health before cleaning for appearance. As this approach to cleaning becomes more widely accepted, the important role that environmental services personnel play in keeping healthcare facilities safe and healthful will become more appreciated. Their role can best be described as removing contaminants from the environment. Workers can help prevent accidents by identifying and correcting hazards. The following safety rules should be observed:
• Wipe up spills, leaks, and tracked-in water immediately.
• Keep oily substances off of floors.
• Replace worn tiles, fix loose floor moldings, and repair torn carpeting as soon as possible.
• Use care in mixing detergents, germicides, and cleansers.
• Never mix chemical solutions because a dangerous reaction could occur.
• Avoid careless placement of tools, supplies, and equipment.
• Post wet-floor signs and barriers when cleaning or refinishing floors.
• Ground electric cords while operating floor machines, vacuums, and other electrical appliances.
• Check electrical equipment for frayed wires and loose plugs and connections before using.
• Never run cleaning machines over electrical cords.
• Never use a product for other than its intended purposes.

Chemical and Physical Hazards — Rules that should be followed when dealing with hazardous chemical and physical agents include the following:

• Know which substances cause sensitization reactions.
• Measure and mix cleaning solutions correctly.
• Use appropriate protective equipment.
• Reduce the use of solvents in cleaning processes.
• Follow safety rules for flammable materials.
• Follow safety rules when using caustic substances.
• Protect the face when exposed to splash or splatter hazards.
• Wear hearing protection in noisy environments.
• Know where the hazard communication plan and the Material Safety Data Sheets (MSDSs) are.

Hand Protection — Glove use determines the glove material required. For most light work, a canvas glove is both satisfactory and inexpensive. For handling rough or abrasive material, leather gloves reinforced with metal stitching are required. Many plastic and plastic-coated gloves are available that are designed to protect against a variety of hazards. Other gloves have granules or rough materials incorporated into the plastic for better gripping quality.

Foot Protection — About a quarter of a million disabling occupational foot injuries take place each year. Many of these injuries could be avoided by wearing proper foot protection. Housekeeping employees should wear well-fitted, sturdy, low-heeled shoes. The soles should be made of skid-resistant material and have some toe reinforcement to protect the wearer against injury from dropped objects.

Other Personal Protective Equipment — The use of other protective clothing and equipment might be required by housekeeping employees, such as aprons for torso protection, “bump” hats for head protection, or noise-control devices for hearing protection.

Worker Training — Workers should be trained in the following topics:

• Cleaning techniques required for cleaning for health
• Infection control and disinfecting procedures
• Workplace safety principles and policies
• Universal precautions
• Infection control procedures
• Selection and use of personal protective equipment (PPE)
• Storage of equipment and chemicals
• Waste management and handling requirements
• Safe lifting and material handling
• Ladder use and safety
• Electrical equipment safety
• Service cart operation and maintenance
• Slip, trip, and fall hazard identification
• Emergency action and injury-reporting procedures

Cleaning and Polishing Agents — The proper cleaner in the specified amount should be used for each cleaning task. Improper usage can result in failure to disinfect or cause overexposure, resulting in dermatitis, slipping hazards, or deterioration of floors and furniture. Other precautions include:

• Never mix cleaning chemicals because some mixtures can create hazardous gases.
• Do not mix chlorine with substances such as vinegar, toilet bowl cleaners, or ammonia.
• Use chemicals from containers that are properly labeled.
• Never transfer cleaners to containers used for food or drink.
• Avoid skin contact when using caustics because even dilute solutions can cause skin burns.
• Never leave cleaning, disinfecting, or polishing agents unattended in areas where patients or visitors might mistakenly ingest or touch them.
• Follow all precautions contained on labels or in the MSDS when using toxic substances.

Electrical Fixtures and Equipment — Electrical equipment should only be handled with dry hands and should always be disconnected before repair or maintenance. Key electrical safety precautions include:

• Disconnect electrical appliances by grasping the plug, not the cord.
• Clean electrical fixtures with a damp cloth after turning them off and unplugging them.
• Clear the area before changing bulbs or fluorescent tubes.
• Never change bulbs when people are below or nearby.
• Never force a fluorescent tube from its socket.

Cleaning Windows

• When cleaning windows, always wear proper clothing.
• Follow the suggestions for safe ladder selection or use.
• Before cleaning, inspect safety belts and attachments and window belt hooks.
• Take down shades, curtains, drapes, and screens that are to be cleaned and stack them neatly in a place where they will not become a tripping hazard.
• Tie or hook any drapes to be left on the window so staff can get in and out safely.

Controlling Environmental Hazards — Slipping and falling hazards result from improper housekeeping practices. Ways to reduce this problem include:

• Immediately clean up all foreign materials on floors, such as liquids, foods, and dirt, as well as other obstructions such as trash and extension cords.
• Be sure entrances, steps, and outside walks are free of ice.
• Keep entrances mopped up in wet weather to prevent slipping hazards.
• Use the type and amount of wax specified for each kind of floor; too much wax, improper buffing, or polishing with an oiled mop creates a slipping hazard.
• Before mopping, rope off corridors and public rooms or put wet-floor floor markers at exits and near stairways.
• Mop or wax only one side of a corridor at a time so a dry path is always available for people to use.
• Keep equipment on the side being cleaned.
• When using electrical equipment, plug it in on the side being cleaned; if this is not possible, use a “Caution” floor marker to call attention to the cord. Do not block doorways or elevator entrances with cleaning equipment.
• Apply high-visibility tape to vacuum cleaner hoses and extension cords to make them more conspicuous.
• Place wet mops, brooms, electrical equipment, and supplies in their proper storage areas as soon as a job is completed.

Cleaning Rooms Using Wet Methods

• Alternate the hand holding a cleaning implement and avoid a tight, static grip; use padded nonslip handles.
• For spray bottles, use trigger handles long enough to accommodate the index and middle fingers; avoid using the ring and little fingers.
• For all cleaning, use chemical cleaners and abrasive sponges to minimize scrubbing force.
• Use kneepads when kneeling.
• Avoid bending and twisting.
• Use extension handles, step stools, or ladders for overhead needs.
• Use carts to transport supplies or carry only small quantities and weights of supplies.
• Ventilate rooms, as necessary, when chemicals are used.
• Avoid lifting heavy buckets (e.g., lifting a large, full bucket from a sink).
• Use wheels on buckets that roll easily and have functional brakes.
• Be sure casters are maintained.
• Wear rubber-soled shoes in wet areas to prevent slipping.

Working with Liquids — Filling and emptying buckets using a floor-drain arrangement reduces the risk of spills and slips, speeds the process, and reduces waste.

• Use buckets with casters.
• Be sure casters do not get stuck in the floor grate.
• Be sure casters are maintained and roll easily.
• Use a hose to fill the bucket.

Cleaning Rooms Using Electrical Equipment — Vacuum cleaners and buffers should be of lightweight construction and should have adjustable handles, triggers long enough to accommodate at least the index and middle fingers, and easy-to-reach controls. Technique is important for both devices, including the use of appropriate grips, avoiding tight grips, and, for vacuuming, alternating grips. The use of telescoping and extension handles, hoses, and tools can reduce the need to reach for low areas, high areas, and far away areas. The equipment should be regularly maintained and serviced, and the vacuum bags should be changed when one-half to three-quarters full. Vacuums and other powered devices are preferred over manual equipment for moderate-to-long-duration use. Heavy canisters or other large, heavy equipment should have brakes.
Maintaining Equipment — Personnel should be provided with well-made and properly maintained equipment. Safety features and cost should be considered when equipment is being purchased. Adequate storage facilities should be provided for housekeeping equipment and supplies. Closets should be organized to provide a designated space, shelf, hanger, or rack for each item used. Equipment should be inspected at least monthly, and a system should be in place for employees to report defective items and conditions. Hazards should be corrected and defective equipment immediately taken out of service and replaced.

Equipment Carts
- Move equipment carts carefully through corridors to avoid collision and tripping hazards.
- Reduce speed near stairways, corridor intersections, elevators, and down ramps.
- Pull a cart through swinging doors, rather than shoving it.
- Push a cart only when visibility is clear.
- Never leave carts, equipment, or supplies in a location that creates a hazard.
- Immediately report a cart that must be repaired.
- Arrange items on a cart for safe and efficient use.

Handling Wastes — Personnel who handle waste should follow all facility guidelines for handling waste materials. Personnel must wear PPE such as approved gloves and aprons. When handling potentially infectious materials, personnel must use universal precautions. Tips on handling waste include:
- Never reach into a wastebasket with the hands; instead, empty the receptacle by tipping it into a collection container or by carefully removing the bag or lining.
- Sweep but never pick up broken glass by hand; pick up the fine pieces with a damp cloth, paper towel, or cotton.
- Never store waste where food is being prepared or served.

Basic Cleaning Levels
- **Sanitary** — General health is protected; a risk of disease may exist, but the risk is considered to be acceptable.
- **Disinfected** — 95% of contaminants, pathogens, or pollutants are removed or killed.
- **Sterile** — Environment is 100% free of contamination.

Guidelines for Cleaning
- The safety of patients, visitors, and staff must be emphasized during the entire cleaning process.
- Removing contaminants should be a priority while minimizing cleaning residues.
- Humans should be protected from exposure to chemicals during the process.
- The cleaning process should be assessed in relation to the entire organization.
- Waste materials must be handled and disposed of properly.

Cleaning Effectiveness
- Cleaning effectiveness and safe performance of the environmental services department impact the quality of patient care; a clean and safe facility impacts the morale and job performance of all healthcare workers.
- Environmental services workers are potentially exposed to all of the health and safety hazards found in the healthcare environment.
- Workers are also prone to strain-related injuries and to slip, trip, and fall hazards.
• Workers must be thoroughly trained on chemical safety and how to use the information found in the MSDSs in accordance with OSHA standards.
• Workers should receive regular training in how to clean for health, as well as awareness training on the specific hazards in each department; hazards encountered by workers include exposure to radiation, compressed gases, infectious materials, and hazardous chemicals.
• The environmental services supervisor plays an important role in keeping custodial workers safe; workers need a proactive supervisor who ensures that all personnel receive the proper tools, equipment, cleaning supplies, and training.
• Environmental services must be integrated into everyday operation.
• Workers must understand the hazards of chemical interactions and the importance of proper storage; storage areas must be kept clean and disinfected.

How Disinfectants Work

• Protein coagulation — Most of the proteins in a cell are enzymatic and exist in a dispersed state within the cell. Disinfecting chemicals that cause these proteins to precipitate and coagulate will make cells nonfunctional and result in death.
• Disruption of cell membrane — Cell membranes act as a selective barrier that allows some solutions to pass through; others solutions are absorbed into the cell wall. Substantial concentrations at the cell membrane may alter the physical and chemical properties of the membrane which would prevent normal function and result in inhibition or death of the cell.
• Removal of free sulfhydryl groups — Many of the enzyme proteins in a cell contain cysteine and have side chains terminating in sulphydryl groups. These enzymes cannot function unless the sulphydryl groups remain free and reduced. If the sulphydryl groups are tied down by an oxidizing agent, the result is damage to the cell and death.
• Chemical antagonism — Enzymes perform their catalytic function through their affinity for specific chemical compounds normally found within cells. If a disinfecting agent structurally resembles a known compound, the agent will take the place of the normal compound of the enzyme and inhibit reproduction of the cell.

Critical Instruments and Surfaces — Critical instruments come into direct contact with the patient’s bloodstream or other sterile areas of the body. Examples of critical instruments are needles, surgical instruments used within the body, intravenous catheters, peritoneal endoscopes, and kidney dialysis membranes. Critical instruments must be sterile; if any microbes remain, the risk of infection is high.

Semi-Critical Instruments and Surfaces — Instruments that contact mucous membranes or skin that is not intact are semi-critical instruments. Mucous membranes are effective barriers against bacterial spores, but not against all viruses, mycobacteria (tuberculosis), and some vegetative bacteria and fungi in some locations; therefore, semi-critical instruments must be free of those organisms, but low numbers of bacterial spores would not present a risk. Examples of semi-critical instruments are gastrointestinal endoscopes, bronchoscopes, endotracheal tubes, vaginal speculums, and respiratory care and anesthesia equipment. Semi-critical instruments must, at a minimum, be high-level disinfected.

Noncritical Instruments and Environmental Surfaces — Examples of noncritical instruments or surfaces are floors, countertops, patient furniture, instrument housings and control knobs, blood pressure cuffs, diagnostic electrodes, wheelchairs, and most physical therapy equipment. These surfaces need only be kept clean and sanitary.
**Sterilants** — Sterilants kill highly resistant bacterial spores, all types of viruses, waxy-coated mycobacteria (tuberculosis), all other vegetative bacteria, and fungi. Examples of sterilants are 2% alkaline glutaraldehyde, 6% hydrogen peroxide, combinations of hydrogen peroxide and peracetic acid, 0.2% peracetic acid (at 50°C), and chlorine dioxide (ClO₂, a sterilant for roughly 6 to 10 hours at 20 to 25°C). Sterilants may be used on heat-sensitive critical equipment.

**High-Level Disinfectants** — All microorganisms other than bacterial spores can be killed by the same solutions as those mentioned above but in a much shorter exposure time (about 20 to 30 minutes at 20 to 25°C); therefore, high-level disinfectants are simply sterilants used for a shorter exposure time. All the sterilants listed above could also be considered high-level disinfectants.

**Peracetic Acid** — Peracetic acid packs a powerful punch and has a sharp pungent odor. At higher concentrations (1%) it has been reported to promote tumors in mouse skin. A machine system containing 0.2% peracetic acid heated to about 50°C can sterilize rigid and flexible endoscopes in a 45-minute cycle time, including a rinse with water filtered through a 0.2-μm membrane to remove bacteria. The system uses the peracetic acid once only and is relatively expensive. Odor and toxicity concerns are minimized by containing the peracetic acid within the closed machine.

**Intermediate-Level Disinfectants** — Intermediate-level disinfectants can kill mycobacteria (tuberculosis); many, but not all, types of viruses; fungi; and vegetative bacteria. These disinfectants are not capable of killing bacterial spores in any practical exposure time. Examples of intermediate-level disinfectants are phenols, 50% to 90% alcohol, iodophors, and combinations of isopropanol plus quaternary ammonium compounds. Noncritical instruments and environmental surfaces may be disinfected with intermediate-level disinfectants. These disinfectants are not capable of killing bacterial spores and may not be able to kill all kinds of viruses. They are capable of killing waxy-coated mycobacteria (tuberculosis), all Gram-positive and Gram-negative bacteria, lipid-coated lipophilic viruses (but not always protein-coated hydrophilic viruses), and fungi. The correct application of intermediate-level disinfectants is for such noncritical items as floors and countertops, furniture in patient rooms, instruments that contact only intact skin, and plastic or metal machine housings that do not directly contact patients.

**Low-Level Disinfectants** — Low-level disinfectants do not kill bacterial spores, mycobacteria (tuberculosis), or all viruses. Low-level disinfectants can kill vegetative bacteria, fungi, and some lipid-coated viruses (e.g., HIV). Low-level disinfectants such as quaternary ammonium compounds are used on floors, countertops, furniture, and plastic and metal housings of machines. Quaternary ammonium compounds (QACs) are disinfectants that list their active ingredient as \( n \)-alkyl dimethyl ethylbenzyl ammonium chloride, \( n \)-alkyl dimethyl benzyl ammonium chloride, or didecyl dimethyl ammonium chloride. QACs can kill vegetative bacteria, fungi, and lipophilic viruses. Unless combined with at least 15% isopropanol, they do not kill tuberculosis. QACs do not kill bacterial spores or hydrophilic viruses. For these reasons, QACs are low-level disinfectants. QACs should be freshly prepared, used once, and discarded. Odorless and relatively nontoxic, QACs are important as cleaner/disinfectants for noncritical surfaces. Some compounds work very effectively as germicides, but only a small number prove effective against bacteria and fungi. Their activity covers both the Gram-positive and Gram-negative bacteria, fungi, and viruses. In summary, then, the selection of the proper quaternary will give the product a wide spectrum of activity. Quaternary ammonium chlorides are odorless. The germicidal effectiveness increases with the pH factor. All
disinfectant chemicals are adversely affected to some extent by organic matter; however, these compounds are among the least affected. Alcohol plus quaternary ammonium compounds of at least 15% isopropanol and 0.25% quaternary ammonium will kill tuberculosis, lipophilic viruses, vegetative bacteria, and fungi. These intermediate-level disinfectants can be used for noncritical surfaces, including nurseries.

**Phenolic Compounds** — Phenolic substances are limited with regard to the number of different types of microorganisms they can kill. Phenolic products are compatible with soaps and synthetic anionic detergents. The resulting formulation is, of course, a relatively ineffective detergent product that is a less effective germicide. Most phenolic substances have a relatively high toxicity rating and are usually skin irritants. All of the phenolic solutions have a noticeable odor, most of them a disagreeable one. Phenolic germicides are most effective against microorganisms at a pH 8 or below. This is usually too low for good detergent action. As the pH increases above 8, germicidal activity decreases. The activity of some phenolic compounds decreases quite rapidly in the presence of organic matter. Phenolics are irritating to the skin and should be used only with gloves and protective clothing. They stand out from other germicides in that they can be concentrated and then greatly diluted for use; will kill tuberculosis at their use concentrations; and have low vapor pressures, making them virtually odorless for use on large areas such as floors and countertops. No other type of germicide has this particular, useful combination of features. Phenolics should not be used on critical or semi-critical instruments because they do not kill bacterial spores or hydrophilic viruses and because they will penetrate and be difficult to rinse from plastic and rubber surfaces. Because they are toxic and easily absorbed through skin, phenolics are not recommended for use in nurseries. Phenolics are single-use disinfectants.

**Iodophors** — Iodophors are excellent broad-spectrum disinfectants. They are formulations of iodine complexed with a carrier molecule. When the formulation is diluted, free iodine dissociates from the carrier molecule to kill tuberculosis, viruses, vegetative bacteria, and fungi. When diluted according to the manufacturer’s directions, iodophors can be used for noncritical surfaces. They are single-use disinfectants that exhibit relatively low toxicity and skin irritation. Iodophors have a very low odor level and in this respect are not objectionable; however, they cannot be formulated with odor counteractants or other materials that would normally leave an air-freshened effect, as the iodine attacks the odor counteraction chemicals, usually creating an unpleasant odor in the process. These products require an acid pH for germicidal activity. This, of course, drastically reduces the efficacy of the detergent. It also eliminates the possibility of using inorganic builders sequestrants and chelating agents to enhance detergent activity. The presence of organic matter sharply reduces the efficacy of iodophors against microorganisms.

**Sodium Hypochlorite (Bleach)** — Sodium hypochlorite is registered by the Environmental Protection Agency (EPA) for use in a wide variety of applications, including sanitation and disinfection of household premises, food processing plants, laundry services, agricultural settings, gardens, animal facilities, hospitals, and human drinking water supplies. Certain products containing sodium hypochlorite are used in the cleanup and disinfection of blood and body-fluid spills. Specific medical uses include dialysis equipment, medical waste, hydrotherapy tanks, and laundry. Sodium hypochlorite effectively kills many bacteria, molds, and mildews and inactivates (kills) lipid and nonlipid viruses. The effectiveness of sodium hypochlorite is dependent on the amount of available chlorine. Only products registered with the EPA for use against specific bloodborne pathogens should be used for blood spills. OSHA states that the use of household bleach, in a dilution of 1:10 (1 part bleach to 10 parts water), is appropriate when used as a disinfectant for blood or body-fluid spills.
Chlorine compounds at appropriate concentrations and pH values can kill spores within about 1 hour at room temperatures. A 10- to 50-fold dilution of 5% laundry bleach gives 1000 to 5000 parts of available chlorine per million parts of water. If the pH value is about 5 to 7, it will kill spores quickly (see Table 10.1 and Table 10.2).

**Human Reactions** — Sodium hypochlorite is highly toxic in concentrated form. If it is accidentally ingested or injected, it can cause pain and burning of the mouth, esophagus, and stomach; internal bleeding; circulatory collapse; confusion; delirium; coma; and death. Contact with skin may cause vesicular eruptions and dermatitis. Injury from household bleach, however, is rare. Low concentrations of 4 to 6% may cause esophagus and gastric burns when ingested, but development of severe toxicity is unlikely. If it is spilled on the skin, it should be rinsed with copious amounts of water and a paste of baking soda applied. If it is accidentally ingested, vomiting should not be induced; instead, the person should immediately swallow milk, egg whites, milk of magnesia, or other protein source and seek medical attention.

**C. LAUNDRY SAFETY**

The laundry department is responsible for laundering, distributing, and storing all linens and other washable items in the facility. Laundry tasks can also include pressing, folding, and repairing. Laundry personnel must also accomplish such special tasks as inspection of surgical and sterile linen supplies. Some hospitals may use a shared facility located offsite. Laundry personnel must be trained in how to process contaminated laundry items. Laundry personnel can be exposed to both biological and chemical hazards. Sharps and needles left in linens can be a real hazard during processing. Laundry personnel must follow universal precautions and take measures to protect themselves from exposure to bloodborne pathogens. Personnel are also exposed to chemical substances such as conditioners, softeners, and detergents. (See Table 10.3.)
Contaminated Laundry — Contaminated laundry is defined by OSHA as laundry that has been soiled with blood or other potentially infectious material or may contain sharps. Laundry personnel should:

- Handle contaminated laundry as little as possible with minimal agitation.
- Bag contaminated laundry at the location of use.
- Place wet contaminated laundry in leakproof, color-coded or labeled containers at the location of use.
- When necessary, transport laundry in bags or containers that prevent soak-through or leakage of fluids.
- Place contaminated laundry in bags or containers labeled with the biohazard symbol or in red bags or use alternative labeling or color-coding if employees recognize the containers.
- Use universal precautions when handling these bags.
- Use red bags or bags marked with the biohazard symbol if the facility does not use universal precautions for all laundry.
- Do not hold contaminated laundry bags close to the body or squeeze them when transporting them to avoid punctures from improperly discarded syringes.
- Use normal laundry cycles according to the washer and detergent manufacturers’ recommendations.

Personal Protective Equipment — Exposure to bloodborne pathogens occurs through contact with contaminated laundry while not wearing appropriate PPE. Employees who have contact with contaminated laundry must wear appropriate PPE, as discussed in the Bloodborne Pathogens standard, when handling and sorting contaminated laundry. Appropriate PPE would include gloves, gowns, face shields, and masks when sorting contaminated laundry. The use of thick utility gloves when sorting contaminated laundry may provide workers with additional protection. Utility gloves may be decontaminated for reuse if the integrity of the glove is not compromised; however, they must be discarded if they are

---

TABLE 10.3  Summary of Safety Guidelines

| Keep floors dry; label wet floors. |
| Provide nonskid mats or flooring in wet areas. |
| Require workers to wear nonskid boots or shoes. |
| Handle laundry carefully; watch for sharps and needles. |
| Handle soiled linens gently to prevent contaminating the air. |
| Use caution when handling linens from radiation or chemotherapeutic drug areas. |
| Place dirty linens in color-coded and impervious bags at collection sites. |
| Use a barrier to separate soiled linen areas from the other laundry areas. |
| Require workers who sort and wash contaminated linens to wear proper protective clothing and respirators. |
| Instruct laundry personnel to wash their hands thoroughly before eating, drinking, and smoking; before and after using toilet facilities; and before going home. |
| Include workers who handle and sort soiled linens in the laundry department in the hospital immunization program. |
| Maintain the wrapping on steam lines to protect workers from burns. |

---
cracked, peeling, torn, or punctured; exhibit other signs of deterioration; or when their ability to function as a barrier is compromised. Disposable single-use gloves should not be washed or decontaminated for reuse.

**Sharps Handling** — Exposure to bloodborne pathogens can also occur by handling contaminated laundry that contains sharps. Contaminated needles and sharps should not be bent, recapped, or removed, and shearing and breaking of needles should not be permitted. Immediately, or as soon as feasible, contaminated sharps should be placed in appropriate containers. Needle containers must be available during the laundry sorting process.

**Hazardous Chemicals** — Broken skin due to soap or detergent irritation may provide an avenue for infection or injury if it is exposed to chemical or biological hazards. The face and eyes must be protected from splattering when pouring from a large container to a smaller one. Soaps and detergents may cause allergic reactions and dermatitis. It is important to remember to:

- Never mix together cleaning solutions that contain ammonia and chlorine.
- Be sure laundry workers understand the requirements of the Hazard Communication standard.
- Teach workers about the written program, warning labels, and access to MSDSs.
- Provide suitable facilities within the work area for quick drenching or flushing of the eyes or body.
- Supply appropriate gloves for latex-sensitive employees.

**Other Hazards** — Laundries can produce high noise levels due to loud machinery that can result in occupationally induced hearing loss, hearing impairment, hypertension, elevated blood pressure, and other health hazards. Workers may also experience exposure to excessive heat. Good work practices should include educating and training employees and supervisors to detect early signs of heat-related illness. General ventilation should be adequate, and local exhaust ventilation should be installed at points of high heat production. Excessive reaching, pushing, and lifting of wet laundry can cause work-related musculoskeletal disorders in the back or shoulder areas. Laundry areas should be evaluated for ergonomic stressors and ways to decrease worker risks. Proper lifting techniques should be used. Workers should be taught to avoid awkward postures or twisting while lifting. Laundry areas pose an increased fire risk due to lint build-up on surfaces and the variety of heat-producing equipment. It is important to routinely clean surfaces to remove lint and to empty traps regularly. The accumulations of flammable and combustible waste materials should be prohibited in all work areas. A written fire prevention plan should be in place, and all employees should be aware of fire hazards in the facility. All workers should receive emergency action training upon assignment.

**Loading or Unloading Laundry**

- Front-loading washers and dryers speed up the process for retrieving and inserting items and minimizes wear and tear on linens.
- Washers with tumbling cycles separate clothes, making removal easier.
- For deep tubs, a rake with a long or extendable handle can be used to pull laundry closer to the door opening.
- Machines should be raised so the openings are level with an employee’s hip and elbow.
- For top-loading washers, work practices that reduce risk include handling small loads of laundry, handling only a few items at a time, and bracing the body against the front of the machine when lifting.
• If items are knotted in the machine, employees should brace with one hand while using the other to gently pull the items free.
• Items should be put into a cart rather than having employees pick up baskets of soiled linen or wet laundry.

Linen Handling — Exposure can occur when handling contaminated linen. Observe the following.
• Place linens in appropriate bags at collection locations.
• Use color-coded bags to alert laundry staff of potential hazards.
• Double-bag linens from isolation rooms.
• Wash hands frequently and wear appropriate personal protective equipment.
• Use universal or standard precautions during handling.
• Teach workers the risks of needles being left in linens.

Linen Carts — Linen carts are spring-loaded carts that automatically bring linens within easy reach. They speed the process for handling linens and reduce wear on linens due to excessive pulling. The spring tension should be appropriate for the weight of the load. Carts should have wheel locks and height-appropriate handles that can swing out of the way. Heavy carts should have brakes.

D. FOOD SERVICE DEPARTMENT SAFETY

Healthcare food service operations prepare meals for both patients and employees. Many organizations also operate snack bars, coffee shops, and cafeterias. The food service operation in an acute-care facility can employ up to 10% of the total workforce. The actual number of employees depends on the size and type of facility, preparation equipment used, and the method of distributing prepared meals. Many food service departments also support special functions, meetings, and seminars. The nutrition function provides therapeutic meals, nutrition counseling, and educational sessions to support organizational and community programs. Many healthcare food service departments are actually two departments that often operate under a single manager or department head. One area is responsible for food preparation and delivery while the other function is concerned with nutrition, meal planning, and therapeutic dietary planning. Food service and preparation areas pose special hazards to the dietary worker, including hot surfaces, cuts from sharp objects, electrical shock, and unguarded equipment.

General Overview of Hazards — Employees must use appropriate hand protection when hands are exposed to hazards such as cuts, lacerations, and thermal burns. Walk-in freezers and coolers must have a panic bar or other means of exit on the inside. Managers should promote the safe handling, use, and storage of knives and other sharp utensils; cutlery should be sharpened and in good condition, as dull knives tend to slip and may cause injuries (see Table 10.4). Food carts should have large, low-rolling, low-resistance wheels that can roll easily over mixed flooring as well as gaps between elevators and hallways. Employees should wear appropriate PPE and receive training to avoid steam burns when working with hot equipment or food; for example, when uncovering a container of steaming food, the worker should raise the cover to deflect steam away from the face. Also, the handles of cooking utensils should be turned away from the front of the stove, grill and grill duct work should be free of residues and properly maintained, and flammable items must be stored away from heat-producing equipment.
TABLE 10.4 Preventing Cuts

Keep cutlery sharpened and in good condition.
Use a cutting board or other firm surface.
Always use cut strokes away from the body.
Wash knives separately and never place them in soapy water.
Wipe knives with a towel, with cutting edge pointed away.
Store knives, saws, and cleavers with blades not exposed.
Use racks or carts to carry small amounts of breakable items.
Drain the sink before removing broken tableware.
Never pick up broken glass with bare hands.
Brush broken glass into a dustpan with a brush or damp towel.
Do not stack glass tumblers inside each other.
Never drop silverware into tumblers or pitchers.
Never use glassware for storing tacks, pins, or chemicals.
Use hand guards to reduce cuts in case hands slip from the knife handle.
Have ample work space for cutting tasks.
Use slip-resistant standing surfaces in all cutting areas.
Keep fatigue mats and wooden duck boards in good repair.
Discard food within a 5-foot radius of glassware breakage.

Types of Food Service Operations

- **Food service operation** — The food service preparation function is normally managed by a professional with education or experience in hospitality, food, or hotel management.

- **Nutrition and dietary management** — The nutrition area is normally headed by a registered dietitian. In many facilities, the registered dietitian serves as the department head and supervises both the food preparation and nutrition planning functions.

- **Contract food service management** — Many facilities now employ professional contract firms to provide senior management personnel or manage the entire food service operation.

Sanitation and Safety — Regardless of organization structure, the food service operation will require a number of workers, including cooks, food handlers, and sanitation workers, who are exposed to a number of safety hazards. Food service departments must meet inspection standards of the local health department and comply with a number of federal, state, and Joint Commission guidelines or standards.

Hiring Safe Workers — Management personnel can greatly affect the safety of their department by selecting and hiring safety-conscious workers. A strong orientation program provides employees with the necessary information and motivation to work safely and avoid hazardous situations.
Orientation Topics — The following areas should be covered during initial orientation and periodically during in-service training sessions:

- Principles of personal hygiene and wearing proper clothing
- How to handle, prepare, and serve food properly
- Selection, use, and care of personal protective equipment
- Good housekeeping procedures
- Principles of sanitary food handling
- Safe food transportation and service methods
- Preventive maintenance and safe operation of equipment
- Food spoilage prevention methods
- Chemical safety and hazard communication procedures
- Emergency response and incident reporting procedures

Infection Control

- Teach all exposed employees how to safely enter and exit isolation rooms and safely handle food trays coming from isolation rooms.
- Encourage staff to bag potentially contaminated trays coming from isolation rooms and label the bag with what precautions are necessary to safely handle the contents (e.g., universal precautions).
- Use only disposable trays and plasticware in isolation rooms.

Common Injury-Producing Hazards — Most injuries occur in food service areas while workers are handling materials, processing food, or distributing meals (see Table 10.5). The following guidelines can reduce hazardous exposures:

- Service electrical components and equipment regularly.
- Train workers in correct material handling techniques.
- Properly guard all machinery and hot surfaces.
- Keep walking and working surfaces free of hazards.
- Require good work and housekeeping practices.
- Teach workers food service safety.

Working with Liquids — To reduce the risk of spills and burns, speed the process, and reduce waste:

- Use an elevated faucet or hose to fill large pots.
- Avoid lifting heavy pots filled with liquids.
- Use ladle to empty liquids, soups, etc. from pots.
- Use small sauce pans to dip liquids from larger pots.

---

**TABLE 10.5 Preventing Strains**

Instruct workers on back health and proper lifting techniques.
Require workers to use safe lifting techniques.
Reduce the strain of handling bulky items by supplying workers with hand trucks, dollies, and other material-handling equipment.
Inspect all food service equipment on a regular basis and repair defective equipment immediately.
Evaluate potential hazards and be sure employees select and use the proper personal protective equipment.
Employers should provide shock-absorbing floors for workers who must stand for more than 2 hours per day or have them wear insoles that minimize back and leg strain. They should also provide a splash guard for hot liquids.

Food Service Equipment Safety

- Properly guard meat saws, slicers, and grinders.
- Use tamps or push sticks to feed grinders and choppers.
- Keep wheels on food carts in good repair.
- Get help when moving a heavily loaded cart.
- Know where shutoff valves are and how to operate them.
- Observe the following rules:
  - Push food carts instead of pulling them.
  - Secure and properly store compressed gas tanks.
  - Keep compressed-gas tank gauges in good working order.
  - Guard exposed drive belts, gears, chains, and sprockets.
  - Secure dumbwaiters when not in use.
  - Clearly label or mark all steam and water pipes.

Burn Prevention Measures

- Consider all stoves, pots, and pans to be potential burn hazards (see Table 10.6).
- Turn cooking utensil handles away from the front of the stove.
- Use hand protection when handling hot utensils.
- Deflect steam with the pan lid when uncovering a pot.
- Stand to the side of the unit when lighting gas stoves and ovens (see Table 10.7).

Electrical Safety — To prevent electrocution or shock from unsafe work practices, faulty electrical equipment, or wiring:

- Be sure that electrical service near sources of water is properly grounded.
- Be sure electrical equipment is free from recognized hazards.
- Tagout and remove from service all damaged receptacles and portable electrical equipment.
- Repair all damaged receptacles and portable electrical equipment before placing them back into service.

---

**TABLE 10.6  Scalds and Burns Prevention Tips**

<table>
<thead>
<tr>
<th>Safety Tip</th>
<th>Safety Tip</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wear well-fitting uniforms with long sleeves.</td>
<td>Have enough dry potholders available.</td>
</tr>
<tr>
<td>Pour hot foods away from the body.</td>
<td>Turn handles of pans and pots in from the edge of the stove.</td>
</tr>
<tr>
<td>Lift lids in such a way as to prevent steam burns.</td>
<td>Properly position cookers and equipment.</td>
</tr>
<tr>
<td>Promptly treat minor burns or scalds with cold water or ice.</td>
<td>Clean stove hoods and filters on a regular schedule.</td>
</tr>
<tr>
<td>Clean grease from the stove hood flange on a regular basis.</td>
<td>Never use a stove without hood filters in place.</td>
</tr>
</tbody>
</table>
Healthcare Hazard Control and Safety Management

450

**TABLE 10.7 Fire Extinguishing Equipment**

Train workers on emergency and evacuation procedures.
Train workers annually on fire extinguisher use.
Make extinguishers of the proper type and capacity available.
Permanently mount all extinguishers and mark their locations.
Keep areas around extinguishers free of clutter.
Aim automatic sprinklers at hazard locations.
Comply with local fire codes and Joint Commission and OSHA requirements.

- Be sure employees are trained not to have wet hands when plugging in or unplugging energized equipment.
- Install ground-fault circuit interrupters (GFCIs) on all 120-volt, single-phase, 15- and 20-ampere receptacles.

Other shock and fire prevention suggestions include:
- Ground or double insulate toasters, blenders, hand mixers, fans, and refrigerators.
- Be sure all personal items are properly grounded for industrial applications.
- Disconnect power before adjusting, cleaning, or servicing equipment.
- Follow prescribed lockout/tagout procedures.
- Tag equipment being serviced or cleaned.
- Never plug in an electrical appliance or equipment with wet hands.
- Never stand in water while around electrical equipment.
- Install GFCIs in all wet areas.
- Be sure receptacle boxes are made of nonconductive materials.
- Identify outlets and fixtures for each circuit breaker or fuse.
- Never use breakers as on and off switches.

**Slip, Trip, and Fall Prevention** — Employee exposure to wet kitchen floors or spills and clutter can lead to slips, trips, falls, and other possible injuries. The following tips can help prevent injury:

- Keep floors clean and dry.
- Immediately clean up spilled foods, liquids, and broken dishes.
- Use appropriate signs to identify spill areas until cleanup is complete.
- Thoroughly clean floors at least three times a week.
- Provide proper lighting in all work areas, corridors, and stairways.
- Keep aisles and passageways clear and in good repair, with no obstructions across or in aisles that could create a hazard.
- Never block aisles, walkways, or exits with carts, boxes, or trash.
- Do not place items in aisles or walkways, even temporarily.
- Be sure electric cords and wires do not cross traffic paths; provide floor plugs or ceiling plugs for equipment so power cords do not run across pathways.
- Never use chairs, stools, or boxes as makeshift ladders.
- Use safety stools or ladders for reaching high storage areas.
- Make sure all ramps, stairs, and steps are safe.
- Repair or replace broken or missing tiles, cracked boards, and damaged floors.
- Routinely inspect for hazards after each mealtime.
- Treat or cover walkways with slip-resistant materials.
• Use nonslip matting in clipper and dishwashing areas.
• Be sure employees wear shoes with slip-resistant soles.
• Place appropriate mats in all wet areas.
• Repair or replace damaged floor mats promptly.

**Chemical Hazards** — Food service employees can be exposed to potentially hazardous chemicals, such as pesticides, disinfectants, and hazardous drugs; for example, ammonia (used as a cleaning agent) and chlorine solutions (used as disinfectants in dishwashing) can cause skin, eye, and nose irritations. To work safely around such chemicals:

• Do not mix chlorine and ammonia solutions, because a chemical reaction may occur that releases a deadly chlorine gas.
• Be aware that drain cleaners, oven cleaners, and grill cleaners are caustic solutions that can cause skin burns and eye and skin irritations.
• Implement a written program that meets the requirements of the Hazard Communication standard to provide worker training, warning labels, and access to MSDSs.
• Require appropriate PPE (gloves, goggles, splash aprons) for employees who handle hazardous detergents and chemicals.
• Where the eyes or body of any person may be exposed to corrosive materials, provide suitable facilities for quick drenching or flushing of the eyes and body within the work area for immediate emergency use.
• Use dishwashing machines with automated detergent dispensers to eliminate employee contact with dishwashing detergents (workers must still be cautious and use appropriate PPE, such as goggles or gloves, when changing out the containers).

Food service employees should:

• Exercise caution when using ammonia and avoid skin contact.
• Wear gloves and face or eye protection when working with ammonia.
• In case of contact with ammonia, flush affected skin areas or eyes promptly with water.
• Use ammonia only in areas with good ventilation.
• Make sure stove hoods are operating when using ammonia to clean grease.
• Wear protective clothing when working with caustic cleaning solutions.
• Take frequent water and rest periods when working in hot areas.
• Regularly check microwaves for defective hinges, doors, and seals.

**OSHA Machine Guarding Requirements** — Commercial mixers, slicers, and other kitchen equipment pose a hazard to workers, who can be caught in the mechanisms and suffer amputations, strangulations, burns, cuts, broken bones, and other injuries. These machines must have guards in place to protect the worker from reaching in, or being pulled into, these hazards. The OSHA Machine Guarding standard (29 CFR 1910.212) requires machine guards to protect the operator and other employees in the machine area from hazards. Meat slicers must be properly guarded and operated by workers trained in safe work practices to avoid cuts and amputations. Workers should use push sticks or other hand tools to feed or remove food from grinders, slicers, or choppers. Continuous-feed dishwashers should be properly guarded to prevent accidental scalding of workers by steam and hot water and possible nip-point injuries from rollers and conveyors. The following safe practices should be observed by workers using cutting or mixing equipment:

• Check and secure guards before starting.
• Use nonmetallic utensils to stir or test contents.
• Stir contents only when equipment is not in motion.
• Never remove food containers until all parts have stopped.
• Wear wire-mesh gloves to clean machines with sharp blades.
• Disconnect all machines before cleaning or servicing.
• Restrict the use of cutting equipment to authorized workers.

Food Service Area Layout — The layout of food preparation and service areas can impact the safety of the entire operation. The relationship between worker tasks and the layout of work areas affects productivity and safety. Areas should be arranged so as to decrease handling time or distance; unnecessary movement and an unproductive arrangement increase the chances for employee accidents or injuries. Food service areas should have sufficient space to properly store all foodstuffs and supplies and a ceiling height of at least 8 feet. Work areas should be at least 3 feet apart. Dining rooms should be large enough to serve guests efficiently. Some other basic layout suggestions include:

• Store supplies where they are used most often.
• Store all cleaning and housekeeping supplies separately from food.
• Modify heavy-lifting tasks, tasks requiring employees to stand for extended periods of time in one place, and uncomfortable work heights.
• Use assembly or straight lines whenever possible.

Dining Room Safety — Facilities with dining rooms or cafeterias should:

• Consider the safety and ease of serving when designing the dining area.
• Be sure that drapes and curtains are made of fire-resistant materials.
• Securely anchor pictures and wall coverings.
• Inspect chairs and tables regularly for defects.
• Arrange tables systematically to allow for efficient dish and tray removal.
• Keep bus carts and racks in good condition.

Foodborne Illness — Foodborne illnesses include intoxications and infections; many times they are incorrectly referred to as food poisoning. The more than 250 different foodborne diseases are caused by viruses, bacteria, parasites, toxins, metals, and prions. Symptoms of foodborne illness range from mild gastroenteritis to life-threatening neurologic, hepatic, and renal syndromes. Foodborne diseases include, but are not limited to, botulism, brucellosis, Campylobacter enteritis, Escherichia coli, hepatitis A, listeriosis, salmonellosis, shigellosis, toxoplasmosis, viral gastroenteritis, taeniasis, and trichinosis. Foodborne disease outbreaks are recognized by the occurrence of illness within a short, but variable, period of time. Illness usually occurs within a few hours to a few weeks among individuals who have eaten the same food. The contaminating agents of a foodborne illness usually cannot be detected through taste, odor, texture, or appearance.

Investigating Outbreaks — Prompt and thorough laboratory evaluation of cases and suspected foods is essential. Single cases of foodborne disease are difficult to identify unless, as in botulism, a distinctive clinical syndrome exists. Although foodborne disease can be an acute illness, many cases and outbreaks go unrecognized and unreported. It is important to report foodborne disease epidemics to local health authorities and to take the following steps when conducting an epidemiological investigation:

• Review reported cases to determine the time and place of exposure and the population at risk.
• Obtain a complete list of foods served.
• Hold and refrigerate all food still available.
Support Department Safety

Collect samples of vomit and feces for laboratory testing and inform the laboratory of suspected contaminants.

Compare illness rates for specific foods eaten and those not eaten; the suspect food will usually have the highest associated illness rates, and most of the sick will have eaten the suspected food.

Investigate the source of suspected food and methods of preparation and storage.

Look for possible sources of contamination and inadequate refrigeration or heating.

Submit samples of suspected food for laboratory testing.

Evaluate food handlers for sources of infections including culture of lesions, nasal swabs, and feces where appropriate.

Controlling Food Contamination — Control of food-related illnesses is based on the following principles: avoidance of contaminated food, destruction of contaminants, and prevention of further spread of contaminants. Prevention is dependent on proper cooking and storing practices and the personal hygiene of food handlers (see Table 10.8). Healthcare facilities should follow all local department of health regulations concerning sanitation. An excellent guide to avoiding food contamination is the U.S. Public Health Service publication Food Service Sanitation Manual. Suggested preventive actions:

- Take precautions when handling potentially hazardous foods such as milk products, eggs, meat, and poultry; fish, shellfish, and edible crustaceans require special attention.
- Maintain potentially hazardous foods at 38 to 41°F, or lower, until they are prepared or served.
- Be aware that reheating foods that have been at room temperature for some time will not protect diners from foodborne illnesses.

Common Foodborne Bacteria — The challenges facing the food industry are predominantly microbiological and chemical in nature. Biological contaminants such as *Salmonella enteritidis*, *Clostridium botulinum*, *Listeria monocytogenes*, and *Escherichia coli* O157:H7 pose the most significant threat.

### TABLE 10.8 Foodborne Illness Prevention Tips

<table>
<thead>
<tr>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wash hands frequently and after smoking or using the restroom.</td>
</tr>
<tr>
<td>Use antibacterial soap and wash for at least 30 seconds.</td>
</tr>
<tr>
<td>Do not use common towels for hand drying.</td>
</tr>
<tr>
<td>Cook and maintain hot foods at a temperature of 140°F or higher.</td>
</tr>
<tr>
<td>Heat poultry and stuffed meat dishes to 165°F.</td>
</tr>
<tr>
<td>Cook pork at 150°F or higher.</td>
</tr>
<tr>
<td>Cook roast beef to a minimum of 130°F (rare).</td>
</tr>
<tr>
<td>Keep cold foods at 38 to 41°F or lower if possible.</td>
</tr>
<tr>
<td>Exclude ill workers from food handling and preparation.</td>
</tr>
<tr>
<td>Refrigerate food immediately.</td>
</tr>
<tr>
<td>Reheat leftovers rapidly to 165°F before serving.</td>
</tr>
<tr>
<td>Refrigerate potentially hazardous foods until used.</td>
</tr>
<tr>
<td>Eliminate all pests from food preparation and storage areas.</td>
</tr>
</tbody>
</table>
• *Salmonella* — This bacteria is found in the intestinal tracts of humans and animals and can cause salmonellosis. It can be transmitted to humans through meat, fish, and eggs. The bacteria is destroyed by heat and certain chemical germicides.

• *Staphylococcus* — This common foodborne bacteria produces a toxin that causes illness. The bacteria is not destroyed by normal cooking temperatures. It can be easily transmitted by unsanitary work habits.

• *Escherichia coli* — This bacteria can cause serious illness and is common in undercooked ground beef. All ground meat must be cooked sufficiently to destroy this deadly bacteria.

**FDA Bad Bug Book** — The FDA’s *Bad Bug Book* provides basic facts regarding foodborne pathogenic microorganisms and natural toxins. It includes information from the Centers for Disease Control and Prevention, Food and Drug Administration, USDA Food Safety Inspection Services, and National Institutes of Health.

### Preventing Cross-Contamination

• Prevent cross-contamination by properly handling and storing containers, utensils, glassware, and dishes.

• Never use the same cutting boards or preparations utensils for different foods without cleaning them first.

• The dishwashing cycle should include cleaning with warm soapy water and rinsing in clear water to remove detergent residue.

• Consider the following sanitizing methods: immerse in clean hot water (170°F) for 30 to 45 seconds or in hypochlorite water solution (50 ppm) for at least 1 minute.

• Mechanical cleaning of dishes and utensils should adhere to the following water temperature requirements:
  - Wash cycle — 140°F
  - Initial rinse — 160°F
  - Final rinse — 180°F

### Food Service Manager’s Safety Responsibilities

• Coordinate safety-related issues with the hazard control manager, safety director, and organizational safety committee.

• Maintain a written hazard communication plan and a current MSDS file.

• Be sure all workers receive a safety orientation when assigned.

• Train workers in the organization’s hazard communication procedures when initially assigned.

• Conduct hazard communication retraining when a new hazardous material is introduced into the workplace or a worker changes job position.

• Be sure all chemicals and hazardous materials are properly stored, used, and labeled.

• Conduct regular safety meetings and give employees an opportunity to attend in-service training and education sessions.

• Be sure periodic safety self-inspections are conducted and all hazards immediately corrected.

**Hazard Analysis and the Critical Control Point System** — The principles of a hazard analysis and critical control point (HACCP) system can be applied to all aspects of the food industry, including growing, harvesting, processing, manufacturing, distributing, merchandising, and preparing food for consumption. A successful program requires a strong management commitment to implementing its principles (see Table 10.9). This management commitment provides employees with a clear understanding of the importance in producing
safe food. HACCP is a proactive plan based on preventing hazards. By monitoring and detecting potential problems throughout an entire process, identification of hazards and application of corrective measures can be implemented immediately. HACCP helps companies apply prevention and detection methods to their specific applications, giving them the freedom to adopt new techniques and technologies more rapidly than previously possible. A successful HACCP plan is built upon a firm commitment from upper management with well-trained and motivated employees actively involved in the process.

Foodborne Illness Primer for Healthcare — Recently, several agencies collaborated on a new publication to help increase awareness of foodborne illnesses among physicians. The primer, *Diagnosis and Management of Foodborne Illness: A Primer for Physicians and Other Health Care Professionals*, was produced by the American Medical Association (AMA), the American Nurses Association (ANA), the Centers for Disease Control and Prevention (CDC), the Center for Food Safety and Applied Nutrition–Food and Drug Administration (CFSAN-FDA), and the Food Safety and Inspection Service (FSIS) of the United States Department of Agriculture. This primer is intended to provide healthcare professionals with current and accurate information for the diagnosis, treatment, and reporting of foodborne illnesses.

### E. FACILITY SECURITY MANAGEMENT

Security management was addressed in Chapter 2, and Chapter 9 contains some information about clinical workplace violence prevention. OSHA recently revised its publication *Guidelines for Preventing Workplace Violence for Health Care and Social Service Workers*; these guidelines can help with planning, assessment, and training functions. In addition, healthcare employers should:

<table>
<thead>
<tr>
<th>Principle</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identify and analyze workplace hazards.</td>
<td>Potential food-related hazards are identified and appropriate control measures suggested.</td>
</tr>
<tr>
<td>Identify critical control points.</td>
<td>A critical control point is defined as a point, procedure, or step at which a food safety hazard could be eliminated, prevented, or reduced.</td>
</tr>
<tr>
<td>Establish critical limits.</td>
<td>Critical limits are maximum or minimum values that will prevent, eliminate, or reduce a biological, chemical, or physical hazard.</td>
</tr>
<tr>
<td>Monitor critical control points.</td>
<td>Monitoring should be continuous to provide accurate readings.</td>
</tr>
<tr>
<td>Define corrective actions.</td>
<td>Actions to correct the cause of a deviation are determined, and a decision is made as to whether or not a food product should be discarded.</td>
</tr>
<tr>
<td>Establish verification procedures.</td>
<td>Verification activities determine the effectiveness of the plan and ensure correct system operation.</td>
</tr>
<tr>
<td>Establish recordkeeping and documentation procedures.</td>
<td>Documentation of the entire food process should include a summary of the hazard analysis.</td>
</tr>
</tbody>
</table>
• Designate a security coordinator (in writing) to oversee the security program, develop procedures for reporting incidents, and investigate all security incidents.
• Provide a system for identifying patients, visitors, contractors, and staff members.
• Teach workers about security concerns, precautions, and emergency actions.
• Be sure the facility security plan describes access and control measures for sensitive, triage, and decontamination areas and provides contingency measures for specific situations.
• Develop policies for emergency departments, parking areas, nurseries, dementia/behavioral units, subacute-care units, and pharmacies.
• Implement procedures to control vehicular access to any emergency care areas.
• Develop procedures for handling civil disturbances, workplace violence issues, VIP visits, media relations, and security during disasters.
• Conduct proactive risk assessments to evaluate the potential adverse situations.
• Establish procedures to address infant or pediatric abduction risks, if applicable.

Risk Assessment — Healthcare facilities should conduct a risk assessment of the local area and campus. Facilities must also identify concerns and evaluate readiness in protecting workers, patients, and visitors from crime. Areas of concern include emergency rooms, mental institutions, and hospital psychiatric wards. Patient care staff and hospital security personnel should be trained to handle any aggressive behavior of patients. Assaults by visitors are also a concern, especially in emergency rooms that handle violent gang-related incidents. Personal and property crimes are frequent because of the around-the-clock operation of healthcare facilities.

General Security Recommendations
• Establish written security policies for patient restraint, weapons detection, prisoner restraint, and emergency response procedures.
• Maintain a working relationship with local law enforcement agencies.
• Establish a security surveillance system that monitors all areas and departments on a 24-hour basis.
• Install a closed-circuit television system to help monitor high-risk areas.
• Provide security escort or shuttle service to parking areas, garages, and public transportation points.
• Be sure lighting and security measures are adequate for all sidewalks, parking areas, and bus stops.
• Install emergency phones in parking lots, underground tunnels, and elevators.
• Limit access through doors by installing outside locking mechanisms, but do not hinder emergency egress.
• Install a buzzer at the emergency room entrance.
• Provide separate emergency room facilities or take additional security measures with mentally disturbed patients.
• Provide physical barriers between reception personnel and patients and visitors.

Emergency Department Security — Emergency care departments are prime targets for violence. People in waiting and reception areas may sometimes be at risk, and many facilities have full-time security personnel located in the emergency room. Access to treatment areas must be controlled and sealed off so emergency care procedures can be accomplished without fear or intimidation. Healthcare facilities should have a written policy to deal with firearms, and signs prohibiting firearms should be posted. Security officers should be trained in how to impound and store weapons, and medical staff members should be trained in the proper use of restraints.
Security in Nurseries — Infant abduction is a great concern for facilities with obstetrical services. Most abductors are females who have no prior criminal record. Nursery staff members should be alert for repeat visits and should never answer questions about nursery procedures or feeding times. Information about floor layouts should not be offered. Unusual behaviors should be reported to security personnel immediately.

Pharmacy Security — Controlling drugs is the primary security issue for the pharmacy. The pharmacy should have well-established procedures to ensure that all drugs are properly stored in locked containers. Security must also be maintained during delivery of medications to patients and to other departments.

Security Incident Emergency Guidelines — Emergency procedures for security should address specific procedures to be followed:

- In the event of an incident or security failure
- During a civil disturbance
- When handling a situation involving VIPs or the media
- When additional staff is needed to control human or vehicular traffic

Parking Security — Healthcare facilities should provide managed parking areas whenever possible. At many facilities, day workers park in remote areas and second-shift workers park in spaces closer to the facility. Lighting is one of the most important factors in parking area safety. Some hospitals have developed and implemented minimum lighting requirements for parking lots. All dark spots should be identified and additional lighting installed. Good lighting also reduces slip, trip, and fall risks. Healthcare facilities should provide training to employees in parking area safety that includes such common-sense reminders as:

- Look around and under the car when returning to it.
- Have keys and self-defense spray in hand.
- Check the back seat before unlocking the car.
- When working late, be sure to let someone know.
- Request an escort to your car when working in a high-crime area after dark.
- Consider attending a self-defense training class.

Patient Security Guidelines

- Develop a plan developed to ensure protection of patients, visitors, employees, hospital property, equipment, and patient valuables.
- Brief security personnel when patients who pose a security risk are treated or admitted to the hospital.
- Have security personnel instruct the public relations office not to release information regarding at-risk patients.
- Instruct the business office not to enter the name of an at-risk patient into the billing computer, and have the medical records office take precautions to protect the patient's privacy.
- Have all hospital departments use patient care numbers for all transactions, reports, and tests.
- Develop a program to deter and preclude individual or group acts ranging from personal theft to solicitation, strikes, or demonstrations.
- Establish security procedures to clear lawyers, investigators, and law enforcement officers before granting them access to a patient’s room or family.
- Be sure social and welfare workers have proper clearance before granting them access to a patient.
• Be aware that some patients are at risk due to gang involvement and some may be targets of domestic violence.
• Even after discharge, continue to protect an at-risk patient’s information, in part by placing an “Information Restricted” label on the patient’s medical record.

Security Program Evaluation — Security programs vary depending on the size, location, and type of facility. Management should consider the following when evaluating security:

• Employee identification system
• Exit/entry control and internal traffic control
• Written plan for managing bomb threat and civil disturbances
• Coordinating plans and in-service training
• Management of prisoner-patients
• Illumination control of external building and grounds
• Surveillance system management by observation and alarm
• Control of packages and patient valuables
• Key control

F. RADIOLOGY AND NUCLEAR MEDICINE

Small quantities of radioactive materials occur naturally in the air, water, and even food. Radiation is a source of internal exposure, and external exposure comes from such sources as sunlight and manmade or naturally occurring radioactive materials. One in three Americans hospitalized each year is diagnosed or treated using nuclear medicine (over 10 million procedures a year). Radiation is also used in over 100 million medical laboratory tests to aid in diagnosing disease. Other applications of radiation in treatment or prevention include:

• Mammography to detect breast cancer at an early stage when it may be curable
• X-rays or other imaging techniques that make needle biopsies safer and more accurate and informative
• Monitoring the response of tumors to treatment and distinguishing malignant from benign tumors
• Bone and liver scans to detect the spread of cancers
• Alleviating or eliminating pain associated with prostate or breast cancer that has spread to the bones

Other Medical Technologies — Technologists and technicians operate and monitor life-saving and life-sustaining equipment. They use such techniques as magnetic resonance imaging (MRI), mammography, positron emission tomography (PET), computerized axial tomography (CAT), ultrasound, and radiography (x-ray) to reveal the presence of disease or injury. They also use radioactivity lasers or linear accelerators in the diagnosis and treatment of disease.

Medical Radioactive Materials — Medicine uses radionuclides and radioactive isotopes. A radionuclide is any type of radioactive material, including elements and the isotopes of elements. An isotope of an element is a particular atomic version of it. Isotopes are atoms of the same element with different atomic structures; they have the same number of protons but a different number of neutrons. Most radioactive materials used in nuclear medicine are isotopes, as a particular medical treatment may require a given isotope’s specific radioactive properties. Molybdenum-99, for example, is used tens of thousands of times each day in the United States to diagnose cancer and other illnesses. Radioisotopes are used to show how
a disease process has altered the normal function of an organ; a patient swallows, inhales, or receives an injection of a tiny amount of the radioisotope, and cameras reveal where the isotope accumulates in the body. Laboratory tests use radioisotopes to measure important substances in the body, including thyroid hormones. Radiation treatments for thyroid diseases are an alternative to thyroid surgery. Some isotopes are used to sterilize hospital equipment, such as sutures, syringes, catheters, and hospital clothing, that would otherwise be destroyed by heat sterilization. Sterilization using radioisotopes is particularly valuable because it can be performed while the items remain in their sealed packages.

**Radiation Control** — The object of any radiation control program is to prevent any deterministic effects and minimize the risk for stochastic effects. When a person inhales or ingests a radionuclide, the organs of the body absorb varying amounts of that radionuclide so each organ receives a different dose. Federal Guidance Report 11 from the EPA lists dose conversion factors for all radionuclides. The dose conversion factor for each organ is the number of rems delivered to that organ by each curie of intake of a specific radioisotope. Nuclear Regulatory Commission (NRC) rules outline minimum safety requirements for workers and patients. Safety instructions and precautions are specified for three categories of therapeutic intervention:

- Radiopharmaceuticals
- Sealed sources and implants
- Teletherapy sources

**Ionizing Radiation** — Ionizing radiation (IR) is produced naturally by the decay of radioactive materials or by the operation of x-ray devices. A radioactive element spontaneously changes to a lower energy state and in the process emits particles and gamma rays from the nucleus. The particles are referred to as alpha or beta particles. X-rays are produced when highly energized electrons strike the nuclei of the target material. The electrons are deflected from their path and then release energy in the form of electromagnetic radiation or x-rays. Ionizing radiation is produced anytime an electron is dislodged from its parent atom or molecule. Ionizing radiation hazards vary in the ability to penetrate the body and produce harmful effects. The ability of radiation to penetrate the body depends on wavelength, frequency, and energy of the material. Some areas in healthcare with ionizing radiation hazards include:

- Diagnostic radiology
- Therapeutic radiology
- Dermatology
- Nuclear medicine (diagnostic and therapeutic)
- Laboratories (radiopharmaceuticals)
- Oncology (therapeutic radionuclides)
- Areas where radioactive materials are stored or discarded

**Alpha Particles** — Alpha particles consist of two neutrons and two protons and have energies of 4 to 8 million electron volts. They do not penetrate the skin and can be shielded by a thin layer of paper or clothing. The outer layer of skin is comprised of dead cells and is several microns thick; alpha particles are unable to penetrate the skin to reach the lower layers of living cells and generally will not cause any skin damage.

**Beta Particles** — Beta particles can travel a few centimeters into tissue. External and internal exposure is potentially hazardous. These particles can travel several meters in the air and are moderately penetrating. If beta-emitting contaminants are allowed to remain on the skin for a prolonged period of time, they may cause skin injury. Beta-emitting contaminants can be harmful if deposited internally.
Gamma and X-Rays — Gamma rays and x-rays can penetrate human tissue. Radioactive materials that emit gamma radiation constitute both an external and internal hazard to humans. Dense materials are needed to shield against gamma radiation. PPE provides little shielding from gamma radiation but will prevent contamination of the skin. Gamma radiation frequently accompanies the emission of alpha and beta radiation. X-rays are like gamma rays but have longer wavelengths, lower frequencies, and lower energies.

Neutrons and Protons — Neutrons are neutral particles emitted from the nucleus of an atom. Neutrons lose most of their energy through collisions with other atomic nuclei. They require special consideration for shielding. Protons are produced by high-energy accelerators and can produce tissue ionization. The path of protons is longer than that of alpha particles.

Units of Measure — Most scientists in the international community measure radiation using the Systéme International d'Unites (SI), a uniform system of weights and measures that evolved from the metric system. The United States uses the conventional system of measurement. Different units of measure are used depending on what aspect of radiation is being measured (see Table 10.10); for example, the amount of radiation being given off, or emitted, by a radioactive material is measured using the conventional unit of a curie (Ci). The radiation dose absorbed by a person is measured in rads or the SI unit grays (Gy). The biological risk of exposure to radiation is measured using rems or the SI unit sieverts (Sv). Radiation doses that people receive are measured in rems or sieverts (1 sievert = 100 rem). About 80% of typical human exposure comes from natural sources and the remaining 20% comes from artificial radiation sources such as medical x-rays.

Radiation Affects — Exposure can affect the body in a number of ways, and the adverse health consequences of exposure may not be seen for many years. These adverse health effects can range from mild effects, such as skin reddening, to serious effects, such as cancer and death, depending on the amount of radiation absorbed by the body (the dose), type of radiation, route of exposure, and length of time a person is exposed. Exposure to very large doses of radiation may cause death within a few days or months. Exposure to lower doses of radiation may lead to an increased risk of developing cancer or other adverse health effects.

<table>
<thead>
<tr>
<th>Unit of Measure</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Curie (Ci)</td>
<td>Unit of measure of the radioactivity of a substance; 1 curie = $3.7 \times 10^{10}$ disintegrations per second</td>
</tr>
<tr>
<td>Absorbed dose</td>
<td>Amount of radiation that is absorbed by the body</td>
</tr>
<tr>
<td>Exposure</td>
<td>Amount of radiation to which the body is exposed</td>
</tr>
<tr>
<td>Radioactive half-life</td>
<td>Time required for the radioactivity of an isotope to decrease by 50%</td>
</tr>
<tr>
<td>Roentgen</td>
<td>Unit of measure for the quantity of radiation produced by gamma or x-rays. One roentgen (R) is equivalent to $2.58 \times 10^{4}$ coulomb per kilogram (C/kg)</td>
</tr>
<tr>
<td>Rad (radiation absorbed dose)</td>
<td>A measure of the absorbed dose of ionizing radiation; 1 rad = 100 erg/g = 0.01 Gy</td>
</tr>
<tr>
<td>Rem (roentgen equivalent, man)</td>
<td>Dosage of any ionizing radiation that will cause biological injury to human tissue equal to the injury caused by 1 roentgen of x-ray or gamma-ray dosage; 1 rem = 0.01 Sv</td>
</tr>
</tbody>
</table>

**Gamma and X-Rays** — Gamma rays and x-rays can penetrate human tissue. Radioactive materials that emit gamma radiation constitute both an external and internal hazard to humans. Dense materials are needed to shield against gamma radiation. PPE provides little shielding from gamma radiation but will prevent contamination of the skin. Gamma radiation frequently accompanies the emission of alpha and beta radiation. X-rays are like gamma rays but have longer wavelengths, lower frequencies, and lower energies.

**Neutrons and Protons** — Neutrons are neutral particles emitted from the nucleus of an atom. Neutrons lose most of their energy through collisions with other atomic nuclei. They require special consideration for shielding. Protons are produced by high-energy accelerators and can produce tissue ionization. The path of protons is longer than that of alpha particles.

**Units of Measure** — Most scientists in the international community measure radiation using the Systéme International d’Unites (SI), a uniform system of weights and measures that evolved from the metric system. The United States uses the conventional system of measurement. Different units of measure are used depending on what aspect of radiation is being measured (see Table 10.10); for example, the amount of radiation being given off, or emitted, by a radioactive material is measured using the conventional unit of a curie (Ci). The radiation dose absorbed by a person is measured in rads or the SI unit grays (Gy). The biological risk of exposure to radiation is measured using rems or the SI unit sieverts (Sv). Radiation doses that people receive are measured in rems or sieverts (1 sievert = 100 rem). About 80% of typical human exposure comes from natural sources and the remaining 20% comes from artificial radiation sources such as medical x-rays.

**Radiation Affects** — Exposure can affect the body in a number of ways, and the adverse health consequences of exposure may not be seen for many years. These adverse health effects can range from mild effects, such as skin reddening, to serious effects, such as cancer and death, depending on the amount of radiation absorbed by the body (the dose), type of radiation, route of exposure, and length of time a person is exposed. Exposure to very large doses of radiation may cause death within a few days or months. Exposure to lower doses of radiation may lead to an increased risk of developing cancer or other adverse health effects.
Support Department Safety

Safety from External Exposure

- Time (decrease the amount of time spent near the source of radiation)
- Distance (increase distance from a radiation source)
- Shielding (increase shielding between a person’s body and the radiation source)

Nuclear Regulatory Commission — The Nuclear Regulatory Commission is responsible for licensing and regulating nuclear facilities and materials and for conducting research in support of the licensing and regulatory process, as mandated by the Atomic Energy Act of 1954, as amended; the Energy Reorganization Act of 1974, as amended; and the Nuclear Nonproliferation Act of 1978, as well as in accordance with the National Environmental Policy Act of 1969 as amended. NRC responsibilities include protecting public health and safety, including workers, and protecting and safeguarding materials and plants in the interest of national security. Agency functions are performed through standards setting and rulemaking; technical reviews and studies; conducting public hearings; issuance of compliance certificates; inspection, investigation, and enforcement; and evaluation of operating experience.

NRC Regulations — The NRC was established under the Energy Reorganization Act of 1974. The NRC ensures that civilian uses of nuclear substances meet the requirements of safety, environmental, and national security laws. The NRC adopts and enforces standards for the department of nuclear medicine in healthcare facilities. Some states have agreements with the government to assume these regulatory responsibilities. The NRC issues a 5-year license to qualified healthcare organizations that follow prescribed safety precautions and standards. Information that must be provided to the NRC includes identifying authorized users, designating a radiation safety officer (RSO), and identifying the locations where radioactive materials are used. The organization must file for a license amendment when any changes are made. In some situations, healthcare facilities have to obtain an NRC or state license. Diagnostic kits are subject to licensing under 10 CFR 31.11. Some vendors of radioactive materials are required by their license to verify that the facilities they supply also have a license before shipment of materials is made. Some radionuclide licenses apply to generators of infectious and medical wastes:

- A general license is issued to physicians, clinical laboratories, and healthcare facilities under the requirements of 10 CFR 31.11.
- A specific-use license is required for physicians in private practice and healthcare institutions; medical use pertains to human administration of radioactive substances or radiation.
- A broad-scope license can be issued to facilities that provide patient care and conduct research using radioactive materials.

NRC Performance-Based Standards — Some parts of the NRC regulations outline detailed procedures while other parts state limits and leave the procedural details to the licensee. In the license application, the institution proposes its intended procedures and disposal methods to meet the performance standards. Approval of the license is contingent on the NRC’s approval of the proposal submitted with the application. Occurrences of therapeutic or diagnostic misadministration must be reported. Therapy errors must be reported to the NRC regional office within 24 hours. The laws require that licensees meet certain standards for protection against radiation as set forth in 10 CFR 20. Also, all individuals working or frequenting areas where radioactive materials are stored or used must be informed of the basic right-to-know information that is stated in 10 CFR 19 (Notices, Instructions, and Reports to Workers; Inspections).
**Agreement States** — The states listed below (agreement states) have entered into an agreement with the federal government to regulate radioisotopes under Section 274b of the Atomic Energy Act as amended in 73 Stat. 689:

<table>
<thead>
<tr>
<th>Alabama</th>
<th>Kansas</th>
<th>North Carolina</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arizona</td>
<td>Kentucky</td>
<td>North Dakota</td>
</tr>
<tr>
<td>Arkansas</td>
<td>Louisiana</td>
<td>Oregon</td>
</tr>
<tr>
<td>California</td>
<td>Maryland</td>
<td>South Carolina</td>
</tr>
<tr>
<td>Colorado</td>
<td>Mississippi</td>
<td>Tennessee</td>
</tr>
<tr>
<td>Florida</td>
<td>Nebraska</td>
<td>Texas</td>
</tr>
<tr>
<td>Georgia</td>
<td>New Hampshire</td>
<td>Washington</td>
</tr>
<tr>
<td>Idaho</td>
<td>New York</td>
<td></td>
</tr>
</tbody>
</table>

**Written Radiation Control Programs** — Each NRC licensee must have a written management program. NRC requires participation in the program by all users, organizational administrators, and radiation safety officers. Licensees must establish procedures to inform all workers about the types and amounts of materials used, including dosing information, safety precautions, recurring training, and continuing education. They must also develop guidelines to keep doses at levels that are as low as reasonably achievable (ALARA). The licensee’s radiation safety officer:

- Develops and implements written procedures to cover the purchase, storage, use, and disposal of radioactive byproducts.
- Ensures all personnel are properly educated and trained.
- Develops procedures to investigate all incidents, accidents, or other deviations from prescribed procedures.
- Works with the radiation safety committee in overseeing the facility’s radiation safety program.
- Maintains documentation as required by the program and other applicable regulations.

**Radiation Safety Committee** — The committee reviews and grants permission for, or disapproves, the use of radioactive material within the institution from the standpoint of radiological health and safety of patients or working personnel and other factors that the committee may wish to establish for medical uses of byproduct materials prior to submission of an application to the division of licensing action. Other duties include prescribing special conditions that will be required during a proposed use of radioactive material, requirements for bioassays, physical examinations of users, and minimum levels of training. The committee also addresses topics such as film badge return rates, exposures that exceed guidelines, information on safety education and training, quality improvement, and issues relating to radiation regulation. The committee should review records and reports from the radiological safety officer. Responsibilities of the committee include recommending remedial action to correct safety infractions and reviewing procedures to ensure the safe use of radioisotopes. The committee must maintain a written record of all actions taken. The committee chairman must be competent in radiation safety, and committee membership should include expertise in diagnostic radiology, clinical pathology, therapeutic radiology, and radiopharmacy. The committee must meet at least quarterly. A summary of key responsibilities includes:

- Approving or disapproving authorized users
- Selecting or appointing the radiation safety officer
- Approving minor changes in operating policies
- Reviewing radiation dose records of all exposed personnel
• Reviewing all radiation incident reports
• Conducting an annual review of the entire radiation safety program

Medical Isotopes Committee — Some facilities establish a radiation isotope committee to ensure individuals working with radioactive material have sufficient training and experience to perform their duties safely. The committee helps ensure that all use of radioactive material is conducted in a safe manner and in accordance with NRC regulations and the conditions of the license. Such a committee reports to the safety committee quarterly and is coordinated by a specialist in nuclear medicine, a person with special competency in radiation safety, and a representative of the institution’s management. Members of the committee should have expertise in diagnostic radiology, clinical pathology, therapeutic radiology, and radiopharmacy.

The Radiation Safety Officer — The radiation safety officer must be qualified by education, training, and experience; should advise others on safety matters pertaining to ionizing radiation; and should supervise the facility’s radiation safety program. Duties include:

• Implementing policies established by the radiation safety committee
• Supervising all aspects of radiation measurement and protection activities
• Supervising personnel monitoring, maintenance of exposure records, survey methods, waste disposal, and radiological safety practices
• Approving all activities and procedures that involve actual or potential exposures
• Educating all users of ionizing radiation and giving advice in radiological safety.
• Maintaining an inventory of all radioisotopes and ionizing radiation producing machines
• Ensuring conduct of radiation surveys as necessary to ensure safety.
• Maintaining records of radiation surveys and exposures of personnel to ionizing radiation
• Obtaining, issuing, collecting, and documenting records results of all personnel monitoring devices
• Ensuring training of users of radioisotopes and ionizing radiation producing machines
• Reporting promptly to the radiation safety committee radiation all hazards, serious infractions of rules, or other items relevant to radiation safety activities

Recordkeeping — Facilities should maintain the following records:

• Personal radiation exposures
• Radioisotope inventory
• Receipt and disposition log
• Radiation survey record and reports
• NRC documentation required in 10 CFR 20.401

Worker Training — Basic training topics for workers should include:

• Visitor control procedures
• Contamination controls
• Waste management requirements
• Emergency reporting and notification policies

Monitoring Devices — Monitoring devices include film badges or other detectors worn on outer clothing to monitor for gamma, x-ray, and beta radiation. They have become quite popular for gamma and beta radiation monitoring. The pocket dosimeter is a direct-reading
portable device. Any monitoring program should include analysis and recording of units. The program must also have procedures for informing workers of their documented exposure. Film badges or equivalent devices are recommended for long-term monitoring. All workers entering a controlled area or who are exposed to radiation from other occupational sources (such as portable x-ray machines) must wear appropriate monitoring devices, such as film badges or thermoluminescent dosimeters, or other devices approved by the radiation safety officer. Monitoring devices must be changed and analyzed at least once a month; thermoluminescent dosimeters may be used longer based on potential exposure but no more than 3 months. If an exposure occurs in excess of the limits specified or is suspected, analysis of the device must be rapid. When not in use, personnel monitoring devices should be stored in areas where they will be protected from radiation. At no time should a personnel monitoring device be exposed to radiation unless it is being worn. They should not be worn during nonoccupational exposure, such as for a diagnostic x-ray. All personnel monitoring records should be maintained by the radiation safety officer. Examples of monitoring devices include:

- **Film badge** — This passive dosimeter for personal exposure monitoring should be worn whenever working with x-ray equipment, radioactive patients, or radioactive materials. Depending on the work situation, body badges may be worn at collar level, chest level, or waist level.
- **Double badging** — Personnel who work in high-dose fluoroscopy settings may be asked to wear two badges for additional monitoring.
- **Ring badges** — Used for measuring beta and gamma doses to the hand, these badges should be worn on the hand closest to the radiation source.

**National Council on Radiation Protection and Measurements (NCRP)** — The National Council on Radiation Protection (NCRP) was created by Congress to collect, analyze, develop, and disseminate information and recommendations on radiation quantities, measurements, and units. The NCRP publishes maximum permissible levels of external and internal radiation. The major sources are the handbooks *Maximum Permissible Body Burdens and Maximum Permissible Concentrations of Radionuclides in Air and Water for Occupational Exposure* and *Review of Current State of Radiation Protection Philosophy*. The NCRP suggests an annual permissible whole-body dose of 5 rem per year, with 3 rem permitted within a 13-week period. NCRP goals are primarily to prevent and reduce cataracts, erythema, and the probability of cancer.

**Food and Drug Administration (FDA)** — The FDA, under the Federal Food, Drug, and Cosmetic Act, has the authority to regulate the manufacture and distribution of radiopharmaceuticals and medical devices that contain radioactive materials. The FDA also sets performance standards for x-ray and other radiation-emitting equipment manufactured after 1974. The FDA issues recommendations for the use of x-ray machines and other radiation-emitting devices. NRC rules on isotope sources can be found in 10 CFR 20 and 34, and FDA x-ray regulations are contained in 21 CFR 1000 and 1050.

**OSHA Ionizing Radiation Standard** — According to the OSHA Ionizing Radiation standard (29 CFR 1919.1096), whole-body radiation exposures must not exceed 3 rem/quarter (year). Lifetime or cumulative exposure must not exceed $5(N - 18)$ rem (where $N - 18$ is the age of the worker minus 18 years). OSHA regulates exposure to all ionizing radiation for sources not under NRC jurisdiction. The OSHA and NRC Memorandum Agreement of 1989 outlines compliance authority of both agencies. OSHA plans to update its standard in the near future. The NRC covers the first three hazards listed below, and OSHA covers the fourth hazard:
• Radiation risk produced by radioactive materials
• Chemical risk produced by radioactive materials
• Facility conditions that affect the safety of radioactive materials and thus present an increased radiation risk to workers
• Facility conditions that result in an occupational risk but do not affect the safety of licensed radioactive materials

OSHA Ionizing Radiation Standard (29 CFR 1910.1096) — The OSHA standards cover x-ray equipment, accelerators, accelerator-produced materials, electron microscopes and betatrons, and naturally occurring radioactive materials such as radium. The OSHA areas of responsibility are subject to all applicable requirements and authorities of the OSH Act; however, the industrial safety record at NRC-licensed nuclear power plants is such that OSHA inspections at these facilities are conducted normally as a result of accidents, fatalities, referrals, or worker complaints. OSHA could report the following to the NRC:

• Lax security control or work practices that would affect radiological safety
• Improper posting of radiation areas
• Licensee employee allegations of NRC license or regulation violations

Diagnostic Procedures — Workers who handle patients receiving diagnostic radioactive materials should:

• Be monitored by the radiation control officer to ensure that all radioactive materials including body wastes are handled properly.
• Use gloves during the collection and transfer of radioactive materials.
• Dispose of patient body wastes in the sanitary sewer.
• Dispose of other materials, such as syringes, as radiation waste according to established procedures.
• Exhaust radioactive gases expired by patients through a shield duct system.

Therapeutic Procedures Classes — Proper control depends on the class of radioactive procedures being used:

• Class A — Procedures that require administration of radioactive materials by mouth
• Class B — Procedures that inject radioactive materials into body cavities
• Class C — Procedures that inject radioactive materials into tumors and such materials are left there permanently
• Class D — Procedures that deliver radiation at distances of up to a few centimeters

Therapeutic Radiation Safety Procedures

• Attach precaution tags to the bed, chart, and patient.
• Enter the patient’s room only to perform normal duties; patients should care for themselves as much as possible.
• Do not allow visitors to get closer than 6 feet to the patient.
• Do not assign pregnant workers to routine care duties for radioactive patients.
• Dispose of contaminated clothing and equipment in a proper manner.
• Allow the radiation control officer to establish limits on the time that a worker can spend with a patient.

General Radiographic Procedures

• Be sure all walls and barriers are sufficiently protective.
• Be sure equipment works properly and complies with applicable standards.
- Survey rooms and floors adjacent to designated radiation-restrictive areas.
- Permit only patients in unshielded areas when x-rays are generated.
- Require technicians to remain in a booth or behind a shield barrier.
- Never allow a person to hold or restrain a patient undergoing diagnostic radiology unless absolutely necessary.
- Always provide protective gear.
- Be sure operators using portable x-ray machines remain at least 6 feet away from the patient.
- Be sure personnel involved in fluoroscopy and angiography follow basic radiation protection measures.

**General Radiology Department Safety** — Staff can be exposed to radiation from portable and fixed x-ray machines. Potential health effects of radiation exposure are somatic (body) or genetic (offspring) in nature. Acute effects include erythema and dermatitis. Large whole-body exposures can cause nausea, vomiting, diarrhea, weakness, and death. Radiation exposure occurs when unprotected employees are near a machine in operation. The degree of exposure depends on the amount of radiation, the duration of exposure, the distance from the source, and the type of shielding in place. The OSHA Technical Manual recommends that workers wear badges or other devices for long-term exposure monitoring. Personnel working with x-ray equipment, radioactive patients, or radioactive materials should wear passive dosimeters. Depending on the work situation, body badges may be attached at collar level, chest level, or waist level. Personnel working in high-dose fluoroscopy settings may be asked to wear two badges for additional monitoring. Ring badges used for measuring beta and gamma doses to the hand should be worn on the hand closest to the radiation source.

X-ray rooms should be equipped with a barrier wall with a lead-plated glass window so technicians can step behind the barrier wall to take x-rays. Lead aprons and lead gloves offer some protection for employees and patients and should be worn in the direct x-ray field. A specific person should have the responsibility for ensuring proper maintenance of portable x-ray machines. Preventive and corrective maintenance programs for x-ray machines are detailed in 21 CFR 1000 (Radiological Health). For information about exposure limits, refer to OSHA’s Ionizing Radiation standard (29 CFR 1910.1096). Employers must supply the appropriate personnel monitoring equipment such as film badges, pocket chambers, pocket dosimeters, or film rings.

**Tuberculosis Exposures** — Facilities must protect the radiology staff from tuberculosis exposures during x-ray procedures. Exposure may also occur after radiology procedures are completed from treatment rooms not properly ventilated after being occupied with a patient who has tuberculosis. Hospitals should develop written procedures for the safe handling of tuberculosis patients in the radiology area. Tuberculosis patients should wear masks and stay in the radiology suite the minimum amount of time possible. Healthcare facilities serving populations that have a high prevalence of tuberculosis may need to supplement the general ventilation or use additional engineering approaches.

**Ergonomics** — Radiology staff are exposed to possible work-related musculoskeletal disorders from constant lifting and reaching for patients during x-ray procedures and transfers. Employers should assess the radiology area for ergonomic stressors and train employees in proper lifting techniques, including the importance of lifting items close to the body, avoiding awkward postures and working above shoulder height, and using mechanical aids to reduce the need to lift. Sufficient staff should be assigned to handle lifts. Patients should be told how to help facilitate any lifts and the procedure.
Slips, Trips, and Falls — A potential for slips, trips, and falls exists in the radiology area during the use of portable x-ray machines, when fluids spill on the floor (such as blood, vomit, or excreta), or when x-ray power cords run across pathways. Aisles and passageways should be kept clear and in good repair, with no obstructions across or in aisles that could create a hazard. Floor plugs for equipment prevent the need to run power cords across pathways. Employees should report and clean up all spills immediately. The use of no-skid waxes, surfaces coated with grit, or waterproof footgear can help decrease slip and fall hazards.

Bloodborne Pathogens
- Follow universal precautions.
- Use appropriate engineering and work practice controls to limit exposure.
- Follow proper work practices when performing vascular access procedures or when handling contaminated items or surfaces.
- Wear gloves, masks, and gowns if blood or fluid exposure is possible.
- Wear gloves when hand contact with blood, mucous membranes, or nonintact skin is anticipated.

Storage and Handling Procedures
- Calibrate radiation measurement instruments before use.
- Train workers handling and exposed to radiation wastes.
- Develop written procedures that cover handling, transportation, and disposal activities for each department or service area that generates or handles radioactive wastes.
- Properly secure and store all waste materials.
- Designate controlled areas.
- Dispense or draw materials only behind a protective barrier.
- Label refrigerators that contain stored materials.
- Monitor all incoming shipments prior to opening.
- Notify the radiation control officer if a contaminated shipment is received.
- Follow spill, leak, and contamination procedures.
- Require handlers to wear rubber gloves and other protection.

Emergency Procedures — Facilities should develop procedures for minor and major spills. Response to a major spill could include the following:
- Require all involved persons to vacate the room or area.
- Right a spilled container if it can be done safely.
- Wash and flush contaminated skin areas immediately.
- Discard contaminated clothing at once.
- Turn off all fans and vacate the room.
- Notify the radiation control officer as soon as possible.
- Be sure exposed personnel are decontaminated at once.
- Decontaminate the area as soon as possible.
- Do not permit work to resume until the area is declared safe.
- Complete a radiation incident report.

Decontamination Procedures
- Remove all external and surface contamination with soap and warm water. Wash hands for three minutes and focus on the areas between the fingers and around the fingernails. Repeat as necessary to remove all radioactive materials.
- Wash all wounds, needle sticks, and lacerations at once under running water.
Healthcare Hazard Control and Safety Management

- Call a physician to treat radiation injuries.
- Treat exposed persons as if contaminated with particulate radioactive material.
- Have exposed persons maintain a distance of at least 6 feet from others.
- Place removed clothing, used towels, and wash cloths in bags and label.
- Take a total body shower, if possible under the circumstances.
- Be aware that special medical procedures apply in situations where a person has inhaled or ingested radioactive material.
- Report all radiation exposure incidents to the radiation control officer, who will determine if a person is contaminated:
  - A person with no radiation hazard will receive appropriate medical care with radiation precautions.
  - For a person determined to have detectable radiation contamination, clothing removal and cleansing operations will begin.
- Be sure attending emergency personnel wear lead aprons.
- Do not allow any person involved in the incident to return to work unless approved by the radiation control officer.
- Monitor exposed personnel for the development of late radiation illness.

Radioactive Waste Management — Radioactive wastes can be generated in nuclear medicine, during clinical testing, and in laboratory departments. Wastes can be solids, liquids, or gases. Solid wastes include rags and papers from cleanup operations, solid chemicals, contaminated equipment, experimental animal carcasses, or human or experimental animal fecal matter. Major ways to manage waste products include dilution, containment, incineration, and return to supplier. The properties of the material must be considered in the method of disposal. Specific disposal methods vary according to the material involved and the licensing authority of the user. Half-life and relative biological hazards should also be taken into consideration. Disposal depends on the half-life of the radionuclide. Material with a short half-life should be disposed of by a commercial contractor. Wastes cannot be treated or neutralized. Radioactive wastes are typically retained onsite in areas 100 to 200 square meters in size until their half-life is spent and they are no longer considered hazardous. These low-level radioactive wastes must be segregated and properly labeled with regard to isotope, form, volume, laboratory origin, activity, and chemical composition. Proper labeling and handling are legally required and make waste management decisions easier. Radioactive and other hazardous wastes should not be mixed. It is advisable to use suppliers that will accept the return of isotope containers. Many chemicals are sensitive to temperature and light, so it is important to store these materials properly. Chemical containers list the recommended storage conditions; meeting the recommended conditions will increase the shelf life of the chemicals.

General Safety Procedures

- Clean equipment with large amounts of water, and treat the water as radioactive liquid waste.
- Dispose of radioactive urine and fecal matter through the sewer system.
- Flush toilets several times after each use.
- In cases where patients receive large doses of radioactive iodine, collect their urine for 48 hours after administration; after analysis in the laboratory, flush it with large quantities of water down the sewer system.
- Handle other liquid wastes in the same manner as solid wastes.
- Store substances with short half-lives in sealed containers until the radioactivity decays; materials with long half-lives should be disposed of by a licensed contractor.
- Gaseous radioactive wastes should be vented to the outside, away from makeup air sources, to prevent re-entry into the facility.
Radiation Waste Plan — Healthcare facilities should develop a plan to ensure that radioactive wastes are disposed of in accordance with government guidelines and regulations (see Table 10.11). The plan should cover procedures for waste that contains radioactive materials as defined by the NRC as being hazardous to humans, animals, and the environment. The emergency plan must be implemented in response to a radiation accident or incident. Personnel monitoring must be conducted to ensure exposure is within acceptable limits.

G. NONIONIZING RADIATION

Nonionizing radiation lacks the energy of ionizing radiation and causes damage by vibrating the atoms or molecules, causing heating by friction. Examples of nonionizing radiation include lasers, microwave- or radiofrequency-generating devices, ultraviolet lamps, MRI machines, cell phones, and other electrical devices that produce electromagnetic fields. Health effects include retinal and skin damage. (Laser hazards and control are addressed in Chapter 9 of this text.)

OSHA Nonionizing Radiation Standard (29 CFR 1910.97) — Electromagnetic radiation has different effects on humans depending on the wavelength and type of radiation involved. Low-frequency radiation such as that generated by broadcast radio and shortwave radio has generally been considered not to be dangerous. Some new information suggests that exposure to electric power frequencies could have an adverse impact on human health. Exposure to microwave radiation can occur in healthcare facilities via microwave ovens, cancer therapy procedures, thawing organs for transplantation, ampule sterilization, and enzyme activation in research animals. The greatest hazard associated with exposure to microwave radiation is thermal heating. The exposure limit for microwaves is (10 mW/cm²) but because it is expressed in voluntary language it has been ruled unenforceable by OSHA; however, some states with their own OSHA-type programs are enforcing this or other radiofrequency exposure limits. OSHA’s Construction standard specifies the design of a radiofrequency warning sign, and 29 CFR 1926.54(l) limits worker exposure to 10 mW/cm².

<table>
<thead>
<tr>
<th>TABLE 10.11 Radioactive Materials Waste Management Best Practice Suggestions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Substitute short-lived isotopes for long-lived isotopes.</td>
</tr>
<tr>
<td>Keep radioactive wastes segregated, centrally processed, and properly labeled.</td>
</tr>
<tr>
<td>Return isotope containers to the distributor.</td>
</tr>
<tr>
<td>Secure radioactive waste storage areas and identify them with the radioactive hazard symbol.</td>
</tr>
<tr>
<td>Install sensors to detect radioactive levels in regular trash and medical waste prior to its leaving the facility.</td>
</tr>
<tr>
<td>Test radiology chemicals with an expired shelf life for effectiveness.</td>
</tr>
<tr>
<td>Consolidate x-ray processor use.</td>
</tr>
<tr>
<td>Recycle lead from spent film generators.</td>
</tr>
<tr>
<td>Install digital imaging and picture archival and communication systems (PACS) to reduce the overall use of radioactive products.</td>
</tr>
<tr>
<td>Designate a radiation safety officer.</td>
</tr>
</tbody>
</table>
Consensus Standards — American National Standards Institute (ANSI) publishes consensus standards on radiofrequency exposures and measurements. The Institute of Electrical and Electronics Engineers (IEEE) Standards Coordinating Committee 28 is the secretariat for ANSI for developing radiofrequency standards. It is also the parent organization for the IEEE Committee on Man and Radiation (COMAR), which publishes position papers on human exposure to electromagnetic fields. ANSI C95.1-1992 (Safety Levels with Respect to Human Exposure to Radiofrequency Electromagnetic Fields, 200 kHz to 100 GHz) includes different exposure limits for controlled and uncontrolled sites. Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields was published by the Federal Communications Commission (OET Bull. No. 65, August 1997); Appendix A (p. 67) provides a table and figure of radiofrequency exposure limits adopted by the FCC. The FCC received concurrence for these limits from other government agencies, including OSHA and NIOSH, with the reservation that current limits be added to the FCC standard.

Ultraviolet Radiation — Ultraviolet radiation can be emitted from germicidal lamps, during some dermatology treatments, from nursery incubators, and even by some hospital air filters. Overexposure can result in skin burns and serious eye damage. Long-term exposure can contribute to accelerated skin aging and increased risk of skin cancer. NIOSH recommendations for ultraviolet exposure range from 200 to 400 nm, depending on the length of exposure. All ultraviolet sources capable of causing eye or skin burns should be interlocked so that direct viewing or bodily exposure is not possible. The total intensity of ultraviolet light from lamps and reflecting surfaces should not exceed the levels specified in the latest edition of the references Documentation of the Threshold Limit Values for Chemical Substances, Documentation of the Threshold Limit Values for Physical Agents, and Documentation of the Biological Exposure Indices, published by the ACGIH.

Radiofrequency and Microwave Radiation — Electromagnetic radiation in the frequency range of 3 kHz to 300 MHz is referred to as radiofrequency, and electromagnetic radiation in the frequency range of 300 MHz to 300 GHz is referred to as microwave. Radiofrequency and microwave radiation are nonionizing in that their energy is not sufficient to ionize atoms. The primary health effects of radiofrequency or microwave energy are a result of heating. The absorption of radiofrequency or microwave energy varies with frequency. Microwave radiation is absorbed near the skin, whereas radiofrequency radiation may be absorbed in deep body organs. Exposure standards of Western countries are based on preventing thermal problems; however, research continues on possible nonthermal effects. Uses of radiofrequency or microwave radiation include radios, cellular phones, processing and cooking foods, heat sealers, vinyl welders, high-frequency welders, induction heaters, flow solder machines, communications transmitters, radar transmitters, ion implant equipment, microwave drying equipment, sputtering equipment, and glue curing. The warning symbol for radiofrequency hazards must consist of a red isosceles triangle above an inverted black isosceles triangle, separated and outlined by an aluminum-colored border. The upper triangle must have the following wording: “WARNING: Radiofrequency Radiation Hazard.”

MRI Safety — The potential benefits of MRI are numerous; however, hazards intrinsic to the MRI environment must be acknowledged and respected. These hazards may be attributed to one or to a combination of the three main components that make up the MRI environment: a strong static magnetic field, including its associated spatial gradient; pulsed gradient magnetic fields; and pulsed radiofrequency fields. For a properly operating system, the hazards associated with the direct interaction of these fields and the body are negligible. It is the interaction of these fields with medical devices placed within the fields that creates concerns for safety. Numerous cases of mishaps in the MRI environment that have resulted
injury and even death have been documented. Adverse events are documented in the Medical Device Reports (MDR) and Problem Reporting Program (PRP) systems. It is likely that many adverse incidents occur but are not reported.

**MRI Hazards** — Key safety concerns involve the use of strong magnetic fields, radiofrequency energy, time-varying magnetic fields, cryogenic liquids, and magnetic field gradients (see Table 10.12). Magnetic fields from large-bore magnets can literally pick up and pull large ferromagnetic items into the bore of the magnet. Caution must be taken to keep all ferromagnetic items away from the magnet for two main reasons: (1) they can injure or kill an individual in the magnet, and (2) they can seriously damage the magnet and imaging coils. The kinetic energy of such an object being sucked into a magnet can smash a radiofrequency imaging coil. Similar forces are at work on ferromagnetic metal implants or foreign matter in those being imaged. These forces can pull on these objects, cutting and compressing healthy tissue. For these reasons, individuals with foreign metal objects such as shrapnel or older ferromagnetic implants are not imaged. There are additional concerns regarding the effect of magnetic fields on electronic circuitry, specifically pacemakers. Walking through a strong magnetic field can induce currents in the circuitry of a person's pacemaker which will cause it to fail and possibly cause death. Magnetic fields will also erase credit cards and magnetic storage media.

**FDA Safety Guidelines** — Food and Drug Administration guidelines state that MRI field strengths not exceeding 2.0 Tesla may be routinely used. People with pacemakers must not be exposed to magnetic fields greater than 5 Gauss. A 50-Gauss magnetic field will erase magnetic storage media. The radiofrequency energy from an imaging sequence can cause heating of the tissues of the body. The FDA recommends that the exposure to radiofrequency energy be limited. The specific absorption rate (SAR) is the limiting measure:

$$\text{SAR} = \frac{\text{joules of radiofrequency/second}}{\text{kg of body weight}} = \text{watts/kg}$$

The recommended SAR limitations depend on the anatomy being imaged. The SAR for the whole body must be less than 0.4 W/kg, and it must be less than 3.2 W/kg averaged over the head. Any pulse sequence must not raise the temperature by more than 1°C and should be no greater than 38°C in the head, 39°C in the trunk, and 40°C in the extremities. Some radiofrequency coils, such as surface coils, have failure modes that can cause burns to the patient. Care should be taken to keep these coils in proper operating order. The FDA recommendations for the rate of change of magnetic fields state that the dB/dt for the system must be less than that required to produce peripheral nerve stimulation. Imaging gradients produce high acoustic noise levels.

**TABLE 10.12 Key MRI Safety and Compatibility Standards**

<table>
<thead>
<tr>
<th>Standard</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASTM F2052-00</td>
<td>Standard Test Method for Measurement of Magnetically Induced</td>
</tr>
<tr>
<td></td>
<td>Displacement Force on Passive Implants in the Magnetic Resonance</td>
</tr>
<tr>
<td></td>
<td>Environment</td>
</tr>
<tr>
<td>ASTM F2119-01</td>
<td>Standard Test Method for Evaluation of MRI Artifacts from Passive</td>
</tr>
<tr>
<td></td>
<td>Implants</td>
</tr>
<tr>
<td>IEC 601-2-33</td>
<td>Medical Electrical Equipment, Part 2, Particular Requirements for the</td>
</tr>
<tr>
<td></td>
<td>Safety of Magnetic Resonance Equipment for Medical Diagnosis</td>
</tr>
</tbody>
</table>
American College of Radiology Safety Recommendations — New safety recommendations for the use of magnetic resonance imaging machines include restricting access to MRI rooms, appointing a special director of hospital MRI facilities, and educating emergency personnel and others who might work near or in an MRI department about safety. Patients with certain implanted devices (such as many types of intracranial aneurysm clips) are contraindicated from MRI imaging as the torque and displacement forces produced on the device could result in the tearing of soft tissues. Other implants, such as certain cardiac pacemakers, are known to function erratically even in relatively weak magnetic fields. In the device labeling for pacemakers, MRI is listed as a contraindication. Individuals with implanted pacemakers, whether or not pacemaker dependent, are contraindicated from entering the MRI procedures room or coming within the 5-Gauss line around the scanner. With regard to medical devices, electrical currents may be induced in conductive metal implants, such as skull plates and hip prostheses. When conductive patient leads are used during MRI scanning, it is especially critical to ensure that no loops are formed by the leads. Looped patient leads or devices such as the halo device used for spinal immobilization can pick up radiofrequency energy, resulting in induced currents, heating of the material, and potentially severe patient burns. To further reduce the possibility of burns, it is recommended to thermally insulate electrically conductive material in the bore of the magnet from the patient using blankets or sheets.

H. LABORATORY SAFETY

Laboratories are major ancillary departments in a healthcare facility (see Table 10.13). This section provides an overview of lab hazards and controls and discusses the OSHA Laboratory standard (29 CFR 1910.1450). It also addresses many of the occupational hazards found in laboratory operations. (Chapter 8 addresses biological hazards in more detail, including biosafety levels.)

Bloodborne Pathogens — If exposure to bloodborne pathogens could occur while handling contaminated lab samples such as blood or other body fluids (including cerebrospinal fluid and semen), employees should wear the appropriate PPE as required by the Bloodborne Pathogens standard. They must wear gloves to protect against contact with blood, mucous

<table>
<thead>
<tr>
<th>Laboratory</th>
<th>Functions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pathology</td>
<td>Processes and tests tissue removed during surgical procedures.</td>
</tr>
<tr>
<td>Cytology</td>
<td>Processes specimens to determine abnormalities in cell structure.</td>
</tr>
<tr>
<td>Chemistry</td>
<td>Analyzes body fluids to determine such things as glucose, protein, enzyme, and hormone levels.</td>
</tr>
<tr>
<td>Serology</td>
<td>Analyzes body fluids for antigens and antibodies.</td>
</tr>
<tr>
<td>Hematology</td>
<td>Analyzes blood to determine information relating to red cells, white cells, and platelets.</td>
</tr>
<tr>
<td>Microscopy</td>
<td>Analyzes urine and body fluids.</td>
</tr>
<tr>
<td>Microbiology</td>
<td>Analyzes specimens to determine causes of infection.</td>
</tr>
</tbody>
</table>
membranes, or nonintact skin. All regulated waste should be either incinerated or decontaminated by a method such as autoclaving that is known to effectively destroy bloodborne pathogens. Contaminated materials that are to be decontaminated at a site away from the work area should be placed in a durable, leakproof, labeled or color-coded container that is closed before being removed from the work area. Laboratory doors must be kept closed when work involving the human immunodeficiency virus (HIV) or hepatitis B virus (HBV) is in progress. Access to the work area should be limited to authorized persons only. Written policies should state that only persons who have been advised of the potential biohazard, who meet entry requirements, and who comply with all entry and exit procedures should be allowed to enter the work areas and animal rooms. Access doors to the work area or containment module should be self-closing. The work areas should be separated from areas that are open to unrestricted traffic flow within the building. Passage through two sets of doors should be the basic requirement for entry into the work area from access corridors or other contiguous areas. Physical separation of the high-containment work area from access corridors or other areas or activities may also be provided by a set of double doors. The surfaces of doors, walls, floors, and ceilings in the work area should be water resistant so they can be easily cleaned. Penetrations in these surfaces should be sealed or capable of being sealed to facilitate decontamination. When other potentially infectious materials or infected animals are present in the work area or containment module, a hazard warning sign incorporating the universal biohazard symbol should be posted on all access doors. All activities involving other potentially infectious materials should be conducted in biological safety cabinets or other physical-containment devices within the containment module. No work with potentially infectious materials should be conducted on an open bench. Certified biological safety cabinets (class I, II, or III) or other appropriate combinations of personal protection or physical containment devices, such as special protective clothing, respirators, centrifuge safety cups, sealed centrifuge rotors, and containment caging for animals, should be used for all activities with other potentially infectious materials that pose a threat of exposure to droplets, splashes, spills, or aerosols. Each work area should contain a sink for washing hands and a readily available eyewash facility. The sink should be foot, elbow, or automatically operated and should be located near the exit door of the work area.

**Tuberculosis** — Exposure of laboratory employees to tuberculosis can occur when they work with specimens (e.g., acid-fast bacilli smears) that may contain tuberculosis. Fluids that may be potential sources of tuberculosis include sputum, cerebrospinal fluid, urine, and fluids collected from gastric or bronchial lavage. All cultures or specimens suspected of containing tuberculosis bacilli must be manipulated in settings where specific engineering controls, administrative procedures, and appropriate personal work practices ensure containment of the organism and protection of the workers. In order for a laboratory to handle tuberculosis sputum and tuberculosis materials, the laboratory must operate at a biosafety level of 2+ or 3. Controlled access, anterooms, sealed windows, directional airflow, no recirculation of laboratory exhaust air, filtration of exhaust air before discharge to the outside, and thimble exhaust connections must be in place to ensure biological safety. Biological safety cabinets must be used whenever lab workers are handling infectious materials that have a chance of aerosolizing. Processes that can expose employees to aerosolized materials include:

- Pouring liquid cultures
- Using fixed-volume automatic pipettors
- Mixing liquid cultures with a pipette
- Preparing specimens and culture smears
- Dropping and spilling tubes containing suspensions of bacilli
**Formaldehyde Exposures** — The employer should make sure no employee is exposed to an airborne concentration of formaldehyde that exceeds 0.75 parts formaldehyde per million parts of air (0.75 ppm) as an 8-hour time-weighted average. Formaldehyde is used as a fixative and is commonly found in most laboratories and the morgue (29 CFR 1910.1048). Eye and respiratory irritation can result from exposure to the liquid and vapor forms. Severe abdominal pains, nausea, vomiting, and possible loss of consciousness could occur if formaldehyde is ingested in large amounts. High concentrations of vapor inhaled for long periods can cause laryngitis, bronchitis, or bronchial pneumonia. Prolonged exposure may cause conjunctivitis. Formaldehyde is a suspected carcinogen. Nasal tumors have been reported in animals. Appropriate PPE must be provided according to 29 CFR 1910.1048(h). If an employee’s eyes could be splashed with solutions containing 0.1% or greater formaldehyde, the employer should provide acceptable eyewash facilities within the immediate work area for emergency use.

**Needlestick or Sharps Injuries** — Because employees can be exposed to bloodborne pathogens by needlestick injuries or cuts from sharp objects when working with specimens, centrifuge tubes, or overfilled sharps containers, the following recommendations should be observed:

- Use engineering controls, such as safer needle devices and work practice controls, to eliminate or minimize exposure to bloodborne pathogens.
- Be aware that OSHA, the FDA, and NIOSH warn healthcare workers about the hazards of breaking glass capillary tubes and recommend using non-glass-capillary tubes.
- Do not allow sharps containers to overfill; replace them routinely.

**HIV and HBV Research Laboratories Requirements of the Bloodborne Pathogens Standard** — For HIV and HBV research laboratories, OSHA sets additional requirements, such as using hypodermic needles and syringes only for parenteral injection and aspiration of fluids from laboratory animals and diaphragm bottles. OSHA requires the use of needle-locking syringes or disposable syringe-needle units for the injection or aspiration of other potentially infectious materials. Extreme caution should be used when handling needles and syringes. A needle should not be bent, sheared, replaced in the sheath or guard, or removed from the syringe following use. The needle and syringe should be promptly placed in a puncture-resistant container and autoclaved or decontaminated before reuse or disposal. Special signs must be posted to identify HBV research areas.

**Work Practices and Behaviors** — Poor work practices and behaviors (e.g., scratching nose or chewing pencils or pens when working with hazardous samples) can lead to worker exposure to hazardous chemicals and diseases; therefore, the following recommendations should be considered:

- Carefully monitor work behaviors and habits to prevent exposures.
- Have employees wear two gloves on each hand so the outer glove can be removed if the employee needs to scratch or to answer a phone and then replaced with a new glove when the employee is ready to return to work.
- Prohibit mouth pipetting or suctioning of blood or other potentially infectious materials.
- Restrict eating, drinking, smoking, applying cosmetics or lip balm, or handling contact lenses in areas with a reasonable likelihood of occupational exposure to bloodborne pathogens.
- Never store food or drink in refrigerators, freezers, shelves, cabinets, or on countertops or bench tops where blood or other potentially infectious materials are present.
• Use splatterguards.
• Install sensor-controlled "automatic sinks" or foot, knee, or elbow controls on sinks to operate handwashing facilities without use of the hands.
• Use centrifuge tubes with caps.
• Work in appropriate biological safety cabinets.
• Check daily for proper air exchange and air flow.
• Keep maintenance records for ventilation systems and other equipment.

Morgue — Potential employee exposures include biological risks from infectious diseases and agents such as staph, strep, tuberculosis, HIV, and HBV. Formaldehyde exposures from contact with cadavers pose a real hazard. Employees should use universal precautions as required by the Bloodborne Pathogens standard and wear appropriate personal protective equipment. Additional protections may be required during autopsies. An appropriate ventilation system should be in operation. Power saws used in the morgue should have local vacuum systems. Shields should be in place when significant splash hazards are anticipated.

Chemical and Fire Hazards — Laboratory workers are routinely exposed to hazardous chemicals such as acetone, carbon monoxide, formaldehyde, hydrogen sulfide, mercury, nitric acid, and xylene. Many exposures occur annually in laboratories, resulting in chemical-related illnesses such as dermatitis, eye irritation, and even fatal pulmonary edema. OSHA’s approach to controlling occupational exposures to hazardous chemicals has been through the development of substance-specific standards such as the standard for benzene. Where substance-specific standards do not exist, published permissible exposure limits (PELs) catalogued in the Z Tables of 29 CFR 1910.1000 should be used. The use of such chemicals is generally limited to small quantities on a short-term basis; however, operations where chemicals are used change frequently, exposing workers to many different chemicals. Refer to NFPA 99 for information on minimizing hazards of fire and explosions.

OSHA Laboratory Standard (29 CFR 1910.1450) — The OSHA Laboratory standard emphasizes the use of safe work practices and appropriate worker protection as required by the laboratory environment. This performance-oriented standard allows employers the flexibility to implement specific safe work practices to help reduce worker injuries and illnesses. The standard covers workers in laboratories located in industrial, clinical, and school settings. The standard covers all chemicals that meet the definition of a health hazard as defined in the Hazard Communication standard (29 CFR 1910.1200). The standard does not specify work practices necessary to protect employees from potential hazards associated with chemical use but does require that physical hazards be addressed in the employer’s training program. The requirement for training on physical hazards, when coupled with current safety regulations, will improve employee safety and protection in laboratories. The standard requires continued compliance with all published PELs and with the employer’s written chemical hygiene plan. The standard requires that special consideration be given to substances that are particularly hazardous, including some selected carcinogens. The standard requires that consideration also be given to reproductive toxins and substances that have a high degree of acute toxicity.

Key Provisions of the Standard

• Employee exposure monitoring (under certain conditions)
• Standard operating procedures for laboratory work with chemicals
• Employee training that supersedes but emphasizes the requirements of the Hazard Communication standard
• Medical consultation and examination
• Hazard identification information such as MSDS and labeling requirements.
• Chemical fume hood performance certification

Chemical Hygiene Plan Requirements — The chemical hygiene officer may have a number of responsibilities, including duties such as monitoring safety, assisting with facility upgrade projects, and advising administrators on ways to improve chemical hygiene practices. The written chemical hygiene plan:

• Provides the basis for meeting the requirements of the standard.
• Allows employers flexibility in providing the type of worker protection appropriate for a specific workplace.
• Specifies the training and information requirement of the standard.
• Establishes appropriate work practices, standard operating procedures, methods of control, and measures for appropriate maintenance and use of protective equipment.
• Details procedures regarding medical examinations and special precautions for work with particularly hazardous substances.
• Must be reviewed annually and updated as required.
• Must be available to employees and their designated representatives and to the assistant secretary of labor for occupational safety and health.

Employers must appoint a chemical hygiene officer and, if appropriate, establish a chemical hygiene committee to participate in developing and implementing the plan. Some workplaces may meet certain criteria of the standard by relying on their existing safety and health plans.

Employee Training — Employers must establish a training and information program for employees exposed to hazardous chemicals in the workplace. The worker program should be initiated at the time of initial assignment and prior to assignments involving new exposure situations. This provision incorporates the training and information requirements of the Hazard Communication standard. Training topics must include the location of the facility hygiene plan, requirements of the OSHA Laboratory standard, PELs for regulated substances, and recommended exposure limits where no regulatory standard applies. Workers must learn about signs and symptoms associated with exposures to hazardous chemicals and substances. Topics to address include:

• Location and availability of chemical hygiene plan, the chemical list, and MSDSs
• Policy documents on safe handling, storage, and disposal of hazardous chemicals in the workplace
• Components of the chemical hygiene plan and how it is implemented in the workplace
• Hazards of the chemicals used in work areas and protective measures employees can take
• Specific procedures put into effect by the employer to increase worker protection, including engineering controls, work practices, and PPE
• Detection methods and observation guidelines, including monitoring procedures, visual appearances, and odors that workers can use to detect the presence of hazardous chemicals

Medical Examinations and Consultations — The laboratory standard does not mandate medical surveillance for all laboratory workers. The employer must provide workers an opportunity for medical attention. This includes follow-up examinations and treatment recommended by an examining physician when an employee exhibits signs or symptoms associated with exposure to a hazardous chemical or the worker is routinely exposed above the action level or PEL for a regulated substance. Other requirements include:
• Employers must offer a medical consultation to any employee potentially exposed through a spill, leak, or explosion of a hazardous chemical.
• Employers must provide information about the hazardous chemical, conditions under which the exposure occurred, and a description of symptoms experienced by the worker.
• Employers must obtain from the treating physician any written opinion requiring follow-up examinations or medical tests.
• Employers must obtain information on any medical condition that might pose an increased risk and a statement that the employee was informed of the results of the medical examination or consultation.

Control Methods and Personal Protective Equipment — Employers must develop criteria for determining and implementing control measures that will reduce exposure to hazardous chemicals. These measures include engineering controls, work practice controls, and personal protective equipment. Engineering controls include general ventilation, fume hoods, glove boxes, and other exhaust systems. Work practice controls may cover items such as restricting eating and drinking areas, prohibiting mouth pipetting, and performing work in a manner that minimizes exposure and maximizes the effectiveness of engineering controls. Respiratory protection is to be used only as an interim measure or when engineering or work practice controls are not feasible. Use of respiratory equipment must comply with the requirements in 29 CFR 1910.134. Other PPE used in laboratories when appropriate includes safety glasses, whole body coverings, and gloves.

Safeguards for Hazardous Substances — Employers must include information on additional protective measures for work that involves carcinogens, reproductive toxins, and acutely toxic substances and must also:
• Establish a designated area with appropriate signs warning of the hazards associated with the substance.
• Provide information on safe and proper use of a fume hood or equivalent containment device.
• Develop procedures for decontaminating the designated area, including the safe removal of contaminated waste such as biohazards.
• Ensure that hazardous chemical container labels are not removed or defaced.
• Require that MSDSs accompany incoming shipments of chemicals and be made available to employees.

Recordkeeping — Employers must establish and maintain employee records of exposure monitoring results, medical examinations, and consultations. These records must be kept, transferred, and made available in accordance with 29 CFR 1910.20. Exposure records and related data analyses must be kept for 30 years. Medical records must be kept for the duration of employment plus 30 years. Medical records for employees who have worked for less than 1 year need not be retained after termination of employment.

Supervisor Responsibilities
• Be sure employees know, understand, and follow the chemical hygiene plan and related standard operating procedures.
• Be sure the proper personal protective equipment is available and in good condition and that employees are trained in its proper use.
• Perform quarterly chemical hygiene and housekeeping inspections.
• Perform semiannual chemical inventories of all laboratories and storage areas.
• Determine the PPE necessary for the procedures and chemicals in use in each area.

Laboratory Worker Responsibilities
• Plan and conduct each laboratory operation in accordance with the chemical hygiene plan.
• Maintain all work areas in good order.
• Correctly select and use required PPE.
• Report exposures, injuries, or problems to the supervisor or chemical hygiene officer.

General Safety Guidelines
• Never stand on chairs, lab stools, boxes, or drums to reach high shelves or the ceiling area; use stepladders or step stools specially designed for such purposes.
• Wash hands and arms several times during the course of the day to remove bits of irritating chemicals, animal dander, or biohazards.
• Maintain adequate ventilation at all times.
• Check hood drafts regularly, and direct questions about the proper functioning of the hood to the maintenance department or the chemical hygiene officer.
• Be aware of static electricity developing when liquids that are poor conductors are transferred from one container to another.
• Watch for electrical charges that can develop when compressed gases are released rapidly from a cylinder; these charges can jump air gaps and form sparks that may ignite flammable vapors or gases.
• Be sure cylinders are properly grounded by connecting the container and receiver by a ground wire.
• Be aware that electrical charges may also build up on personnel wearing shoes with rubber or plastic soles.

Other precautions include:
• Designate regulated areas and marking doors “Authorized Personnel Only,” “Restricted Area,” or “No Admittance.”
• Never permit workers to enter regulated areas or rooms without first consulting the responsible supervisor. The supervisor will then describe what PPE or safety equipment is required before entering the area. In some cases, the room may be equipped with a red light, which will be on when it is unsafe to enter the room.
• Report sluggish drains to the maintenance department immediately.
• Never pour chemicals down the drain that will attack the pipe material or cause a chemical reaction.
• Never pour flammable materials down the drain.

Refer to NFPA 45 (Fire Protection Standard for Laboratories Using Chemicals) for information on construction, ventilation, and fire protection requirements.

Animal Research Laboratories — When using animals to study the progress of disease, it is the responsibility of the supervisor to explain the methods of protection available to all workers, who are advised to:
• Use care when handling animals to avoid being bitten or scratched.
• Use proper restraining or protective devices whenever possible.
• Wear protective gloves when dissecting or conducting necropsy.
• Use first-aid procedures to treat animal bites and scratches and report all incidents immediately.
• Immediately report allergic reactions to animals or to drugs used to treat animals.
• Thoroughly disinfect living area of infected animals.
• Render all animal carcasses noninfectious by autoclaving or incineration.

Holding and Disposing of Microorganisms — Laboratory supervisors must caution all workers about relevant microorganism hazards and emphasize the importance of using sterile techniques:

• Before disposal, autoclave or disinfect by other means cultures containing microorganisms or viruses.
• Place pipettes used in handling infectious disease agents in a disinfectant solution immediately after use and autoclave as soon as possible.
• Autoclave other contaminated glassware before washing.

Laboratory Infection Control — Organisms can be inhaled, ingested, or inoculated through the skin. Many laboratory-acquired infections, especially common diseases, are not reported. Laboratory-acquired tuberculosis and hepatitis are significantly under-reported. Nearly all sizeable blood banks and serology laboratories report at least one case of hepatitis. Other commonly recognized exposure incidents are spills, breakages resulting in sprays (aerosols) of infectious material, injuries due to broken glass, sharps injuries, and aspiration during mouth pipetting. Research laboratories are the most hazardous type because many lack the standardized handling procedures found in large commercial laboratories.

I. CENTRAL STERILE SUPPLY

Sterilization activities are normally the main function of this department. Many sterilization activities are very similar to small manufacturing plants or distribution centers. Central supply departments receive, package, process, sterilize, and distribute nondrug items for most medical and patient care units in the organization. These supplies include items such as glassware, gloves, surgical accessories, and intravenous solutions. Central supply also processes, inspects, and packages sterile linen for use in areas such as surgical and care delivery areas. Hazards in this department include those associated with material handling and sterilization processes. Improper use of sterilization equipment can result in burns from steam and exposure to ethylene oxide. The use of ethylene oxide requires aeration of sterilized items and exhaust ventilation for the waste gas. Detailed operating and emergency instructions must be available. Also:

• Post detailed operating instructions at or near sterilization units.
• Inspect autoclaves and other steam-pressured vessels regularly.
• Keep ethylene oxide cartridges in a cool dry place.
• Label exhaust systems for ethylene oxide.
• Be aware that cuts, bruises, and puncture wounds from blades, needles, knives, and broken glass are among the most common accidents in central supply areas.
• Establish policies for disposing of sharps or other hazardous instruments.
• Provide workers with appropriate carts, dollies, and other material handling devices.
• Use only approved step stools and ladders.
• Never use chairs, boxes, or other makeshift devices for climbing tasks.
Some potential hazards identified by OSHA include:

- Ethylene oxide gas
- Mercury exposure
- Glutaraldehyde
- Burns/cuts
- Bloodborne pathogens
- Ergonomics
- Hazardous chemicals
- Slips, trips, and falls
- Latex allergy

Exposure to Ethylene Oxide Gas — Ethylene oxide gas (EtO) possesses several physical and health hazards that merit special attention. EtO is a colorless liquid below 51.7°F; above that temperature, it is a gas that has an ether-like odor at concentrations above 700 ppm and is both flammable and highly reactive. The current OSHA PEL for EtO is 1 ppm for an 8-hour time-weighted average with a 5-ppm excursion level. Exposure usually results from improper aeration of the ethylene oxide chamber after the sterilizing process, during off-gassing of sterilized items, or from poor gasline connections. Ethylene oxide can cause eye irritation and injury to the cornea, frostbite, and severe irritation and blistering of the skin upon prolonged or confined contact. Ingesting EtO can cause gastric irritation and liver injury. Acute effects from inhaling vapors include respiratory irritation, lung injury, headache, nausea, vomiting, diarrhea, and shortness of breath. Exposure has also been associated with the occurrence of cancer, reproductive effects, and sensitization. Ethylene oxide has been shown to cause cancer in laboratory animals and has been associated with higher incidences of cancer in humans. Other cold sterilants can be substituted for EtO; however, extreme care must be taken when selecting possible substitutes. It is necessary to fully evaluate possible health effects and exposure potentials of alternatives to EtO before making a selection.

OSHA Ventilation Recommendations — Typical operations that could cause worker exposure to EtO are removing sterilized items from the EtO sterilizer, moving items from the EtO sterilizer to the aerator unit, and changing bottles of EtO gas. It is important to:

- Control airborne concentrations at the source of contamination by enclosing the operation or using local exhaust ventilation.
- Never allow workers to occupy the sterilizer loading and mechanical rooms while operating the sterilizer unit.
- Remind workers to crack the door no more than 2 inches to allow the load to offgas before it is moved to transfer carts.
- Install a ventilated exhaust hood above the sterilizer door.
- Avoid close contact with newly sterilized unaerated loads.
- Vent ethylene oxide through a nonrecycled or dedicated ventilation system; for a discussion of ventilation of aeration units, sterilizer door areas, sterilizer relief valves, and ventilation during cylinder changes, see the appendix of 29 CFR 1910.1047 (Ethylene Oxide).
- Have machine alarms in place to detect inadequate ventilation and cause automatic shutdown.
- Maintain a negative air pressure in laboratories and isolation rooms so contaminated air is drawn through the exhaust vents rather than circulating throughout the rest of the building.
- Use appropriate PPE when changing cylinders (butyl apron, gloves, and a canister respirator).
• Use EtO detector systems and room monitors to signal any leakage of gas and passive dosimeters for personal exposure monitoring.
• Use specialized gasline connections to minimize EtO leakage during use and during changeout of EtO cylinders.
• Conduct periodic personal monitoring, as well as monitoring for leaks at gasline connectors.
• Keep a written log of any detected leaks and service done on an ethylene oxide chamber.
• Replace sterilizer and aerator door gaskets, valves, and fittings when necessary.

Mercury Exposure — Employees can be exposed to mercury from accidental spills that occur during sterilization and centrifugation of thermometers in central supply areas. Exposure to mercury occurs through inhalation or through skin contact. If spills are not promptly cleaned up, mercury may accumulate on surfaces and then vaporize and be inhaled by unaware workers. Spills can be prevented by replacing outdated glass thermometers and sphygmomanometers; they should be cleaned up promptly and safely by a trained response team. Spill kits should be available to help clean up small spills of 25 mL or less.

Glutaraldehyde — Employees could be exposed to a number of substances containing glutaraldehyde. Most of these sterilants are used to for sterilization functions. It is important to:
• Keep these products in closed containers in well-ventilated areas.
• Post signs to remind staff to replace lids after use.
• Use glutaraldehyde products in rooms that are well ventilated and large enough to ensure adequate dilution of vapor, with a minimum air exchange rate of 10 air changes per hour.
• Install local exhaust ventilation, such as a properly functioning laboratory fume hood to control vapor.
• Use appropriate PPE to minimize exposure including impervious gloves and splash-proof goggles or full-face shields.
• Have emergency drenching stations available where the risk of eye or body exposure exists.

Preventing Burns and Cuts — Employee exposure to burns or cuts can occur from handling or sorting hot sterilized items or sharp instruments when removing them from autoclaves or sterilizers or from steam lines that service the autoclaves. Work practices to prevent hazards include:
• Never remove items from sterilizers until cooled.
• Avoid handling the sharp ends of instruments.
• Use forceps or other devices to remove sharp instruments from baskets or autoclaves.
• Provide appropriate personal protective equipment.

Personal Protective Equipment
• Use appropriate hand protection when hands are exposed to hazards such as cuts or lacerations and thermal burns.
• Use oven mitts when handling hot items and appropriate gloves when handling or sorting sharp instruments.

Bloodborne Pathogens — Employee exposure to bloodborne pathogens and other potentially infectious materials can happen when sorting or handling contaminated surgical instruments and sharps. Workers must discard any disposable sharps and recycle reusable instruments and equipment that must be washed and sterilized before their next use. Also:
Workers must wear gloves during times of hand contact with blood, mucous membranes, and other potentially infectious materials.

Workers must wear gloves when handling contaminated items or surfaces.

Workers sorting contaminated items should wear thick utility gloves and gowns for additional protection.

Workers can decontaminate utility gloves for reuse if the integrity of the glove is not compromised; however, these gloves must be discarded if they are cracked, peeling, torn, punctured, or exhibit other signs of deterioration or when their ability to function as a barrier is compromised.

### Ergonomics

- Work to prevent musculoskeletal disorders by educating workers to avoid repetitive, prolonged, and over-reaching tasks.
- Evaluate tasks that require lifting above shoulder height to reach high shelves of equipment or when pushing and pulling heavy carts full of dirty or clean items.
- Redesign workstations so packaging and equipment can be reached while maintaining the elbows in close to the body.
- Minimize prolonged overhead activity.
- Use carts with large and low resistance casters.
- Use height-adjustable work surfaces or lift tables to minimize head tilt.
- Provide fatigue mats for workers standing in one position while sorting instruments.
- Be aware that contact trauma to the forearm area can occur if employees rest their wrists on hard counter surfaces when sorting.
- Pad the edges of work surfaces that come into contact with workers’ elbows or forearms and could cause contact trauma.
- Rotate workers through repetitive tasks.
- Provide sit or stand stools at work stations.
- Require workers to wear shoes with well-cushioned insteps and soles.
- Provide a foot rest bar so employees can continually alter their posture by raising one foot.

### Emergency Drenching Facilities

According to OSHA, employers must provide drenching stations for workers whose eyes or bodies might be exposed to injurious corrosive materials. The facilities for quick drenching or flushing the eyes and body must be located within the work area for immediate emergency use.

### Slips, Trips, and Falls

- Keep floors clean and dry.
- Maintain clear aisles and passageways without obstructions that could create a hazard.
- Provide floor plugs or ceiling plugs for equipment so power cords do not extend across pathways.

### Process of Disinfection in Central Sterile

Steam sterilizers go through a cycle that consists of many steps of pre-vacuum, an exposure time at a certain pressure and temperature, exhaust, and a drying phase. Instruments must be thoroughly cleaned to remove visible soil. Some cleaning agents may themselves be disinfectants and aid in decontaminating or sanitizing the instrument. Low-level quaternary ammonium compounds and intermediate-level disinfectants such as quaternary ammonium compounds containing 15% alcohol work...
well as cleaning agents. Detergents with enzymes can also be used as cleaning agents. A tight-fitting brush can be used on the interior channels of endoscopes. Channels too small for a brush should be flushed with a syringe. Cleaning removes not only visible soil but also at least 99.9% of the microbes on the instrument. Both the removal of visible soil and reduction of the bioburden (microbes) help the disinfectant finish the job of killing all of the microbes. Cleaning agents may not be compatible with the disinfectant. Enzymes in cleaning agents are proteins and will react to neutralize or partially neutralize some disinfectants; therefore, the cleaning agent should be rinsed off with potable (drinkable) water before placing the instrument into a disinfectant.

Contact with the Disinfectant — Disinfectants must be in contact with both the exterior and interior surfaces of an instrument for the recommended exposure time and temperature. Some agitation and physical positioning may be necessary to fill the interior lumen of hollow instruments and dislodge air pockets from some instruments. Disinfectants kill living cells, whether those cells are microbes or the cells of a mucous membrane; therefore, it is vitally important for patient and staff safety to rinse away all disinfectants from instruments with copious amounts of sterile water. A double or triple rinse with smaller volumes of sterile water is more effective than a single rinse. Each rinse removes about 90% of the disinfectant. A double rinse removes 99% and a triple rinse removes 99.9% of the disinfectant. A flowing rinse where sterile water is poured or flushed over an instrument is more effective than a static rinse where the instrument is soaked in a container of rinse water.

Drying and Storage of Instruments — Bacteria and fungi cannot grow without water. If an instrument is dried after disinfection and rinsing, then the few (less than 100) microbes that might recontaminate it from the environment may die; they will not grow to infectious numbers. If instruments are stored wet, *Pseudomonas* or *Aspergillus* from the environment may multiply quickly to dangerous numbers. Instruments may be dried by blowing filtered air through the interior channels, by low-intensity heat lamps, or simply by hanging the instruments to drip dry. When they are dry, the instruments should be stored in a cabinet that will protect them from dust and other environmental contaminants. Critical instruments should be stored in a sterile container or processed immediately before use. In either case, sterile instruments are again rinsed with sterile water immediately prior to use.

Surfaces — Floors, countertops, furniture, and machinery housings should be wiped once with an intermediate- or low-level disinfectant to remove soil and rewiped with fresh disinfectant to complete the killing of microbes. Environmental surfaces do not have to be rinsed unless the label so directs or unless the surface might come into contact with eyes.

J. PHARMACY SAFETY

Pharmacies must comply with the Joint Commission, American Osteopathic Association, or other Medicare accreditation or certification standards. OSHA regulates worker safety in pharmacies, including exposures to hazardous materials and drugs. In hospital settings, the pharmacy plays a key role in providing quality care. The pharmacy serves other functions such as directing special drug programs, providing services to satellite locations, and managing drug information systems. The pharmacy department also plays a key role in preventing medication errors. Onsite licensed pharmacists prepare pharmacy compounds and mix all sterile medications, intravenous admixtures, or other drugs except in emergencies situations. This section of the text covers some pharmacy management procedures, general safety requirements, and hazardous drug safety.
General Safety Considerations

- Use safety materials and equipment while preparing hazardous medications.
- Avoid contamination by using clean or sterile technique as appropriate.
- Maintain clean, uncluttered, and functionally separate areas for product preparation.
- Use a laminar airflow hood or other class 100 environment while preparing any intravenous admixtures in the pharmacy.
- Inspect the integrity of the medications.
- Be aware that workers not aware of proper work practices and controls may be exposed to hazardous drugs through the skin or by mouth or inhalation.

The OSHA Technical Manual and 2004 NIOSH guidelines provide guidance regarding the safety, use, administration, storage, and disposal of hazardous drugs.

Pharmacy Hazards — Pharmacy workers are subject to slips and falls, back injuries, cuts from broken bottles and equipment, and exposure to chemicals such as alcohols and solvents, dusts such as talc and zinc oxide, and antineoplastic drugs. The following hazard control measures should be considered:

- Make stepladders available to help personnel reach items stored on high shelves.
- Encourage workers to promptly clean up spills.
- Be sure broken bottles and unusable pharmaceutical products are disposed of according to established procedures.
- Guard mixers, packaging and bottling equipment, and labeling machinery.
- Provide adequate exhaust hoods where needed.
- Check laminar airflow hoods frequently to determine if they are operating properly.
- Make pharmacy personnel aware of the hazards associated with handling chemotherapeutic agents and be sure they are familiar with safety guidelines.
- Instruct workers in safe practices for lifting and carrying to prevent injuries.
- Do not allow thermometers, manometers, and other instruments that contain mercury to be repaired in the pharmacy; such equipment should either be repaired in an appropriate hospital shop or sent out for repair.
- Install opening devices on the inside of walk-in vaults and refrigerators to prevent workers from being accidentally locked inside.
- Identify through medical surveillance the adverse effects of exposure to any medications that are packaged or dispensed in the pharmacy.
- Do not allow workers to smoke or eat in pharmacy preparation areas because drug aerosols may be inhaled or drugs may be ingested.

Pharmacy Departmental Safety — Most healthcare organizations have a safety management program. The American Society of Health-System Pharmacists (ASHP) recommends that pharmacies develop and implement a safety management program. Pharmacy representation on the safety committee is important not only to the department but also to the effectiveness of the safety committee. Concern over safe handling of medication errors and hazardous drug safety has increased the pharmacy’s presence on such committees. The pharmacy director must be sure that the department conducts an effective orientation and on-the-job training program that addresses:

- The importance of practicing safety on the job
- The department’s disaster planning and emergency response roles
- Hazards found in specific jobs or processes
- Organizational and departmental safety policies and procedures
Emergency Management — Personnel must be familiar with the organization’s emergency management plan and the department’s responsibilities in supporting the plan. The department should develop a plan for obtaining and distributing drugs during emergency situations.

Fire Safety — Pharmacy staff members should know:

- Fire identification and reporting procedures
- The classes and hazards of fire
- How to activate the fire alarm and notify others
- How to select and use the proper fire extinguisher
- Techniques for controlling smoke and fire
- Evacuation routes and egress responsibilities

OSHA’s Hazard Communication Standard — A written program should be in place that meets the requirements of the Hazard Communication standard for employees handling or otherwise exposed to chemicals, including drugs that represent a health hazard to employees. The written program must provide for worker training, warning labels, and access to MSDSs. Employees must be informed of the requirements of the Hazard Communication standard, including operations or procedures with hazard exposures. The Hazard Communication standard applies to drugs and pharmaceuticals that the manufacturer has determined to be hazardous. It could also apply to hazardous substances known to be present in the workplace that could pose exposures under normal conditions or in a foreseeable emergency. The exemptions to the standard include:

- Drugs that are in solid, final form for direct administration to the patient (e.g., tablets or pills)
- Tablets or pills that are occasionally crushed, if the pill or tablet is not designed to be dissolved or crushed prior to administration
- Consumer products that are subject to the labeling requirements of the terms as defined in the Consumer Product Safety Act and the Federal Hazardous Substances Act

Pharmacy Ergonomics — Pharmacy personnel may be exposed to such musculoskeletal disorders as carpel tunnel syndrome or tendonitis from activities that involve repetitive tasks, forceful exertions, awkward postures, or contact stress. Assistive devices should be used whenever possible, and pharmacy tasks can be modified to decrease the incidence of work-related musculoskeletal disorders. Such redesign could include incorporating variation into the task. Ergonomically comfortable workstations should include wrist pads, adjustable padded chairs, and a keyboard tray and monitor that are at a comfortable height.

Workplace Violence — Pharmacists may be exposed to workplace violence due to the availability of drugs and money in the pharmacy area. OSHA recommends that employers establish and maintain a violence prevention program, in addition to:

- Installing Plexiglas® in the payment window in the pharmacy area
- Providing better visibility and lighting in the pharmacy area
- Teaching the staff how to recognize and manage hostile and assaultive behavior
- Implementing security devices such as panic buttons, beepers, surveillance cameras, alarm systems, two-way mirrors, card-key access systems, and security guards
General Medication Labeling — Standardize labeling to meet organization policy, applicable law, or practice standards:

- Properly label all medication when prepared if it will not be administered immediately.
- Appropriately label any container including plastic bags, syringes, bottles, or boxes that can be labeled and secured.
- Label in such a manner that the contents can be readily determined to be intact and not expired.
- Label with drug name, strength, and amount (if not apparent from the container).
- Include an expiration date if the drug will not be used within 24 hours.
- Label compounded intravenous admixtures and nutrition solutions with the date prepared and diluent.
- When preparing medications for multiple patients or the preparing person will not administer the medication, include the patient name and location on the label.

Closed Pharmacy Procedures

- Develop a process for providing medications to meet patient needs when the pharmacy is closed.
- If the law permits a nonpharmacist healthcare professional to obtain medications after closure of the pharmacy, limit access to a set of medications approved by the organization.
- Store the medications in a night cabinet, automated storage and distribution device, or a selected section of the pharmacy.
- Only permit trained, designated prescribing professionals and nurses access to medications.
- Establish quality control procedures such as a second check by another individual or a secondary verification such as bar coding to prevent medication retrieval errors.
- Arrange for a qualified pharmacist to be available on call to answer questions or provide medications beyond those accessible to nonpharmacy staff.
- Implement changes as needed to reduce the amount of times nonpharmacist healthcare professionals must obtain medications after the pharmacy is closed.

Drug Recalls or Safety Alerts — When the organization has been informed of a medication recall or discontinuation by the manufacturer or the FDA for safety reasons, medications within the organization are retrieved and appropriately handled per organization policy and law and regulation. Although recalls are generally by lot number, an organization may retrieve all lots of a recalled medication instead of recording and identifying medications by individual lot number. When the organization has been informed of a medication recall or discontinuation by the manufacturer or the FDA for safety reasons, all those ordering, dispensing, and administering recalled or discontinued medications are notified.

High-Risk Medications — High-risk or high-alert drugs increase the risk for medication error or sentinel event occurrence; refer to lists of high-risk or high-alert drugs available from the Institute for Safe Medication Practices (ISMP) or the U.S. Pharmacopeial Convention (USP). Organizations should develop a list of high-risk or high-alert drugs based on their utilization patterns, administered drugs, and internal data about medication errors. High-risk drugs may include investigational drugs, controlled medications, medications not on the approved FDA list, medications with a narrow therapeutic range, psychotherapeutic medications, and look-alike or sound-alike medications. As appropriate to the services provided, the organization develops processes for procuring, storing, ordering, transcribing, preparing, dispensing, administering, and monitoring high-risk or high-alert medications.
Investigational Medication Safety — The organization protects the safety of patients participating in investigational or medication studies by ensuring adequate control and support. The organization should:

- Be sensitive to the use of particular populations for experimentation and research and review all investigational medications to evaluate safety.
- Develop a written process for reviewing, approving, supervising, and monitoring investigational medications use.
- Review and accommodate, as appropriate, the patient’s continued participation in the protocol.
- Specify that the pharmacy controls the storage, dispensing, labeling, and distribution of investigational medications.

Evaluation of Medication Management

- Evaluate the medication management system for risk points and identify areas in which safety can be improved.
- Routinely evaluate literature for new technologies or successful practices that enhance safety and can improve the medication management system.
- Review internally generated reports to identify trends or issues within the system.
- When the organization has been informed of a medication recall or discontinuation by the manufacturer or the FDA for safety reasons, identify patients who may have received the medication and inform them of the recall or discontinuation.
- Return medications when allowed under law and organizational policy.
- Account for and control previously dispensed but unused, expired, or returned medications.
- Have the pharmacy be responsible for controlling and accounting for all unused medications returned to the pharmacy.
- Have a process in place that addresses if and when unused, expired, or returned medications will be managed by the pharmacy.
- Have a process in place that addresses how medications can be returned to the pharmacy’s control, including procedures that address preventing diversion of medications and account for all unused, expired, or returned medications.
- Have a process in place that addresses how outside sources, if any, are used for the destruction of medications.

Drug Quality — The American Society of Health-System Pharmacists (ASHP) sets guidelines on drug quality and specifications. Pharmacy procedures should require that all drugs and medications meet the standards of the U.S. Pharmacopeia/National Formulary (USP/NF). Drugs not included in the USP/NF should be approved by the FDA. Drugs must be obtained from known sources and meet identity, purity, and potency requirements. Drugs should comply with FDA current manufacturing practices.

Drug Storage

- Store drugs for external use separately from medications that can be taken internally.
- Do not keep respiratory care drugs and those used to prepare irrigation solutions with other injectable drugs.
- Store large quantities of acids or other hazardous materials close to floor level.
- Store large or heavy drug containers on lower shelves.
- Identify hazardous storage areas with an appropriate caution or warning.
- Store poisons in a secure area and clearly label them.
- Never store drugs in a refrigerator that contains food or drink.
Evaluating Drug Suppliers — The following technical factors should be considered when assessing sources of drugs and medications:

- Data on sterility and analytical controls
- Bioavailability and bioequivalency information
- Information about raw materials and finished products
- Miscellaneous information on the quality of the drug or medication

Hazardous Drug Safety — In 2004, NIOSH released new hazardous drug guidelines for healthcare organizations. OSHA currently enforces safety issues using the general-duty clause and existing standards dealing with hazard communication and personal protective equipment. All drugs with toxic, irritating, sensitizing, or organ-targeting characteristics should be considered hazardous, as should any substances listed in the Hazard Communication standard (Appendix A) and chemicals listed in 29 CFR 1910.1000 (Table Z-2). The OSHA Technical Manual provides recommendations for characterizing hazardous drugs. Material Safety Data Sheets should be readily available for all hazardous chemicals, including hazardous drugs that meet the Hazard Communication standard criteria. All personnel involved in any aspect of the handling of covered hazardous drugs, including physicians, nurses, pharmacists, housekeepers, and others involved in receiving, transport, or storage, must receive information and training to apprise them of the hazards presented by hazardous drugs in the work area, including the following:

- Methods and observations that may be used to detect the presence or release of a covered hazardous drug in the work area
- Physical and health hazards of the covered drugs in the work area
- Measures employees can take to protect themselves from these hazards

Such training should include specific procedures that the employer has implemented to protect employees from exposure to such drugs, such as identification of covered drugs and those to be handled as hazardous, appropriate work practices, and emergency procedures for spills or employee exposure.

Hazardous Drug Safety Plan

- Carry out a workplace analysis of all hazardous drug areas.
- Develop, implement, maintain, and review annually a written hazardous drug safety and health plan (Table 10.14) to protect those employees who handle or are otherwise exposed to drugs that pose a health hazard to them.
- Maintain copies of relevant MSDSs for guidance.

NIOSH and the OSHA’s Technical Manual (Part V) provide guidance in the development of a drug safety and health plan.

Training

- Train personnel on personal protective equipment use.
- Communicate to all workers details of the written hazard communication program, including an explanation of the labeling system, and MSDS availability.
- Teach workers how to obtain and use the appropriate hazard information.

Exposure Risks — Examples of antineoplastic or chemotherapeutic drugs include vincristine, dacarbazine, mitomycin, cytosine, arabinoside, and fluorouracil. The Hazard Communication standard states that drugs requiring special precautions must be handled as hazardous substances. This mandate applies to healthcare professionals providing direct
patient care and to support personnel involved in product acquisition, storage, transportation, housekeeping, and waste disposal. The risk of exposure to hazardous drugs through inhalation or direct skin contact can occur while transferring hazardous drugs from one container to another and while reconstituting or manipulating them. Exposure can also occur during withdrawal of needles from drug vials and from an expulsion of air from a drug-filled syringe. Employees should expel air from syringes in a biological safety cabinet.

- Place all syringes and needles used in the course of preparation in sharps containers for disposal.
- Do not crush, clip, or cap needle devices.
- Be sure drug administration sets are prepared, set, and primed within a biological safety cabinet prior to adding the drug.
- Prime with a non-drug-containing solution or use a back-flow closed system.
- Label all syringes and intravenous bags containing hazardous drugs with a warning label, such as “Special Handling/Disposal Precautions.”

Exposures to hazardous drugs during preparation are primarily due to ineffective engineering or work practice controls and not using personal protective equipment; for example:

- Recommended biological safety cabinets not used
- Appropriate personal protective equipment not worn
- Unsafe handling practices for hazardous substances
- Improper procedures in drug preparation areas

**Personal Protections** — In OSHA 29 CFR 1910.132, the standard requires the employer to assess potential hazards and provide the appropriate personal protective equipment. OSHA 29 CFR 1910.133 requires the use of chemical-barrier face and eye protection whenever splashes, sprays, or aerosols of drugs may be generated. Approved biological safety cabinets should be used when preparing hazardous medications (e.g., class II, type B, or class III vented to the outside). OSHA does not recommend horizontal-type cabinets for the preparation of hazardous drugs, as they increase the likelihood of drug exposure. The prep cabinet should also contain covered needle containers for needle disposal and waste containers for excess fluids disposal. NIOSH recommends wearing double gloves appropriate for mixing hazardous drugs. When double gloving, one glove should be placed under the
gown cuff and one over. The glove/gown interface should be such that no skin on the arm or wrist is exposed. To limit the transfer of contamination, the outer gloves should be discarded in a closed container after each mixing task. Hazardous drugs should be prepared by pharmacy, not nursing, personnel. Employees should:

- Change gloves often and when they are no longer providing protection.
- Use thick, long gloves that cover the gown cuff.
- Use powder-free gloves to minimize absorption of contamination.
- Wear a protective disposable gown made of lint-free, low-permeability fabric with a solid front, long sleeves, and tight-fitting elastic or knit cuffs.
- Prepare hazardous drugs only in restricted areas with appropriate signs.
- Refrain from smoking, drinking, applying cosmetics, or eating where hazardous drugs are prepared, stored, or used.

**Hazardous Drug Preparation** — Workers preparing hazardous drugs should use a ventilated cabinet to reduce the potential for occupational exposure. Performance test methods and criteria for biological safety cabinets may be found in *Primary Containment for Biobazards: Selection, Installation, and Use of Biological Safety Cabinets*, 2nd ed. (CDC/NIH, 2000). A class II cabinet should be properly installed, maintained, and routinely cleaned. Its performance should be field certified upon installation, following relocation, after maintenance repairs to internal components, after HEPA filter replacement, and every 6 months thereafter. A current field-certification label should be prominently displayed on the ventilated cabinet per NFS/ANSI 49-2002. Other types of ventilated cabinets should be treated similarly as to care and frequency of performance verification tests.

**Ventilated Cabinets**

- Conduct all tasks related to mixing, preparing, or manipulating hazardous drugs within a ventilated cabinet designed specifically to prevent hazardous drugs from being released into the surrounding environment.
- Follow aseptic requirements established by state boards of pharmacy.
- Use ventilated cabinets when concerned about hazardous drug containment and aseptic processing; use a class I biosafety cabinet or an isolator for containment when asepsis processing is not required.
- When an aseptic technique is required, use the preferred ventilated cabinet (e.g., a class II, type B2); type A2 and B1 cabinets are allowed under certain conditions.
- If possible, use class III cabinets as isolators intended for asepsis and containment.
- Equip all ventilated cabinets with a continuous monitoring device to confirm adequate airflow prior to each use.
- Filter exhaust from these controls with a HEPA filter.
- Install an outside exhaust system to prevent reentrainment of vented air by the building envelope or HVAC systems.
- Exhaust cabinets 100% to the outside, if feasible.
- Place the fan downstream of the HEPA filter to ensure that contaminated ducts remain under negative pressure.
- Never use a ventilated cabinet with air recirculation unless the hazardous drug in use will not volatilize during process manipulation or after capture by the HEPA filter.
- Use the information on volatilization provided by the drug manufacturer or from air-sampling data.
- Refer to NSF/ANSI 49 for additional information regarding placement of cabinets, exhaust systems, and stack design.
- Never consider additional engineering or process controls such as needleless systems, glove bags, and closed-system drug transfer devices as substitutes for ventilated cabinets.
Receiving and Storage Hazardous Drugs

- Limit access to areas where hazardous drugs are prepared and stored.
- Place signs to restrict entry.
- Design bins or shelves for storing hazardous drugs in such a way as to prevent breakage and limit the risk of falling.
- Apply warning labels to all hazardous drug containers, shelves, and bins.
- Store hazardous drugs requiring refrigeration separately from nonhazardous drugs.
- Begin exposure control at the point where drugs enter the facility.
- Be aware that the most significant risk for exposure during distribution and transport is from spills due to damaged containers. PPE is generally not required when packaging is intact during routine activities; however, workers should be prepared for the possibility of spills when handling containers.
- Label the outside of medical product containers in a way that is understandable to all levels of personnel who will be separating hazardous drugs from nonhazardous ones.
- When opening a container to unpack drugs, wear chemotherapy gloves, protective clothing, and eye protection to reduce the possibility of spreading contamination if damaged containers are encountered.
- Wear chemotherapy gloves when transporting a vial or syringe to the work area due to possible contamination.
- Store hazardous drugs separately from other drugs.

Personal Protections

- Use appropriate personal protective equipment, including double gloves and protective gowns, during drug reconstitution and admixture. Gloves should be specified as chemotherapy gloves on the box or by the manufacturer. While a number of glove materials are suitable for protecting against exposure to antineoplastic drugs, consideration must be given to those individuals who are sensitive to latex products. For hazardous drugs that are not chemotherapy drugs or for which no information is available, a chemotherapy glove can be used.
- Use double gloves for all activities involving hazardous drugs (outer glove should extend over the cuff of the gown).
- Inspect gloves for physical defects before use.
- Wash hands with soap and water before donning protective gloves and immediately following removal.
- Change gloves every 30 minutes or when torn, punctured, or contaminated and discard them immediately in a yellow chemotherapy waste container.
- Wear protective gowns that are disposable, low lint, and closed in front; have tight-fitting cuffs at the wrist; and have low permeability to the agents being handled.
- Dispose of protective gowns after each use.
- Wear disposable sleeve covers to protect the wrist area (remove the covers after the task is completed).
- Polypropylene-based gown materials provide inadequate protection against many of the commonly used antineoplastic drugs.
- Polyethylene-coated materials provide better protection.

Transfer Procedures — Transfers from primary packaging such as vials to dosing equipment such as infusion bags, bottles, or pumps should be carried out using closed systems whenever possible. Devices that contain the product within a closed system during drug transfers limit the potential for aerosol generation, as well as exposure to sharps. Evidence has documented a decrease in drug contaminants present within a class II biosafety cabinet.
when a closed system transfer device was used; however, a closed-system transfer device is not an acceptable substitute for a ventilated cabinet and should only be used in conjunction with a ventilated cabinet.

**Safe Drug Administration** — Safe drug administration requires the use of protective medical devices such as needleless systems, closed systems, and techniques such as priming of intravenous tubing by pharmacy personnel in a ventilated cabinet or priming inline with nondrug solutions. In addition, employees should:

- Wear personal protective equipment, including double gloves, goggles, and protective gowns, for all activities associated with drug administration: opening outer bags, assembling delivery systems, actual patient delivery and removal, and disposal of all equipment used in administration.
- Remove outer gloves and gowns and bag them for disposal in yellow chemotherapy waste containers at the site of administration.
- Double-bag drug waste before removing inner gloves.
- Wash hands with soap and water prior to leaving the site of administration.
- Attach administration sets to the IV bag and prime it prior to adding the drug to the bag.
- Prime IV tubing and syringes in a ventilated cabinet, never in a patient’s room.
- Never remove tubing from an IV bag containing a hazardous drug.
- Never disconnect tubing at other points in the system until the tubing has been thoroughly flushed.
- When possible, remove the IV bag and tubing intact.
- Place disposable items directly into yellow chemotherapy waste containers and be sure the lid is closed.
- Double bag all contaminated equipment.

**Exposure to Hazardous Drugs During Caregiving**

- Use special precautions when dealing with excreta that may contain high concentrations of hazardous drugs.
- Use universal precautions for all contacts with blood or other potentially infectious materials.
- Wear two pairs of appropriate gloves and a disposable gown when handling patient linens and excreta from patients who have received hazardous drugs within the last 48 hours or, in some cases, up to 7 days; discard them after each use or whenever contaminated.
- Wear face shields if splashing is possible.
- Remove the outer gloves and gown by turning them inside out and placing them into yellow chemotherapy waste containers, then remove the inner gloves.
- Wash hands with soap and water after removing gloves.
- Discard gloves after each use.
- Discard gowns upon leaving the patient-care area.
- Use disposable linen or protective pads for incontinent or vomiting patients.

**Administering Aerosolized Drugs** — Ribavirin, an antiviral drug, is used to treat some infants and young children with lower respiratory syncytial virus (RSV) infections; it is aerosolized to a respirable size of approximately 1.3 μm. It normally is administered to patients in an oxygen tent or wearing a face mask. When administering aerosolized drugs additional precautions may be necessary to protect the employee from exposure, such as:
• Use only NIOSH-approved respirators.
• If possible, administer the drugs using treatment booths with local exhaust ventilation or in isolation rooms with separate HEPA-filtered ventilation systems.
• Follow ASHP or NIOSH guidelines when administering hazardous drugs.
• Permit only trained personnel to administer hazardous drugs.
• Require employees to wear disposable gloves and gowns.
• Prohibit the use of intravenous containers designed with venting tubes.
• Use plastic-backed, absorbent liners under intravenous tubing during administration of hazardous drugs to absorb any leakage.
• Encourage employees to work at waist level, if possible, and avoid working above the head.
• Warn staff who are pregnant or breast-feeding to avoid contact with these drugs.

Storage Recommendations — Work should be carried out in areas that are sufficiently ventilated to prevent the build-up of airborne drug concentrations. Protocols should specify that unvented areas such as storage closets should not be used for drug storage or any tasks involving hazardous drugs. Hazardous drugs should be stored and transported in closed containers that minimize the risk of breakage. The storage area should have sufficient general exhaust ventilation to dilute and remove any airborne contaminants. Depending upon the physical nature and quantity of the stored drugs, consideration should be given to installing a dedicated emergency exhaust fan sufficient in size to quickly purge (to the outdoors) any airborne contaminants within the storage room and to prevent airborne contamination in adjacent areas in the event of a spill.

Housekeeping Recommendations
• Clean work surfaces according to a cleaning protocol that includes use of an appropriate deactivation (if available) and cleaning agent before and after each activity and at the end of the work day.
• Establish periodic cleaning routines for all work surfaces and equipment that may become contaminated, including administration carts and trays.
• At a minimum, require employees to wear safety glasses with side shields and protective gloves; face shields should be worn if splashing or spraying is expected.
• Select protective gloves by referring to the MSDS or glove selection guidelines or by conferring with the glove manufacturer; gloves should be chemically resistant to the deactivation or cleaning agent, and double gloving is recommended.

Hazardous Drug Wastes — The Hazard Communication standard covers bags containing materials contaminated with hazardous drugs:
• Use thick, leakproof plastic bags colored differently from other hospital bags.
• Use these bags for routine collection of discarded gloves, gowns, and other disposable materials.
• Label the bags as hazardous drug wastes.
• Keep waste bags inside a covered waste container clearly labeled “Hazardous Drug Waste Only”; at least one such receptacle should be located in every area where the drugs are prepared or administered.
• Do not move hazardous waste from one area to another.
• Seal the bag when it is full and tape the covered waste container.
• Label needle containers and breakable items of hazardous waste as “Hazardous Drug Waste Only.”
• Be aware that the Bloodborne Pathogens standard requires the use of properly labeled, sealed, and covered disposal containers for wastes containing blood or other potentially infectious materials.

• Dispose of hazardous-drug-related wastes according to EPA, state, and local regulations for hazardous waste; this disposal can occur at either an EPA-compliant incinerator or a licensed sanitary landfill for toxic wastes. Commercial waste disposal must be performed by a licensed company.

• While awaiting its removal, hold the waste in a secure area in covered, labeled drums with plastic liners.

**Spill Control** — Spills are managed according to the workplace hazardous drug spill policy and procedures. The size of the spill might determine both who is authorized to conduct the cleanup and decontamination and how that cleanup is managed. Whenever possible, individuals who are trained in handling hazardous materials should handle the cleanup of large spills (29 CFR 1910.1200). Spill kits and other cleanup materials should be located in the immediate vicinity of a potential, unintentional exposure; however, OSHA requires that persons who wear respirators such as those contained in some spill kits follow a complete respiratory protection program, including fit testing (29 CFR 1910.134). The written program should address the protective equipment required for various amounts spilled, the possible spreading of material, restricted access to hazardous drug spills, and signs to be posted. All spill cleanup materials should be disposed of in a hazardous chemical waste container in accordance with RCRA regulations regarding hazardous waste, not in a chemotherapy waste or biohazard container.

**Medical Surveillance** — In addition to preventing exposure to hazardous drugs and careful monitoring of the environment, medical surveillance is an important part of a safe handling program. NIOSH recommends that employees handling hazardous drugs be encouraged to participate in any medical surveillance programs that are provided at their workplace. The OSHA Technical Manual suggests that workers handling hazardous drugs should be monitored in a medical surveillance program that includes the taking of a medical and exposure history, a physical examination, and some laboratory measures. Professional organizations also recommend medical surveillance as the recognized standard of occupational health practices for hazardous drug handlers.

**List of Hazardous Drugs** — Employers are required by OSHA to develop a hazard communication program appropriate for their workplace. An essential part of such a program is the identification of all hazardous drugs an employee may encounter in the facility. Compliance with the Hazard Communication standard involves evaluating medications to determine which ones meet criteria of hazardous drugs. NIOSH now provides a sample listing of hazardous drugs. Institutions should compare their lists to the sample listing provided by NIOSH. Compliance with the standard requires specific assessments for drugs used at any one time by a facility. Such evaluations must be a continual process. Local hazard communication programs should provide assessment of all new drugs entering the marketplace; when appropriate, the list should be reassessed when drugs are added or removed. Some drugs defined as hazardous may not pose a significant risk of direct occupational exposure due to their dosage or formulation. An additional consideration is the risks associated with altering drugs by crushing tablets or mixing solutions outside of a ventilated cabinet.
K. MEDICAL EQUIPMENT MANAGEMENT

Introduction — The Safe Medical Device Act (SMDA) of 1990 requires all healthcare facilities to report all medical device-related serious injuries and deaths to the manufacturer. The Food and Drug Administration must be notified of all incidents that result in death. The SMDA gives FDA investigators access to the facility and to organizational equipment records. Healthcare facilities should:

- Develop a medical device management program.
- Establish formal reporting and investigation procedures.
- Train staff members how to respond to potentially serious medical device incidents.
- Never release the device or accessories to any outside party until independent testing has been conducted and documented.

Management of Equipment

- Establish criteria for identifying, evaluating, and inventorying all equipment before placing it in use.
- Provide guidance on monitoring and actions to take during equipment recall situations.
- Describe processes for managing an effective, safe, and reliable equipment program.
- Identify and implement all processes for selecting and acquiring medical equipment.
- Evaluate the condition and function of the equipment when received.
- Determine level of training needed by staff before releasing the equipment for use on patients.

The organization may:

- Choose to include all medical equipment in the management plan and use any appropriate strategy, including interval-based predictive maintenance, interval-based inspections, corrective maintenance, or metered maintenance to ensure reliable performance.
- Define intervals for inspecting, testing, and maintaining appropriate equipment.
- Minimize clinical and physical risks by using criteria such as the manufacturer’s recommendations, risk levels, and current organization experience.
- Implement processes for monitoring and acting on equipment hazard notices and recalls.
- Develop procedures for monitoring and reporting equipment incidents that must be reported by the Safe Medical Devices Act of 1990.

Risk assessment criteria should include determining or documenting:

- Equipment function such as diagnosis, care, treatment, or monitoring
- Clinical use or application
- Maintenance requirements
- Equipment incident history

Maintenance, Testing, and Inspecting

- Maintain an up-to-date inventory of all equipment identified in the medical equipment management plan regardless of ownership.
- Document performance and safety testing of all equipment identified in the program before initial use.
• Document maintenance of equipment used for life support consistent with maintenance strategies to minimize any clinical and physical risks identified in the equipment plan.
• Document maintenance of non-life-support equipment consistent with maintenance strategies to minimize clinical and physical risks.
• Document performance testing of all sterilizers used.
• Document chemical and biological testing of water used in renal dialysis based on regulations, manufacturers’ recommendations, and organization experience.

Medical Equipment Reporting — The FDA Modernization Act of 1997 changed medical device adverse event reporting effective in 1998. On January 26, 2000, the FDA published in the Federal Register changes to the implementing regulations (21 CFR 803 and 804) to reflect these amendments and the removal of part 804. The user facility semiannual reporting requirement was changed to annual reporting. The annual report is now due on January 1 of each year. The identity of user facilities that are submitting reports is protected from disclosure except in connection with certain actions brought to enforce device requirements under the Act or a communication to a manufacturer of a device that is the subject of a report to FDA of death, serious illness or injury, or other significant adverse experience.

Safe Medical Device Act of 1990 — The Safe Medical Device Act requires healthcare facilities to report serious or potentially serious device-related injuries or illness of patients and employees to the manufacturer of the device. The FDA wants to obtain important information on device problems. The Act applies to all inpatient facilities, ambulatory surgery care centers, perioperative facilities, diagnostic units, and outpatient treatment centers. It does not apply to physician offices. Failure to comply can result in civil penalties. Healthcare workers that provide care, review patient care, repair devices, or provide preventive maintenance must report device-related incidents. The incidents include device failure, malfunction, design problems, user errors, and inadequate labeling. Reporting responsibilities extend to physicians, nurses, allied health professionals, students, and other organizational personnel. Examples of medical devices include anesthesia machine, pacemaker, heart valve, suture, surgical sponge, wheelchair, hospital bed, catheter, infusion pump, dialysis machine, artificial joint, and implant device.

SMDA Reportable Events — Reportable events include adverse events or problems that must be reported due to medical device regulations. User errors must also be reported. Medical device events involving patient deaths must be reported to the FDA; serious injuries caused by devices or in which devices played a role should be reported to the manufacturer. The FDA requires that hospitals maintain documentation of all reportable events, including the identity of the person who completed the investigation and the information used to form an opinion about the causes of the event. When reporting, use the following forms:

• FDA Form 3500, MedWatch Voluntary Reporting
• FDA Form 3500A, MedWatch Mandatory Reporting Medication and Device Experience Report
• FDA Form 3419, Medical Device Reporting Annual User Facility Report

Suggested Actions — When a device-related incident occurs:

• Protect the device, including packaging material and related parts.
• Document the equipment or device engineering and serial numbers.
• Remove the equipment from use and tag as defective.
• Notify the patient’s physician as appropriate.
• Notify safety, risk management, and appropriate response departments.
• Complete an incident report as required by the policies but within 24 hours.
• File the report with the manufacturer or FDA within 10 days.

Other Reporting Requirements — The FDA mandates the reporting and tracking of designated devices. These devices are primarily medical devices that are permanently implanted in a patient or certain life-sustaining or life-supporting devices used outside of the hospital. The designated devices include vascular grafts, ventricular bypass devices, pacemakers, and implant-type infusion pumps. The Act requires that receipt of tracked devices be reported to the manufacturer and that patient demographic and medical information be reported to the manufacturer upon implanting or use of the device within 5 working days. This enables the manufacturer to trace specified medical devices to patients and to facilitate patient notification and device recall.

I. OSHA HAZWOPER TRAINING FOR SUPPORT PERSONNEL

Healthcare workers dealing with emergencies may be exposed to chemical, biological, physical, or radiological hazards. Protecting healthcare workers who respond to these emergencies is critical. Hospitals responding to these emergencies must be prepared to carry out their missions without jeopardizing the safety and health of their staff. OSHA established a comprehensive rule to protect employee health and safety during hazardous waste operations, including emergency responses to the release of hazardous substances. The Hazardous Waste Operations and Emergency Response (HAZWOPER) rule (29 CFR 1910.120) became effective in 1990. HAZWOPER requires employers, including hospitals, to plan for emergencies if they expect to use their employees to handle an emergency involving hazardous substances. A hospital’s exposure would include treating patients of chemical spills or releases, industrial accidents, or bioterrorist attacks. To determine the appropriate level and type of training needed, hospital personnel should access the exposures in their community. The hospital must also define its role in community emergency response by preplanning and coordinating with other local emergency response organizations such as fire departments.

Training Requirements — The HAZWOPER rule requires varying levels of training for personnel involved in hazardous material releases or cleanup. HAZWOPER is a performance-based regulation that allows individual employers flexibility in meeting the requirements of the regulation in the most economical manner. After determining possible exposures through worst-case scenarios, all employees must be adequately trained to perform their anticipated job duties without endangering themselves or others. Medical personnel who will decontaminate victims must be trained to the first-responder operations level, with an emphasis on the use of PPE and decontamination procedures (29 CFR 1910.120(q)(6)). The employer must certify that personnel are trained to safely perform the job duties and responsibilities. This includes 8 hours of training or demonstrated competencies and annual refreshers. Hospitals may develop an in-house training course on decontamination, PPE use, and measures to prevent the spread of contamination to other portions of the hospital, or they may provide additional training in decontamination and PPE use after sending personnel to a standard first-responder operations level training course. Emergency medical services (EMS) personnel are often the first on the scene and should receive first-responder awareness level training as a minimum. No specific hourly minimum is required, but the training must be sufficient or the employees must have proven experience in specific competencies with an annual refresher. Individuals who develop the decontamination procedures and select PPE for the workers or who help decontaminate patients must be trained to the first-responder operations level, with additional training in decontamination procedures.
Every member of the emergency room staff along with any employee who might be exposed to hazardous substances during an emergency response incident should be familiar with how the hospital intends to respond to hazardous substance incidents; should be trained in the use of PPE; and should be required to participate in scheduled drills. This staff could consist of physicians, nurses, aids, and support personnel such as respiratory therapy, security, and maintenance personnel. Finally, all hospital employees, including ancillary personnel such as housekeeping and laundry staff, must be adequately trained to perform their assigned job duties in a safe manner. If ancillary personnel are expected to clean up the decontamination area, they must receive training in accordance with 29 CFR 191.120(q)(11).

M. SUPPORT DEPARTMENT ERGONOMICS

A number of work-related injuries in healthcare can occur in activities other than patient or resident lifting. Workers in all healthcare departments should be trained to lift correctly. Workers should also know some of the ergonomic risks encountered on the job:

- **Force** is the amount of physical effort required to perform a task or to maintain control of equipment or tools.
- **Repetition** is performing the same motion or series of motions continually or frequently.
- **Awkward postures** are positions that place stress on the body; some of these positions include reaching above shoulder height, kneeling, squatting, leaning over a bed, or twisting the torso while lifting.
- Excessive exposure to these risk factors can result in a variety of disorders in affected workers.

**Storage and Transfer of Food, Supplies, and Medications** — Employees should use carts when moving food trays, cleaning supplies, equipment, maintenance tools, and dispensing medications, as they speed the process of accessing and storing items. The carts should have full-bearing wheels of a material designed for the floor surface in the facility. Cart handles that are vertical, with some horizontal adjustability, allow all employees to push at elbow height and shoulder width; handles that swing out of the way may be useful for saving space or reducing reach. Low-profile medication carts with easy-open side drawers are recommended to accommodate the hand height of shorter nurses. Carts should have wheel locks, and heavy carts should have brakes.

- Place items on the cart so the most frequently used and heavy items are within easy reach, between hip and shoulder height.
- Balance loads and keep loads under cart weight restrictions.
- Be sure the stack height does not block vision.

**Mobile Medical Equipment** — Develop methods and tools to transport equipment:

- **Oxygen tanks** — Use small cylinders with handles to reduce weight and allow for easier gripping; secure oxygen tanks to transport device.
- **Medication pumps** — Use stands on wheels.
- **Transporting equipment** — Push equipment, rather than pull, when possible. Keep arms close to the body and push with the whole body, not just the arms. Remove unnecessary objects to minimize weight. Avoid obstacles that could cause abrupt stops. Place equipment on a rolling device if possible. Take defective equipment out of service.
- Perform routine maintenance on all equipment.
Hand Tools

- Select and use properly designed tools; this enhances tool safety, speeds the process, and reduces waste.
- Be sure handles fit the grip size of the user.
- Use bent-handled tools to avoid bending the wrists.
- Use the appropriate tool weight.
- Select tools that have minimal vibration or vibration damping devices.
- Implement a regular maintenance program for tools to keep blades sharp and edges and handles intact.
- Always wear the appropriate personal protective equipment.

Reaching into Sinks — When cleaning small objects in a deep sink, place an object such as a plastic basin in the bottom of the sink to raise the work surface; an alternative is to use a smaller porous container to hold the objects when soaking them, then transfer them to an adjacent countertop for aggressive cleaning, and then transfer them back to the sink for final rinsing. Store these inserts and containers in a convenient location to encourage consistent use. Note that this technique is not suitable in kitchens or food preparation.

Handling Bags — When handling laundry, trash, or other bags, the use of carts reduces the risk of items being dropped and speeds the process of removing and disposing of items. Receptacles that hold bags of laundry or trash should have side openings that keep the bags within easy reach and allow employees to slide the bag off the cart without lifting. Handles decrease the strain of handling. Chutes and dumpsters should be positioned to minimize lifting. It is best to lower the dumpster or chute rather than lift materials to higher levels. Automatic door openers or hardware that keeps doors open minimize twisting and awkward handling.

General Back Care Safety Tips for Support Personnel

Bending

- Kneel down on one knee (do not bend from the waist when cleaning).
- Bend knees and hips, not the back.
- When leaning forward, move the entire body, not just the arms.

Twisting

- Kneel down on one knee.
- Position yourself so you have the best possible leverage.
- Use arms and legs, not the back, to perform the task.

Repetitive Motions

- Keep loads small.
- Turn the whole body; do not twist.
- Get the body close to the load.
- Do not reach and lift.
- Lift with arms and legs.
- Change position frequently.

Reaching

- Reach only as high as is comfortable; never strain.
- Never reach above shoulder level; use a stool.
- Test the weight of the load.
• Use your arms and legs to do the work.
• Tighten stomach muscles as you lift.

**Pushing and Pulling**
• Stay close to the load but do not lean forward.
• When possible, push instead of pull.
• Use both arms.
• Tighten stomach muscles when pushing.
• Use a carrier with wheels.

**SUMMARY**
This chapter addressed a number of important safety issues and hazards found in key healthcare support departments. The first department addressed in the chapter was environmental services. This key department works to keep healthcare facilities clean and healthy. The dedicated men and women serving in this department deal with physical, chemical, environmental, and biological hazards on a daily basis. The chapter also covered specific hazards such as electrical hazards and working with cleaning equipment. The chapter provided a detailed look at various categories and types of disinfectants and detailed specific safety issues found in healthcare laundries such as handling, sorting, and loading or unloading laundry. The chapter presented an overview of food safety that addressed protecting humans from foodborne illnesses, hazards encountered when preparing meals, and general safety requirements of food preparation areas. The chapter also discussed facility security issues, including patient guidelines, and provided timely information on hazards found in radiology and nuclear medicine departments and related regulations, standards, and safety recommendations. Nonionizing hazards were also covered. Other departments and topics of interest in the chapter included laboratory safety, central sterile supply, pharmacy safety, medical equipment management, hazardous waste operations training, and MRI safety.

**FOR REVIEW AND DISCUSSION**
1. Why would cleaning for safety and health be more important than cleaning simply for appearances?
2. List at least eight topics that must be addressed when training environmental service workers.
3. Define the following terms:
   Sanitize
   Disinfect
   Sterilize
4. Explain the four ways in which a disinfectant works to eliminate pathogens.
5. Explain the difference between an intermediate-level and a low-level disinfectant.
6. List three advantages and three disadvantages of using sodium hypochlorite.
7. Define the term food cross-contamination.
8. What are two common examples of foodborne illnesses?
10. Which agency requires briefing workers about radiation reproductive hazards?
11. Define the radiation terms of \textit{rad} and \textit{rem}.
12. List the three best controls against exposure to external radiation.
13. List and define four types of ionizing radiation found in healthcare environments.
14. What provides the greatest protection against external radiation hazards?
15. Cold foods should be kept within what temperature range?
16. Hot foods on a serving line should be maintained at what minimum temperature?
17. List five departments or functions that have special security risks.
18. Explain the roles of OSHA and the Nuclear Regulator Agency in regulating ionizing radiation.
19. What is the difference between ionizing and nonionizing radiation?
20. What federal agency publishes MRI safety guidelines?
21. List at least five elements that should be included in a hazardous drug safety plan.
22. List the four elements of a medical equipment risk management program.
absorb  To transform radiant energy into a different form, with a resultant rise in temperature.

absorbed dose  The amount of energy deposited by ionizing radiation in a unit mass of tissue. It is expressed in units of joule per kilogram (J/kg) and is called “gray” (Gy).

absorption  (1) Transformation of radiant energy to a different form of energy by the interaction of matter, dependent on temperature and wavelength; (2) the process by which a liquid penetrates the solid structure of the fibers or particles of an absorbent.

accessible emission level  The magnitude of accessible laser (or collateral) radiation of a specific wavelength or emission duration at a particular point as measured by appropriate methods and devices; also means radiation to which human access is possible in accordance with the definitions of the hazard classification of the laser.

accessible emission limit (AEL)  The maximum accessible emission level permitted within a particular class; in ANSI Z136.1, the AEL is determined as the product of accessible emission.

action level  The amount of a material in air at which certain OSHA regulations to protect employees take effect; exposure at or above the action level is termed occupational exposure.

action plan  Documented outline of specific projected activities to be accomplished within a specified period to meet a defined need, goal, or objective.

ALS (Advanced Life Support)  Procedures and techniques utilized by EMT-P.

active electrode  Electrosurgical accessory that directs current flow to the surgical site; also called a cautery tip.

activity (radioactivity)  The rate of decay of radioactive material expressed as the number of atoms breaking down per second; measured in units called becquerels or curies.

acute effect  An adverse effect on humans or animals, with symptoms developing rapidly and quickly becoming a crisis resulting from short-term exposure.

acute radiation exposure  Exposure to radiation that occurs in a matter of minutes as opposed to continuous exposure over a longer period of time.

acute radiation syndrome (ARS)  A serious illness resulting from a person receiving a dose of greater than 50 rads of penetrating radiation in a short time (usually minutes). The earliest symptoms are nausea, fatigue, vomiting, and diarrhea. Hair loss, bleeding, swelling of the mouth and throat, and general loss of energy may follow. If the exposure has been approximately 1000 rads or more, death may occur within 2 to 4 weeks. For more information, see the CDC’s fact sheet on ARS.
adaptation  Change in the structure of an organism that results in its adjustment to its surroundings.

adjustable height bed  A bed with a high/low function such that the height of the sleep surface can be adjusted.

adsorption  A process by which a liquid adheres to the surface of a material but does not penetrate the fibers of the material.

aerobic  Requiring the presence of air or oxygen to live, grow, and reproduce.

aerosol  Liquid droplets or solid particles dispersed in air (0.01 to 100 mm).

agreement state  Any state with which the Nuclear Regulatory Commission has entered into an effective agreement under Section 274b of the Atomic Energy Act of 1954, as amended (73 Stat. 689).

air exchange rate  The speed at which outside air replaces air inside a building or the number of times the ventilation system replaces air within a room or building.

airborne radioactive material  Any radioactive material dispersed in the air in the form of a dust, fume, mist, aerosol, vapor, or gas.

aliphatic  Refers to a major series of organic compounds whose carbon atoms are arranged in straight or branched chains.

alkali  A term normally used to refer to hydroxides and carbonates of the metals of Group IA of the Periodic Table, as well as to ammonium hydroxide.

allergen  A substance or particle that causes an allergic reaction.

alloy  A mixture or solution of metals, either solid or liquid, which may or may not include a nonmetal.

alpha particle  A positively charged particle emitted by certain radioactive materials. It is identical to the nucleus of the helium atom and consists of two neutrons and two protons bound together. It is the least penetrating type of radiation and may be stopped by a sheet of paper. Because of its low penetrating power, external exposure to alpha particles is not considered particularly dangerous; however, damage to internal body tissue by this particle is rather high and is considered quite harmful if the emitting substance enters the body.

alternate site burn  A patient burn resulting from electricity exiting the body by unintended means.

ambient air  Outside or surrounding air.

amercuric (Am)  A silvery metal; a man-made element whose isotopes Am-237 through Am-246 are all radioactive. Am-241 is formed spontaneously by the beta decay of plutonium-241. Trace quantities of americium are widely used in smoke detectors and as neutron sources in neutron moisture gauges.

anemometer  A rotating vane, swinging vane, or hot-wire device used to measure air velocity.

anhydrous  Without water; a substance in which no water is present in the form of a hydrate or water of crystallization.

anion  A negatively charged ion.

annual summary  The occupational injury and illness totals for the year reported on OSHA Form 300; includes company name and address, certification signature, and date.

annual survey  A survey conducted each year by the Bureau of Labor Statistics to produce national data on occupational injury and illness rate. Information is provided by employers from injury and illness records.

anode  The positive electrode in an electrolytic cell.

anosmia  Reduced sensitivity to odor detection.

antidote  An agent that neutralizes or counteracts the effects of a poison.

antimicrobial  An agent that destroys microbial organisms.

antiseptic agent  Substances applied to skin to reduce microbial flora such as alcohols, chlorine, iodine, quaternary ammonium compounds, and triclosan.

aperture  An opening through which radiation can pass.
approved  Method, procedure, equipment, or tool that has been determined to be satisfactory for a particular purpose.

aqueous  A solution or suspension in which the solvent is water.

argon  A gas used as a laser medium; it emits blue–green light primarily at 448 and 515 nm.

aromatic hydrocarbons  A major series of unsaturated cyclic hydrocarbons in which the carbon atoms are arranged in closed rings and which are characterized by the presence of a benzene nucleus.

asbestos  Fibrous magnesium silicate.

asphyxiant  A chemical gas or vapor that can cause unconsciousness or death by suffocation. Simple asphyxiants such as nitrogen use up or displace oxygen in the air. Chemical asphyxiants such as carbon monoxide interfere with the body’s ability to receive or use oxygen.

atom  The smallest particle of an element that can enter into a chemical reaction.

atomic mass number  Total number of protons and neutrons in the nucleus of an atom.

atomic mass unit (amu)  One amu is equal to 1/12 of the mass of a carbon-12 atom.

atomic number (Z)  The number of protons (positively charged particles) in the nucleus of an atom. Each chemical element has a characteristic atomic number. All isotopes of a given element have the same atomic number.

atomic weight  The mass of an atom relative to other atoms based on the mass of the carbon-12 atom. The atomic weight of an atom is approximately equal to the total number of protons and neutrons in its nucleus.

attenuated vaccine  Vaccine that has been weakened but must still be controlled as infectious by some regulatory programs.

attenuation  The decrease in energy (or power) as a beam passes through an absorbing or scattering medium.

autoclave  Device used to sterilize medical instruments and equipment by using steam under pressure.

auto-ignition temperature  Temperature at which a material will self-ignite and maintain combustion without a fire source.

auto-ignition temperature  A feature of a bed where the thigh section of the sleep surface articulates upward as the head section travels upward, thereby reducing the likelihood of the patient or mattress migrating toward the foot end of the bed.

automatic sprinklers  System built in or added to a structure that automatically delivers water in case of fire.

background radiation  The radiation in our natural environment, including cosmic rays and radiation from naturally occurring radioactive elements.

bacteria  Microscopic living organism.

base  A substance that (1) liberates hydroxyl ions when dissolved in water, (2) liberates negative ions of various kinds in any solvent, (3) receives a hydrogen ion from a strong acid to form a weaker acid, (4) gives up two electrons to an acid, forming a covalent bond with the acid.

beam  A collection of rays that may be parallel, convergent, or divergent.

beam diameter  The distance between diametrically opposed points in the cross-section of a circular beam where the intensity is reduced by a factor of $e^{-1}$ (0.368) of the peak level (for safety standards); the value is normally chosen at $e^{-2}$ (0.135) of the peak level for manufacturing specifications.

beam divergence  Angle of beam spread measured in radians or milliradians (1 milliradian = 3.4 minutes of arc, or approximately 1 mil). For small angles where the cord is approximately equal to the arc, the beam divergence can be closely approximated by the ratio of the cord length (beam diameter) divided by the distance (range) from the laser aperture.

becquerel (Bq)  The amount of a radioactive material that will undergo one decay (disintegration) per second.

bed alarms  Alarms intended to notify caregivers of unwanted patient or resident egress or that the patient or resident is near the edge of the mattress.

bed rail extender  A detachable device intended to bridge the space between the head and foot bed rail.
bed rails  Adjustable metal or rigid plastic bars that attach to the bed. They are available in a variety of types, shapes, and sizes ranging from full to one-half, one-quarter, or one-eighth lengths. Synonymous terms are side rails, bed side rails, and safety rails.

beta particle  A particle emitted from a nucleus during radioactive decay; it can be stopped by a sheet of metal or acrylic plastic, depending on the emitted energy level of a particular isotope. If it does reach the skin, beta radiation can cause burns, and beta emitters can be harmful to inside tissue if they enter the body.

bioassay  An assessment of radioactive materials that may be present inside a person’s body through analysis of the person’s blood, urine, feces, or sweat.

biocide  A substance that can kill living organisms.

biodegradable  A substance with the ability to decompose or break down into natural components.

Biological Effects of Ionizing Radiation (BEIR) reports  Reports of the National Research Council’s Committee on the Biological Effects of Ionizing Radiation. For more information, see http://www.nap.edu/books/0309039959/html/.

biological half-life  The time required for one half of the amount of a substance, such as a radionuclide, to be expelled from the body by natural metabolic processes, not counting radioactive decay, once it has been taken in through inhalation, ingestion, or absorption.

bioremediation  The management of microorganisms.

bipolar  Forceps-shaped active electrode; current flows through the tissue from one tip to the other. Does not require a return electrode.

bloodborne pathogens  Pathogenic microorganisms that are present in human blood and can cause disease in humans; these pathogens include, but are not limited to, hepatitis B virus (HBV) and human immunodeficiency virus (HIV).

bloodborne pathogens engineering controls  Controls that isolate or remove the bloodborne pathogens hazard from the workplace (e.g., sharps disposal containers, self-sheathing needles, safer medical devices such as sharps with engineered sharps injury protections and needleless systems).

bloodborne pathogens exposure incident  A specific eye, mouth, other mucous membrane, nonintact skin, or parenteral contact with blood or other potentially infectious materials that results from the performance of an employee’s duties.

BLS (Basic Life Support)  Basic, noninvasive, first-aid procedures and techniques utilized by most trained medical personnel, including first responders, to stabilize critically sick and injured people.

boiling point  The temperature at which a liquid changes to a vapor; expressed in degrees Fahrenheit at sea-level pressure. Flammable materials with a low boiling point generally present special fire hazards.

bolt ring  Closing device used to secure a cover to the body of an open-head drum; this ring requires a nut and bolt to secure the closure.

bonding  The interconnecting of two objects (tanks, cylinders, etc.) with clamps and bare wire as a safety practice to equalize the electrical potential between the objects and help prevent static sparks that could ignite flammable materials. Dispensing or receiving a flammable liquid requires dissipating the static charge by bonding between containers.

breakthrough time  The time from initial chemical contact to detection.

brightness  The visual sensation of the luminous intensity of a light source; the brightness of a laser beam is most closely associated with the radiometric concept of radiance.

brix  A density scale used chiefly in the sugar industry to indicate the sucrose concentration of a solution.

buffer  An acid–base balancing or control reaction in which the pH of a solution is protected from major change when acids or bases are added to it.

building-related illness (BRI)  Diagnosable illnesses with identifiable symptoms that can be attributed to airborne building contaminants.

bung  A threaded closure located in the head or body of a drum.

burn back  The distance a flame will travel from the ignition source back to the aerosol container.
canister or cartridge  A container with a filter, sorbent, or catalyst, or a combination of these items, that removes specific contaminants from air passing through the container.
carbonate  A compound formed by the reaction of carbonic acid with either a metal or an organic compound.
carbon dioxide  A heavy, colorless, nonflammable, relatively nontoxic gas that is produced by the combustion and decomposition of organic substances and as a byproduct of many chemical processes; also used as a firefighting agent.
carbon monoxide  A colorless, odorless, toxic gas generated by the combustion of common fuels in the presence of insufficient air or where combustion is incomplete.
catalyst  An element or compound that accelerates the rate of a chemical reaction but is neither changed nor consumed by it.
carbonic acid  A compound formed by the reaction of carbon dioxide with water.
celastrinogen  Any chemical substance or agent that has been found to induce the formation of cancerous tissue in experimental animals or in humans.
carpal tunnel syndrome  A common affliction caused by compression of the median nerve in the carpal tunnel; often associated with tingling, pain, or numbness in the thumb and first three fingers.
CAS (Chemical Abstracts Service; Columbus, OH)  CAS, a division of the American Chemical Society, assigns the unique numerical identifiers known as CAS Registry Numbers (CASRNs), to chemical compounds; it is also the publisher of Chemical Abstracts and other publications and offers several database services.
CAS number  A number assigned to identify a chemical substance. The Chemical Abstracts Service (CAS) indexes information that appears in Chemical Abstracts, published by the American Chemical Society. The CAS number identifies a specific chemical and is assigned sequentially but possesses no chemical significance. The CAS number provides a concise means of material identification.
ceiling  Maximum allowable exposure limit not to be exceeded for an airborne substance.
Ceiling concentration  Maximum concentration of a toxic substance allowed at any time or during a specific sampling period.
Ceiling limit  Maximum allowable concentration of a toxic substance to which an employee may be exposed in a given time period; normally expressed as threshold limit value (TLV) and permissible exposure limit (PEL).
centigrade  The temperature scale universally used by scientists in which the freezing point of water is represented by 0°C and its boiling point by 100°C; it is also called Celsius, after its inventor, Anders Celsius.
cf chloride  Chlorofluorocarbon; chlorofluorocarbons are being phased out worldwide because of their detrimental effect on the ozone layer.
 CFM  Cubic feet per minute; a unit of measure of airflow that is used when evaluating ventilation systems.
CFR (Code of Federal Regulations)  A codification of rules published in the Federal Register by the executive departments and agencies of the federal government; the code is divided into 50 titles that represent the broad areas subject to federal regulation.
chain reaction  A process that initiates its own repetition. In a fission chain reaction, a fissile nucleus absorbs a neutron and fissions (splits) spontaneously, releasing additional neutrons. These, in turn, can be absorbed by other fissile nuclei, releasing still more neutrons. A fission chain reaction is self-sustaining when the number of neutrons released in a given time equals or exceeds the number of neutrons lost by absorption in nonfissile material or by escape from the system.
characteristic waste  Hazardous waste that exhibits one of four characteristics: ignitability, reactivity, toxicity, or corrosivity.

chemical  An element, compound, or mixture of elements or compounds.

chemical disinfection  The use of formulated chemical solutions to treat and decontaminate infectious waste.

chemical family  A group of compounds with related chemical and physical properties, such as the ketone or aldehyde family.

chemical hygiene plan  A written plan that addresses job procedures, work equipment, protective clothing, and training necessary to protect employees from chemical and toxic hazards; required by OSHA under its laboratory safety standard.

chemical name  Scientific designation of a chemical substance.

chemotherapy  The development and use of chemical compounds that are specific for the treatment of diseases.

CHEMTREC (Chemical Transportation Emergency Center)  An organization that provides immediate information for members on what to do in case of spills, leaks, fires, or exposures.

chlorinated solvent  Organic solvent that contains chlorine atoms; examples are methylene chloride or perchloroethylene.

chocolate  Theobroma oil.

chronic effect  An adverse effect on animals or humans. Symptoms develop slowly over a long period of time or recur frequently.

chronic exposure  Exposure to a substance over a long period of time, possibly resulting in adverse health effects.

class A fire  Fire that involves wood, paper, cloth, trash, or other ordinary materials.

class B fire  Fire that involves gasoline, grease, oil, paint, or other flammable liquids.

class C fire  Fire that involves live electrical equipment.

class D fire  Fire that involves flammable metals.

class K fire  Fire that involves kitchen oils used for frying.

Clean Air Act (CAA)  Public Law (PL) 91-604, 40 CFR 50-80; under EPA jurisdiction, this is the regulatory vehicle that sets limits and monitors airborne pollution that may harm public health or natural resources. The EPA sets national ambient air quality standards; enforcement and issue of discharge permits are carried out by the states under implementation plans.

clinical laboratory  Workplace where diagnostic or other screening procedures are performed on blood or other potentially infectious materials.

closed installation  Location where lasers are used that will be closed to unprotected personnel during laser operation.

CO₂ laser  A widely used laser in which the primary lasing medium is carbon dioxide gas. The output wavelength is 10.6 μm (10600 nm) in the far infrared spectrum. It can be operated either CW or pulsed.

cobalt (Co)  A gray, hard, magnetic, somewhat malleable metal that is relatively rare and generally obtained as a byproduct of other metals, such as copper. Its most common radioisotope, cobalt-60 (Co-60), is used in radiography and medical applications. Cobalt-60 emits beta particles and gamma rays during radioactive decay.

coherence  A term describing light as waves which are in phase in both time and space; monochromaticity and low divergence are two properties of coherent light.

collective dose  The estimated dose for an area or region multiplied by the estimated population in that area or region.

collimated light  Rays that are parallel. Collimated light is emitted by many lasers; diverging light may be collimated by a lens or other device.

collimation  Ability of the laser beam not to spread significantly (low divergence) with distance.

colorimetry  An analytical method by which the amount of a compound in solution can be determined by measuring the strength of its color by either visual or photometric methods.

combustible  A term used to classify certain liquids that will burn on the basis of flash point. NFPA and DOT define combustible liquids as having a flash point of 100°F (38°C) or higher. Nonliquid substances such as wood and paper are classified as ordinary combustibles by NFPA. OSHA defines combustible...
liquids under the Hazard Communication standard as any liquid having a flash point at or above 100°F (38°C) but below 200°F (93.3°C).

combustible material Term usually applied to materials that ignite above 65°C and burn relatively slowly.

committed dose A dose that accounts for continuing exposures expected to be received over a long period of time (such as 30, 50, or 70 years) from radioactive materials that were deposited inside the body.

compliance safety and health officer An OSHA representative whose primary job is to conduct workplace inspections.

concentration The ratio of the amount of a specific substance in a given volume or mass of solution to the mass or volume of solvent.

conductivity The property of a circuit that permits the flow of an electrical current.

Conference of Radiation Control Program Directors (CRCPD) An organization whose members represent state radiation protection programs; for more information, see the CRCPD website (http://www.crcpd.org).

consensus standard A standard developed according to a consensus of agreement among several organizations or individuals.

contaminated The presence or the reasonably anticipated presence of blood or other potentially infectious materials on an item or surface.

contaminated laundry Laundry that has been soiled with blood or other potentially infectious materials or may contain sharps.

contaminated sharps Any contaminated object that can penetrate the skin including, but not limited to, needles, scalpels, broken glass, broken capillary tubes, and exposed ends of dental wires.

contamination, radioactive The deposition of unwanted radioactive material on the surfaces of structures, areas, objects, or people.

continuous mode The duration of laser exposure is controlled by the user (by foot or hand switch).

continuous wave (CW) Constant, steady-state delivery of laser power.
least perceptible) to 130 (average pain level); sound doubles every 10 decibels.

dBA Decibels on the A scale, a unit of measure of sound intensity.

decay Disintegration of the nucleus of an unstable nuclide by spontaneous emission of charged particles or photons.

decay chain (decay series) Series of decays that certain radioisotopes go through before reaching a stable form. For example, the decay chain that begins with uranium-238 (U-238) ends in lead-206 (Pb-206) after forming isotopes such as uranium-234 (U-234), thorium-230 (Th-230), radium-226 (Ra-226), and radon-222 (Rn-222).

decay constant The fraction of a number of atoms of a radioactive nuclide that disintegrates in a unit of time; the decay constant is inversely proportional to the radioactive half-life.

decay products (or daughter products) The isotopes or elements formed and the particles and high-energy electromagnetic radiation emitted by the nuclei of radionuclides during radioactive decay; also known as decay chain products or progeny (the isotopes and elements). A decay product may be either radioactive or stable.

decay, radioactive Disintegration of the nucleus of an unstable atom by the release of radiation.

decomposition The breakdown of a chemical or substance into different parts or simpler compounds; decomposition can occur due to heat, chemical reaction, decay, etc.

decontamination The reduction or removal of radioactive or other types of contamination from a structure, object, or person.

defatting The removal of natural oils from the skin by the use of a fat-dissolving solvent.

delayed treatment Second priority in patient treatment according to the S.T.A.R.T. triage system; these people require aid but their injuries are less severe than those of other patients. A hospitalized patient may be categorized from “guarded” to “serious,” requiring at least minimal hospital services.

deluge All heads are open and water is released from a main valve.

demand respirator An atmosphere-supplying respirator that admits breathing air to the face piece only when a negative pressure is created inside the face piece by inhalation.

denaturant A substance added to ethyl alcohol to prevent its being used for internal consumption.

denier A term used in the textile industry to designate the weight per unit length of a filament.

density The ratio of weight (mass) to volume of any substance; usually expressed as grams per cubic centimeter; water has a density of 1.

depleted uranium Uranium containing less than 0.7% uranium-235, the amount found in natural uranium.

deposition density The activity of a radionuclide per unit area of ground. Reported as becquerels per square meter or curies per square meter.

dermatitis An inflammation of the skin caused by defatting of the dermis.

desiccant A chemical substance that absorbs moisture.

deterministic effects Effects that can be related directly to the radiation dose received; the severity increases as the dose increases. A deterministic effect typically has a threshold below which the effect will not occur.

deuterium A nonradioactive isotope of the hydrogen atom that contains a neutron in its nucleus in addition to the one proton normally seen in hydrogen. A deuterium atom is twice as heavy as normal hydrogen.

dfm Acronym that refers to a respirator filter cartridge suitable for use against dusts, fumes, or mists.

dielectric A material that is an electrical insulator or in which an electric field can be sustained with a minimum dissipation of power.

diffuse reflection Occurs when different parts of a beam incident on a surface are reflected over a wide range of angles in accordance with Lambert’s law. The intensity will fall off as the inverse of the square of the distance away from the surface and also obey a cosine law of reflection.

dirty bomb A device designed to spread radioactive material by conventional explosives when the bomb explodes. A dirty bomb kills
or injures people through the initial blast of the conventional explosive and spreads radioactive contamination over possibly a large area, hence the term “dirty.” Such bombs could be miniature devices or large truck bombs. A dirty bomb is much simpler to make than a true nuclear weapon.

disabling injury An injury that prevents a person from performing a regularly established job for 24 hours beyond the day of occurrence.

disinfectant Chemical agent with the ability to kill more than 99% of microorganisms; registered by the EPA for public health use. The EPA registers three types: limited, broad-spectrum, and hospital.

divergence Increase in the diameter of a laser beam with distance from the exit aperture. The value gives the full angle at the point where the laser radiant exposure or irradiance is $e^{-1}$ or $e^{-2}$ of the maximum value, depending on which criterion is used.

dose Quantity of radiation absorbed per unit of mass by the body or by any portion of the body. Units of dose measurement are the rad, the roentgen, and the rem.

dose coefficient The factor used to convert radionuclide intake to dose; usually expressed as dose per unit intake (e.g., sieverts per becquerel).

dose equivalent A quantity used in radiation protection to place all radiation on a common scale for calculating tissue damage. Dose equivalent is the absorbed dose in grays times the quality factor. The quality factor accounts for differences in radiation effects caused by different types of ionizing radiation. Some radiation, including alpha particles, causes a greater amount of damage per unit of absorbed dose than other radiation. The sievert (Sv) is the unit used to measure dose equivalent.

dose, radiation Radiation absorbed by person’s body. Several different terms describe radiation dose.

dose rate The radiation dose delivered per unit of time.

dose reconstruction A scientific study that estimates doses to people from releases of radioactivity or other pollutants. The dose is reconstructed by determining the amount of material released, the way people came into contact with it, and the amount they absorbed.

dose–response The relationship between the amount of a toxic or hazardous substance and the extent of illness or injury produced.

dosimeter A small portable instrument (such as a film badge, thermoluminescent dosimeter [TLD], or pocket dosimeter) for measuring and recording the total accumulated dose of ionizing radiation a person receives.

dosimetry Assessment (by measurement or calculation) of radiation dose.

drop test A test required by DOT regulations to determine the quality of a container or finished product.

dry bulb temperature The temperature of air measured with a dry bulb thermometer in a psychrometer to measure relative humidity.

dry pipe Piping under pressure; when the head opens, air is released and water flows into the system.

dusts Solid particles generated by handling, crushing, grinding, rapid impact, detonation, and decrepitation of organic or inorganic materials such as rock, ore, metal, coal, wood, and grain. Dusts do not tend to flocculate, except under electrostatic forces; they do not diffuse in air but settle under the influence of gravity.

EDA (Emergency Declaration Area) Officially designated area for cleanup of hazardous waste or materials, such as at a National Priorities List hazardous waste site.

effective dose A dosimetric quantity useful for comparing the overall health affects of irradiation of the whole body; takes into account the absorbed doses received by various organs and tissues and weighs them according to present knowledge of the sensitivity of each organ to radiation. It also accounts for the type of radiation and the potential for each type to inflict biologic damage. The effective dose is used, for example, to compare the overall health detriments of different radionuclides in a given mix. The unit of effective dose is the sievert (Sv); 1 Sv = 1 J/kg.

effective half-life The time required for the amount of a radionuclide deposited in a living organism to be diminished by 50% as a result of the combined action of radioactive decay and biologic elimination.

elastomer A term coined about 1935, when synthetic rubber-like materials were introduced on a commercial scale; to describe any
high polymer having the essential properties of vulcanized natural rubber.

electrochemistry That portion of chemistry concerned primarily with the relationship between electrical forces and chemical reactions.

electrode A material used in an electrolytic cell that allows the current to enter or leave the solution.

electrolysis Decomposition of a chemical compound by means of an electric current.

electron An elementary particle with a negative electrical charge and a mass 1/1837 that of a proton. Electrons surround the nucleus of an atom because of the attraction between their negative charge and the positive charge of the nucleus. A stable atom will have as many electrons as it has protons. The number of electrons that orbit an atom determines its chemical properties.

electron volt (eV) A unit of energy equivalent to the amount of energy gained by an electron when it passes from a point of low potential to a point 1 volt higher in potential.

electrosurgery Radiofrequency energy used to cut and cause coagulation of body tissues.

electrosurgical unit Machine that produces radiofrequency energy for electrosurgery; also known as a *Bovie*, *power unit*, or *generator*.

element (1) All isotopes of an atom that contain the same number of protons; for example, the element uranium has 92 protons, and the different isotopes of this element may contain 134 to 148 neutrons. (2) In a reactor, a fuel element is a metal rod containing the fissile material.

embedded laser A laser with an assigned class number higher than the inherent capability of the laser system in which it is incorporated, where the system’s lower classification is appropriate to the engineering features limiting accessible emission.

**Emergency Response Guide** A document providing guidance on emergency response in a transportation incident involving a particular chemical; the term is used within the context of U.S. Department of Transportation requirements.

emergency situation Any occurrence such as, but not limited to, equipment failure, rupture of containers, or failure of control equipment that may or does result in an uncontrolled substantial release of an airborne contaminant.

employee exposure An exposure to a concentration of an airborne contaminant that would occur if the employee were not using respiratory protection.

EMT (Emergency Medical Technician) An individual trained in Basic Life Support according to the standards prescribed by the Health and Safety Code and who has a current and valid EMT-I certificate. This definition includes EMT-I (NA), EMT-FS, and EMT-II.

EMT-II (Emergency Medical Technician II) An individual with additional training in limited Advanced Life Support according to the standards prescribed by the Health and Safety Code and who has a current and valid certificate.

EMT-P An individual EMT-I or EMT-II who has received additional training in Advanced Life Support according to the Health and Safety Code and who has a current and valid county certificate.

eulsion A stable mixture of two or more liquids held in suspension by small percentages of substances called *emulsifiers*.

enclosed laser device Any laser or laser system located within an enclosure that does not permit hazardous optical radiation emission from the enclosure; the laser inside is termed an *embedded laser*.

end-of-service-life indicator (ESLI) System that warns the respirator user of the approach of the end of adequate respiratory protection; for example, the sorbent is approaching saturation or is no longer effective.

end point That point in a titration at which no further addition of titrating solution is necessary.

endothermic A term used to characterize a chemical reaction that requires absorption of heat from an external source.

energy (Q) Capacity for doing work; energy is commonly used to express the output from pulsed lasers and is generally measured in Joules (J). It is the product of power (watts) and duration (seconds); 1 watt second = 1 Joule.

engineering controls Preferred method of controlling employee exposures in the workplace; engineering controls involve modifying the workplace environment.
enriched uranium  Uranium in which the proportion of the isotope uranium-235 has been increased by removing uranium-238 mechanically.

entrapment  An event in which a patient is caught, trapped, or entangled in the spaces in or about the bed rail, mattress, or hospital bed frame; entrapment can result in serious injury or death.

enzyme  Complex protein produced by living cells that initiates biochemical reactions.

EPA (U.S. Environmental Protection Agency)  A federal agency with environmental protection regulatory and enforcement authority; administers the Clean Air Act, Clean Water Act, Resource Conservation and Recovery Act, Toxic Substances Control Act, and other federal environmental laws.

epidemiology  The study of the distribution and determinants of health-related states or events in specified populations and the application of this study to the control of health problems.

ergonomics  A multidisciplinary activity that deals with interactions between workers and their total working environment plus stresses related to environmental elements such as atmosphere, heat, light, and sound, as well as tools and equipment in the workplace.

escape-only respirator  Respirator intended to be used only for emergency exit.

etiologic agent  A viable microorganism or its toxin that can cause human disease.

evaporation rate  The rate at which a material is converted to a vapor at a given temperature and pressure when compared to the evaporation rate of a given substance.

excimer  Gas mixture used as the active medium in a family of lasers emitting ultraviolet light.

exhaust ventilation  The removal of air from any space, usually by mechanical means. The flow of air between two points is due to the occurrence of a pressure difference between the two points; this pressure difference causes air to flow from the high-pressure zone to the low-pressure zone.

exothermic  A term used to characterize a chemical reaction that gives off heat as it proceeds.

experience rating  Process of basing insurance or worker’s compensation fund premiums on the insured’s record.

explosion class 1  Flammable gas/vapor.

explosion class 2  Combustible dust.

explosion class 3  Ignitable fibers.

explosion-proof  An electrical apparatus designed so that the explosion of flammable gas or vapor inside an enclosure will not ignite flammable gas or vapor outside.

explosive limit  The amount of vapor in the air that forms an explosive mixture.

exposure  Subjection to a hazardous chemical or biological substance through any route of entry (inhalation, ingestion, skin contact, absorption, etc.).

exposure (radiation)  A measure of ionization in air caused by x-rays or gamma rays only. The unit of exposure most often used is the roentgen.

exposure level  The level or concentration of a physical or chemical hazard to which an individual is exposed.

exposure limit  Concentration of a substance under which it is believed that nearly all workers may be repeatedly exposed day after day without adverse effects. ACGIH limits are referred to as TLVs; OSHA limits, as PELs.

exposure pathway  A route by which a radionuclide or other toxic material can enter the body; the main exposure routes are inhalation, ingestion, absorption through the skin, and entry through a cut or wound in the skin.

exposure rate  A measure of the ionization produced in air by x-rays or gamma rays per unit of time (frequently expressed in roentgens per hour).

external exposure  Exposure to radiation outside of the body.

exudate  Material such as fluid, cells, or cellular debris that has escaped from blood vessels and is in tissue material.

face velocity  Average air velocity into the exhaust system measured at the opening into the hood or booth.

Fahrenheit  The temperature scale commonly used in the United States; the freezing point of water is 32°F and the boiling point is 212°F at sea level.
fail-safe interlock An interlock where the failure of a single mechanical or electrical component of the interlock will cause the system to go into, or remain in, a safe mode.

fallout, nuclear Minute particles of radioactive debris that descend slowly from the atmosphere after a nuclear explosion.

FDA U.S. Food and Drug Administration.

Federal Register A publication that officially documents rules and regulations promulgated under law; it is published each day following a government working day and is a supplement to the Code of Federal Regulations.

FEMA Federal Emergency Management Agency.


film badge A package of photographic film worn like a badge by persons working with or around radioactive material to measure exposure to ionizing radiation; the absorbed dose can be calculated from the degree of film darkening caused by the irradiation.

filter or air-purifying element A component used in respirators to remove solid or liquid aerosols from the inspired air.

filtering face piece (dust mask) Negative-pressure particulate respirator with a filter as an integral part of the face piece or an entire face piece composed of the filtering medium.

fremain's pole A pole secured (floor and ceiling moorings) next to a bed that acts as a support for the patient to get into and out of the bed.

first aid According to OSHA, any one-time treatment and subsequent observation of minor scratches, cuts, burns, and splinters that normally does not require medical care; it is also aid provided by qualified first responders until more qualified medical aid arrives.

First Report State-published worker's compensation form used to report work-related injuries and illnesses; the form may qualify as a substitute for OSHA Form 301.

first responder Personnel who have the responsibility to initially respond to emergencies such as firefighters, police officers, highway patrol officers, lifeguards, forestry personnel, ambulance attendants, and other public service personnel. State law requires such persons to have completed a first aid course and to be trained in cardiopulmonary resuscitation.

fissile material Any material in which neutrons can cause a fission reaction; the three primary fissile materials are uranium-233, uranium-235, and plutonium-239.

fission (fissioning) The splitting of a nucleus into at least two other nuclei that releases a large amount of energy. Two or three neutrons are usually released during this transformation.

fit factor A quantitative estimate of the fit of a particular respirator to a specific individual; typically estimates the ratio of the concentration of a substance in ambient air to its concentration inside the respirator when worn.

fit test The use of a protocol to qualitatively or quantitatively evaluate the fit of a respirator on an individual.

flame arrester A mesh or perforated metal insert within a flammable storage can that protects its contents from external flame or ignition.

flame extension The distance a flame will travel from an aerosol container when exposed to an ignition source.

flame retardant A substance applied to or incorporated in a combustible material to reduce or eliminate its tendency to ignite when exposed a low-energy flame.

flammable Describes a substance with a flash point less than 100°F and vapor pressure not over 50 psia at 100°F (definition may vary).

flammable liquid A liquid with a flash point below 100°F (37.8°C).

flash back A phenomenon characterized by vapor ignition and flame traveling back to the vapor source.

flash point (1) The temperature at which an organic liquid evolves a high enough concentration of vapor at or near its surface to form an ignitable mixture with air. (2) The lowest temperature at which a flammable vapor-air mixture will ignite when an ignition source is introduced.

flocculation The process to make solids in water increase in size by biological or chemical means so they may be separated from water.

fluorocarbon Any of a broad group of organic compounds analogous to hydrocarbons in
which most of the hydrogen atoms of a hydrocarbon have been replaced by fluorine. Some types also contain chlorine and are called chlorofluorocarbons (CFCs).

**flux** Any material or substance that will reduce the melting or softening temperature of another material when added to it.

**FM (Factory Mutual)** A national testing laboratory and approval service recognized by OSHA.

**fomite** An object not harmful in itself but one that can harbor pathogenic microorganisms.

**fractionated exposure** Exposure to radiation that occurs in several small acute exposures rather than continuously as in a chronic exposure.

**frequency** The number of wave cycles in a second, measured in units called hertz.

**FRP** Fiberglass-reinforced plastic.

**fumes** Particulate matter consisting of the solid particles generated by condensation from the gaseous state, generally after violation from melted substances, and often accompanied by a chemical reaction, such as oxidation.

**fungi** Organisms that lack chlorophyll and must receive food from decaying matter.

**fusion** A reaction in which at least one heavier, more stable nucleus is produced from two lighter, less stable nuclei. Reactions of this type are responsible for the release of energy in stars or in thermonuclear weapons.

**galvanizing** Application of a protective layer of zinc to a metal, chiefly steel, to prevent or inhibit corrosion.

**gamma radiation** High-energy photon; short-wavelength, ionizing, electromagnetic radiation emitted by nuclei of radioactive atoms during radioactive decay.

**gamma rays** High-energy electromagnetic radiation emitted by certain radionuclides when their nuclei transition from a higher to a lower energy state. These rays have high energy and a short wavelength. All gamma rays emitted from a given isotope have the same energy, a characteristic that enables scientists to identify which gamma emitters are present in a sample. Gamma rays penetrate tissue farther than do beta or alpha particles but leave a lower concentration of ions in their path to potentially cause cell damage. Gamma rays are very similar to x-rays.

**gas** A state of matter in which a material has very low density and viscosity; gases expand and contract greatly in response to changes in temperature and pressure.

**gas discharge laser** A laser containing a gaseous lasing medium in a glass tube in which a constant flow of gas replenishes the molecules depleted by the electricity or chemicals used for excitation.

**gas/vapor sterilization** A waste treatment technique that uses gases or vaporized chemicals such as ethylene oxide and formaldehyde as sterilizing agents.

**gauge** Thickness of the steel used to manufacture a drum; the lower the gauge, the thicker the material. It is also used to measure glove thickness in inches.

**Geiger counter** A radiation detection and measuring instrument consisting of a gas-filled tube containing electrodes, between which an electrical voltage but no current flows. When ionizing radiation passes through the tube, a short, intense pulse of current passes from the negative electrode to the positive electrode and is measured or counted. The number of pulses per second measures the intensity of the radiation field. Geiger counters are the most commonly used portable radiation detection instruments.

**generator** Any person, organization, or agency whose act or process produces medical waste or causes waste to become subject to regulation.

**genetic effects** Hereditary effects (mutations) that can be passed on through reproduction because of changes in sperm or ova.

**glacial** A term applied to a number of acids, which, in a highly pure state, have a freezing point slightly below room temperature.

**gram** A standard unit of mass (weight) equivalent to 1/453.49 pound.

**GRAS (Generally Recognized as Safe)** Referring to those food additives that meet the requirements of the Food and Drug Administration.

**gravimetric** A term used by analytical chemists to denote methods of quantitative analysis that depend upon the weight of the components in the sample.

**gray (Gy)** A unit of measurement of the amount of energy absorbed in a material. The
Gy can be used for any type of radiation but does not describe the biological effects of the different radiations. 

Conducting body (e.g., the Earth or an object connected to Earth) that can neutralize a charged particle.

Half-life (1) The time any substance takes to decay by half of its original amount. (2) The time required for half of the nucleus of one atom of a particular radioactive substance to disintegrate to another nuclear form; may range from a few minutes to thousands of years.

A term (literal meaning "saltmaker") that refers to the five elements of Group VIIA of the Periodic Table: fluorine, chlorine, bromine, iodine, and astatine.

Refers to either antiseptic handwash or antiseptic hand rub.

A general term that applies to either handwashing, antiseptic handwash, antiseptic hand rub, or surgical hand antisepsis.

Devices attached to either side of the bed to give patients or residents the ability to reposition themselves while in bed; also serves as an aid for the patient to enter or leave the bed.

A structured means of evaluating a complex process to reveal problems associated with the operability or safety of the process.

Nine descriptive terms established by the United Nations Committee of Experts to categorize hazardous chemical, physical, and biological materials: flammable liquids, explosives, gaseous oxidizers, radioactive materials, corrosives, flammable solids, poisons, infectious substances, and dangerous substances.

(1) A classification system that uses a four-color diamond to communicate health, flammability, reactivity, and specific hazard information for a chemical substance. (2) A numbering system that rates hazards from 0 (lowest) to 4 (highest).

Any chemical that poses a physical or health hazard.

A substance or material that has been determined by the Department of Transportation to pose an unreasonable risk to health, safety, and property when transported in commerce (49 CFR 171.8).

Under RCRA, any solid or combination of solid wastes that, because of its physical, chemical, or infectious characteristics, may pose a hazard when not managed properly.

Hepatitis B virus.

Hazard communication standard; the OSHA standard cited in 29 CFR 1910.1200 requiring communication of risks from hazardous substances to workers in regulated facilities.

A chemical for which there is statistically significant evidence that acute or chronic health effects may occur in exposed individuals.

A scientific field that focuses on protection of humans and the environment from radiation. Health physics uses physics, biology, chemistry, statistics, and electronic instrumentation to help protect individuals from any damaging effects of radiation.

Preventing or minimizing noise-induced deafness through the use of hearing protection devices, engineering methods, annual audiometric tests, and employee training.

A laser in which the active medium is a mixture of helium and neon; its wavelength is usually in the visible range. It is used widely for alignment, recording, printing, and measuring.

A rigid respiratory inlet covering that also provides head protection against impact and penetration.

A filter that is at least 99.97% efficient in removing monodispersed particles 0.3 μm in diameter and larger. The equivalent NIOSH 42 CFR 84 particulate filters are the N100, R100, and P100 filters.

Mat placed next to the bed to absorb the shock if the patient falls from the bed.

The radioactive material resulting from spent nuclear fuel reprocessing. This can include liquid waste directly produced in reprocessing or any solid material derived from the liquid wastes having a sufficient concentration of fission products. Other radioactive materials can be designated as high-level waste if they require permanent isolation. This determination is made by the
Nuclear Regulatory Commission on the basis of criteria established in U.S. law.
HIV Human immunodeficiency virus.
HMAC (Hazardous Materials Advisory Council) National organization that represents the hazardous materials industry; devoted to safety in transportation and handling of hazardous materials.
HMRs (Hazardous Materials Regulations) Regulations administered and enforced by DOT covering the transportation of hazardous materials by air, highway, rail, water, and intermodal means.
hood A respiratory inlet covering that completely covers the head and neck and may also cover portions of the shoulders and torso.
Hospital Emergency Incident Command System (HEICS) A generic crisis management plan expressly for comprehensive medical facilities that is modeled closely after the Fire Service Incident Command System.
hot spot Any place where the level of radioactive contamination is considerably greater than in the area around it.
HSWA (Hazardous and Solid Waste Amendments) The 1984 amendments to the RCRA establishing a timetable for more stringent regulation of RCRA-covered activities.
humidity (relative) The ratio of the amount of water vapor present in air at a given temperature to the maximum that can be held by air at that temperature, i.e., saturation.
HVAC Heating, ventilating, and air conditioning system.
hydrocarbon Any compound composed of carbon and hydrogen.
hydrophilic A term that refers to substances that tend to absorb and retain water.
hydrophobic A term that describes substances that repel water.
hygroscopic A term used to describe solid or liquid materials that pick up and retain water vapor from the air.
hypersensitivity diseases Diseases characterized by allergic responses to animal antigens; often associated with indoor air quality conditions such as asthma and rhinitis.
I.D./O.D. Inside/outside diameter of a container.
ignitable A solid, liquid, or compressed gas that has a flash point less than 140°F.
ignition temperature Lowest temperature at which a substance can catch fire and continue to burn.
illumination The amount of light a surface receives per unit area, expressed in lumens per square foot or foot candles.
immediate danger to life or health (IDLH) An exposure to a concentration of a hazardous substance in the air that can threaten life or cause irreversible health effects.
immediate threat to life Would cause irreversible adverse health effects or would impair an individual's ability to escape from a dangerous atmosphere.
immediate treatment First level of patient priority according to the S.T.A.R.T. triage system; a patient who requires rapid assessment and medical intervention in order to increase chances of survival; a hospitalized patient who may be classified from "serious to "critical" and is capable of being treated and discharged.
immiscible A term used to describe substances of the same phase that cannot be uniformly mixed or blended.
Incident Command System (ICS) A flexible organizational structure that provides a basic expandable system; developed by the Fire Services to mitigate any size emergency situation.
incident commander (IC) The individual who holds overall responsibility for incident response and management.
incompatible The term used to indicate that one material cannot be mixed with another without the possibility of a dangerous reaction.
indicator A measurement used to evaluate program effectiveness within an organization.
indoor air quality (IAQ) (1) The study, evaluation, and control of indoor air quality related to temperature, humidity, and airborne contaminants. (2) A general term encompassing a multitude of issues related to complaints by the occupants of buildings about illnesses or discomfort resulting from being in the building.
inert Having little or no chemical affinity or activity.
infectious waste Waste containing pathogens that can cause infectious disease in humans.
infectious  Capable of invading a susceptible host, replicating, and causing an altered host reaction commonly referred to as a disease.

infrared radiation (IR)  Invisible electromagnetic radiation with wavelengths that lie within the range of 0.70 to 1000 μm; these wavelengths are often broken up into regions: IR-A (0.7–1.4 μm), IR-B (1.4–3.0 μm), and IR-C (3.0–1000 μm).

infrared spectrophotometer  Operates in the region of electromagnetic radiation of lower energy than visible, also known as heat waves; used primarily for identifying organic compounds.

ingestion  (1) The act of swallowing, or taking a substance into the body through the mouth.  (2) In the case of radio-nuclides or chemicals, swallowing radionuclides or chemicals by eating or drinking.

inhalation  (1) The act of breathing in an airborne substance into the body; may be in the form of a gas, vapor, fume, mist, or dust.  (2) In the case of radionuclides or chemicals, breathing in radionuclides or chemicals.

inhibitor  Any substance that retards or reduces the rate of a chemical reaction.

innocuous  Harmless.

inorganic  Refers to a major and the oldest branch of chemistry concerned with substances that do not contain carbon.

interdisciplinary team  May vary in constituency depending on the nature of the care and service setting and the patients’ needs; members may include, but are not limited to, the patient; family member (or patient’s legal representative); nursing, social services, and dietary personnel; attending physician (or designee); medical director; rehabilitation and occupational therapists; and medical equipment suppliers.

interior structural firefighting  The physical activity of fire suppression or rescue, or both, inside of buildings or enclosed structures that are involved in a fire situation beyond the incipient stage.

internal exposure  Exposure to radioactive material taken into the body.

intrabeam viewing  The viewing condition whereby the eye is exposed to all or part of a direct laser beam or a specular reflection.

iodine  A nonmetallic solid element. Iodine has both radioactive and nonradioactive isotopes; the radioactive isotopes are widely used in medical applications. Radioactive iodine is a fission product and is the largest contributor to people’s radiation dose after an accident at a nuclear reactor.

ion  An atom that has fewer or more electrons than it has protons, causing it to have an electrical charge and be chemically reactive.

ionization  The process of adding one or more electrons to, or removing one or more electrons from, atoms or molecules to create ions; high temperatures, electrical discharges, or nuclear radiation can cause ionization.

ionizing radiation  Any radiation capable of displacing electrons from atoms, thereby producing ions. High doses of ionizing radiation may produce severe skin or tissue damage.

irradiance (E)  Radiant flux (radiant power) per unit area incident upon a given surface; measured as watts per square centimeter. (Sometimes referred to as power density, although not exactly correct.).

irradiation  Exposure to radiation.


isomer  One of two or more compounds having the same molecular weight and formula but often having quite different properties and somewhat different structure.

isotonic  Having the same osmotic pressure as the fluid phase of a cell or tissue.

isotope  One of two or more atoms with the same atomic number (the same chemical element) but with different atomic mass; the atomic mass determines the isotope and varies with the number of neutrons.

IUPAC  International Union of Pure and Applied Chemistry.

job hazard analysis  The breaking down of methods, tasks, or procedures into components to determine hazards.

joule  Unit of energy used to describe a single pulsed output of a laser; equal to 1 watt-second or 0.239 calories.

kaolin  The most widely used industrial type of clay (aluminum silicate).
ketone  A class of unsaturated and reactive compounds whose formula is characterized by a carbonyl group to which two organic groups are attached.

kilogram  Equal to about 2.2 pounds (1 ounce = 28 grams).

kiloton (Kt)  The energy of an explosion that is equivalent to an explosion of 1000 tons of TNT; 1 kiloton equals 1 trillion (1012) calories.

kinetic energy  The energy that a particle or an object possesses due to its motion or vibration.

Kjeldahl  An analytical method for determination of nitrogen in certain organic compounds.

lab pack  Generally refers to any small container of hazardous waste in an overpacked drum; not restricted to laboratory wastes.

lacquer  A type of organic coating in which rapid drying is effected by evaporation of solvents.

laser (light amplification by stimulated emission of radiation)  A cavity with mirrors at either end, filled with a material such as crystal, glass, liquid, gas, or dye. It produces an intense beam of light with the unique properties of coherency, collimation, and monochromaticity.

laser medium  Material used to emit the laser light and for which the laser is named.

laser rod  A solid-state, rod-shaped lasing medium in which ion excitation is caused by a source of intense light, such as a flash lamp; various materials are used for the rod, the earliest of which was synthetic ruby crystal.

laser safety officer (LSO)  One who has authority to monitor and enforce measures to control laser hazards and to perform the knowledgeable evaluation and control of laser hazards.

laser system  An assembly of electrical, mechanical, and optical components that comprise a laser; under federal standards, a laser in combination with its power supply (energy source).

latent period  The time between exposure to a toxic material and the appearance of a resultant health effect.

lead (Pb)  A heavy metal; several isotopes of lead, such as Pb-210 which emits beta radiation, are in the uranium decay chain.

Lead Federal Agency (LFA)  The federal agency that leads and coordinates the emergency response activities of other federal agencies during a nuclear emergency.

leak test  A test performed to detect leakage of a radiation source.

lens  A curved piece of optically transparent material which, depending on its shape, is used to either converge or diverge light.

lifting pole  A device suspended above the bed for the patient to grip to change position.

light  The range of electromagnetic radiation frequencies detected by the eye, or the wavelength range from about 400 to 760 nm. The term is sometimes used loosely to include radiation beyond visible limits.

light-emitting diode (LED)  A semiconductor diode that converts electric energy efficiently into spontaneous and noncoherent electromagnetic radiation at visible and near-infrared wavelengths.

limiting aperture  Maximum circular area over which radiance and radiant exposure can be averaged when determining safety hazards.

liquid crystal display (LCD)  A constantly operating display that consists of segments of a liquid crystal for which the reflectivity varies according to the voltage applied to them.

liter  A standard unit of volume for gases and liquids.

local emergency planning committee  A group defined under SARA as responsible for developing emergency plans.

local exhaust ventilation  A ventilation system that captures and removes contaminants at the point where they are produced before they can escape into the work area.

local radiation injury (LRI)  Acute radiation exposure (more than 1000 rads) to a small, localized part of the body. Most local radiation injuries do not cause death; however, if the exposure is from penetrating radiation (neutrons, x-rays, or gamma rays), internal organs may be damaged and some symptoms of acute radiation syndrome (ARS), including death, may occur. Local radiation injury invariably involves skin damage, and a skin graft or other surgery may be required.

loose-fitting face piece  A respiratory inlet covering that is designed to form a partial seal with the face.
loss ratio  A fraction calculated by dividing losses by the amount of premiums.

lost workdays  The number of workdays an employee is away from work beyond the day of injury or onset of illness.

low bed  Defined according to the patient; a bed is considered low if, when the patient is sitting on the side of the bed with feet on the floor, the angle of the patient's bent knees is 90 degrees or less.

low-level waste (LLW)  Radioactively contaminated industrial or research waste such as paper, rags, plastic bags, medical waste, and water-treatment residues; waste that does not meet the criteria for any of three other categories of radioactive waste: spent nuclear fuel and high-level radioactive waste, transuranic radioactive waste, or uranium mill tailings. Its categorization does not depend on the level of radioactivity it contains.

lower explosive limit (LEL)  Lowest concentration of a substance that will produce a fire or flash when an ignition source is present; expressed as a percent of vapor or gas in the air by volume.

LP (liquefied petroleum) gas  A gas usually comprised of propane and some butane created as a byproduct of petroleum refining.

lumbar  The section of the lower vertebral column immediately above the sacrum; located in the small of the back, it consists of five large lumbar vertebrae. It is a highly stressed area in work situations and in supporting the body structure.

-lysis  A suffix commonly used in chemical terminology; derived from the Greek word for "to free" or "to loosen."

mass  Refers to the amount of material substance present in a body, irrespective of gravity.

mass spectroscopy  Identifies compounds by breaking them up into all combinations of ions and measuring mass-to-charge ratios at a detector.

Material Safety Data Sheet (MSDS)  A document that contains descriptive information on hazardous chemicals per OSHA's Hazard Communication standard; data sheets also provide precautionary information, safe handling procedures, and emergency first aid procedures.

mattress with raised edges  A mattress that has a perimeter configured in a manner that allows the patient or resident to be "cradled" in the center of the mattress and reduces the likelihood of unwanted patient egress. It has a central area on the side of the mattress that is not raised and is used for egress.

maximum permissible exposure (MPE)  The level of laser radiation to which a person may be exposed without hazardous effect or adverse biological changes in the eye or skin.

measure  A term used in the quality field for the collection of quantifiable data and information about performance, production, and goal accomplishment.

medical waste  Any solid waste generated in the diagnosis, treatment, or immunization of humans or animals.

megaton (Mt)  The energy of an explosion that is equivalent to an explosion of 1 million tons of TNT; 1 megaton is equal to a quintillion (10^18) calories.

melting point  The temperature at which a solid substance changes to a liquid.

meter  A standard unit of length equivalent to 39.375 inches.

mg/m^3  Milligrams per cubic meter; unit used to measure air concentration of dust, gas, mist, and fume.

microbes  Minute organisms, including bacteria, protozoa, and fungi, which are capable of causing disease.

micron  A unit of length in the metric system equivalent to one-millionth of a meter.

mil  One mil equals 1/1000 of an inch; used in reference to glove thickness.

minor treatment  Third priority of patient in the S.T.A.R.T. triage system where a patient requires only simple, rudimentary first aid. These patients are considered ambulatory. A hospitalized patient may be considered minor if they are in "stable" condition and capable of being treated and discharged.

mist  Suspended liquid droplets generated by condensation from a gaseous to liquid state. Liquids can be broken up into a dispersed state by splashing, foaming, or atomizing. Mist is formed when a finely divided liquid is suspended in air. Mist particles measure between 40 and 500 microns.
mixture Any combination of two or more chemicals where the combination is not, in whole or in part, the result of a chemical reaction.
molecular weight The total obtained by adding together the weights of all the atoms present in a molecule.
molecule A combination of two or more atoms that are chemically bonded. A molecule is the smallest unit of a compound that can exist by itself and retain all of its chemical properties.
monitor An instrument that measures the level of ionizing radiation in an area.
mppcf Million particles per cubic foot.
MSDS Material Safety Data Sheet; provided by chemical manufacturers, required by OSHA to be available to workers.
mutagen A substance or agent capable of changing the genetic material of a living cell.
naphtha Any of several liquid mixtures of hydrocarbons of specific boiling and distillation ranges derived from either petroleum or coal tar.
narcosis Stupor or unconsciousness caused by exposure to a chemical.
natural gas A combustible gas composed largely of methane and other hydrocarbons obtained from natural earth fissures.
necrosis Death of plant or animal cells.
needleless system A device that does not use needles for the collection of bodily fluids or withdrawal of body fluids after initial venous or arterial access is established.
negative pressure A condition caused when less air is supplied to a space than is exhausted from the space; the air pressure in the space is less than that in surrounding areas.
negative pressure respirator (tight fitting) A respirator in which the air pressure inside the face piece is negative during inhalation with respect to the ambient air pressure outside the respirator.
negligence Failure to do what reasonable and prudent persons would do under similar or existing circumstances.
neoplastic Pertaining to the pathologic process resulting in the formation and growth of an abnormal mass of tissue.
neutralization The reaction between equivalent amounts of an acid and a base to form a salt.
neutron A small atomic particle possessing no electrical charge typically found within an atom’s nucleus. Neutrons are, as the name implies, neutral in their charge; that is, they have neither a positive nor a negative charge. A neutron has about the same mass as a proton.
nitrogen oxide Compound produced by combustion.
NMR Nuclear magnetic resonance.
nomenclature Names of chemical substances and the system used for assigning them.
nominal hazard zone (NHZ) Describes the space within which the level of the direct, reflected, or scattered radiation during normal operation exceeds the applicable MPE. Exposure levels beyond the boundary of the NHZ are below the appropriate maximum permissible exposure level.
nonionizing radiation Radiation that has lower energy levels and longer wavelengths than ionizing radiation. It is not strong enough to affect the structure of atoms it contacts but is strong enough to heat tissue and can cause harmful biological effects. Examples include radio waves, microwaves, visible light, and infrared from a heat lamp.
nonstochastic effects Effects that can be related directly to the radiation dose received. The effect is more severe with a higher doses; the dose of radiation typically has a threshold below which the effect will not occur. These are sometimes called deterministic effects. For example, a skin burn from radiation is a nonstochastic effect that worsens as the radiation dose increases.
normal temperature and pressure 70 °F and 14.696 psia.
NPL National Priority List; the official list of hazardous waste sites to be addressed by CERCLA.
nuclear energy Heat energy produced by the process of nuclear fission within a nuclear reactor or by radioactive decay.
nuclear fuel cycle The steps involved in supplying fuel for nuclear power plants. These steps can include mining, milling, isotopic enrichment, fabrication of fuel elements, use
in reactors, chemical reprocessing to recover the fissile material remaining in the spent fuel, reenrichment of the fuel material refabrication into new fuel elements, and waste disposal.

nuclear tracers  Radioisotopes that give doctors the ability to look inside the body and observe soft tissues and organs, in a manner similar to the way x-rays provide images of bones. A radioactive tracer is chemically attached to a compound that will concentrate naturally in an organ or tissue so an image can be taken.

nucleon  A proton or a neutron; a constituent of the nucleus of an atom.

nucleus  The central part of an atom that contains protons and neutrons; the nucleus is the heaviest part of the atom.

nuclide  A general term applicable to all atomic forms of an element; nuclides are characterized by the number of protons and neutrons in the nucleus, as well as by the amount of energy contained within the atom.

occupational exposure limit  The maximum allowable amount of a toxic material in workroom air; established to protect exposure during a lifetime of work.

occupational illness  An illness caused by environmental exposure during employment.

occupational injury  An injury such as a cut, fracture, sprain, amputation, etc. that results from an on-the-job accident or from a single exposure in the workplace.

occurrence  An incident classified as major or minor that results from apparent or unforeseen causal factors.

octane number  An arbitrary value denoting the antiknock rating of a gasoline.

odor threshold  The minimum concentration of a substance at which most people can detect and identify its characteristic odor.

oleophilic  Having an affinity for, attracting, adsorbing, or absorbing oil.

oleum  Alternative name for fuming sulfuric acid (i.e., sulfuric acid mixed with sulfur trioxide).

opacity  The amount of light obscured by particulate matter in air.

optical cavity (resonator)  Space between the laser mirrors where lasing action occurs.

optical density (OD)  Logarithmic expression for the attenuation produced by an attenuating medium, such as an eye protection filter.

optical fiber  A filament of quartz or other optical material capable of transmitting light along its length by multiple internal reflection and emitting it at the end.

optical pumping  Excitation of the lasing medium by the application of light rather than electrical discharge.

optical radiation  Ultraviolet, visible, and infrared radiation that falls in the region of transmittance of the human eye.

order of magnitude  A term used in science to indicate a range of values representing numbers, dimensions, distances, etc.; it starts at any given value and ends at 10 times that value.

organic  Designation of any chemical compound that contains carbon; also used to describe substances derived from living organisms.

other potentially infectious materials (OPIM)  (1) The following human body fluids: semen, vaginal secretions, cerebrospinal fluid, synovial fluid, pleural fluid, pericardial fluid, peritoneal fluid, amniotic fluid, saliva in dental procedures, any body fluid that is visibly contaminated with blood, and all body fluids in situations where it is difficult or impossible to differentiate between body fluids. (2) Any unfixed tissue or organ (other than intact skin) from a human (living or dead). (3) HIV-containing cell or tissue cultures, organ cultures, and HIV- or HBV-containing culture medium or other solutions, and blood, organs, or other tissues from experimental animals infected with HIV or HBV.

outcome  A result reached due to performance (or nonperformance) of a task, job, or process.

output power  Energy per second measured in watts emitted from the laser in the form of coherent light.

oxidant  An oxygen-containing substance that reacts chemically to produce a new substance.

oxidation  The reverse of reduction; a reaction in which electrons are transferred from one atom to another either in the uncombined state or within a molecule.
oxidation number The number of electrons a given element can transfer to another element with which it combines.

oxidizer A material that can cause the ignition of a combustible material without the aid of an external ignition source.

oxygen-deficient atmosphere An atmosphere with an oxygen content below 19.5% by volume.

ozone A reactive oxidant that contains three atoms of oxygen.

parenteral Piercing of the mucous membranes or skin barrier by, for example, needles, ticks, human bites, cuts, and abrasions.

part B permit The second, narrative section submitted by generators in the RCRA permitting process; it covers in detail the procedures followed at a facility to protect human health and the environment.

particulates Fine solid or liquid particles found in air and other emissions.

pasteurization Heat treatment of liquid or semi-liquid food products for the purpose of killing or inactivating disease-causing bacteria.

pathways The routes by which people are exposed to radiation or other contaminants; the three basic pathways are inhalation, ingestion, and direct external exposure.

patient assessment The assessment provides ongoing information necessary to develop a care plan, to provide the appropriate care and services for each patient, and to modify the care plan and care or services based on the patient’s status.

pediatric rail A rail in which the bar spacing is no larger than 2-3/8 inches.

PEL (permissible exposure limit) OSHA limit for employee exposure to chemicals (29 CFR 1910.1000).

pendant control A means used by either the patient or the operator to control the drives that activate various bed functions and is attached to the bed by a cord.

penetrating radiation Radiation that can penetrate the skin and reach internal organs and tissues. Photons (gamma rays and x-rays), neutrons, and protons are penetrating radiations; however, alpha particles and all but extremely high-energy beta particles are not considered penetrating radiation.

periodic law Law stating that the arrangement of electrons in the atoms of any given chemical element and the properties determined by this arrangement are closely related to the atomic number of that element. As the atomic number increases from one element to the next, the arrangement of electrons changes in a regularly repeated sequence.

Periodic Table A systematic classification of the chemical elements based on the periodic law.

permeation rate An invisible process by which a hazardous chemical moves through a protective material; measured in mg/m²/sec.

persistent activity Activity defined as the prolonged or extended antimicrobial activity that prevents or inhibits the proliferation or survival of microorganisms after application of the product.

personal protective equipment (PPE) Devices such as respirators, gloves, and hearing protectors worn by workers to protect against hazards in the environment.

pH A measure of how acidic or caustic (basic) a substance is on a scale from 1 to 14 (1, very acidic; 7, neutral; 14, very caustic).

photochromic Denotes a material to which has been added a low percentage of light-sensitive chemical, the effect of which is to cause the material to darken in the presence of strong light and to resume its original transparency when the light intensity is decreased.

photon Discrete packet of pure electromagnetic energy; photons have no mass and travel at the speed of light. The term “photon” was developed to describe energy when it acts like a particle (causing interactions at the molecular or atomic level) rather than a wave. Gamma rays and x-rays are photons.

physical hazard A chemical validated as being or having one of the following characteristics: combustible liquid, compressed gas, explosive, flammable, organic peroxide, oxidizing qualities, pyrophoric, unstable, or water reactive.

physical restraint Any manual method or physical or mechanical device, material, or equipment attached or adjacent to the resident’s or patient’s body that the individual cannot remove easily and that restricts freedom of movement or normal access to one’s body.
pitchblende A brown to black mineral that has a distinctive luster; it consists mainly of uraninite (UO$_2$) but also contains radium (Ra). It is the main source of uranium ore.

plume Material spreading from a particular source and traveling through environmental media, such as the air or groundwater; for example, a plume could describe the dispersal of particles, gases, vapors, and aerosols in the atmosphere or the movement of contamination through an aquifer (e.g., dilution, mixing, or adsorption onto soil).

plutonium (Pu) A heavy, manmade, radioactive metallic element. The most important isotope is Pu-239, which has a half-life of 24,000 years; Pu-239 can be used in reactor fuel and is the primary isotope in weapons. One kilogram is equivalent to about 22 million kilowatt-hours of heat energy. The complete detonation of a kilogram of plutonium produces an explosion equal to about 20,000 tons of chemical explosive. All isotopes of plutonium are readily absorbed by the bones and can be lethal depending on the dose and exposure time.

poise The standard unit for the viscosity of a fluid.

poison A A poisonous gas or liquid of such toxicity that when mixed with air a very small amount is dangerous to life.

poison B A solid or liquid substance that is known to be so toxic to humans as to afford a hazard to health during transportation.

polychlorinated biphenyls (PCBs) A pathogenic and teratogenic industrial compound used as a heat transfer agent; PCBs accumulate in human or animal tissue.

polymerization A chemical reaction in which one or more small molecules combine to form larger molecules; hazardous polymerization is a reaction that takes place at a rate at which large amounts of energy are released.

polyvinyl chloride (PVC) A member of the family of vinyl resins.

positive-pressure respirator A respirator in which the pressure inside the respiratory inlet covering exceeds the ambient air pressure outside the respirator.

potash Potassium hydroxide.

potential That which is currently latent or unrealized.

power Rate of energy delivery expressed in watts (Joules per second).

powered air-purifying respirator (PAPR) An air-purifying respirator that uses a blower to force the ambient air through air-purifying elements to the inlet covering.

ppm (parts per million) Unit for measuring the concentration of a gas or vapor in contaminated air; also used to indicate the concentration of a particular substance in a liquid or solid.

pre-action When the main water control valve is opened by an actuating device.

prefilter A filter used in conjunction with a cartridge on an air-purifying respirator.

pregnancy Radiation exposure to an embryo or fetus while still in the mother’s womb; at certain stages of the pregnancy, the fetus is particularly sensitive to radiation and the health consequences could be severe above 5 rads, especially to brain function.

pressure demand respirator A positive pressure atmosphere-supplying respirator that admits breathing air to the face piece when the positive pressure is reduced inside the face piece by inhalation.

process A method of interrelating steps, events, and mechanisms to accomplish an action or goal.

Protective Action Guide (PAG) A guide that tells state and local authorities at what projected dose they should take action to protect people from exposure to unplanned releases of radioactive material into the environment.

protective housing A protective housing is a device designed to prevent access to radiant power or energy.

proton A small atomic particle, typically found within the nucleus of an atom, that possesses a positive electrical charge. Even though protons and neutrons are about 2000 times heavier than electrons, they are tiny.

psi Pounds per square inch.

psia Pounds per square inch absolute; the absolute thermodynamic pressure exerted upon an area of 1 square inch.
pulse  A discontinuous burst of laser, light, or energy, as opposed to a continuous beam; a true pulse achieves higher peak powers than that attainable by CW output.

pulse duration  The "on" time of a pulsed laser; it may be measured in terms of milliseconds, microseconds, or nanoseconds as defined by half-peak-power points on the leading and trailing edges of the pulse.

pulsed laser  A laser that delivers energy in the form of a single pulse or train of pulses.

pyrolysis  A chemical change brought about by heat alone.

pyrophoric  Describes a chemical that will ignite spontaneously in air at or below room temperature, without a supply of heat, friction, or shock.

qualitative analysis  (1) The examination of a sample of a material to determine the kinds of substances present and to identify each constituent. (2) The analysis of a gas, liquid, or solid sample to identify the elements or compounds the sample is composed of.

qualitative fit test (QLFT)  A pass/fail fit test to assess the adequacy of respiratory fit that relies on the individual’s response to the test agent.

quality factor (Q)  The factor by which the absorbed dose (rad or gray) is multiplied to obtain a quantity that expresses, on a common scale for all ionizing radiation, the biological damage (rem) to an exposed person. It is used because some types of radiation, such as alpha particles, are more biologically damaging internally than other types.

quantitative analysis  The analysis of a gas, liquid, or solid to determine the precise percentage composition of elements or compounds.

quantitative fit test (QNFT)  An assessment of the adequacy of respirator fit by numerically measuring the amount of leakage into the respirator.

quaternary ammonium compounds  Chemical substances used to disinfect or sanitize by rupturing the cell walls of microorganisms.

quicklime  Calcium oxide.

rad  (radiation absorbed dose)  A basic unit of absorbed radiation dose; the traditional unit of absorbed dose. It is being replaced by the unit gray (Gy), which is equivalent to 100 rad. One rad equals the dose delivered to an object of 100 ergs of energy per gram of material.

radiant energy (Q)  Energy in the form of electromagnetic waves; usually expressed in units of joules (watt-seconds).

radiant exposure (H)  Total energy per unit area incident upon a given surface. It is used to express exposure to pulsed laser radiation in units of J/cm².

radiation  Energy moving in the form of particles or waves. Familiar radiations are heat, light, radio waves, and microwaves; ionizing radiation is a very high-energy form of electromagnetic radiation.

radiation warning symbol  A symbol prescribed by the Code of Federal Regulations; it is a magenta or black trefoil on a yellow background. It must be displayed where certain quantities of radioactive materials are present or where certain doses of radiation could be received.

radioactive contamination  The deposition of unwanted radioactive material on the surfaces of structures, areas, objects, or people; it can be airborne, external, or internal.

radioactive decay  The spontaneous disintegration of the nucleus of an atom.

radioactive half-life  The time required for a quantity of a radioisotope to decay by half.

radioactive material  Material that contains unstable (radioactive) atoms that give off radiation as they decay.

radioactivity  Spontaneous transformation of the nucleus, generally with the emission of alpha or beta particles often accompanied by gamma rays; this process is referred to as the decay or disintegration of an atom.

radioassay  A test to determine the amounts of radioactive materials through the detection of ionizing radiation; radioassays detect transuranic nuclides, uranium, fission and activation products, naturally occurring radioactive material, and medical isotopes.

radiogenic  Refers to health effects caused by exposure to ionizing radiation.

radiography  (1) Medical: the use of radiant energy (such as x-rays and gamma rays) to
image body systems. (2) Industrial: the use of radioactive sources to photograph internal structures, such as turbine blades in jet engines. A sealed radiation source, usually iridium-192 (Ir-192) or cobalt-60 (Co-60), beams gamma rays at the object to be checked. Gamma rays passing through flaws in the metal or incomplete welds strike special photographic film (radiographic film) on the opposite side.

radioisotope (radioactive isotope) The isotopes of an element that have an unstable nucleus; radioactive isotopes are commonly used in science, industry, and medicine. Approximately 3700 natural and artificial radioisotopes have been identified. The nucleus eventually reaches a stable number of protons and neutrons through one or more radioactive decays.

radiological (radiologic) Related to radioactive materials or radiation; the radiological sciences focus on the measurement and effects of radiation.

radiological dispersal device (RDD) Device that disperses radioactive material by conventional explosive or other mechanical means, such as a spray.

radionuclide An unstable and therefore radioactive form of a nuclide.

radium (Ra) A naturally occurring radioactive metal; radium is a radionuclide formed by the decay of uranium and thorium in the environment. It occurs at low levels in virtually all rock, soil, water, plants, and animals. Radon is a decay product of radium.

radon (Rn) A naturally occurring radioactive gas found in soils, rock, and water throughout the United States. Radon causes lung cancer and is a threat to health because it tends to collect in homes, sometimes at very high concentrations; as a result, radon is the largest source of exposure from naturally occurring radiation.

reactivity The susceptibility of a substance to undergo a chemical reaction and change that could result in an explosion or fire; reactive materials may also produce corrosive or toxic emissions.

reagent Any chemical compound used in laboratory analyses to detect and identify specific constituents of the material being examined.

recommended exposure limit (REL) NIOSH chemical exposure limit recommendation.

recordkeeping system According to OSHA, a nationwide system of reporting and recording occupational injuries and illnesses (29 CFR 1904).

reduction The reverse of oxidation; the gaining or acceptance of one or more electrons from another substance.

reflection Return of radiant energy (incident light) by a surface with no change in wavelength.

refraction Change of direction of propagation of any wave, such as an electromagnetic wave, when it passes from one medium to another in which the wave velocity is different; the bending of incident rays as they pass from one medium to another (e.g., air to glass).

regulated material A substance or material that is subject to regulations set forth by a federal agency, such as the EPA or DOT.

regulated waste (biohazard) OSHA term that means liquid or semiliquid blood or other potentially infectious materials; contaminated items that would release blood or other potentially infectious materials in a liquid or semiliquid state if compressed; items that are caked with dried blood or other potentially infectious materials and are capable of releasing these materials during handling; contaminated sharps; pathological and microbiological wastes containing blood or other potentially infectious materials.

relative humidity Ratio of the quantity of water vapor present in air to the quantity that would saturate the air at any specific temperature.

relief valve Valve designed to release excess pressure within a system without damaging the system.

rem (roentgen equivalent, man) A unit of equivalent dose. Not all radiation has the same biological effect, even for the same amount of absorbed dose; rem relates the absorbed dose in human tissue to the effective biological damage of the radiation. It is determined by multiplying the number of rads by the quality factor, a number reflecting the potential damage caused by the particular type of radiation. The rem is the traditional unit of equivalent dose, but it is being replaced by the sievert (Sv), which is equal to 100 rem.
resin  Naturally occurring water-insoluble mixtures of carboxylic acids, essential oils, and other substances formed in numerous varieties of trees and shrubs.

resonator  Mirrors (or reflectors) making up the laser cavity including the laser rod or tube. The mirrors reflect light back and forth to build up amplification.

Resource Conservation and Recovery Act (RCRA)  An act that regulates waste materials (including hazardous wastes) from generation through final disposal; referred to as the "cradle-to-grave" regulation.

respiratory inlet covering  The portion of a respirator that forms the protective barrier between the user's respiratory tract and an air-purifying device or breathing air source, or both. It may be a face piece, helmet, hood, suit, or a mouthpiece respirator with nose clamp.

retainer ring or cap  A plastic ring that holds a cartridge or filter on a respirator mask or holds a prefilter on a cartridge.

reversible  A chemical reaction that can proceed first to the right and then to the left when the conditions change.

right to know  Refers to an individual employee's right to know about the nature and hazards of agents used in the workplace or to the right of communities and their members to know about materials used and wastes generated by workplaces situated within or adjacent to the community.

risk  The probability of injury, disease, or death under specific circumstances and time periods. Risk can be expressed as a value that ranges from 0% (no injury or harm will occur) to 100% (harm or injury will definitely occur). Risk can be influenced by several factors: personal behavior or lifestyle, environmental exposure to other material, or inborn or inherited characteristics known from scientific evidence to be associated with a health effect. Because many risk factors are not exactly measurable, risk estimates are uncertain.

risk assessment  An evaluation of the risk to human health or the environment by hazards; risk assessments can look at either existing hazards or potential hazards.

roentgen (R)  A unit of exposure to x-rays or gamma rays; 1 roentgen is the amount of gamma or x-rays needed to produce ions carrying 1 electrostatic unit of electrical charge in 1 cubic centimeter of dry air under standard conditions (0°C and 760 mmHg).

ruby  First laser type; a crystal of sapphire (aluminum oxide) containing trace amounts of chromium oxide.

safety belt  A belt worn to prevent falls when working in high places; a belt used to secure passengers in vehicles or airplanes. Back safety belts provide support for planned lifting tasks.

safety can  An approved container of not more than 5-gallon capacity with a spring-closing lid and a spout cover designed to safely relieve internal pressure when exposed to fire.

safety hat (hard hat)  Rigid headgear worn to protect a worker from head injuries, flying particles, and electric shock.

salt  One of the products resulting from a reaction between an acid and a base.

sanitize  Destroy microorganisms on a surface to a safe level.

scanning laser  A laser having a time-varying direction, origin, or pattern of propagation with respect to a stationary frame of reference.

scfm  Standard cubic feet per minute.

secured enclosure  An enclosure to which casual access is impeded by an appropriate means (e.g., door secured by lock, magnetically or electrically operated latch, or screws).

seizure pads  Padded covers for bed rails that may be used to prevent unwanted patient or resident cuts and bruising from repeated contact with the bed rails; also used to cover openings within the perimeter of the side rails and space between the head and foot rails.

self-contained breathing apparatus (SCBA)  An atmosphere-supplying respirator for which the breathing air source is designed to be carried by the user; designed for entry into and escape from atmospheres that are immediately dangerous to life or health (IDLH) or are oxygen deficient.

semiconductor laser  Type of laser that produces its output from semiconductor materials.

sensitivity  Ability of an analytical method to detect small concentrations of radioactive material.

sensitizer  A substance that may cause no reaction in a person during initial exposure but will cause an allergic response upon further exposure.
serious injury  An injury classification that includes disabling work injuries and injuries in the following categories: eye injuries, fractures, hospitalization for observation, loss of consciousness, and any other injury that requires medical treatment by a physician.
service life  The period of time that a respirator, filter or sorbent, or other respiratory equipment provides adequate protection to the wearer.
sharp  An object that can penetrate the skin, such as needles, scalpels, and lancets.
shielding  The material between a radiation source and a potentially exposed person that reduces exposure.
short-term exposure limit (STEL)  Maximum concentration for a continuous 15-minute exposure period. A maximum of four such periods per day is allowed. A minimum of 60 minutes must be provided between exposure periods, and the daily TLV-TWA must not be exceeded.
sick building syndrome (SBS)  A term that describes a situation where building occupants experience acute health or comfort effects that appear to be linked to time spent in the building; no specific illness or cause can be determined.
sievert (Sv)  A unit used to derive a quantity known as the dose equivalent which relates the absorbed dose in human tissue to the effective biological damage of the radiation. Not all radiation has the same biological effect, even for the same amount of absorbed dose. Dose equivalent is often expressed as millionths of a sievert, or micro-sieverts (μSv); 1 sievert is equivalent to 100 rem.

sleeping environment  Includes physical components such as the bed size and height and mattress, the accessibility of personal items and accessories such as a call bell, and the room temperature and noise or light levels. The environment also includes nonphysical aspects such as comfort and security. These aspects may be related to the physical features of the bed such as the degree of mattress firmness, or features that facilitate freedom from physical pain or a feeling of safety and privacy.
sludge  A solid material that collects as the result of air or water treatment processes.
solubility  The percentage of a material (by weight) that will dissolve in water at a specified temperature.
solution  A mixture in which the components lose their identities and are uniformly dispersed.
solvent  A liquid that can reduce certain solids or liquids to molecular or ionic form by relaxing the intermolecular forces that unite them; a substance that dissolves or disperses another substance.
somatic effects  Effects of radiation that are limited to the exposed person, as distinguished from genetic effects, which may also affect subsequent generations.
source  Either laser or laser-illuminated reflecting surface (i.e., source of light).
specific gravity  The weight of a material compared to the weight of an equal volume of water.
spectrum  A range of frequencies within which radiation has some specified characteristic, such as the audiofrequency, ultraviolet, and radio spectrums.
stable nucleus  The nucleus of an atom in which the forces among its particles are balanced.
standard industrial classification (SIC)  A classification developed by the Office of Management and Budget; establishments are assigned an industry code determined by the product manufactured or service provided. The system uses a two-, three-, or four-digit code according to information available.
standard procedure  A written instruction that establishes what action is required, who is to act, and when the action is to take place.
Staphylococcus  Any of various spherical parasitic bacteria that occur in grape-like clusters and cause infections.
S.T.A.R.T. (Simple Triage and Rapid Treatment)  Initial triage system developed by Hoag Hospital and Newport Beach Fire Department, Newport Beach, CA, that has been adopted for use by the California Fire Chief’s Association.
static pressure  The potential pressure exerted in all directions by a fluid at rest; when combined with velocity pressure, it gives total pressure.
steam sterilization  A treatment method for infectious waste using saturated steam within a pressurized vessel (autoclave).
sterilize  To use a physical or chemical procedure to destroy all microbial life, including highly resistant bacterial endospores.

sterilizer  One of three groups of antimicrobials registered by the EPA. A sterilizer removes all forms of bacteria, fungi, and viruses and their spores. A sporicide is considered to be a sterilizer.

stochastic effect  Effect that occurs on a random basis independent of the size of dose. The effect typically has no threshold and is based on probabilities, with the chances of seeing the effect increasing with dose. If it occurs, the severity of a stochastic effect is independent of the dose received. Cancer is a stochastic effect.

stoichiometry  Study of the mathematics of the material and energy balances (equilibrium) of chemical reactions.

STP  Standard temperature and pressure.

Streptococcus  Any of various rounded, disease-causing bacteria that occur in pairs or chains.

strontium (Sr)  A silvery, soft metal that rapidly turns yellow in air. Sr-90 is one of the radioactive fission materials created within a nuclear reactor during its operation. Strontium-90 emits beta particles during radioactive decay.

stuff pads  Plastic-covered pads used to seal open spaces between bed rails and mattresses or mattresses and head- or footboards.

substandard condition  Any physical state that deviates from what is acceptable, normal, or correct and is a potential hazard.

substantivity  An attribute of certain active ingredients that adhere to the stratum corneum (i.e., remain on the skin after rinsing or drying) to provide an inhibitory effect on the growth of bacteria remaining on the skin.

supplied air  Breathable air supplied to a worker's mask/hood from a source outside the contaminated area.

supplied-air respirator (SAR), airline respirator  An atmosphere-supplying respirator for which the source of breathing air is not designed to be carried by the user.

supported gloves  Gloves constructed of a coated fabric.

surface burst  A nuclear weapon explosion that is close enough to the ground for the radius of the fireball to vaporize surface material; fallout from a surface burst contains very high levels of radioactivity.

surgical hand antisepsis  A handwash or antiseptic hand rub performed preoperatively by surgical personnel to eliminate transient or resident hand flora. Antiseptic detergent preparations often have persistent antimicrobial activity.

survey  A comprehensive study or assessment of a facility, workplace, or activity for insurance or loss control purposes.

synergism  A phenomenon often encountered in chemistry in which one or more properties of a mixture are affected to a far greater extent than would be indicated by adding the values for the components taken individually.

systematic  Striving toward goal accomplishment in a planned manner using predetermined steps or procedures.

tailings  Waste rock from mining operations that contains concentrations of mineral ore that are too low to make typical extraction methods economical.

Tare  A weight used in analytical work to offset the weight of a container.

teratogen  A substance or agent which, when a pregnant female is exposed to it, can cause malformations in the fetus.

teratogenic effect  Birth defects that are not passed on to future generations and are caused by the exposure of a fetus to a toxin.

terrestrial radiation  Radiation emitted by naturally occurring radioactive materials, such as uranium, thorium, and radon, in the earth.

thermoluminescent dosimeter (TLD) badge  A badge that contains a thermoluminescent chip and is worn by persons working with or around radioactive materials. When the chip is heated in a special instrument, the light emitted is directly proportional to the quantity of ionizing radiation received by the badge and thus the wearer.

thermonuclear device  A hydrogen bomb; a device with explosive energy that comes from fusion of small nuclei, as well as fission.

thorium (Th)  A naturally occurring radioactive metal found in small amounts in soil, rocks, water, plants, and animals; the most common isotopes of thorium are thorium-232 (Th-232), thorium-230 (Th-230), and thorium-238 (Th-238).
tight-fitting face piece  A respiratory inlet covering that forms a complete seal with the face.

titration  A volumetric means of finding the amount of a given substance in a solution.

TLD  Thermoluminescent dosimeter.

TLV (threshold limit value)  The airborne concentration of a hazardous or toxic substance to which workers may be repeatedly exposed day after day without adverse effect. TLV values are published yearly by the ACGIH.

toxic substance  Any substance that can cause acute or chronic injury or illness to the human body.

toxicity  The potential of a substance to have a harmful effect and a description of the effect and the conditions or concentration under which the effect takes place.

toxin  A substance that is poisonous to varying degrees.

trace elements  The five elements that are necessary for plant nutrition and are present in the soil in minute concentrations: boron, copper, manganese, molybdenum, and zinc.

transfer bar  A one-piece device, attached to the bed frame on one or both sides of the bed, that the patient grasps to aid in bed entry and exit.

transfer device  Support for transfers, such as half- or quarter-length upper bed rails, bed grab bars, bed handles attached to the bed frame, or fireman’s transfer pole.

transuranic  Pertaining to elements with atomic numbers higher than uranium (92). For example, plutonium and americium are transuranics.

treatment program (care plan)  Measurable objectives and timetables to meet the patient’s medical, nursing, mental, and psychosocial needs as identified through the assessment process. The effectiveness of the treatment program is evaluated and modified as necessary. The interdisciplinary team reviews, revises, and initiates changes to the program as needed in accordance with professional standards of practice after each assessment.

triage  The process of screening and classification of sick, wounded, or injured persons to determine priority needs in order to ensure the efficient use of medical manpower, equipment, and facilities.

triage personnel  Trained individuals who are responsible for triaging patients and assigning them to appropriate transportation or treatment areas.

triage tag  A tag used by triage personnel to identify and document the classification, or level, of a patient’s medical condition.

tritium (chemical symbol H-3)  A radioactive isotope of the element hydrogen (chemical symbol H).

TSCA  Toxic Substances Control Act.

tunable laser  A system that can be tuned to emit laser light over a continuous range of wavelengths or frequencies.

TWA (time-weighted average)  Usually a personal 8-hour average exposure concentration to an airborne chemical hazard; expressed in ppm or mg/m^3.

UEL (upper explosive limit)  The highest concentration of a substance that will burn or explode when an ignition source is present; expressed in percent of vapor or gas in the air by volume.

UFC (Uniform Fire Code)  Regulations consistent with nationally recognized good practice for safeguarding life and property from the hazards of fire and explosion that arise from the storage, handling, and use of hazardous substances, materials, and devices.

UL (Underwriters Laboratories)  An independent, nonprofit organization that operates laboratories for the investigation of devices and materials with respect to hazards that affect life and property.

ultraviolet (UV) radiation  Wavelengths of the electromagnetic spectrum that are shorter than those of visible light and longer than x-rays; wavelength 10^-5 to 10^-6 cm.

universal precautions  An OSHA terms for the method of infection control in which all human blood and certain other materials are treated as infectious for HIV, HBV, and other bloodborne pathogens.


unstable  A chemical that, when in the pure state, will vigorously polymerize, decompose, condense, or become self-reactive under conditions of shock, pressure, or temperature.
unstable nucleus A nucleus that contains an uneven number of protons and neutrons and seeks to reach equilibrium between them through radioactive decay (i.e., the nucleus of a radioactive atom).

unsupported glove Unlined glove without any type of fabric lining.

uranium (U) A naturally occurring radioactive element for which the principal isotopes are uranium-238 (U-238) and uranium-235 (U-235). Natural uranium is a hard, silvery-white, shiny metallic ore that contains a minute amount of uranium-234 (U-234).

uranium mill tailings Naturally radioactive residue from the processing of uranium ore. Although the milling process recovers about 95% of the uranium, the residues, or tailings, contain several isotopes of naturally occurring radioactive material, including uranium, thorium, radium, polonium, and radon.

USC United States Code.

user seal check An action conducted by the respirator user to determine if the respirator is properly seated to the face.

valance A whole number indicating for any element its ability to combine with another element.

vapor The gaseous form of a substance that is normally in the solid or liquid state at room temperature and pressure.

vapor density The weight of a vapor or gas compared to the weight of an equal volume of air.

vapor pressure The pressure exerted by a saturated vapor above its own liquid in a closed container. Vapor pressure is usually expressed as pounds per square inch but on MSDSs it is expressed in millimeters of mercury (mmHG) at 68°F. The lower the boiling point of a substance, the higher its vapor pressure.

VCM Vinyl chloride monomer.

vector An organism that carries disease, such as insects or rodents.

viscosity The property of a liquid that causes it to resist flow or movement in response to external force applied to it.

visible radiation (light) Electromagnetic radiation (10^-4 to 10^-5 wavelengths) that can be detected by the human eye.

volatile The tendency or ability of a liquid to vaporize; liquids such as alcohol or gasoline are volatile because they have a tendency to evaporate quickly.

volatile organic compounds (VOC) Compounds that evaporate from many housekeeping, maintenance, and building products made from organic chemicals. VOCs can cause eye, nose, and throat irritation; some can also cause headaches, dizziness, visual problems, and memory impairment. Highly toxic VOCs can cause cancer in animals.

volume of air An expression of density of a vapor or gas; materials lighter than air have a vapor density less than 1.

water-reactive A chemical that reacts with water to release a gas that either is flammable or presents a health hazard.

wavelength Length of the light wave, usually measured from crest to crest, which determines its color. Common units of measurement are the micrometer (micron), the nanometer, and (earlier) the Angstrom unit.

whole body count The measurement and analysis of radiation emitted from a person's entire body, detected by a counter external to the body.

whole body exposure An exposure of the body to radiation, in which the entire body, rather than an isolated part, is irradiated by an external source.

wood alcohol Methyl alcohol.

work practice controls Controls that reduce the likelihood of exposure by altering the manner in which a task is performed (e.g., prohibiting recapping of needles by a two-handed technique).

xenobiotic A manmade substance, such as plastic, found in the environment.

x-ray Electromagnetic radiation caused by deflection of electrons from their original paths or inner orbital electrons that change their orbital levels around the atomic nucleus. Like gamma rays, x-rays can travel long distances through air and most other materials, and they require more shielding to reduce their intensity than do beta or alpha particles. Gamma rays and x-rays differ primarily in their origin; x-rays originate in the electronic shell, and gamma rays originate in the nucleus.
# APPENDIX A. ACRONYMS

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Full Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>AAS</td>
<td>atomic absorption spectroscopy</td>
</tr>
<tr>
<td>ABC</td>
<td>airway, breathing, circulation</td>
</tr>
<tr>
<td>ABIH</td>
<td>American Board of Industrial Hygiene</td>
</tr>
<tr>
<td>ABSA</td>
<td>American Biological Safety Association</td>
</tr>
<tr>
<td>ACBM</td>
<td>asbestos-containing building material</td>
</tr>
<tr>
<td>ACCSH</td>
<td>Advisory Committee on Construction Safety and Health</td>
</tr>
<tr>
<td>ACGIH</td>
<td>American Conference of Governmental Industrial Hygienists</td>
</tr>
<tr>
<td>ACM</td>
<td>asbestos-containing material</td>
</tr>
<tr>
<td>ACP</td>
<td>area contingency plan</td>
</tr>
<tr>
<td>ACRSP</td>
<td>Association of Canadian Registered Safety Professionals</td>
</tr>
<tr>
<td>ACS</td>
<td>American Chemical Society</td>
</tr>
<tr>
<td>ADA</td>
<td>Americans with Disabilities Act</td>
</tr>
<tr>
<td>ADR</td>
<td>Alternative Dispute Resolution</td>
</tr>
<tr>
<td>AE</td>
<td>atomic emission</td>
</tr>
<tr>
<td>AEL</td>
<td>acceptable exposure limit</td>
</tr>
<tr>
<td>AGA</td>
<td>American Gas Association</td>
</tr>
<tr>
<td>AGST</td>
<td>above-ground storage tank</td>
</tr>
<tr>
<td>AHM</td>
<td>acutely hazardous material</td>
</tr>
<tr>
<td>AlChE</td>
<td>American Institute of Chemical Engineers</td>
</tr>
<tr>
<td>AIDS</td>
<td>acquired immune deficiency syndrome</td>
</tr>
<tr>
<td>AIHA</td>
<td>American Industrial Hygiene Association</td>
</tr>
<tr>
<td>ALARA</td>
<td>as low as reasonably achievable</td>
</tr>
<tr>
<td>ALJ</td>
<td>administrative law judge</td>
</tr>
<tr>
<td>ALS</td>
<td>advanced life support</td>
</tr>
<tr>
<td>ANPR</td>
<td>advanced notice of proposed rulemaking</td>
</tr>
<tr>
<td>ANSI</td>
<td>American National Standards Institute</td>
</tr>
<tr>
<td>APE</td>
<td>assigned protection factor</td>
</tr>
<tr>
<td>APHA</td>
<td>American Public Health Association</td>
</tr>
<tr>
<td>API</td>
<td>American Petroleum Institute</td>
</tr>
<tr>
<td>APIH</td>
<td>Association of Professional Industrial Hygienists</td>
</tr>
<tr>
<td>APR</td>
<td>air-purifying respirator</td>
</tr>
<tr>
<td>ASHRAE</td>
<td>American Society of Heating, Refrigerating, and Air Conditioning Engineers</td>
</tr>
<tr>
<td>ASME</td>
<td>American Society of Mechanical Engineers</td>
</tr>
<tr>
<td>ASP</td>
<td>Association of Safety Professionals</td>
</tr>
<tr>
<td>ASQC</td>
<td>American Society for Quality Control</td>
</tr>
<tr>
<td>ASSE</td>
<td>American Society of Safety Engineers</td>
</tr>
<tr>
<td>AST</td>
<td>above-ground storage tank</td>
</tr>
<tr>
<td>ASTM</td>
<td>American Society for Testing Materials</td>
</tr>
<tr>
<td>ATC</td>
<td>automatic temperature compensation</td>
</tr>
<tr>
<td>ATCM</td>
<td>air toxics control measure</td>
</tr>
<tr>
<td>ATSDR</td>
<td>Agency for Toxic Substances and Disease Registry</td>
</tr>
<tr>
<td>AWT</td>
<td>advanced wastewater treatment</td>
</tr>
<tr>
<td>BACT</td>
<td>best available control technology</td>
</tr>
<tr>
<td>BBP</td>
<td>bloodborne pathogens</td>
</tr>
<tr>
<td>BBS</td>
<td>behavior-based safety</td>
</tr>
<tr>
<td>BCSP</td>
<td>Board of Certified Safety Professionals</td>
</tr>
<tr>
<td>BCT</td>
<td>best conventional pollutant control technology</td>
</tr>
<tr>
<td>BLS</td>
<td>basic life support</td>
</tr>
<tr>
<td>BLS</td>
<td>Bureau of Labor Statistics</td>
</tr>
<tr>
<td>BPT</td>
<td>best practicable control technology currently available (CCAA)</td>
</tr>
<tr>
<td>BS</td>
<td>British standards</td>
</tr>
<tr>
<td>BSC</td>
<td>biological safety cabinet</td>
</tr>
<tr>
<td>BSI</td>
<td>British standards institute</td>
</tr>
</tbody>
</table>
ERPG, emergency response planning guideline
ERRIS, Emergency and Remedial Response Inventory System
ERT, emergency response team
ERT, Environmental Response Team
ES&H, environment, safety, and health
ESA, Endangered Species Act
ESA, environmental site assessment
ESC, evidence of standards compliance
ESCBA, escape self-contained breathing apparatus
EtO, ethylene oxide
FAQs, frequently asked questions
FBI, Federal Bureau of Investigation
FDA, Food and Drug Administration
FEMA, Federal Emergency Management Agency.
FIFRA, Federal Insecticide, Fungicide, and Rodenticide Act
FM, Factory Mutual; fire marshal
FMCSR, Federal Motor Carrier Safety Regulations
FMEA, failure mode and effect analysis
FMECA, failure mode, effects, and criticality analysis
FOIA, Freedom of Information Act
FR, flame resistant
FR, Federal Register
FS, feasibility study
FSAR, Final Safety Analysis Report
FTA, fault tree analysis
FTU, fixed treatment unit
FWPCA, Federal Water Pollution Control Act
GACT, generally available control technology
GAO, General Accounting Office
GC/MS, gas chromatography/mass spectrometry
GERT, general employee radiation training
GFCI, ground-fault circuit interrupter
GLC, ground-level concentration
GLP, good laboratory practice
gpm, gallons per minute
GSA, General Service Administration
GW, ground water
HAPs, hazardous air pollutants
HASP, health and safety plan
HazCom, Hazard Communication
HAZMAT, hazardous materials
HAZWOPER, Hazardous Waste Operations and Emergency Response
HBV, hepatitis B virus
HCA, Hazard Communication Act
HCFCs, hydrochlorofluorocarbons
HCl, hydrogen chloride
HCO, health care organization
HCS, Hazard Communication standard
HEPA, High-Efficiency Particulate Air (filtration)
HE, hydrogen fluoride
HID, high-intensity discharge
HIV, human immunodeficiency virus
HMEP, hazardous materials emergency preparedness
HMIG, hazardous materials identification guide
HMIS, hazardous materials information system
HMRT, hazardous materials response team
HMTC, hazardous materials technical center
HP, health physicist
HRS, hazard ranking system
HS, hazardous substance
HSWA, Hazardous and Solid Waste Amendments
HVAC, heating, ventilation, and air conditioning
HWMU, Hazardous Waste Management Units
IAFF, International Association of Firefighters
IAP, incident action plan
IAQ, indoor air quality
IARC, International Agency for Research on Cancer
IATA, International Air Transport Association
IBNR, incurred but not reported
IBR, incorporated by reference
IC, Incident Command
ICAO, International Civil Aviation Organization
ICC, Interstate Commerce Commission
ICP, incident command post
ICS, incident command system
IDLH, immediately dangerous to life and health
IEC, International Electrotechnical Commission
IHMM, Institute of Hazardous Materials Management
IR, infrared
ISEA, Industrial Safety Equipment Association
ISO, International Organization for Standardization
IUPAC, International Union of Pure and Applied Chemistry
JCAHO, Joint Commission on Accreditation of Healthcare Organizations
JHA, job hazard analysis
JIC, Joint Information Center
LCD, liquid crystal display
LEA, local enforcement agency
LEC, local emergency coordinator
LED, light-emitting diode
LEL, lower explosive limit
LEPC, local emergency planning committee
LIMS, laboratory information management system
LSO, laser safety officer
LUST, leaking underground storage tank
LWDII, lost workday due to injury and illness
MAWP, maximum allowable working pressure
MCL, maximum concentration limits or maximum contaminant level
MCS, multiple chemical sensitivity
MECO, Modern Engineering Company
mg/m³, milligrams per cubic meter
mil, 1 mil = 1/1000 of an inch
MIS, management information systems
mL, milliliter (also ml)
MMAD, mass median aerodynamic diameter
MOA, memorandum of agreement
MOS, measures of success
MOU, memorandum of understanding
mppcf, million particles per cubic foot
MS, mass spectroscopy
MSDS, Material Safety Data Sheet
MTD, maximum tolerated dose
MTU, mobile treatment unit
MUTCD, Manual for Uniform Traffic Control Devices,
NAICS, North American Industry Classification System
NAS, National Academy of Sciences
NCP, National Contingency Plan; National Oil and Hazardous Substances Pollution Contingency Plan
NCRIC, National Chemical Response and Information Center
NDPES, National Pollutant Discharge Elimination System
NEIC, National Enforcement Investigations Center
NEMA, National Electrical Manufacturers Association
NEPA, National Environmental Policy Act
NESHAPs, National Emission Standards for Hazardous Air Pollutants
NFIC, National Fire Code
NFPA, National Fire Protection Association
NFR, National Fire Rating
NH₃, ammonia
NHTRA, National Highway Traffic Safety Administration
NiCad, nickel–cadmium
NIEHS, National Institute of Environmental Health Sciences
NIH, National Institutes of Health
NIHL, noise-induced hearing loss
NIIMS, National Interagency Incident Management System
NIOSH, National Institute of Occupational Safety and Health
NIST, National Institute of Standards and Technology
NMFC, National Motor Freight Class
NMR, Nuclear Magnetic Resonance Spectroscopy
NOAA, National Oceanic and Atmospheric Administration
NPDES, National Pollutant Discharge Elimination System
NPL, National Priority List
NRC, Nuclear Regulatory Commission; National Response Center
NRDA, Natural Resource Damage Assessment
NRDAR, Natural Resource Damage Assessment and Restoration
NRR, noise reduction rating
NRS, National Response System
NRT, National Response Team
NRTL, nationally recognized testing laboratory
NSC, National Safety Council
NSF, National Sanitation Foundation; National Science Foundation
NSFCC, National Strike Force Coordination Center
NTIS, National Technical Information Service
NTP, National Toxicology Program
NWPA, Nuclear Waste Policy Act
OBES, Office of Basic Energy Sciences
OCMV, open container in motor vehicle
OECM, Office of Enforcement and Compliance Monitoring
OMB, Office of Management and Budget
OPA, Oil Pollution Act of 1990
ORM, other regulated material
ORR, operational readiness review
OSC, on-scene coordinator
OSHA, Occupational Safety and Health Administration
OEHRC, Occupational Safety and Health Review Commission
OSWER, Office of Solid Waste and Emergency Response
OTA, Office of Technology Assessment
OV/AG, organic vapor/acid gas
PAPR, powered air-purifying respirator
PCB, polychlorinated biphenyls
PE, Professional Engineer
PEL, permissible exposure limit
PFA, priority focus areas
PFP, priority focus process
PFS, Professional Food Systems
PHA, preliminary hazards analysis
PHS, particularly hazardous substance
PHI, poison inhalation hazard
PL, Public Law
POA, plan of action
POP, performance-oriented packaging
POTW, publicly owned treatment works
ppb, parts per billion
PPE, personal protective equipment
ppm, parts of contaminant per million parts of air or fluid
PPR, periodic performance review
PRCS, permit-required confined space
PRP, potentially responsible party
PSA, preliminary site assessment
PSEL, plant specific emission limit
PSI, pollution standards index
psi, pounds per square inch
psig, pounds per square inch gauge
PSM, process safety management
PVA, polyvinyl alcohol
QA/QC, quality assurance/quality control
QRA, quantitative risk assessment
R&D, research and development
RCRA, Resource Conservation and Recovery Act
RFI, radiofrequency interference
RFI, requirement for improvement
RIH, Registered Industrial Hygienist
RMI, repetitive motion injury
RMP, risk management program
rms, root mean squared
RP, responsible party
RRT, regional response team
RSI, repetitive strain injury
RSO, radiological safety officer or radiation safety officer
RSPA, Research and Safety officer or radiation
SARA, Superfund Amendments and Reauthorization Act
SATR, site assessment and technical assistance
SCBA, self-contained breathing apparatus
SDWA, Safe Drinking Water Act
SEI, Safety Equipment Institute
SERC, State Emergency Response Commission
SHEM, Safety, Health, and Environmental Management
SHEP, Safety, Health, and Environmental Program
SIC, Standard Industrial Classification
SIP, State Implementation Plan
SITE, Superfund Innovative Technology Evaluation
SOP, standard operating procedure
SPCC, spill prevention, control, and countermeasures
SQG, small-quantity generator
STEL, short-term exposure limit
STP, standard temperature and pressure
SUD, safe use determination
SWA, Solid Waste Act
SWMP, Stormwater Monitoring Program
SWMU, Solid Waste Management Unit
SWPPP, Stormwater Pollution Prevention Program
APPENDIX B1. ACCIDENT INVESTIGATION REPORT

Facility ______________________________________

Date of Accident ______________________ Date Reported _____________________

Employee(s) Names(s) _________________________________________________________

Time of Accident ______________________________________________________________

Location of Accident ___________________________________________________________

Department Shift Supervisor ____________________________________________________

Machines/Tools/Processes/Operations Involved _____________________________________

______________________________________________________________________________

______________________________________________________________________________

Brief Description of Injuries _____________________________________________________

______________________________________________________________________________

______________________________________________________________________________

Property Damage_______________________________________________________________

______________________________________________________________________________

Witnesses _____________________________________________________________________

______________________________________________________________________________

______________________________________________________________________________

______________________________________________________________________________

Check each item that contributed to the accident:

[ ] Improper instruction [ ] Improper maintenance [ ] Unsafe position [ ] Physical impairment
[ ] Lack of training [ ] Human error [ ] Poor ventilation [ ] Improper clothing
[ ] Horseplay [ ] Lack of supervision [ ] Improper procedure [ ] No authority to operate
[ ] Unsafe arrangement [ ] Failure to use PPE [ ] Unsafe equipment [ ] Poor housekeeping
[ ] Failure to secure [ ] Inoperative safety device [ ] Improper guarding [ ] Safety rule violation
[ ] Using wrong tool [ ] Failure to lockout [ ] Other

List:

Summary of Investigation: _______________________________________________________

______________________________________________________________________________

Signature/Title ___________________________ Date

Corrective Actions ______________________________________________________________

______________________________________________________________________________

______________________________________________________________________________

Signature/Title ___________________________ Date

Comments ______________________________________________________________________

______________________________________________________________________________

Initials ________________________________ Date Reviewed _____________________

Sent to _______________________________________________________________________
APPENDIX B2. NEAR-HIT REPORT

A near miss is a potential hazard or incident that has not resulted in any personal injury. Unsafe working conditions, unsafe employee work habits, improper use of equipment, and use of malfunctioning equipment have the potential to cause work-related injuries. It is everyone’s responsibility to report and correct these potential accidents or incidents immediately. Please complete this form as a means to report near-miss situations.

Department/Location _______________________________ Date_____________________

Time _______________ [ ] a.m. [ ] p.m.

Please check all appropriate conditions:

[ ] Unsafe act  [ ] Unsafe equipment
[ ] Unsafe condition  [ ] Unsafe use of equipment

Description of incident or potential hazard ________________________________________
______________________________________________________________________________
______________________________________________________________________________

Employee Signature______________________________ Date_____________________

NEAR-HIT INVESTIGATION

Description of near-miss condition _______________________________________________
______________________________________________________________________________

Causes (primary and contributing) _______________________________________________
______________________________________________________________________________
______________________________________________________________________________

Corrective action taken (remove, replace, repair, or retrain) __________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________

Department/Location _______________________________ Date_____________________

Signed _______________________________ Date Completed _______________

Not completed for the following reason ___________________________________________

Supervisor Signature _______________________________ Date ____________________
APPENDIX C1. KEY OSHA BLOODBORNE PATHOGENS COMPLIANCE ISSUES

Prescription Drug Law of 2003 — The new Medicare law requires hospitals not required by law to comply with the OSHA Bloodborne Pathogens standard to agree contractually to comply with those standards. An obscure provision included in the Medicare Prescription Drug, Improvement, and Modernization Act of 2003 contained a provision titled “Application of OSHA Bloodborne Pathogens Standard to Certain Hospitals.” Under this provision, for hospitals to be eligible to participate in Medicare they must comply with the following requirements:

- Any hospitals not subject to the Occupational Safety and Health Act of 1970 or an approved state plan must comply with the Bloodborne Pathogens standard under Section 1910.1030 of Title 29 of the Code of Federal Regulations.
- The new legislation further provides that if a hospital fails to comply with 29 CFR 1910.1030 it would be subject to a civil money penalty “similar to the amount of civil penalties” that may be imposed under OSHA for a violation of the Bloodborne Pathogens standard.
- A hospital that is subject to the provisions of the Act had to begin compliance July 1, 2004.

In the past, a state, municipal, county, or parish hospital (or any other hospital considered a political subdivision of the state) was not subject to the OSHA Bloodborne Pathogens requirements unless covered by a state OSHA program.

Exposure Control Plan — The exposure control plan may be part of a larger document but, because the plan must be accessible to employees, it must be a cohesive entity by itself or the employer must provide a guiding document stating overall policy goals and referencing the elements of existing separate policies that comprise the plan. Employers must annually review and update the plan to reflect significant modifications in tasks or procedures required in 29 CFR 1910.1030(c)(1)(iv). The plan must be available to workers on their shifts. If it is maintained solely on a computer, employees must be trained to operate the computer. Paragraph (c)(1)(iv) requires the exposure control plan to be reviewed and updated at least annually (every 12 months) and whenever necessary to reflect new or modified tasks and procedures that affect occupational exposure and to reflect new or revised employee positions with occupational exposure. A periodic review ensures that the exposure control plan remains current with the latest information and scientific knowledge pertaining to bloodborne pathogens. The exposure control plan must document consideration and implementation of appropriate commercially available and effective engineering controls designed to eliminate or minimize exposure. The employer must review and update the plan, as necessary, to reflect changes in technology such as the use of effective engineering controls that can eliminate or minimize exposures. If the employer does not review and update its exposure control plan at least annually, paragraph (c)(1)(iv) should be cited.

Engineering Controls and Handwashing Facilities — The OSHA Compliance Officer evaluates the procedures for regular checking and evaluation of engineering controls as required by 29 CFR 1910.1030(d)(2)(ii). Paragraphs (d)(2)(iii) through (d)(2)(vi) require employers to provide handwashing facilities that are readily accessible to employees. Handwashing with soap and at least tepid running water must be performed as soon as feasible, particularly in cases of gross contamination, to adequately flush contaminated material from the skin. Paragraph (d)(2)(iv) allows the use of alternative handwashing methods as an interim measure when soap and water are not a feasible means of washing the hands or other parts
of the body. In such cases, the employer must provide either antiseptic hand cleaner and clean cloths or paper towels (or antiseptic towelettes). When using alternatives methods, workers must wash their hands with soap and running water as soon as feasible thereafter.

**Hepatitis B Vaccine** — Both the hepatitis B vaccine and vaccination series are addressed in 29 CFR 1910.1030(f)(1). In paragraph (f)(1)(ii)(A), “at no cost to the employee” means no out-of-pocket expense of any kind. The employer may not institute a program in which the employee pays the original cost of the vaccine and is reimbursed by the employer if she or he remains employed for a specified period of time. An “amortization contract” that requires employees to reimburse the employer for the cost of the vaccination should they leave that company’s employ prior to a specified period of time is similarly prohibited. A waiver of liability with respect to acceptance of the vaccine is also prohibited. The term “reasonable time and place” requires the medical procedures and evaluations to be convenient to the employee. They must normally be offered during employees’ scheduled work hours. If participation requires travel away from the worksite, the employer must bear the cost.

**Labeling of Containers** — The labeling requirements of 29 CFR 1910.1030 do not preempt either the U.S. Postal Service labeling requirements (39 CFR Part III) or the Department of Transportation’s Hazardous Materials regulations (49 CFR Parts 171, 180). DOT labeling is required on some transport containers (i.e., those containing “known infectious substances”). It is not required on all containers for which 29 CFR 1910.1030 requires the biohazard label. Where there is an overlap between the OSHA-mandated label and the DOT-required label, the DOT label will be considered acceptable on the outside of the transport container, provided that the OSHA-mandated label appears on any internal containers that may be present. Containers serving as collection receptacles within a facility must bear the OSHA label as these are not covered by the DOT requirements.

**Information and Training** — According to 29 CFR 1910.1030(g)(2), all employees with occupational exposure must receive initial and annual training on the hazards associated with exposure to bloodborne pathogens. The training must also address the protective measures to be taken to minimize the risk of occupational exposure. Employers must conduct retraining when changes in procedures or tasks occur. The provisions for employee training are performance oriented but employers have the flexibility to tailor their presentations to the employees’ backgrounds and responsibilities while still covering the topics listed in paragraph (g)(2)(vii). Training requires site-specific information. Employers must provide training at the time of initial employment and at least annually thereafter. Annual retraining for employees must be provided within 1 year of their original training. Refresher training must cover topics listed in the standard to the extent needed and must emphasize new information or procedures. Employers must train part-time employees, temporary employees, and workers referred to as “agency” or “per diem” employees. Paragraph (g)(2)(vii)(F) requires training to include an explanation of the use and limitations of methods that will prevent or reduce exposure, including appropriate engineering controls, work practices, and personal protective equipment. Training must include instruction in any new techniques and practices. “Hands-on” training is particularly useful.

**Training Methods and Interactive Question Opportunities** — Training employees solely by means of a film or video without the opportunity for a discussion period would constitute a violation of 29 CFR 1910.1030(g)(2). Similarly, a generic computer program, even an interactive one, is not considered appropriate unless the employer supplements such training with the site-specific information required (e.g., the location of the exposure control plan and the procedures to be followed if an exposure incident occurs) and a trainer is accessible for interaction. Trainees must have direct access to a qualified trainer during training. OSHA’s
requirement can be met if trainees have direct access to a trainer by way of a telephone hotline. The use of an electronic mail system to answer employee questions is not considered direct access to a qualified trainer, unless the trainer is available to answer e-mailed questions at the time the questions arise.

**Trainer Qualifications** — According to 29 CFR 1910.1030(g)(2)(viii), persons conducting training must be knowledgeable in the subject matter covered by the elements contained in the training program. The trainer must demonstrate expertise in the area of the occupational hazard of bloodborne pathogens and be familiar with local procedures. Trainers, such as infection control practitioners, registered nurses, occupational health professionals, physician’s assistants, emergency medical technicians, industrial hygienists, and professional trainers, may conduct the training provided they are knowledgeable in the subject matter covered by the training program as it relates to the workplace. In dentist and physician offices, individual employers may conduct the training, provided they are familiar with bloodborne pathogen exposure control and the subject matter required by paragraphs (g)(2)(vii)(A) through (N).

**Medical Recordkeeping** — Medical recordkeeping is covered by 29 CFR 1910.1020(h), which requires employers to keep medical and training records for each employee. Medical records required by paragraph (h)(1) are of particular importance to healthcare professionals when determining vaccination status and recommendations for treatment in the event of an exposure incident. The provisions of 29 CFR 1910.1020(d)(1) require that the medical records of employees working for less than 1 year need not be retained beyond the term of employment if they are provided to the employee upon termination of employment. Paragraph (h)(1) requires that medical records are to be kept confidential except for disclosures permitted when required by this standard or other federal, state, or local law. All medical records required to be kept by this standard are also required to be made available to OSHA. The Compliance Officer must protect the confidentiality of these records. If they are copied for the case file, the provisions of 29 CFR 1913.10 must be followed. Records concerning employee exposure to bloodborne pathogens and documenting HIV/HBV status are considered medical records within the meaning of 29 CFR 1910.1020.

**Training Recordkeeping** — Paragraph (h)(2) requires accurate recordkeeping of training sessions, including titles of the employees who attend. The records are necessary to assist the employer and OSHA in determining whether the training program adequately addresses the risks involved in each job. Additionally, this information is helpful in tracking the relationship between exposure incidents and the corresponding levels of training. Training records can be stored onsite where the actual documents will be easily accessible for review. In order to ensure that the employee training is complete, all the components of the program required by 29 CFR 1910.1020(g)(2)(vii) must be covered. Training records are not considered to be confidential. Training records can be stored onsite where the actual documents are readily accessible. They must be retained for 3 years from the training date.

**Hazardous Waste Operations and Emergency Response (HAZWOPER)** — The HAZWOPER standard (29 CFR 1910.1020) covers workers expected to respond to emergencies caused by the uncontrolled release of a hazardous substance. The definition of a hazardous substance includes any biological agent or infectious material that may cause disease or death. Potential scenarios where the Bloodborne Pathogens and HAZWOPER standards may interface include healthcare workers responding to an emergency caused by the uncontrolled release of infectious material. Employers of employees engaged in this types of activity must comply with the requirements in 29 CFR 1910.120 as well as the Bloodborne Pathogens standard. If there is a conflict or overlap, the provision that is more protective of employee safety and health applies.
APPENDIX C2. SAMPLE OSHA BLOODBORNE PATHOGENS
STANDARD EXPOSURE CONTROL PLAN

Organization_______________________________________ Date_____________________

This organization strives to provide a safe and healthful work environment for our entire staff. To help achieve this goal, the following exposure control plan provides information and guidance to eliminate or minimize occupational exposure to Bloodborne Pathogens in accordance with OSHA standard 29 CFR 1910.1030. The exposure control plan serves as the key document to assist the members of our organization in implementing and complying with the standard. Our efforts to protect our employees include determining worker exposure risks and implementing a number of exposure controls, such as:

- Requiring adherence to universal precautions
- Implementing engineering and work practice controls
- Requiring use of personal protective equipment
- Following sound and effective housekeeping practices
- Encouraging and offering exposed workers the hepatitis B vaccination
- Developing effective post-exposure evaluation and follow-up procedures
- Communicating hazards to employees and providing performance training
- Maintaining an effective recordkeeping system as required by OSHA standards
- Developing procedures for evaluating circumstances surrounding exposure incidents
- Maintaining an up-to-date exposure control plan to meet organizational needs

Program Administration

[Name] is responsible for implementing the plan. [Name] will maintain, review, and update the plan at least annually and whenever necessary to include new or modified tasks and procedures. The annual review will include using evaluation data of safer devices and information contained in the Sharps Injury Log. Contact [Name/Location/Phone Number].

Employees who are determined to have occupational exposure to blood or other potentially infectious materials (OPIM) must comply with the procedures and work practices outlined in this plan.

[Name] will maintain and provide all necessary personal protective equipment (PPE), engineering controls, sharps containers, labels, and red bags as required by the standard. [Name] will ensure that adequate supplies of the aforementioned equipment are available in the appropriate sizes. Contact [Name/Location/Phone Number].

[Name] will be responsible for ensuring that all medical actions required are performed and that appropriate employee health and OSHA records are maintained. Contact [Name/Location/Phone Number].

[Name] will be responsible for the training, documentation of training, and making the written plan available to employees, OSHA, and NIOSH representatives. Contact [Name/Location/Phone Number].
Employee Exposure Determination

A. The following job classifications have occupational exposure:

<table>
<thead>
<tr>
<th>Job Title</th>
<th>Department/Location</th>
</tr>
</thead>
</table>

(List all that apply)

B. The following is a list of job classifications in which some employees at our facility have occupational exposure. Included is a list of tasks and procedures, or groups of closely related tasks and procedures, in which occupational exposure may occur for these individuals:

<table>
<thead>
<tr>
<th>Job Title/Department</th>
<th>Risks, Tasks, and Procedures</th>
</tr>
</thead>
</table>

(List all that apply)

Example:
Housekeeper/Environmental Services Handling regulated waste

C. Describe in the exposure plan how part-time, temporary, contract, and per diem employees will be protected by standard.

Methods of Implementation and Control — Universal precautions: All employees will utilize universal (standard) precautions.

Exposure Control Plan — Employees covered by the OSHA standard receive an explanation of this exposure plan during their initial training session. Plan elements will be reviewed during refresher training. Employees may review this plan at any time during their work shifts by contacting [Name]. If requested, we will provide an employee with a copy of the plan free of charge and within 15 days of the request. [Name] is responsible for reviewing and updating the plan annually and as necessary to reflect any new or modified tasks and procedures affecting occupational exposures. The plan will also be updated to reflect new or revised employee positions with exposure.

Engineering Controls and Work Practices — Engineering controls and work practice controls will be used to prevent or minimize exposure risks. The specific engineering controls and work practice controls (e.g., nonglass capillary tubes and needleless systems) used are listed below:

(List all that apply)

Sharps disposal containers will be inspected, located, maintained, or replaced by [Name] every [time frame] or whenever necessary to prevent overfilling

Evaluation of Procedures and New Products — We evaluate new procedures and new products regularly by:

(Describe the processes, literature reviewed, supplier information, or products considered.)
Frontline care providers and appropriate managers work together in the new product selection and evaluation process:

(Describe employees' involvement and name of person or department responsible for implementation of recommendations.)

______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________

The following guidelines (e.g., review of OSHA records, employee interviews, committee activities) will be followed by the facility to identify the need for changes in engineering controls and work practices:

______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________

**Personal Protective Equipment (PPE)** — The organization provides PPE for employees at no cost. PPE training is provided by [Name] on the tasks or procedures employees perform. The types of PPE available to employees include [list]:

______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________

PPE location(s):

______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________

Contact [Name] to obtain PPE. [Specify how employees are to obtain PPE and who is responsible for ensuring availability.] All employees using PPE must observe the following precautions:

- Wash hands immediately or as soon as feasible after removal of gloves or other PPE.
- Remove PPE after it becomes contaminated, and before leaving the work area.
- Dispose of used PPE in [appropriate containers for storage, laundering, decontamination, or disposal].
- Wear appropriate gloves when it can be reasonably anticipated that there may be hand contact with blood or OPIM and when handling or touching contaminated items or surfaces; replace gloves if they become torn, punctured, or contaminated or if their ability to function as a barrier is otherwise compromised.
- Decontaminate utility gloves for reuse if their integrity is not compromised; discard utility gloves if they show signs of cracking, peeling, tearing, puncturing, or deterioration.
- Never wash or decontaminate disposable gloves for reuse.
- Wear appropriate face and eye protection when splashes, sprays, spatters, or droplets of blood or OPIM pose a hazard to the eye, nose, or mouth.
- Remove immediately or as soon as feasible any garment contaminated by blood or OPIM in such a way as to avoid contact with the outer surface.
Procedures for handling used PPE (e.g., how to decontaminate face shields, eye protection, resuscitation equipment) are as follows:

Housekeeping — Regulated waste must be placed in containers that can be closed, are constructed to contain all contents and prevent leakage, are appropriately labeled or color-coded (see Labels section), and are closed prior to removal to prevent spillage or protrusion of contents during handling.

The procedure for handling sharps disposal containers is:

[Refer to specific agency procedure by title or number and last date of review.]

The procedure for handling other regulated waste is:

[Refer to specific agency procedure by title or number and last date of review.]

Contaminated sharps are discarded immediately or as soon as possible in containers that can be closed. Be sure containers are puncture-resistant, leakproof on sides and bottoms, and labeled or color-coded as appropriate. Sharps disposal containers are available at [Location].

Containers must be easily accessible and located as close as possible to the immediate area where sharps are used.

Bins and pails (e.g., wash basins) must be cleaned and decontaminated as soon as possible after visible contamination.

Broken glassware that may be contaminated must be picked up using mechanical means, such as a brush and dust pan.

Laundry — The following contaminated articles will be laundered by the facility: [List]. Laundering will be performed by [Name] at [Time or Location].

The following laundering requirements must be met:

- Handle contaminated laundry as little as possible, with minimal agitation.
- Place wet contaminated laundry in leakproof, labeled, or color-coded containers before transport (use red bags for this purpose).
- Wear the following PPE when handling and/or sorting contaminated laundry: [List].

Labels — The following labeling methods (e.g., size and color of label, type of hazardous materials, type of container) apply in this facility [List]:

______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
[Name] will ensure that warning labels are affixed or red bags are used as required if regulated waste or contaminated equipment is brought into the facility. Employees are to notify [Name] if they discover regulated waste containers, refrigerators containing blood or OPIM, contaminated equipment, etc. without proper labels.

**Hepatitis B Vaccination** — [Name] will provide training to employees on the hepatitis B vaccination that addresses its safety, benefits, efficacy, methods of administration, and availability. The hepatitis B vaccination series is available at no cost after training and within 10 days of initial assignment to employees identified in the exposure determination section of this plan. Vaccination is encouraged unless:

- Documentation exists that the employee has previously received the series.
- Antibody testing reveals that the employee is immune.
- Medical evaluation shows that vaccination is contraindicated.

If an employee chooses to decline the vaccination, the employee must sign a declination form. Employees who decline may request and obtain the vaccination at a later date at no cost. Documentation of refusal of the vaccination is kept at [Location]. Vaccination will be provided by [Healthcare Professional] at [Location].

Following hepatitis B vaccination, the healthcare professional's written opinion will be limited to whether the employee requires the hepatitis vaccine and whether the vaccine was administered.

**Post-Exposure Evaluation and Follow-Up** — In the event that an exposure incident occurs, employees should contact [Name] at [Phone Number]. An immediately available confidential medical evaluation and follow-up will be conducted by [Healthcare Professional]. Following the initial first aid (clean the wound, flush eyes or other mucous membrane, etc.), it will then be necessary to:

- Document the routes of exposure and how the exposure occurred.
- Identify and document the source individual (unless that identification is not feasible or is prohibited by state or local law).
- Obtain consent and make arrangements to have the source individual tested as soon as possible to determine HIV, HCV, and HBV infectivity; if the source individual is already known to be HIV, HCV, or HBV positive, new testing need not be performed.
- Document that the source individual’s test results were conveyed to the employee’s healthcare provider.
- Provide the exposed employee with the source individual’s test results and with information about applicable disclosure laws and regulations concerning the identity and infectious status of the source individual (e.g., laws protecting confidentiality).
- After obtaining consent, collect the exposed employee’s blood as soon as feasible after the exposure incident and test the employee’s blood for HBV and HIV serological status.
- Perform testing as soon as feasible if the exposed employee elects to have the baseline sample tested during this waiting period.
- Preserve the baseline blood sample for at least 90 days if the employee does not give consent for HIV serological testing during collection of blood for baseline testing.

**Administration of Post-Exposure Evaluation and Follow-Up** — [Name] ensures that the healthcare professional responsible for the employee’s hepatitis B vaccination and post-exposure evaluation and follow-up is given a copy of OSHA’s Bloodborne Pathogens standard. [Name] ensures that the healthcare professional evaluating an employee after an exposure incident also receives the following:
• Description of the employee's job duties relevant to the exposure incident
• Route of exposure
• Circumstances of exposure
• If possible, results of the source individual's blood test
• Relevant employee medical records, including vaccination status

[Name] provides the employee with a copy of the evaluating healthcare professional's written opinion within 15 days after completion of the evaluation.

**Procedures for Evaluating the Circumstances Surrounding an Exposure Incident** — [Name] will review the circumstances of all exposure incidents to determine:

• Engineering controls in use at the time
• Work practices followed
• Description of the device being used
• Protective equipment or clothing used at the time of the exposure incident (e.g., gloves, eye shields)
• Where the incident occurred
• Procedure being performed when the incident occurred
• Employee's training

If it is determined that revisions need to be made, [Name] will ensure that appropriate changes are made to this plan. (Changes may include an evaluation of safer devices, adding employees to the exposure determination list, etc.)

**Employee Training** — All employees who have occupational exposure to bloodborne pathogens must receive training conducted by [Name and Qualifications]. All employees who have occupational exposure to bloodborne pathogens must receive training on the epidemiology, symptoms, and transmission of bloodborne pathogen diseases at the time of initial assignment to jobs with potential exposure. During training, employees will receive:

• A copy and explanation of the standard and local plan with instructions on how to obtain a copy.
• An explanation of methods used to recognize tasks or activities that may involve exposure to blood or OPIM and what constitutes an exposure incident.
• An explanation of uses for and limitations of engineering controls, work practices, and PPE.
• An explanation of the types, uses, location, removal, handling, decontamination, and disposal of PPE.
• An explanation of the basis for PPE selection.
• Information on the hepatitis B vaccine, including its efficacy, safety, method of administration, benefits of vaccination, and that the vaccine will be offered free.
• Information on the appropriate actions to take and persons to contact in an emergency involving blood or OPIM.
• An explanation of the procedure to follow if an exposure incident occurs, including how to report the incident and the medical follow-up that will be made available.
• Information on the post-exposure evaluation and follow-up that the employer is required to provide for the employee following an exposure incident.
• An explanation of the signs and labels or color coding required by the standard and used at this facility.
• Opportunity for interactive questions and answers with the person conducting the training session.

Training materials for this facility are available at [Location].
Recordkeeping — Training records are completed for each employee upon completion of training. These documents will be kept for at least 3 years by [Name or Department]. The training records include:

- Dates of the training sessions
- Contents or a summary of the training sessions
- Names and qualifications of persons conducting the training
- Names and job titles of all persons attending the training sessions

Employee training records are provided upon request to the employee or the employee’s authorized representative within 15 working days. Such requests should be addressed to [Name or Department].

Medical Records — Medical records are maintained for each employee with occupational exposure in accordance with 29 CFR 1910.20, Access to Employee Exposure and Medical Records. [Name or Department] is responsible for maintenance of the required medical records. These confidential records are kept at [Location] for at least the duration of employment plus 30 years. Employee medical records are provided upon request of the employee or to anyone having written consent of the employee within 15 working days. Such requests should be sent to [Name or Department and Address].

OSHA Recordkeeping — An exposure incident is evaluated to determine if the case meets OSHA’s Recordkeeping Requirements (29 CFR 1904). This determination and the recording activities are done by [Name or Department].

Hepatitis B Vaccine Declination Statement (Mandatory) — I understand that due to my occupational exposure to blood or other potentially infectious materials I may be at risk of acquiring hepatitis B virus (HBV) infection.

I have been given the opportunity to be vaccinated with hepatitis B vaccine, at no charge to myself; however, I decline the hepatitis B vaccination at this time.

I understand that, by declining this vaccine, I continue to be at risk of acquiring hepatitis B, a serious disease.

If in the future I continue to have occupational exposure to blood or other potentially infectious materials and I want to be vaccinated with hepatitis B vaccine, I can receive the vaccination series at no charge to me.

Employee Name__________________________________________________________

Signature__________________________________________ Date_____________________

Witness Signature ________________________________________________________________________
APPENDIX C3. OSHA BLOODBORNE PATHOGENS TRAINING REQUIREMENTS AND SAMPLE EDUCATION PLAN

Employers must be sure that all employees with occupational exposure participate in a training program that is provided at no cost to the employee and during working hours. Training shall be provided at the time of the initial assignment for tasks where occupational exposure may take place and at least annually thereafter. For employees who have received training on bloodborne pathogens in the year preceding the effective date of the standard, only training with respect to the provisions of the standard that were not included need be provided. Annual training for all employees must be provided within 1 year of their previous training. Employers will provide additional training when changes such as modification of tasks or procedures or institution of new tasks or procedures affect the employee’s occupational exposure. The additional training may be limited to addressing the new exposures created. Material appropriate in content and vocabulary to educational level, literacy, and language of employees shall be used. The training program should contain at a minimum the following elements:

- An accessible copy of the regulatory text of this standard and an explanation of its contents
- A general explanation of the epidemiology and symptoms of bloodborne diseases
- An explanation of the modes of transmission of bloodborne pathogens
- An explanation of the employer’s exposure control plan and the means by which the employee can obtain a copy of the written plan
- An explanation of the appropriate methods for recognizing tasks and other activities that may involve exposure to blood and other potentially infectious materials
- An explanation of the use and limitations of methods that will prevent or reduce exposure including appropriate engineering controls, work practices, and personal protective equipment
- Information on the types, proper use, location, removal, handling, decontamination, and disposal of personal protective equipment
- An explanation of the basis for selection of personal protective equipment
- Information on the hepatitis B vaccine, including information on its efficacy, safety, method of administration, the benefits of being vaccinated, and that the vaccination will be offered free of charge
- Information on the appropriate actions to take and persons to contact in an emergency involving blood or other potentially infectious materials
- An explanation of the procedures to follow if an exposure incident occurs, including the method of reporting the incident and the medical follow-up that will be made available
- Information on the post-exposure evaluation and follow-up that the employer is required to provide for the employee following an exposure incident
- An explanation of the signs and labels or color coding required
- An opportunity for interactive questions and answers with the person conducting the training session.

The person conducting the training should be knowledgeable in the subject matter covered by the training program as it relates to the workplace.
Sample Bloodborne Training Program

Learning Objective A

Participants will be able to:

• Describe the OSHA Bloodborne Pathogens standard.
• State which employees are covered under the standard.
• Describe what is required to meet the standard.
• Discuss the following:
  • Provisions of the OSHA Bloodborne Pathogens standard
  • Who is covered
  • How to meet the OSHA standards
  • Training program requirements

Additional training is necessary if new equipment is introduced to the work area. Standards include the potential for exposure, not just exposure.

A written exposure control plan is necessary for the safety and health of workers. Participants should be able to:

• Identify job classifications where there is exposure to blood or other potentially infectious materials.
• Explain the protective measures currently in effect in the acute-care facility and methods of compliance to be implemented, including hepatitis B vaccination and post-exposure follow-up procedures, how hazards are communicated to employees, personal protective equipment, housekeeping, and recordkeeping.
• Establish procedures for evaluating the circumstances of an exposure incident.

Learning Objective B

Participants will be able to explain the transmission, course, and effects of bloodborne pathogens by acquiring an understanding of the following:

• Definition of a bloodborne pathogens
• Types of bloodborne pathogens
• Hepatitis B virus (HBV) — definition of, symptoms, course, and effects
• Human immunodeficiency virus (HIV) — definition of, symptoms, course, and effects
• Mode of transmission of bloodborne pathogens (including modes of transmission other than occupational transmission)

Employees should be reminded that:

• HBV is more persistent than HIV.
• Nonintact skin makes employees vulnerable to infection.
• Clean work surfaces decrease the risk of infection.
• A person cannot be identified as HBV or HIV positive just by his or her appearance.
• Due to the length of time before symptoms appear, employees may not be aware that they have contracted a disease.
• All exposures must be reported.
• Handwashing is important for preventing transmission of bloodborne pathogens.
• Work surfaces must be cleaned with an appropriate disinfectant.
• Personal protective equipment must be used as per the employer.

With regard to workplace transmission, employees should be made aware that HBV, HIV, and other pathogens may be present in:
Body fluids such as saliva, semen, vaginal secretions, cerebrospinal fluid, synovial fluid, pleural fluid, peritoneal fluid, pericardial fluid, amniotic fluid, and any other body fluids visibly contaminated with blood

- Saliva and blood contacted during dental procedures
- Unfixed tissue or organs other than intact skins from living or dead humans
- Organ cultures, culture media, or similar solutions
- Blood, organs, and tissues from experimental animals infected with HIV or HBV

Employees should learn that the means of transmission include:

- An accidental injury by a sharp object contaminated with infectious material, such as:
  - Needles
  - Scalpels
  - Broken glass
  - Exposed ends of dental wires
  - Anything that can pierce, puncture, or cut your skin.
- Open cuts, nicks, and skin abrasions, even dermatitis and acne, as well as the mucous membranes of the mouth, eyes, or nose
- Indirect transmission, such as touching a contaminated object or surface and transferring the infectious material to the mouth, eyes, nose, or open skin

**Learning Objective C**

Participants will be able to describe the types of hepatitis B vaccines and their usage and contraindications and should be able to identify who should receive the vaccine. The following points should be addressed:

- Types of hepatitis B vaccines available
- Who should receive the hepatitis B vaccine
- When and how the vaccine is given:
  - Vaccine must be given to employee during work hours.
  - Vaccine is given in three doses according to a dose schedule.
  - Vaccine is given in the upper arm area (deltoid muscle).
  - Vaccine is provided by the employer at no out-of-pocket expense to the employee.
  - Employers cannot require employees to bill their insurance plans for the cost of the vaccine.
  - Employers cannot require that employees stay at a specific job for a specific amount of time to receive the vaccine free of charge.
  - No prescreening is required, and the employer cannot make this a requirement for receiving the vaccine.
- To whom the vaccine does not have to be offered:
  - Employees who have previously completed the hepatitis B vaccination series
  - When immunity is confirmed through antibody testing
  - Contraindications to receiving the vaccine exist
- Side effects of the vaccine
- Dosage (10 μg or 1.0 mL):
  - Dose 1 — at target date
  - Dose 2 — 30 days later
  - Dose 3 — 6 months after first dose
Learning Objective D

The participants will be able to describe the controls that reduce exposure to bloodborne pathogens:

- Provide an overview of four prevention strategies: engineering controls, work practice controls, PPE, and universal precautions.
- Differentiate between engineering and work practice controls.
- Discuss handwashing and location of handwashing facilities.
- Go over work practice requirements.
- Discuss sharps, including how to handle contaminated sharps (disposable/reusable).
- Describe the personal protective equipment used in the facility and give examples.
- Emphasize that PPE must be readily available and sized appropriately.
- Make it clear that PPE must be provided and maintained at no cost to the employee.
- Advise employees what to do if:
  - PPE becomes contaminated
  - Personal clothing becomes contaminated
- Discuss gloves and activities that may alter the integrity of gloves (e.g., cleaning with surfactants).
- Give examples of the limited exceptions to using PPE.
- Describe the concept of universal precautions.
- Describe acceptable containers.
- Describe biohazard containers.
- Describe surfaces in the facility that could be contaminated with blood or other potentially infectious materials.
- Explain how to clean work surfaces in the facility (e.g., what cleaners are used).
- Explain the cleaning schedule established in the facility.
- Explain how to clean up broken glass or a contaminated spill.
- Explain how to clean reusable sharps (if appropriate to the facility).
- Explain how laundry is handled in the facility.
- Caution employees to be careful when handling contaminated laundry.
- Advise employees to watch for hidden sharps.

Ask participants if they have any questions about this material.

- Summary:
  - Use puncture-resistant, leakproof containers, color-coded red or labeled depending on the standard, to discard contaminated items such as needles, broken glass, scalpels, or other items that could cause a cut or puncture wound.
  - Use puncture-resistant, leakproof containers, color-coded red or labeled, to store contaminated reusable sharps until they are properly reprocessed.
  - Store and process reusable contaminated sharps in a way that ensures safe handling; for example, use a mechanical device to retrieve used instruments from soaking pans in decontamination areas.
  - Use puncture-resistant, leakproof containers to collect, handle, process, store, transport, or ship blood specimens and potentially infectious materials.
  - Label these specimens if they are to be shipped outside the facility.
  - Labeling is not required when specimens are handled by employees trained to use universal precautions with all specimens and when these specimens are kept within the facility.
• Wash hands when gloves are removed and as soon as possible after contact with blood or other potentially infectious materials.
• Provide and make available a mechanism for immediate eye irrigation in the event of an exposure incident.
• Do not bend, recap, or remove contaminated needles unless required to do so by specific medical procedures or the employer can demonstrate that no alternative is feasible.
• In these instances, use mechanical means such as forceps, or a one-handed technique to recap or remove contaminated needles.
• Do not shear or break contaminated needles.
• Discard contaminated needles and sharp instruments in puncture-resistant, leak-proof, red or biohazard-labeled containers that are readily accessible, maintained upright, and not allowed to be overfilled.
• Do not eat, drink, smoke, apply cosmetics, or handle contact lenses in areas of potential occupational exposure.
• Do not store food or drink in refrigerators or on shelves where blood or potentially infectious materials are present.
• Use red labels or affix biohazard labels to containers when storing, transporting, or shipping blood or other potentially infectious materials.
• Universal precautions:
  • Workers should protect their skin from contact with any body fluids.
  • Workers should wear gloves when handling anything that contains these fluids.
  • Workers should use such a barrier when handling blood, body fluids (e.g., urine, vomit), mucous membranes, or skin that is not attached.
  • If the splatter of blood is anticipated, then workers should wear masks, protective eyewear, and aprons.
  • Workers should wash hands and other skin surfaces immediately and thoroughly if they become contaminated with blood or other body fluids.
  • Workers should wash their hands thoroughly after removing protective gloves.
  • All healthcare workers should be careful not to be injured by needles, scalpels, and other sharp instruments or devices during procedures.
  • Workers should take special care when cleaning up after surgical procedures or disposing of any needles or instruments so other workers do not come into contact with these instruments.
  • Workers should use puncture-resistant containers to collect and dispose of these objects.
  • Workers should take care at all times when working near sharp instruments and the disposal containers.
  • Workers can minimize the need for emergency mouth-to-mouth resuscitation by using other ventilation devices to perform this operation when necessary; this precaution is taken even though saliva has not been implicated in HIV transmission.
  • Healthcare workers who have exudative lesions or weeping dermatitis should refrain from all direct patient care and handling patient equipment until the condition is resolved.
  • Pregnant healthcare workers should be completely familiar with and particularly careful to observe the precautions to minimize the risk of HIV transmission to their infants.
Learning Objective E

Participants will be able to determine whether an exposure incident could occur within their worksite and describe steps to take after an exposure incident. Discussion should address the following topics:

- Local exposure control plan
- Defining an occupational exposure incident
- Information given to healthcare professionals
- Steps to minimize exposure
- Potential exposure incidents applicable to the work site

Sessions must be comprehensive in nature and include information on bloodborne pathogens as well as on OSHA regulations and the employer’s exposure plan. The person conducting the training must be knowledgeable in the subject matter. The training program must accomplish the following:

- Explain the regulatory text and make a copy available.
- Explain the epidemiology and symptoms of bloodborne diseases.
- Explain the modes of transmission of bloodborne pathogens.
- Explain the employer’s written exposure control plan.
- Describe the methods to control transmission of HBV and HIV.
- Explain how to recognize occupational exposure.
- Inform workers about the availability of free hepatitis B vaccinations, vaccine efficacy, safety, benefits, and administration.
- Explain the emergency procedures and reporting of exposure incidents.
- Inform workers of the post-exposure evaluation and follow-up available from healthcare professionals.
- Describe how to select, use, remove, handle, decontaminate, and dispose of personal protective clothing and equipment.
- Explain the use and limitations of safe work practices, engineering controls, and personal protective equipment.
- Explain the use of labels, signs, and color coding required by the standard.
- Provide an interactive question and answer session on the training.
APPENDIX C4. BARRIER PRECAUTIONS
FOR EXPOSURE TO BLOOD OR BODY FLUIDS

<table>
<thead>
<tr>
<th>Description of Task</th>
<th>Hand Washing</th>
<th>Gloves</th>
<th>Gown or Apron</th>
<th>Mask</th>
<th>Eye Protection</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Physical assessment</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Giving medications:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oral</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Piggybacks</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IM, IV, stopcock,</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Catheter hub</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Suppository, rectal or vaginal</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Routine bath</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Tube feeding</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Enema</td>
<td>X</td>
<td>X</td>
<td>+</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Foley irrigation</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Emptying Foley bag, urine receptacles, bedpan, emesis basin</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>8. Insertion of NG tube</td>
<td>X</td>
<td>X</td>
<td>+</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>9. Vaginal irrigation</td>
<td>X</td>
<td>X</td>
<td>+</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Sitz bath</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Applying pressure to control bleeding</td>
<td>X</td>
<td>X</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>12. Feeding patients</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Emptying wastebaskets</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. Cleanup of incontinent patients:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urine</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Feces</td>
<td>X</td>
<td>X</td>
<td>+</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. Decubitus care</td>
<td>X</td>
<td>X</td>
<td>+</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16. Collecting specimens: sputum, stool, urine, wounds</td>
<td>X</td>
<td>X</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>17. Keto urine checks</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18. Oral suctionings, oral/nasal care</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19. Nasotracheal or endotracheal suctioning</td>
<td>X</td>
<td>X</td>
<td>+</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>20. Cleaning up spills of blood or body substance</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21. Direct contract with patients with frequent forceful coughing</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>22. Applying topical ointment to lesion</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Description of Task</td>
<td>Hand Washing</td>
<td>Gloves</td>
<td>Gown or Apron</td>
<td>Mask</td>
<td>Eye Protection</td>
</tr>
<tr>
<td>----------------------------------------</td>
<td>--------------</td>
<td>--------</td>
<td>---------------</td>
<td>------</td>
<td>----------------</td>
</tr>
<tr>
<td>23. Traction</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24. Vital signs: oral temperature, pulse, respiration, blood pressure</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25. Rectal temperature</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>26. Shaving</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>27. Washing hair</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28. Postmortem care</td>
<td>X</td>
<td>X</td>
<td>+</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>29. Removal of fecal impaction</td>
<td>X</td>
<td>X</td>
<td>+</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30. Gastric lavage</td>
<td>X</td>
<td>X</td>
<td>+</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>31. Changing visibly soiled beds</td>
<td>X</td>
<td>X</td>
<td>+</td>
<td></td>
<td></td>
</tr>
<tr>
<td>32. Placing oxygen cannula or mask</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>33. Cleaning surfaces contaminated by blood or body substances</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>34. Ostomy care, teaching, and irrigation</td>
<td>X</td>
<td>X</td>
<td>+</td>
<td></td>
<td></td>
</tr>
<tr>
<td>35. Routine dressing changes and wound care</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>36. Dressing changes wounds with large amounts of dressing</td>
<td>X</td>
<td>X</td>
<td>+</td>
<td></td>
<td></td>
</tr>
<tr>
<td>37. Wound irrigation</td>
<td>X</td>
<td>X</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Description of Task</td>
<td>Hand Washing</td>
<td>Gloves</td>
<td>Gown or Apron</td>
<td>Mask</td>
<td>Eye Protection</td>
</tr>
<tr>
<td>-----------------------------------------------------------------------------------</td>
<td>--------------</td>
<td>--------</td>
<td>---------------</td>
<td>------</td>
<td>----------------</td>
</tr>
<tr>
<td>38. Burn dressing changes</td>
<td>X</td>
<td>X</td>
<td>+</td>
<td></td>
<td></td>
</tr>
<tr>
<td>39. Tracheotomy care</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>40. Dressing removal</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>41. Wound packing</td>
<td>X</td>
<td>X</td>
<td>+</td>
<td></td>
<td></td>
</tr>
<tr>
<td>42. Suture or staple removal: clean, dry wound</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>43. Suture or staple removal: wound with drainage</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>44. Wound packing</td>
<td>X</td>
<td>X</td>
<td>+</td>
<td></td>
<td></td>
</tr>
<tr>
<td>45. I &amp; D of abscess</td>
<td>X</td>
<td>X</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>46. Changing pleuravac</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>47. Placement of Foley catheter for fecal incontinence and emptying of bag</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>48. Assisting with invasive procedures: lumbar puncture, bone marrow, thoracentesis, paracentesis, liver biopsy:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inside sterile field</td>
<td>X</td>
<td>X</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Outside sterile field</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chest tube insertion</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Chest tube removal</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

*Note: X, use routinely; +, use if soiling or splattering is likely.*
# APPENDIX D. OSHA STANDARDS
## FOR SELECTED AREAS OR DEPARTMENTS

### Heliports

<table>
<thead>
<tr>
<th>Potential Hazards</th>
<th>Possible Applicable OSHA Standards</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exposure to helicopter hazards</td>
<td>1910.183(g)</td>
</tr>
<tr>
<td>Exposure to high noise levels</td>
<td>Occupational Noise Exposure standard (1910.95)</td>
</tr>
</tbody>
</table>

### Radiology

<table>
<thead>
<tr>
<th>Potential Hazards</th>
<th>Possible Applicable OSHA Standards</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exposure to radiation</td>
<td>Ionizing Radiation (1910.1096)</td>
</tr>
<tr>
<td>Exposure to hazardous chemicals</td>
<td>Hazard Communication standard (1910.1200)</td>
</tr>
<tr>
<td></td>
<td>Respiratory Protection standard (1910.134)</td>
</tr>
<tr>
<td>Exposure to bloodborne pathogens such as HIV, HBV, HCV</td>
<td>Bloodborne Pathogens standard (Universal Precautions: 1910.1030(d)(1))</td>
</tr>
<tr>
<td></td>
<td>Personal Protective Equipment (1910.1030(d)(3)(x))</td>
</tr>
<tr>
<td>Exposure to tuberculosis</td>
<td>Accident Prevention Signs and Tags (1910.145)</td>
</tr>
<tr>
<td>Exposure to wet surfaces and potential slips and falls</td>
<td>General Requirements: Walking/Working Surfaces (1910.22)</td>
</tr>
</tbody>
</table>

### Surgical Suite

<table>
<thead>
<tr>
<th>Potential Hazards</th>
<th>Possible Applicable OSHA Standards</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exposure to compressed gases</td>
<td>Compressed Gases (1910.101)</td>
</tr>
<tr>
<td></td>
<td>Hydrogen (1910.103)</td>
</tr>
<tr>
<td></td>
<td>Oxygen (1910.104)</td>
</tr>
<tr>
<td></td>
<td>Nitrous Oxide (1910.105)</td>
</tr>
<tr>
<td>Exposure to blood and OPIM from needlesticks, lack of PPE</td>
<td>Bloodborne Pathogens Standard (1910.1030(d)(3)(ix); 1910.1030(c)(1)(iv)(B); 1910.1030(d)(2)(i); 1910.1030(h)(5))</td>
</tr>
<tr>
<td>Exposure to laser hazards</td>
<td>Nonionizing Radiation (1926.54)</td>
</tr>
<tr>
<td>Exposure to latex allergy</td>
<td>Bloodborne Pathogens standard (1910.1030(d)(iii)); alternatives to latex gloves must be provided</td>
</tr>
<tr>
<td>Exposure to hazardous chemicals</td>
<td>Hazard Communication standard (1910.1200)</td>
</tr>
<tr>
<td></td>
<td>Respiratory Protection standard (1910.134)</td>
</tr>
<tr>
<td>Exposure to potential slips and falls from cluttered or obstructed floor surfaces</td>
<td>General Requirements: Walking/Working Surfaces (1910.22)</td>
</tr>
<tr>
<td>Lack of personal protective equipment</td>
<td>Personal Protective Equipment (1910.132(a))</td>
</tr>
<tr>
<td></td>
<td>Hand Protection (1910.138(a))</td>
</tr>
</tbody>
</table>
### Physical Therapy

<table>
<thead>
<tr>
<th>Potential Hazards</th>
<th>Possible Applicable OSHA Standards</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exposure to hazardous chemicals</td>
<td>Hazard Communication standard (1910.1200)</td>
</tr>
<tr>
<td></td>
<td>Respiratory Protection standard (1910.134)</td>
</tr>
<tr>
<td>Exposure to bloodborne pathogens such as HIV, HBV, and HCV</td>
<td>Bloodborne Pathogens standard (1910.1030)</td>
</tr>
<tr>
<td>Exposure of eyes or body of any person to injurious corrosive materials</td>
<td>Medical Services and First Aid (1910.151(c))</td>
</tr>
<tr>
<td>Exposure to wet surfaces and potential slips and falls</td>
<td>General Requirements: Walking/Working Surfaces (1910.22)</td>
</tr>
<tr>
<td>Lack of personal protective equipment</td>
<td>Personal Protective Equipment: (1910.132(a))</td>
</tr>
<tr>
<td></td>
<td>Hand Protection (1910.138(a))</td>
</tr>
</tbody>
</table>

### Pharmacy

<table>
<thead>
<tr>
<th>Potential Hazards</th>
<th>Possible Applicable OSHA Standards</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exposure to hazardous chemicals or drugs</td>
<td>Hazard Communication standard (1910.1200)</td>
</tr>
<tr>
<td></td>
<td>Material Safety Data Sheets (MSDS)</td>
</tr>
<tr>
<td></td>
<td>Respiratory Protection standard (1910.134)</td>
</tr>
<tr>
<td>Exposure to bloodborne pathogens such as HIV, HBV, and HCV</td>
<td>Bloodborne Pathogens standard (1910.1030)</td>
</tr>
<tr>
<td>Exposure of eyes or body of any person to injurious corrosive materials</td>
<td>Medical Services and First Aid (1910.151(c))</td>
</tr>
<tr>
<td>Denied right of employee or designated representatives to access relevant exposure and medical records</td>
<td>Employee Exposure and Medical Records standard (1910.1020)</td>
</tr>
<tr>
<td>Exposure to wet surfaces and potential slips and falls</td>
<td>General Requirements: Walking/Working Surfaces (1910.22)</td>
</tr>
<tr>
<td>Exposure to latex allergy</td>
<td>Bloodborne Pathogens standard (1910.1030)(d)(i)(iiii); provide alternatives to those employees who are allergic to the gloves normally provided</td>
</tr>
<tr>
<td>Lack of personal protective equipment</td>
<td>Personal Protective Equipment (1910.132(a))</td>
</tr>
<tr>
<td></td>
<td>Hand Protection (1910.138(a))</td>
</tr>
<tr>
<td></td>
<td>Eye and Face Protection (1910.133)</td>
</tr>
<tr>
<td><strong>Laboratory</strong></td>
<td></td>
</tr>
<tr>
<td>----------------</td>
<td></td>
</tr>
<tr>
<td><strong>Potential Hazards</strong></td>
<td><strong>Possible Applicable OSHA Standards</strong></td>
</tr>
</tbody>
</table>
| Exposure to hazardous chemicals | Hazard Communication standard (1910.1200)  
Respiratory Protection standard (1910.134) |
| Exposure to bloodborne pathogens such as HIV, HBV, and HCV | Bloodborne Pathogens standard (1910.1030) |
| Exposure of eyes or body of any person to injurious corrosive materials | Medical Services and First Aid (1910.151(c)) |
| Exposure to wet surfaces and potential slips and falls | General Requirements: Walking/Working Surfaces (1910.22) |
| Lack of personal protective equipment | Personal Protective Equipment (1910.132(a))  
Hand Protection (1910.138(a)) |

<table>
<thead>
<tr>
<th><strong>Intensive-Care Unit</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Potential Hazards</strong></td>
</tr>
<tr>
<td>Exposure to bloodborne pathogens such as HIV, HBV, and HCV</td>
</tr>
<tr>
<td>Exposure to latex allergy</td>
</tr>
<tr>
<td>Exposure to wet surfaces and potential slips and falls</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Housekeeping</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Potential Hazards</strong></td>
</tr>
</tbody>
</table>
| Exposure to hazardous chemicals | Hazard Communication standard (1910.1200)  
Respiratory Protection standard (1910.134) |
| Exposure to bloodborne pathogens such as HIV, HBV, and HCV | Bloodborne Pathogens standard (1910.1030) |
| Exposure of eyes or body of any person to injurious corrosive materials | Medical Services and First Aid (1910.151(c))  
Personal Protective Equipment (1910.132) |
| Exposure to wet surfaces and potential slips and falls | General Requirements: Walking/Working Surfaces (1910.22)  
Specifications for Accident Prevention Signs and Tags (1910.145(c)(2)) |
| Lack of personal protective equipment | Personal Protective Equipment (1910.132(a))  
Hand Protection (1910.138(a)) |
### Engineering

<table>
<thead>
<tr>
<th>Potential Hazards</th>
<th>Possible Applicable OSHA Standards</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exposure to hazardous chemicals</td>
<td>Hazard Communication standard (1910.1200)</td>
</tr>
<tr>
<td></td>
<td>Respiratory Protection standard (1910.134)</td>
</tr>
<tr>
<td>Exposure to electrical hazards</td>
<td>Electrical, General (1910.301, Subpart S)</td>
</tr>
<tr>
<td>Exposure to equipment not locked or tagged out during servicing</td>
<td>Lockout/Tagout standard (1910.147)</td>
</tr>
<tr>
<td>Exposure to mercury</td>
<td>Air Contaminants (1910.1000 [Table Z-2])</td>
</tr>
<tr>
<td>Exposure to asbestos</td>
<td>Asbestos standard (1910.1001)</td>
</tr>
<tr>
<td>Exposure to unguarded equipment</td>
<td>Machine Guarding standard (1910.212)</td>
</tr>
<tr>
<td>Exposure to welding</td>
<td>General Industry Welding, Cutting, and Brazing standard (1910 Subpart Q)</td>
</tr>
<tr>
<td>Lack of personal protective equipment</td>
<td>Personal Protective Equipment (1910.132(a))</td>
</tr>
<tr>
<td></td>
<td>Hand Protection (1910.138(a))</td>
</tr>
</tbody>
</table>

### Emergency Department

<table>
<thead>
<tr>
<th>Potential Hazards</th>
<th>Possible Applicable OSHA Standards</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exposure to blood and OPIM from needlesticks or sharps injury</td>
<td>Bloodborne Pathogens standard</td>
</tr>
<tr>
<td></td>
<td>(1910.1030(c)(1)(iv)(B); 1910.1030(d)(2)(i); 1910.1030(h)(5))</td>
</tr>
<tr>
<td></td>
<td>Recordkeeping Standard: 1904</td>
</tr>
<tr>
<td>Contact with blood or OPIM, lack of universal precautions, lack of PPE</td>
<td>Bloodborne Pathogen Standard 1910.1030(d)(1)</td>
</tr>
<tr>
<td></td>
<td>1910.1030(d)(3)(i)</td>
</tr>
<tr>
<td>Exposure to latex allergy</td>
<td>Bloodborne Pathogens standard</td>
</tr>
<tr>
<td></td>
<td>(1910.1030(d)(3)(iii)); provide alternatives to those employees who are allergic to the gloves normally provided</td>
</tr>
<tr>
<td>Exposure to potential slips and falls from cluttered or obstructed floor surfaces</td>
<td>General Requirements: Walking/Working Surfaces (1910.22)</td>
</tr>
</tbody>
</table>
### Dietary

<table>
<thead>
<tr>
<th>Potential Hazards</th>
<th>Possible Applicable OSHA Standards</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exposure to electrical hazards</td>
<td>Electrical, General (1910.301, Subpart S)</td>
</tr>
<tr>
<td></td>
<td>Wiring Methods, Components, and Equipment for General Use (1910.305)</td>
</tr>
<tr>
<td></td>
<td>Electrical Systems (1910.303)</td>
</tr>
<tr>
<td>Exposure to hazardous chemicals</td>
<td>Hazard Communication standard (1910.1200)</td>
</tr>
<tr>
<td></td>
<td>Respiratory Protection standard (1910.134)</td>
</tr>
<tr>
<td>Exposure to fire; no escape procedures in place for emergencies; blocked exits or</td>
<td>Employee Emergency Plans and Fire Prevention Plans (1910.38)</td>
</tr>
<tr>
<td>passageways</td>
<td>Portable Fire Extinguishers (1910.157)</td>
</tr>
<tr>
<td></td>
<td>Fire Brigades (1910.156)</td>
</tr>
<tr>
<td></td>
<td>General Requirement Egress (1910.36)</td>
</tr>
<tr>
<td></td>
<td>Fixed Extinguishing Systems, General (1910.160)</td>
</tr>
<tr>
<td>Exposure to bloodborne pathogens such as HIV, HBV, and HCV</td>
<td>Bloodborne Pathogens standard (1910.1030)</td>
</tr>
<tr>
<td>Exposure of eyes or body of any person to injurious corrosive materials</td>
<td>Medical Services and First Aid (1910.151(c))</td>
</tr>
<tr>
<td>Employees trapped in walk-in freezers</td>
<td>Means of Egress standard (1910.37)</td>
</tr>
<tr>
<td>Exposure to unguarded kitchen equipment</td>
<td>Machine Guarding standard (1910.212)</td>
</tr>
<tr>
<td>Exposure to wet surfaces and potential slips and falls</td>
<td>General Requirements: Walking/Working Surfaces (1910.22)</td>
</tr>
<tr>
<td>Lack of personal protective equipment</td>
<td>Personal Protective Equipment (1910.132(a))</td>
</tr>
<tr>
<td></td>
<td>Hand Protection (1910.138(a))</td>
</tr>
</tbody>
</table>

### Central Supply

<table>
<thead>
<tr>
<th>Potential Hazards</th>
<th>Possible Applicable OSHA Standards</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exposure to ethylene oxide (EtO)</td>
<td>EtO standard (1910.1047)</td>
</tr>
<tr>
<td>Exposure to hazardous chemicals</td>
<td>Hazard Communication standard (1910.1200)</td>
</tr>
<tr>
<td></td>
<td>Respiratory Protection standard (1910.134)</td>
</tr>
<tr>
<td>Exposure to bloodborne pathogens such as HIV, HBV, and HCV</td>
<td>Bloodborne Pathogens standard (1910.1030)</td>
</tr>
<tr>
<td></td>
<td>Recordkeeping standard (1904, Recording and Reporting Occupational Injuries and Illnesses)</td>
</tr>
<tr>
<td>Exposure of eyes or body of any person to injurious corrosive materials</td>
<td>Medical Services and First Aid (1910.151(c))</td>
</tr>
<tr>
<td>Exposure to mercury</td>
<td>Air Contaminants (1910.1000 [Table Z-2])</td>
</tr>
<tr>
<td>Exposure to wet surfaces and potential slips and falls</td>
<td>General Requirements: Walking/Working Surfaces (1910.22)</td>
</tr>
<tr>
<td>Lack of personal protective equipment</td>
<td>Personal Protective Equipment (1910.132(a))</td>
</tr>
<tr>
<td></td>
<td>Hand Protection (1910.138(a))</td>
</tr>
</tbody>
</table>
## Laundry

<table>
<thead>
<tr>
<th>Potential Hazards</th>
<th>Possible Applicable OSHA Standards</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exposure to hazardous chemicals</td>
<td>Hazard Communication standard (1910.1200)</td>
</tr>
<tr>
<td></td>
<td>Respiratory Protection standard (1910.134)</td>
</tr>
<tr>
<td>Exposure of the eyes or body of any person to injurious corrosive materials</td>
<td>Medical Services and First Aid (1910.151(c)</td>
</tr>
<tr>
<td>Exposure to bloodborne pathogens from contaminated laundry or needlesticks</td>
<td>Bloodborne Pathogens standard (1910.1030; 1910.1030(d)(4)(iv); 1910.1030(d)(4)(iii)(A)(1);</td>
</tr>
<tr>
<td></td>
<td>1910.1030(d)(4)(iii)(A)(2))</td>
</tr>
<tr>
<td>Lack of personal protective equipment</td>
<td>Bloodborne Pathogens standard (1910.1030(d)(4)(iv)(B)</td>
</tr>
<tr>
<td>Exposure to latex allergy</td>
<td>Bloodborne Pathogens standard (1910.1030(d)(iii))</td>
</tr>
<tr>
<td>Exposure to wet surfaces and potential slips and falls</td>
<td>General Requirements: Walking/Working Surfaces (1910.22)</td>
</tr>
<tr>
<td>Exposure to high noise levels</td>
<td>Occupational Noise Exposure standard (1910.95)</td>
</tr>
<tr>
<td>Exposure to fire</td>
<td>Employee Emergency Plans and Fire Prevention Plans (1910.38(b)(5))</td>
</tr>
</tbody>
</table>
APPENDIX E. OSHA HOSPITAL HEALTH HAZARDS

Biological Agents: Blood and Body Fluids

<table>
<thead>
<tr>
<th>Use or Exposure</th>
<th>Health Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contact with blood and body fluids may occur as a result of medical and surgical procedures, such as labor and delivery, blood or body fluid collection or analysis, handling contaminated wastes (e.g., gloves, linens, bandages, protective clothing), or suctioning airways. Exposure usually occurs because inadequate infection control procedures are in use.</td>
<td>Acute: The severity of infection depends on (1) number of pathogens encountered; (2) worker’s resistance, which is affected by such things as state of health, predisposing diseases, age, sex, and hereditary factors; (3) portal of entry (via inhalation, ingestion, mucous membrane or skin contact, or direct inoculation); (4) virulence of the organism. Chronic: Reproductive consequences range from congenital anomalies to death of the fetus; other chronic diseases, such as cirrhosis of the liver and primary liver cancer, may result from some viruses, including HBV, rubella, cytomegalovirus, herpes, and HIV. Biological agents: Refer to OSHA Instruction CPL 2-2.44B: Enforcement Procedures for Occupational Exposure to Hepatitis B Virus (HBV) and Human Immunodeficiency Virus (HIV).</td>
</tr>
</tbody>
</table>

Biological agents: Refer to OSHA Instruction CPL 2-2.44B: Enforcement Procedures for Occupational Exposure to Hepatitis B Virus (HBV) and Human Immunodeficiency Virus (HIV).
### Physical Agents

<table>
<thead>
<tr>
<th>Use or Exposure</th>
<th>Health Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Laser:</strong> Used in the operating rooms for excision</td>
<td><em>Acute:</em> From direct beam exposure, burns to skin and eyes can possibly occur,</td>
</tr>
<tr>
<td>and cauterization of tissue. Class 3b and 4 lasers</td>
<td>resulting in blindness; chemical byproducts in the smoke plume may cause</td>
</tr>
<tr>
<td>are most often used. Exposure usually occurs from</td>
<td>irritation to eyes, nose, and throat and nausea (see OSHA Hazard Information</td>
</tr>
<tr>
<td>unintentional operation and/or when proper controls</td>
<td>bulletins). Biological and inert particulates can also be found in the smoke</td>
</tr>
<tr>
<td>are not in effect. The high electrical energy used to</td>
<td>plume but these have not been well studied for their effects.</td>
</tr>
<tr>
<td>generate the beam is a potential shock hazard. The</td>
<td></td>
</tr>
<tr>
<td>smoke plume during a surgical procedure and the reaction of the laser to certain</td>
<td></td>
</tr>
<tr>
<td>explosive or flammable agents also present hazards</td>
<td><strong>Chronic:</strong> Unknown.</td>
</tr>
<tr>
<td>in the operating room.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Ionizing radiation:</strong> Portable and fixed x-ray</td>
<td>*Effects of radiation exposure are somatic (body) or genetic (offspring) in</td>
</tr>
<tr>
<td>machines are used for diagnostic procedures. Exposure</td>
<td>nature.</td>
</tr>
<tr>
<td>occurs when unprotected employees are near a machine</td>
<td><em>Acute:</em> Erythema and dermatitis can occur; large whole-body exposures cause</td>
</tr>
<tr>
<td>in operation. The degree of exposure depends on the</td>
<td>nausea, vomiting, diarrhea, weakness, and death.</td>
</tr>
<tr>
<td>amount of radiation, the duration of exposure, the</td>
<td></td>
</tr>
<tr>
<td>distance from the source, and the type of shielding</td>
<td><strong>Chronic:</strong> Skin cancer and bone marrow suppression can occur; genetic</td>
</tr>
<tr>
<td>in place. Kits containing radioactive isotopes or</td>
<td>effects may lead to congenital defects in the employee's offspring.</td>
</tr>
<tr>
<td>specimens and excreta of humans and animals who have</td>
<td></td>
</tr>
<tr>
<td>received radionucleotides may pose a hazard. Exposure</td>
<td></td>
</tr>
<tr>
<td>may also result from handling of radioactive spills</td>
<td></td>
</tr>
<tr>
<td>Magnetic radiation: Magnetic resonance instrumentation.</td>
<td>No conclusive effects are documented.</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Electrical hazards:</strong> Exposure may occur when there</td>
<td><em>Acute:</em> Painful shocks can lead to respiratory inhibition, deep burns (electric</td>
</tr>
<tr>
<td>is lack of maintenance to any electrical equipment,</td>
<td>and thermal), heart rate irregularities, death.</td>
</tr>
<tr>
<td>abuse, and lack of understanding of the equipment</td>
<td><strong>Chronic:</strong> No documented effects.</td>
</tr>
<tr>
<td>and/or its controls. Oxygen-enriched atmospheres and</td>
<td></td>
</tr>
<tr>
<td>water may contribute to hazardous conditions.</td>
<td></td>
</tr>
<tr>
<td>Ultraviolet radiation: Ultraviolet lamps are</td>
<td><em>Acute:</em> Skin burns, damage to the eye can occur.</td>
</tr>
<tr>
<td>sometimes used in biological safety cabinets.</td>
<td><strong>Chronic:</strong> No documented effects other than cataracts.</td>
</tr>
<tr>
<td>Compressed gases: Compressed gases are used in many</td>
<td>Compressed gases can be toxic, radioactive, flammable, and explosive; these</td>
</tr>
<tr>
<td>clinical laboratories in varying sizes and in pure or</td>
<td>effects arise from the compression of the gas and the health effects of the</td>
</tr>
<tr>
<td>mixed states; examples include ammonia, carbon</td>
<td>chemical itself.</td>
</tr>
<tr>
<td>dioxide, and nitrogen</td>
<td></td>
</tr>
</tbody>
</table>


Chemical Agents

The following are specifically mentioned because of the severity of their health effects. This list is by no means all-inclusive.

<table>
<thead>
<tr>
<th>Use or Exposure</th>
<th>Health Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethylene oxide (EtO): A disinfectant and sterilant, EtO is usually used in the central supply area. Exposure usually occurs from improper aeration of the ethylene oxide chamber after the sterilizing process. It can also occur in outpatient surgery clinics and in the cardiac catheterization laboratory (29 CFR 1910.1047).</td>
<td><strong>Acute:</strong> Respiratory and eye irritation, vomiting, and diarrhea.  <strong>Chronic:</strong> Altered behavior, anemia, secondary respiratory infections, skin sensitization, miscarriages, reproductive problems. It is a carcinogen.</td>
</tr>
<tr>
<td>Waste anesthetic gases such as nitrous oxide, halothane, enfluorane: Waste gases result from poor work practices during the anesthetization of patients, improper or inadequate maintenance of the machine, and/or patient exhalation after the surgical procedure (recovery).</td>
<td><strong>Acute:</strong> Drowsiness, irritability, depression, headaches, nausea, problems with coordination and judgment.  <strong>Chronic:</strong> Embryotoxicity, liver and kidney disease, cancer.</td>
</tr>
<tr>
<td>Antineoplastic (cancer) drugs, such as vincristine, dacarbazine, mitomycin, cytosine, arabinoside, and fluorouracil: Antineoplastic drugs, used in the treatment of cancer and other tumors, are usually given as intravenous fluids. Mixing usually occurs in the pharmacy area of the hospital in a biological safety cabinet. Exposure may occur during preparation, administration, or disposal of the drug and equipment.</td>
<td><strong>Acute:</strong> Severe soft-tissue damage, fetotoxicity, headaches, lightheadedness, dizziness, and nausea.  <strong>Chronic:</strong> Chromosomal damage, teratogenesis, carcinogenesis.</td>
</tr>
<tr>
<td>Methyl methacrylate (MMA): This acrylic cement-like substance is used to secure prostheses to bone during orthopedic surgery. Exposure usually occurs during mixing and preparation and in the operating room.</td>
<td><strong>Acute:</strong> It is an eye, skin, and mucous membrane irritant; acute effects have varied from a decrease in blood pressure to (rarely) cardiac arrest.  <strong>Chronic:</strong> Degeneration of the liver, mutagenesis, teratogenesis.</td>
</tr>
<tr>
<td>Ribavirin: This antiviral drug is used to treat some infants and young children with lower respiratory syncytial virus (RSV) infections. This drug is aerosolized to a respirable size of approximately 1.3 microns and is usually administered to the patient in an oxygen tent or face mask. This is when exposure can occur.</td>
<td><strong>Acute:</strong> Headaches, coughing, dry upper respiratory tract, dry-burning eyes.  <strong>Chronic:</strong> Carcinogenesis, fertility impairment, fetotoxicity.</td>
</tr>
<tr>
<td>Use or Exposure</td>
<td>Health Effects</td>
</tr>
<tr>
<td>----------------</td>
<td>----------------</td>
</tr>
</tbody>
</table>
| **Formaldehyde:** Used as a fixative, it is commonly found in most laboratories and the morgue (29 CFR 1910.1048). | *Acute:* Eye and respiratory irritation is caused by the liquid and vapor forms; severe abdominal pains, nausea, vomiting, and possible loss of consciousness could occur if ingested in large amounts.  
*Chronic:* A high concentration of vapor inhaled for long periods can cause laryngitis, bronchitis, or bronchial pneumonia. Prolonged exposure may cause conjunctivitis. Nasal tumors have been reported in animals. It is a suspected carcinogen. |
| **Toluene or xylene:** These solvents are used to fix tissue specimens and rinse stains. They are primarily found in the histology, hematology, microbiology, and cytology laboratories (29 CFR 1910.1000, Subpart Z). | *Acute:* Exposure to vapor or liquid forms can cause eye and mucous membrane irritation. Inhalation of vapors can cause headache and mental confusion. Ingestion or absorption through the skin can cause poisoning. A potential for thermal burns exists as it is extremely flammable.  
*Chronic:* If the xylene or toluene contains benzene as an impurity, repeated breathing of the vapor over long periods may cause leukemia. Prolonged skin contact may cause dermatitis. Toluene has been implicated in reproductive disorders. |
| **Acrylamide:** The resin, usually found in research labs, is used to make gels for biochemical separations (29 CFR 1910.1000, Subpart Z). | *Acute:* Eye and skin irritation.  
*Chronic:* It can cause central nervous system disorders (e.g., polyneuropathy) and is a suspected carcinogen and mutagen. |
APPENDIX F. OSHA MULTI-EMPLOYER CITATION POLICY

Multi-Employer Worksites Policy

A. Multi-Employer Worksites. On multi-employer worksites (in all industry sectors), more than one employer may be citable for a hazardous condition that violates an OSHA standard. A two-step process must be followed in determining whether more than one employer is to be cited.

1. **Step 1.** The first step is to determine whether the employer is a creating, exposing, correcting, or controlling employer. The definitions in paragraphs (B) to (E) below explain and give examples of each. Remember that an employer may have multiple roles (see paragraph H). Once you determine the role of the employer, go to step 2 to determine if a citation is appropriate. (Note: Only exposing employers can be cited for General Duty Clause violations.)

2. **Step 2.** If the employer falls into one of these categories, it has obligations with respect to OSHA requirements. Step 2 is used to determine if the employer's actions were sufficient to meet those obligations. The extent of the actions required of employers varies based on which category applies. Note that the extent of the measures that a controlling employer must take to satisfy its duty to exercise reasonable care to prevent and detect violations is less than what is required of an employer with respect to protecting its own employees.

B. The Creating Employer

1. **Step 1. Definition:** The employer that caused a hazardous condition that violates an OSHA standard.

2. **Step 2. Actions Taken:** Employers must not create violative conditions. An employer that does so is citable even if the only employees exposed are those of other employers at the site.

C. The Exposing Employer

1. **Step 1. Definition:** An employer whose own employees are exposed to the hazard. See Chapter III, section (C)(1)(b), for a discussion of what constitutes exposure.

2. **Step 2. Actions Taken:** If the exposing employer created the violation, it is citable for the violation as a creating employer. If the violation was created by another employer, the exposing employer is citable if it (a) knew of the hazardous condition or failed to exercise reasonable diligence to discover the condition, and (b) failed to take steps consistent with its authority to protect its employees. If the exposing employer has authority to correct the hazard, it must do so. If the exposing employer lacks the authority to correct the hazard, it is citable if it fails to do each of the following: (a) ask the creating and/or controlling employer to correct the hazard; (b) inform its employees of the hazard; and (c) take reasonable alternative protective measures. In extreme circumstances (e.g., imminent danger situations), the exposing employer is citable for failing to remove its employees from the job to avoid the hazard.

D. The Correcting Employer

1. **Step 1. Definition:** An employer who is engaged in a common undertaking, on the same worksite, as the exposing employer and is responsible for correcting a hazard. This usually occurs where an employer is given the responsibility of installing and/or maintaining particular safety/health equipment or devices.

2. **Step 2. Actions Taken:** The correcting employer must exercise reasonable care in preventing and discovering violations and meet its obligations of correcting the hazard.
E. The Controlling Employer

1. **Step 1. Definition:** An employer who has general supervisory authority over the worksite, including the power to correct safety and health violations itself or require others to correct them. Control can be established by contract or, in the absence of explicit contractual provisions, by the exercise of control in practice. Descriptions and examples of different kinds of controlling employers are given below.

2. **Step 2. Actions Taken:** A controlling employer must exercise reasonable care to prevent and detect violations on the site. The extent of the measures that a controlling employer must implement to satisfy this duty of reasonable care is less than what is required of an employer with respect to protecting its employees. This means that the controlling employer is not normally required to inspect for hazards as frequently or to have the same level of knowledge of the applicable standards or trade expertise as the employer it has hired.

3. **Factors Relating to Reasonable Care Standard:** Factors that affect how frequently and closely a controlling employer must inspect to meet its standard of reasonable care include:
   - The scale of the project
   - The nature and pace of the work, including the frequency with which the number or types of hazards change as the work progresses
   - How much the controlling employer knows both about the safety history and safety practices of the employer it controls and about that employer’s level of expertise

   More frequent inspections are normally needed if the controlling employer knows that the other employer has a history of noncompliance. Greater inspection frequency may also be needed, especially at the beginning of the project, if the controlling employer had never before worked with this other employer and does not know its compliance history. Less frequent inspections may be appropriate where the controlling employer sees strong indications that the other employer has implemented effective safety and health efforts. The most important indicator of an effective safety and health effort by the other employer is a consistently high level of compliance. Other indicators include the use of an effective, graduated system of enforcement for noncompliance with safety and health requirements coupled with regular jobsite safety meetings and safety training.

4. **Evaluating Reasonable Care.** In evaluating whether a controlling employer has exercised reasonable care in preventing and discovering violations, consider questions such as whether the controlling employer:
   - Conducted periodic inspections of appropriate frequency (frequency should be based on the factors listed in G.3)
   - Implemented an effective system for promptly correcting hazards
   - Enforces the other employer’s compliance with safety and health requirements with an effective, graduated system of enforcement and follow-up inspections

5. **Types of Controlling Employers.**
   a. **Control Established by Contract.** In this case, the employer has a specific contract right to control safety. To be a controlling employer, the employer must itself be able to prevent or correct a violation or to require another employer to prevent or correct the violation. One source of this ability is explicit contract authority. This can take the form of a specific contract right to require another employer to adhere to safety and health requirements and to correct violations the controlling employer discovers.
   b. **Control Established by a Combination of Other Contract Rights.** Where there is no explicit contract provision granting the right to control safety, or where
the contract says the employer does not have such a right, an employer may still be a controlling employer. The ability of an employer to control safety in this circumstance can result from a combination of contractual rights that, together, give it broad responsibility at the site involving almost all aspects of the job. Its responsibility is broad enough so its contractual authority necessarily involves safety. The authority to resolve disputes between subcontractors, set schedules and determine construction sequencing are particularly significant because they are likely to affect safety.

c. **Architects and Engineers.** Architects, engineers, and other entities are controlling employers only if the breadth of their involvement in a construction project is sufficient to bring them within the parameters discussed above.

d. **Control Without Explicit Contractual Authority.** Even where an employer has no explicit contract rights with respect to safety, an employer can still be a controlling employer if, in actual practice, it exercises broad control over subcontractors at the site.
APPENDIX G1. GERMICIDE EFFECTIVENESS

This chart features the common active ingredients in many germicides. It shows the normal concentrations of each ingredient, along with the activity level — expressed as high (H), medium (M), or low (L) — as an indicator of the disinfecting strength of a germicide.

<table>
<thead>
<tr>
<th>Substance</th>
<th>Sterilization Properties</th>
<th>Concentration Activity</th>
<th>Disinfection Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alcohols</td>
<td>None</td>
<td>70%</td>
<td>M</td>
</tr>
<tr>
<td>Chlorine dioxide</td>
<td>Variable</td>
<td>Variable</td>
<td>H</td>
</tr>
<tr>
<td>Chlorine mixtures</td>
<td>None</td>
<td>500–5000 mg free chlorine</td>
<td>M</td>
</tr>
<tr>
<td>Formaldehyde</td>
<td>6–8%</td>
<td>1–8%</td>
<td>H, M, L</td>
</tr>
<tr>
<td>Glutaraldehyde</td>
<td>Variable</td>
<td>Variable</td>
<td>H, M</td>
</tr>
<tr>
<td>Hydrogen peroxide</td>
<td>6–30%</td>
<td>3–6%</td>
<td>H, M</td>
</tr>
<tr>
<td>Iodophor mixtures</td>
<td>None</td>
<td>40–50 mg free iodine</td>
<td>M</td>
</tr>
<tr>
<td>Peracetic acid</td>
<td>Variable</td>
<td>Variable</td>
<td>M</td>
</tr>
<tr>
<td>Phenolic mixtures</td>
<td>None</td>
<td>0.5–3%</td>
<td>M, L</td>
</tr>
<tr>
<td>Quaternary ammonium</td>
<td>None</td>
<td>0.1–0.2%</td>
<td>L</td>
</tr>
</tbody>
</table>

Source: University of California, Davis, disinfectant website (www.ucdavis.edu).
APPENDIX G2. LEADERSHIP TIPS FOR HEALTHCARE ENVIRONMENTAL SERVICES PROFESSIONALS

Introduction — The healthcare cleaning function in hospitals and nursing homes deserves recognition as a true profession. Without a doubt a science is involved in proper cleaning processes within healthcare organizations. Healthcare cleaning must also be viewed as a safety necessity, quality benchmark, risk management tool, patient satisfaction indicator, and foundational to the infection control program. Professional and trade organizations now promote environmental services as a foundational function of ensuring a proper care environment. This appendix addresses several challenges facing those in the profession of cleaning and senior healthcare leaders. In many organizations, the number of full-time workers in the environmental services department is insufficient to keep the facility clean and safe. A contributing factors is the lack of support from others within the organization. Some healthcare organizations acknowledge that it is everyone’s job to keep the facility clean; however, true support for the frontline cleaning staff can hardly be found. Healthcare organizations need to understand the role that the environmental services staff plays in cleaning and safety. Departments need to be fully staffed using guidelines designed for healthcare facilities. Cleaning a healthcare building is like cleaning no other structure. Environmental service workers must demonstrate an interest in, motivation for, and ability to clean for safety and health. They must have a desire to contribute to improving the indoor environment for the sake of the patients, residents, workers, and visitors.

Train the housekeeping staff like professionals, expect professional results, and acknowledge professional contributions. Most frontline environmental services workers do not receive quality training when hired, and continuing in-service education is almost nonexistent. Providing training and certification opportunities for managers should yield better results within this developing discipline. Professionals should expect adequate staffing, good equipment, top-notch training, and a fair wage.

Professionalism — True professionals must first view themselves as professionals. Professionals do not demand respect but command it by their conduct. Cleaning is not just another job — it is a profession. Professionals in any field must have commitment, courage, and a strong belief in doing a job right. Professionals need to be knowledgeable with respect to cleaning principles and concepts. They must adhere to organizational values and a professional code of ethics. When healthcare environmental service workers do their jobs correctly, it produces an environment that enhances the performance of the care staff. It is essential for facilities to:

- Publish a safety and environmental statement.
- Develop a quality process that uses a systems approach to cleaning.
- Provide professional development of managers, supervisors, and line workers.
- Allocate adequate resources, including a budget for training.
- Invest in environmental and ergonomic technology.
- Educate and train staff at regular intervals.
- Benchmark, audit, and monitor the impact of environmental services on the entire system.
- Promote teamwork within the entire organization.

Quality and a Professional Cleaning Approach — Senior leaders must take responsibility, emphasize values, and expect quality performance. Human resource departments and other managers must learn not to refer to a worker as an “FTE” and should lead workers on a path toward success through training, involvement, and recognition. Leaders must
understand the processes used in effective cleaning and their impact on the organizational mission and should use both quality and quantity indicators to measure success. They should improve their knowledge by assessing facts and not making assumptions and should emphasize continuous improvement by using team problem solving and root-cause analysis techniques to improve productivity.

**Professional Development**

- Demand performance and professional behavior.
- Use procedures that follow professional standards.
- Approach cleaning from a systems, not a fragmented, approach.
- Treat cleaning as a science.
- Teach fundamentals as well as techniques.
- Expand training to address safety, environmental, and infection control practices.
- Support research that addresses better ways to clean and disinfect.

**Cleaning Is a Science and Management Process**

- Help senior leaders to view cleaning personnel as managers of the built environment and to understand the capabilities of the cleaning profession and its dedication to organizational excellence.
- Teach all workers to clean for safety and health.
- Don’t over-emphasize appearance.
- Integrate cleaning with other environmental and safety issues such as pollution control, waste management, pollution source control, slip and fall prevention, and infection control activities.
- Look for ways to train and educate organizational members with regard to the role that housekeeping plays in protecting safety and health.
- Educate caregivers and other organizational members with regard to their role in helping maintain the built environment.

**Key Healthcare Cleaning Issues**

- Humans, especially sick ones, respond to indoor contaminants.
- Professional cleaning practices result in better health.
- Environmental services personnel must view themselves as indoor environmental managers.
- Healthcare facilities have special cleaning needs beyond clean-looking floors.
- Good cleaning processes improve care and patient outcomes.
- Cleaning information should be shared throughout the organization.
- Cleaning professionals must keep up with technological advances in equipment and solutions.
- The primary goal of a healthcare cleaning crew is to kill pathogenic microorganisms.
- Cleaning processes must remove unwanted pollutants and byproducts.

**Healthcare Cleaning Objectives**

- Disinfect properly to reduce pathogens within the environment.
- Consider the areas cleaned to be a complete environmental system.
- Cleaning for safety and health first and appearance second.
- Minimize human exposure to harmful contaminants and cleaning residues.
- Minimize chemicals, particles, and moisture when cleaning.
- Maintain worker and resident or patient safety.
- Dispose of cleaning wastes safely.
Commandments of Healthcare Cleaning

- Never harm anyone in the process.
- Act like a professional at all times.
- Keep equipment and storage closets clean.
- Follow all safety procedures and look for hazards during your shift.
- Promote the team work concept for keeping things clean.
- Practice prevention in all things but keep it as simple as possible.
- Try to exceed everyone's expectation of clean.
- Work to continuously improve all processes.
- Clean it right the first time with a good attitude.
- Communicate effectively for those you serve.
- Never deny that problems exists; always take a close look at the situation.
- Clean for safety and health first and appearance will follow.
- If you cleaned it and it gets messed up, get over it because you work in health care.
- If you have done all of the above, leave with your head held high for you are a professional.

Environmental Service Training Suggestions

- Base training on performance needs.
- Use adult education techniques.
- Provide hands-on training out of the classroom.
- Don't attempt training during new worker orientation.
- Conduct training during the worker's shift.
- Don't schedule second- and third-shift workers for day training session.
- Provide sleep deprivation education to shift workers.
- Budget and schedule professional education for frontline workers.
- Provide follow-up activities to validate learning.
- Adapt the training program to meet changing needs.
- Provide training on hazard identification and slip, trip, and fall prevention.
- Provide training on appropriate OSHA topics as detailed in OSHA Publication 2254.

Provide Leadership

- Treat people as individuals.
- Understand the culture of trust.
- Recognize, reward, and promote people who deserve it.
- Give employees the freedom to be real people.
- Attitudes are caught, never taught.
- Learn to listen, listen again, and then listen some more.
- Provide a safe equipment and work environment.
- Understand the needs of people to build trust.
- Realize that motivation begins with a little self-esteem.
- Understand the hidden culture and that some people have their own agendas.
- All people are motivated by something.
- Turn a person's weakness into a strength.
- Remember that goal setting is visualizing the results.

Benefits of Good Cleaning Processes

- Puts things in order and improves quality of life and care.
- Restores the environment to a safe and healthful condition.
- Improves the environment quickly and visibly.
• Controls the quality of the indoor environment.
• Reduces human concern and anxiety.
• Protects the safety and health of everyone.

Keys to Clean and Healthy Healthcare Buildings
• Healthy buildings help develop a sense of pride among workers.
• Poorly maintained environments are disorganized and unsanitary.
• Proper operations are necessary for healthy buildings.
• Maintaining buildings correctly requires trained and educated operators who understand the entire building system.
• Effective maintenance is necessary for a healthy building (e.g., plumbing, lighting, and HVAC maintenance).

Hazards within Built Environments
• Biological contaminants
• Carcinogens
• Products of incomplete combustion
• Environmental air quality
• Pesticides and organic compounds (gases and solids)
• Particles and dust

Cleaning for Health
• Use methods that sanitize or disinfect.
• Clean regularly and frequently.
• Use the safest products available.
• Eliminate or control dangerous or hazardous operations.
• Evaluate cleaning processes and their relationship to human safety and health.
• Be sure that safety is a part of the cleaning culture.

Inspecting Cleaning Effectiveness
• Don’t forget the cleaning objective.
• Observe the total environment, not just a part of it.
• Consider how the environment acts and reacts to cleaning operations.
• Develop a process for identifying problems, sources, and conditions that can affect human safety and health.

The Local Environment
• Dirt surfaces, walkways, shrubbery, and types of soils in the area
• Air pollution, including traffic and local industries
• Poorly drained surfaces and bodies of water, including fountains
• Animals such as squirrels and pigeons
• Pollen sources, such as leaves and flowers
• Location of trash and garbage holding areas
• Sources of toxic substances, including vehicle traffic volume

Important Considerations
• Determine how pollutants enter the building.
• Evaluate the building from the bottom up.
• Check basements for dust, insects, standing water, mold, and rodents.
• Be aware that mechanical and plumbing systems can deliver pollutants throughout the building and that garages, parking decks, and workshops can emit volatile organic carbons and carbon monoxide.
• Know that stairs, landings, and elevators provide continuous paths for pollutant travel.

Preventing Infections
• Wash hands frequently when handling potentially contaminated materials.
• Don’t place dirty or clean linen on floors.
• Don’t leave linen in areas where it can become contaminated.
• Disinfect areas that have been in contact with dirty linen.
• Don’t mix clean and soiled linens, supplies, or equipment.
• Don’t use gloves as a substitute for washing hands.
• Make sure all disinfecting tasks are done according to specifications.
• Remember that it is everyone’s job to keep the facility clean, sanitary, and disinfected.
APPENDIX H. OSHA HAZWOPER (29 CFR 1910.120)

TRAINING REQUIREMENTS

29 CFR 1910.120(e)(3). Initial Training

29 CFR 1910.120(e)(3)(i). General site workers (such as equipment operators, general laborers, and supervisory personnel) engaged in hazardous substance removal or other activities which expose or potentially expose workers to hazardous substances and health hazards shall receive a minimum of 40 hours of instruction off site, and a minimum of three days actual field experience under the direct supervision of a trained, experienced supervisor.

29 CFR 1910.120(e)(3)(ii). Workers on site only occasionally for a specific limited task (such as, but not limited to, ground water monitoring, land surveying, or geophysical surveying) and who are unlikely to be exposed over permissible exposure limits and published exposure limits where respirators are not necessary, and the characterization indicates that there are no health hazards or the possibility of an emergency developing, shall receive a minimum of 24 hours of instruction off the site and the minimum of one day actual field experience under the direct supervision of a trained, experienced supervisor.

29 CFR 1910.120(e)(3)(iv). Workers with 24 hours of training who are covered by this section and who become general site workers or who are required to wear respirators, shall have the additional 16 hours and 2 days of training necessary to total the training specified in paragraph (e)(3)(i)(4).

29 CFR 1910.120(e)(4). Management and Supervisor Training — Onsite management and supervisors directly responsible for, or who supervise employees engaged in, hazardous waste operations shall receive 40 hours initial training, and three days of supervised field experience the training may be reduced to 24 hours and 1 day if the only area of their responsibility is employees covered by paragraphs (e)(3)(ii) and at least 8 additional hours of specialized training at the time of job assignment on such topics as, but not limited to, the employer’s safety and health program and the associated employee training program, personal protective equipment program, spill containment program, and health hazard monitoring procedure and techniques.

29 CFR 1910.120(e)(5). Qualifications for Trainers — Trainers shall be qualified to instruct employees about the subject matter that is being presented in training. Such trainers shall have satisfactorily completed a training program for teaching the subjects they are expected to teach, or they shall have the academic credentials and instructional experience necessary for teaching the subjects. Instructors shall demonstrate competent instructional skills and knowledge of the applicable subject matter.

29 CFR 1910.120(e)(6). Training Certification — Employees and supervisors that have received and successfully completed the training and field experience specified in paragraphs (e)(1) through (e)(4) of this section shall be certified by their instructor or the head instructor and trained supervisor as having successfully completed the necessary training. A written certificate shall be given to each person so certified. Any person who has not been so certified or who does not meet the requirements of paragraph (e)(9) of this section shall be prohibited from engaging in hazardous waste operations.

29 CFR 1910.120(e)(7). Emergency Response — Employees who are engaged in responding to hazardous emergency situations at hazardous waste cleanup sites that may expose them to hazardous substances shall be trained in how to respond to such expected emergencies.
29 CFR 1910.120(e)(8). Refresher Training — Employees specified in paragraph (e)(1) of this section, and managers and supervisors specified in paragraph (e)(4) of this section, shall receive 8 hours of refresher training annually on the items specified in paragraph (e)(2) and/or (e)(4) of this section, critiques of incidents that have occurred in the past year that can serve as training examples of any related work, and other relevant topics.

29 CFR 1910.120(e)(9). Equivalent Training — Employers who can show by documentation or certification that an employee’s work experience and/or training has resulted in training equivalent to that training required in paragraphs (e)(1) through (e)(4) of this section shall not be required to provide the initial training requirements of those paragraphs to such employees. However, certified employees or employees with equivalent training new to a site shall receive appropriate, site-specific training before site entry and have appropriate supervised field experience at the new site. Equivalent training includes any academic training or the training that existing employees might have already received from actual hazardous waste site work experience. However, certified employees or employees with equivalent training new to a site shall receive appropriate, site specific training before site entry and have appropriate supervised field experience at the new site. Equivalent training includes any academic training or the training that existing employees might have already received from actual hazardous waste site work experience.

Hazardous Waste Operations: Emergency Responders

29 CFR 1910.120(p)(8)(iii)(A). Training — Training for emergency response employees shall be completed before they are called upon to perform in real emergencies. Such training shall include the elements of the emergency response plan, standard operating procedures the employer has established for the job, the personal protective equipment to be worn and procedures for handling emergency incidents.

Exception
An employer need not train all employees to the degree specified if arrangements have been made in advance for an outside fully trained emergency response team to respond in a reasonable period and all employees, who may come to the incident first, have sufficient awareness training to recognize that an emergency response situation exists and they have been instructed to call the designated outside, fully trained emergency response team for assistance. The employee shall certify that each covered employee has attended and successfully completed the training required in paragraph (p)(8)(iii) of this section, or shall certify the employee’s competency at least yearly. The method used to demonstrate competency for certification of training shall be recorded and maintained by the employer.

29 CFR 1910.120(p)(7)(i). New Employees — The employer shall develop and implement a training program, which is part of the employer’s safety and health program, for employees exposed to health hazards or hazardous substances at TSD operations to enable the employees to perform their assigned duties and functions in a safe and healthful manner so as not to endanger themselves or other employees. The initial training shall be for 24 hours and refresher training shall be for 8 hours annually. Employees who have received the initial training required by this paragraph shall be given a written certificate attesting that they have successfully completed the necessary training.

29 CFR 1910.120(p)(7)(ii). Current Employees — Employers who can show by an employee’s previous work experience and/or training that the employee has had training equivalent to the initial training required by this paragraph shall be considered as meeting the initial training requirements of this paragraph as to that employee. Equivalent training
includes the training that existing employees might have already received from actual site work experience. Current employees shall receive eight hours of refresher training annually.

29 CFR 1910.120(p)(7)(iii). Trainers — Trainers who teach initial training shall have satisfactorily completed a training course for teaching the subjects they are expected to teach or they shall have the academic credentials and instruction experience necessary to demonstrate a good command of the subject matter of the courses and competent instructional skills.

29 CFR 1910.120(p)(8)(iii)(A). Training — Training for emergency response employees shall be completed before they are called upon to perform in real emergencies. Such training shall include the elements of the emergency response plan, standards operating procedures the employer has established for the job, the personal protective equipment to be worn, and procedures for handling emergency incidents.

29 CFR 1910.120(q)(4). Skilled Support Personnel — Personnel, not necessarily an employer’s own employees, who are skilled in the operation of certain equipment, such as mechanized earth moving or digging equipment or crane and hoisting equipment, and who are needed temporarily to perform immediate emergency support work that cannot reasonably be performed in a timely fashion by an employer’s own employees, and who will be or may be exposed to the hazards at an emergency response scene, are not required to meet the training required in this paragraph for the employer’s regular employees. However, these personnel shall be given an initial briefing at the site prior to their participation in any emergency response. The initial briefing shall include instruction in any emergency response. The initial briefing shall include instruction in the wearing of appropriate personal protective equipment, what chemical hazards are involved, and what duties are to be performed. All other appropriate safety and health precautions provided to the employer’s own employees shall be used to assure the safety and health of these personnel.

29 CFR 1910.120(q)(5). Specialist Employees — Employees who, in the course of their regular job duties, work with and are trained in the hazards of specific hazardous substances, and who will be called upon to provide technical advice or assistance at a hazardous substance release incident to the individual in charge, shall receive training or demonstrate competency in the area of their specialization annually.

29 CFR 1910.120(q)(6). Training — Training shall be based on the duties and function to be performed by each responder of an emergency response organization. The skill and knowledge levels required for all new responders, those hired after the effective date of this standard, shall be conveyed to them through training before they are permitted to take part in actual emergency operations on an incident. Employees who participate, or are expected to participate in emergency response, shall be given training in accordance with the following paragraphs:

29 CFR 1910.120(q)(6)(i). First Responder Awareness Level — First responders at the awareness level are individuals who are likely to witness or discover a hazardous substance release and who have been trained to initiate an emergency response sequence by notifying the proper authorities of the release. First responders at the awareness level shall have sufficient training or have had sufficient experience to objectively demonstrate competency in the following areas:

(A) An understanding of what hazardous substances are, and the risks associated with them in an incident.

(B) An understanding of the potential outcomes associated with an emergency created when hazardous substances are present.
(C) The ability to recognize the presence of hazardous substances in an emergency.
(D) The ability to identify the hazardous substances if possible.
(E) An understanding of the role of the first responder awareness individual in the employer's emergency response plan including site security and control and the U.S. Department of Transportation's Emergency Response Guidebook.
(F) The ability to realize the need for additional resources, and to make appropriate notifications to the communications center.

29 CFR 1910.120(q)(6)(ii). First Responder Operations Level — First responders at the operations level are individuals who respond to releases or potential releases of hazardous substances as part of the initial response to the site for the purpose of protecting nearby persons, property, or the environment from the effects of the release. They are trained to respond in a defensive fashion without actually trying to stop the release. Their function is to contain the release from a safe distance, keep it from spreading, and prevent exposures. First responders at the operational level shall have received at least eight hours of training or have had sufficient expertise to objectively demonstrate competency in the following areas in addition to those listed for the awareness level and the employer shall so certify:

(A) Knowledge of the basic hazard and risk assessment techniques.
(B) Know how to select and use proper personal protective equipment provided to the first responder operational level.
(C) An understanding of basic hazardous materials terms.
(D) Know how to perform basic control, containment, and/or confinement operations within the capabilities of the resources and personal protective equipment available with their unit.
(E) Know how to implement basic decontamination procedures.
(F) An understanding of the relevant standard operating procedures and termination procedures.

29 CFR 1910.120(q)(6)(iii). Hazardous Materials Technician — Hazardous materials technicians are individuals who respond to releases or potential releases for the purpose of stopping the release. They assume a more aggressive role than a first responder at the operations level in that they will approach the point of release in order to plug, patch, or otherwise stop the release of a hazardous substance. Hazardous materials technicians shall have received at least 24 hours of training equal to the first responder operations level and in addition have competency in the following areas and the employer shall so certify:

(G) Know how to implement the employer's emergency response plan.
(H) Be able to function within an assigned role in the Incident Command System.
(I) Know how to select and use proper specialized chemical personal protective equipment provided to the hazardous materials technician.
(J) Understand hazard and risk assessment techniques.
(K) Be able to perform advance control, containment, and/or confinement operations within the capabilities of the resources and personal protective equipment available with the unit.
(L) Understand and implement decontamination.
(M) Understand termination procedures.
(N) Understand basic chemical and toxicological terminology and behavior.
29 CFR 1910.120(q)(6)(iii). **Hazardous Materials Specialist** — Hazardous materials specialists are individuals who respond with and provide support of hazardous materials technicians. Their duties parallel those of the hazardous materials technician, however, those duties require a more directed or specific knowledge of the various substances they may be called upon to contain. The hazardous materials specialist would also act as the site liaison with Federal, state, local, and other government authorities in regards to site activities. Hazardous materials specialists shall have received at least 24 hours of training equal to the technician level and in addition have competency in the following areas and the employer shall so certify:

(A) Know how to implement the local emergency response plan.
(B) Understand classification, identification, and verification of known and unknown materials by using advanced survey instruments and equipment.
(C) Know of the state emergency response plan.
(D) Be able to select and use proper specialized chemical personal protective equipment provided to the hazardous materials specialist.
(E) Understand in-depth hazard and risk techniques.
(F) Be able to perform specialized control, containment, and/or confinement operations within the capabilities of the resources and personal protective equipment available.
(G) Be able to determine and implement decontamination procedures.
(H) Have the ability to develop a site safety and control plan.
(I) Understand chemical, radiological, and toxicological terminology and behavior.

29 CFR 1910.120(q)(6)(v). **On Scene Incident Commander** — Incident commanders, who will assume control of the incident scene beyond the first responder awareness level, shall receive at least 24 hours of training equal to the first responder operations level and in addition have competency in the following areas and the employer shall so certify:

(A) Know and be able to implement the employer’s incident command system.
(B) Know how to implement the employer’s emergency response plan.
(C) Know and understand the hazards and risks associated with employees working in chemical protective clothing.
(D) Know how to implement the local emergency response plan.
(E) Know of the state emergency response plan and of the Federal Regional Response Team.
(F) Know and understand the importance of decontamination procedures.

29 CFR 1910.120(q)(7). **Trainers** — Trainers who teach any of the above training subjects shall have satisfactorily completed a training course for teaching the subjects they are expected to teach, such as the courses offered by the U.S. National Fire Academy, or they shall have the training and/or academic credentials and instructional experience necessary to demonstrate competent instructional skills and a good command of the subject matter of the courses they are to teach.
APPENDIX I. MODEL LABORATORY CHEMICAL HYGIENE PLAN

The general intent of the chemical hygiene plan for Facility Name is:

1. To protect laboratory employees from health hazards associated with the use of hazardous chemicals in our laboratory.
2. To ensure that our laboratory employees are not exposed to substances in excess of the permissible exposure limits as defined by OSHA in 29 CFR 1910, Subpart Z.

The plan will be available to all employees for review and a copy will be located in the following areas: [List]

This plan will be reviewed annually by [Name or Position] and updated as necessary.

[Name] is the designated Chemical Hygiene Officer (see sections VI and VII for details).

I. Standard Operating Procedures (SOPs) To Be Followed in the Laboratory Relevant to Safety and Health When Using Chemicals

These are general procedures of laboratory operation that are likely already in effect. Section E of Appendix A of 1910.1450 lists the following considerations:

A. Accidents, spills
B. Avoidance of routine exposure
C. Choice of chemicals
D. Eating, drinking, smoking, etc.
E. Equipment and glassware
F. Exiting
G. Horseplay
H. Mouth suction
I. Personal apparel
J. Personal housekeeping
K. Personal protection
L. Planning
M. Unattended operations
N. Use of hood
O. Vigilance
P. Waste and disposal storage
Q. Working alone

Section F, Appendix A, of 1901.1450 includes additional safety recommendations:

A. Corrosive agents
B. Electrically powered laboratory apparatus
C. Fires, explosions
D. Low temperature procedures
E. Pressurized and vacuum operations
F. Compressed gases
G. Chemical storage

Attached to this plan, in the appendix, are the SOPs in place at [Name of Organization] for the safe handling of chemicals in our laboratory. Often these standard operating procedures
Appendices

will be comprised of the laboratory safety manual that is already in place. If you have the following programs, they can also be referenced:

- The written portion of the laser safety program is located at [Location].
- The written portion of the radiation safety program is located at [Location].
- The written portion of the biological safety program is located at [Location].

II. Criteria for Use of Control Measures To Reduce Employee Exposure to Hazardous Chemicals

A. The following operations will be performed in laboratory fume hoods: [List]
B. The following operations will be performed in biological safety cabinets: [List]
C. The following operations will be performed in glove boxes: [List]
D. Respirators will be used in accordance with the respiratory protection policy of [Name of Organization] and with the OSHA respirator standard (29 CFR 1910.134). This policy and associated documentation is filed at [Location] for employee review.
E. Appropriate protective apparel compatible with the required degree of protection for substances handled will be used. [Name or Position] will advise employees on the use of gloves, gowns, eye protection, barrier creams, etc. Permeability charts are available at [Location].
F. Employees will be instructed on the location and use of eyewash stations and safety showers. [Name or Position] is responsible for this instruction.
G. Employees will be trained [Frequency (e.g., annually)] on the use of fire extinguishers and other fire protection systems.

III. Maintenance of Fume Hoods and Other Protective Equipment

A. Fume hoods will be inspected every month by [Name or Position]; adequacy of face velocity will be determined by [Method]; reports of hood inspections are filed at [Location] for employee review.

(Provide this same information for each additional major category of protective equipment, such as biological safety cabinets, ventilation of storage cabinets, interlocks on high-voltage equipment, safety showers, eyewash stations, indicating how often they are inspected and by whom, what is measured, and where the inspection records and checklists are filed.)

IV. Employee Information and Training

A. All employees covered by the laboratory standard will be provided with information and training so they are aware of the hazards of the chemicals present in their work areas. This training will be given at the time of initial assignment and prior to new assignments involving different exposure situations. Refresher training will be given [Frequency].
B. The training/information session will include:
   1. The contents of 1910.1450 and its appendices, available to employees at [Location]
   2. The availability and location of the written chemical hygiene plan
   3. Information on OSHA permissible exposure limits (PELs) where they exist and other recommended exposure limits
   4. Signs and symptoms associated with exposure to hazardous chemicals in laboratories
   5. Location of reference materials, including all MSDSs received, on the safe handling of chemicals in laboratories
   6. Methods to detect the presence or release of chemicals (e.g., monitoring, odor thresholds)
7. The physical and health hazards of chemicals in laboratory work areas
8. Measures to protect employees from these hazards, including:
   a. Standard operating procedures
   b. Work practices
   c. Emergency procedures
   d. Personal protective equipment
   e. Detail of the chemical hygiene plan
C. [Name or Position] is responsible for conducting the training sessions, which will consist of [Training Methods, such as videotape, slide tape, lecture]. An outline of the training program is in the appendix.
D. Each employee will sign a form documenting that they have received training. (Note that a signed form does not necessarily mean that person has understood and retained the training provided; an enforcement officer would determine training based on employee interviews and employee knowledge.)
E. [Name or Position] is responsible for developing SOPs. [Name or Position] is responsible for the portion of the training on SOPs.

V. Prior Approval for Specific Laboratory Operations
Certain laboratory procedures that present a serious chemical hazard require prior approval by [Name or Position] before work can begin. For this facility, these procedures include:
   A. Work with select carcinogens
   B. Work with reproductive hazards
   C. Work with neurotoxins
   D. Work with acutely hazardous chemicals (considering the eight physical hazards as well as the health hazards in this determination)

These chemicals include: [List acutely hazardous chemicals (e.g., cyanide)]
(If the laboratory does not utilize these classes of chemicals, then include a sentence that states, “Our laboratory does not at this time use any chemicals that are sufficiently hazardous to require prior approval before they are used.”)

VI. Medical Consultation and Examination
[Company Name] will provide to affected employees medical attention, including follow-up examinations, which [Clinic or Physician Name] determines is necessary under the following circumstances:
   A. Whenever an employee develops signs and symptoms associated with a hazardous chemical to which he or she may have been exposed, the employee will be provided an opportunity to receive appropriate medical examination. The employee should contact the Chemical Hygiene Officer to initiate the medical program.
   B. Where exposure monitoring reveals an exposure level routinely above the OSHA action level (AL) or, in the absence of an AL, exposure above the OSHA permissible exposure level (PEL), for OSHA-regulated substances for which medical monitoring and medical surveillance requirements exist, medical surveillance will be established for that employee. Currently our laboratory uses:
      1. (e.g., benzene)
      2. (e.g., formaldehyde)
      3. [List]

All of these have different OSHA standards and medical surveillance requirements. (If none of these substances is used, indicate that no substances for which OSHA has medical monitoring requirements are being used.)
C. Whenever an event takes place in the work area, such as a spill, leak, explosion, or other occurrence resulting in the likelihood of a hazardous exposure, the affected employee, laboratory, or custodial staff will be provided an opportunity for a medical consultation. This consultation is for the purpose of determining the need for a medical examination.

D. All medical examinations and consultations are provided for by [Physician’s Name or Name of Clinic or Hospital]. All aspects of these examinations are provided by a licensed physician or supervised by a licensed physician. These examinations are provided without cost to the employee, without loss of pay, and at a reasonable time and place.

E. The [Name of Position] will provide the following information to the physician:
   1. Identity of the hazardous chemical to which the employee may have been exposed
   2. Description of the conditions of the exposure, including exposure date if available
   3. Description of signs and symptoms of exposure that the employee is experiencing (if any)

F. The written opinion that the company receives from the physician will include:
   1. Recommendations for future medical follow-up
   2. Results of examination and associated tests
   3. Any medical condition revealed that may place the employee at increased risk as the result of a chemical exposure
   4. Statement that the employee has been informed by the physician of the results of the examination or consultation and has been told of any medical conditions that may require additional examination or treatment

G. The material returned to [Name of Organization] by the physician will not include specific findings and diagnoses that are unrelated to occupational exposure.

VII. Responsibilities Under the Chemical Hygiene Plan

[Name or Position] is designated as the Chemical Hygiene Officer for [Name of Organization]. (The qualifications for this individual are important; this person should have a background in both chemistry and safety.) A chemical hygiene committee will be formed. The membership list and minutes of their meetings are filed at [Location] for employee review.

(At this point, you may want to follow the categories in Appendix A of the Lab Standard (29 CFR 1910.1450) and assign some chemical hygiene duties to all staff. The categories used in this appendix are Chief Executive Officer, Department Supervisor, Chemical Hygiene Officer, Laboratory Supervisor, Project Director, and Laboratory Worker. You could designate your existing committee or a subgroup of that committee as your Chemical Hygiene Committee.)

VIII. Additional Protection for Work with Select Carcinogens, Reproductive Toxins, and Chemicals with High Acute Toxicity

When any of these chemicals are used, the following provisions will be employed where appropriate:

   A. Establishment of a designated area
   B. Use of containment devices such as fume hoods or glove boxes
   C. Procedures for safe removal of contaminated waste
   D. Decontamination procedures

Appendix A of the standard has detailed programs for working with these chemicals; refer to Appendix A as a guide for your detailed procedures. Note that, according to the standard,
a "select carcinogen" means any substance that meets one of the following criteria: (1) it is regulated by OSHA as a carcinogen; (2) it is listed under the category "known to be carcinogens" in the latest edition of the Annual Report on Carcinogens published by the National Toxicology Program (NTP); (3) it is listed under Group 1, "carcinogenic to humans," in the latest edition of the International Agency for Research on Cancer (IARC) Monographs; or (iv) it is listed under either Group 2A or 2B by IARC or under the category "reasonably anticipated to be carcinogens" by the NTP. The appendix to this plan includes the special procedures used in this laboratory for the use of these chemicals.

IX. Emergency Response

(Two additional OSHA standards interface with the Chemical Hygiene Plan: Employee Emergency Plans and Fire Prevention Plans (29 CFR 1910.38) and Hazardous Waste Operations and Emergency Response (29 CFR 1910.120(p)–(q)), which was developed in response to SARA Title III. Review these two standards and develop appropriate emergency procedures for your facility if your facility is covered by one of these standards.)

The appendix provides [Name of Organization]'s emergency action plan under 29 CFR 1910.38 and emergency response plan under 29 CFR 1910.120.

**Standards and Guidelines for Laboratories Using Hazardous Chemicals**

- ANSI B31.1, Power Piping
- ANSI B31.2, Fuel Gas Piping
- ANSI B31.3, Petroleum Refinery Piping
- ANSI Z358.1, Emergency Eyewash and Shower Equipment
- NSF/ANSI Standard 49, Biohazard Cabinetry
- ANSI/AIHA Standard Z9.5, Laboratory Ventilation
- Institute of Environmental Sciences (IES) Standard IES-RP-CC002, Laminar Flow Clean Air Devices
- ASHRAE handbook and standards
- *Industrial Ventilation: A Manual of Recommended Practice* (ACGIH)
- *NIH Design Policy and Guidelines: Design Criteria for Research Laboratories*
- *NIH Design Policy and Guidelines: Design Criteria for Research Laboratory Mechanical Systems*
- *Guide for the Care and Use of Laboratory Animals* (NIOSH Publ. No. 86-23)
- *Medical Laboratory Planning and Design* (College of American Pathologists)
- *Standards for Medical–Surgical Vacuum Systems in Hospitals* (CGA Pamphlet P-21)
- NFPA 50, Bulk Oxygen Systems at Consumer Sites
- NFPA 50A, Gaseous Hydrogen Systems at Consumer Sites
- NFPA 50B, Liquefied Hydrogen Systems at Consumer Sites
- NFPA 51, Design and Installation of Oxygen-Fuel Gas Systems for Cutting and Welding
- NFPA 54, National Fuel Gas Code
- NFPA 55, Compressed and Liquefied Gases in Portable Cylinders
- NFPA 58, Storage and Handling of Liquefied Petroleum Gases
- NFPA 91, Installation of Blower and Exhaust Systems
- OSHA 29 CFR 1910.1450, Laboratory Safety
APPENDIX J1. HAZARDOUS MATERIALS TRAINING PLAN

Suggested Teaching Time: 0.5 to 1.0 hour (expand as necessary to cover all hazards)

Teaching Methods: Video presentation and informal discussion

References: OSHA HAZCOM standard (29 CFR 1910.1200); facility hazard communication plan

Visual Aid: HAZCOM video or chemical safety video

Learning Objectives: At the conclusion of the session, each employee will know, understand, or comprehend the following HAZCOM principles and information:

- Purpose and requirements of the OSHA standard
- Location of the written HAZCOM program
- Methods and observations necessary to detect hazardous materials in the workplace
- Labeling system used by the employer, location of the MSDS file, and definitions of the categories of hazards
- Operations in the workplace with potential hazards
- Procedures to follow in the event of a spill or release of hazardous materials
- Principles of safe handling, including proper use of personal protective equipment, safety rules, engineering controls, and specific emergency responsibilities
- Specific hazardous materials in the employee's work area

The final two objectives above should be trained in the employee's work area by the responsible supervisor, if possible.

Recommended Training Sequence

- Show an appropriate video, which is an excellent way to introduce the topic and create interest.
- At the conclusion of the video, review steps for safe handling and emphasize the personal responsibility of the work.
- Present the objectives by discussing the main points as required by the OSHA standard.
- Allow employees to ask questions or make comments during the session.
- Emphasize objectives that refer to the local program.
- Summarize important points of the lesson or areas that were questioned during the session.
- Use a written or oral quiz of 10 questions to reinforce learning.
- Be sure that all workers sign and initial the training documentation report before leaving the area.
- If training is done in two sessions, be sure that phase II training is completed within 30 days.

Training Outline

Introduction — The training session begins with a short video that shows how to work safely with hazardous materials. Ask employees to think of hazardous materials in their work areas or departments while they watch the video. After the video, review the steps and discuss the OSHA HAZCOM standard and the local HAZCOM plan.

A. Review the video by asking these questions:
   Step 1. Why are warning signs important?
   Step 2. What information should be on hazard labels? (e.g., chemical identification, warnings, and precautions to take when working with the substance and protective equipment)
Step 3. What information does the MSDS contain? (e.g., identification, hazardous ingredients, physical/chemical characteristics, fire/explosion information, reactivity data, health hazards, and precautions for safe handling)

Step 4. What safety equipment is required for handling hazardous materials?

Step 5. Why is it important to follow safety procedures?

Step 6. What are symptoms of overexposure to hazardous materials? (e.g., dizziness; nausea; irritation of eyes, nose, and throat; skin rash; nervousness; agitation; sluggishness)

Step 7. Why is hygiene a priority?

Step 8. What should you do in an emergency?

Step 9. Who should you contact with questions about hazardous materials? (e.g., supervisor, safety coordinator)

Step 10. Why is personal responsibility so important?

B. The video has provided key elements of working safely with hazardous materials. OSHA published the Hazard Communication standard in 1987 to require employers to communicate hazard information to workers.

Overview of 29 CFR 1910.1200

A. The OSHA standard requires workers to be informed about workplace hazards to which they may be exposed under normal working conditions or in a foreseeable emergency situation.

B. The standard covers all types of hazards, including solids, gases, and liquids.

C. Employers must publish a written hazard communication plan that describes the following:

1. Labeling systems used in the facility
2. Information on location and availability of Material Safety Data Sheets
3. Hazard evaluation procedures
4. Training procedures

Location of the Written HazCom Program

A. The written HAZCOM plan for this facility is located at [Location]

B. Workers can access all hazard information by contacting their immediate supervisor.

Methods Used To Observe/Detect Hazards in the Work Area

A. Detection methods:

1. Observation
2. Presence of exposure symptoms (e.g., rashes, headaches, dizziness)
3. Olfactory indications
4. Employee monitoring
5. Hygiene surveys

B. This facility relies on information provided by the supplier on the MSDSs to evaluate the hazardous potential of all substances.

C. Safety personnel also monitor operations and work areas to determine and evaluate environmental exposure risks.
Labeling, MSDS, and Health Hazard Information

A. Labeling system:
   1. Explain the labeling system.
   2. Each container is checked to make sure the following information is on the label:
      a. Chemical identity (must match MSDS)
      b. Appropriate warnings in words or pictures
      c. Required protective clothing or equipment (by words, pictures, or symbols)
      d. Special handling or storage requirements
      e. Manufacturer's name, address, phone number
      f. Numbers to call for emergency assistance/information

B. MSDSs contain information describing health and physical hazard evaluations. The MSDS files are located at [Location]. Employees may request hazard information from the MSDS files by contacting their immediate supervisors. The appearance and length of the MSDSs vary, but all should have the following:
   1. Chemical description
   2. Conditions that could increase the hazard
   3. Manufacturer or supplier
   4. Safe handling procedures
   5. Protection required for safe handling
   6. Why the substance is hazardous
   7. What to do if overexposed
   8. How a person can be exposed
   9. What to do in case of spill or release of the substance

C. Section 1. General information about the chemical and who produces it

D. Section 2. Information about hazardous ingredients normally above the threshold set by OSHA; information about exposure limits

E. Section 3. Information about physical data such as boiling point, vapor density, volatility, specific gravity, color, and odor

F. Section 4. Fire and explosion data, including flash point, flammable limits, unusual hazards, and firefighting procedures

G. Section 5. Health hazard data, including effects of overexposure, primary routes of entry into the body, and emergency procedures

H. Section 6. Toxicology information obtained from controlled studies

I. Section 7. Reactivity and stability of the substance under normal foreseeable conditions; conditions to avoid; incompatibility with other materials

J. Section 8. Steps to take in case of an accidental release or spill; waste disposal methods; best procedures for controlling the spill

K. Section 9. Special protection information on ventilation requirements, respiratory protection, gloves, eye protection, and any other equipment or clothing required to work safely with the substance

L. Section 10. Storage and handling information for optimal safe performance and shelf life

M. Categories of hazards:
   1. Health hazards — acutely toxic, carcinogenic, corrosive, mutagenic, sensitizing agent, irritant, teratogenic
   2. Physical hazards — flammable, combustible, explosive, oxidizers, water-reactive, unstable
Operations with Hazardous Materials

Procedures To Follow in Case of a Spill

A. Immediately notify your fellow workers and your supervisor.
B. Clear the area and assist others as required.
C. Implement the emergency action plan.
D. Do not clean up the spill or fight the fire unless that is your designated responsibility.

Hazard Communication Training Record

Employee Name________________________________________________________

Organization/Department________________________________________________________________

I, the undersigned, attended company-provided Hazard Communication Training, Phase I and Phase II, as indicated below:

Phase I. Topics
1. Requirements and overview of the Hazard Communication standard
2. Operations and processes where hazardous materials are present
3. Location and availability of the written HAZCOM program
4. Methods and observations used to evaluate hazards and how to detect the presence of hazardous materials in the work area
5. Various aspects of the company plan:
   • Description of the labeling system
   • Material Safety Data Sheets
   • Information on unlabeled pipes
   • Hazards of nonroutine tasks
   • How to obtain and use local hazard information

Employee’s Signature __________________________________________________________

Trainer’s Initials/Date __________________________________________________________

Phase II. Topics
1. Physical and health hazards of chemicals used in the department or work area
2. Measures workers must take to protect themselves from exposure and specific procedures the company has implemented to protect workers, such as:
   • Safety rules
   • Engineering controls
   • Emergency response procedures
   • Correct use of personal protective equipment

Employee’s Signature __________________________________________________________

Trainer’s Initials/Date __________________________________________________________
APPENDIX J2. MODEL HAZARD COMMUNICATION PROGRAM

To ensure that information about the dangers of all hazardous chemicals used by [Name of Organization] are known by all affected employees, the following hazardous materials information program has been established. Under this program, employees will be informed of the contents of the OSHA Hazard Communications standard, the hazardous properties of chemicals with which they work, safe handling procedures, and measures to take to protect themselves from these chemicals. This program applies to all work operations in [Name of Organization] where employees may be exposed to hazardous chemicals under normal working conditions or during emergency situations. All work units of [Name of Organization] will participate in the hazard communication program. Copies of the hazard communication program are available in the [Location] for review by any interested employee. [Name or Position] is the program coordinator and has overall responsibility for the program, including reviewing and updating this plan as necessary.

**Container Labeling** — [Name or Position] will verify that all containers received for use are clearly labeled as to the contents, appropriate hazard warnings, and manufacturer's name and address. [Name or Position] in each section will ensure that all secondary containers are labeled with either an extra copy of the original manufacturer's label or with labels marked with the identity and the appropriate hazard warning. For help with labeling, see [Name or Position].

On the following individual stationary process containers, we are using [description of labeling system used] rather than labels to convey the required information [list]:

______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________

We are using an in-house labeling system that relies on [Describe (e.g., numbers or graphics used to convey hazard information)].

The [Name or Position] will review the company labeling procedures every [Frequency] and will update labels as required.

**Material Safety Data Sheets** — [Name or Position] is responsible for establishing and monitoring the company MSDS program, ensures that procedures are developed to obtain the necessary MSDSs, and reviews incoming MSDSs for new or significant health and safety information. [Name or Position] will see that any new information is communicated to affected employees. The procedure below will be followed when an MSDS is not received at the time of initial shipment: [Describe]. Copies of MSDSs for all hazardous chemicals to which employees are exposed or are potentially exposed will be kept in [Location]. MSDSs are readily available to all employees during each work shift [Describe]. If an MSDS is not available, contact [Name or Position]. (Note: If an alternative to paper copies of MSDSs are used, describe the format and how employees can access them.) When revised MSDSs are received, the following procedures will be followed to replace old MSDSs [describe]:

______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
Employee Training and Information — [Name or Position] is responsible for the hazard communication program and ensures that all program elements are carried out. Everyone who works with or is potentially exposed to hazardous chemicals will receive initial training on the Hazard Communication standard and this plan before beginning work. New employees will attend a health and safety orientation that covers the following topics:

- Overview of the OSHA Hazard Communication standard
- Hazardous chemicals present in the work areas
- Physical and health risks of these hazardous chemicals
- Symptoms of overexposure
- How to determine the presence or release of hazardous chemicals in the work area
- How to reduce or prevent exposure to hazardous chemicals through use of control procedures, work practices and personal protective equipment
- Steps the company has taken to reduce or prevent exposure to hazardous chemicals
- Procedures to follow if employees are overexposed to hazardous chemicals
- How to read labels and MSDSs to obtain hazard information
- Location of the MSDS file and written hazard communication program

Prior to introducing a new chemical hazard into any section of this company, each employee in that section will be given information and training as outlined above for the new chemical hazard. The training format will be as follows [describe (e.g., audiovisuals, interactive computer programs, classroom instruction)]:

______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________

Hazardous Nonroutine Tasks — Periodically, employees are required to perform nonroutine tasks that are hazardous. Examples of nonroutine tasks are confined space entry, tank cleaning, and painting reactor vessels. Prior to starting work on such projects, each affected employee will be given information by [Name or Position] about the hazardous chemicals that employee may encounter during such activity. This information will include specific chemical hazards, protective and safety measures the employee should use, and steps the company is taking to reduce the hazards, including ventilation, respirators, the presence of another employee (buddy system), and emergency procedures. Examples of nonroutine tasks performed by employees of this company include [list]:

______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________

Informing Other Employers/Contractors — It is the responsibility of [Name or Position] to provide other employers and contractors with information about hazardous chemicals that their employees may be exposed to on a job site and suggested precautions for employees. It is the responsibility of [Name or Position] to obtain information about hazardous chemicals used by other employers to which employees of this company may be exposed. Other employers and contractors will be provided with MSDSs for hazardous chemicals generated by this company’s operations in the following manner: [Describe]. In addition to providing a copy of the MSDS to other employers, other employers will be
informed of necessary precautionary measures to protect employees exposed to operations performed by this company. Also, other employers will be informed of the hazard labels used by the company. If symbolic or numerical labeling systems are used, the other employees will be provided with the information necessary to understand the labels used for hazardous chemicals to which their employees may be exposed.

List of Hazardous Chemicals — A list of all known hazardous chemicals used by our employees is attached to this plan. This list includes the name of the chemical, the manufacturer, the work area in which the chemical is used, dates of use, and quantity used. Further information on each chemical may be obtained from the MSDSs, located at [Location]. When new chemicals are received, this list is updated (including the date the chemicals were introduced) within 30 days. To be sure that new chemicals are added in a timely manner, the following procedures will be followed: [Describe]. The hazardous chemical inventory is compiled and maintained by [Name or Position/Phone Number].

Chemicals in Unlabeled Pipes — Work activities are sometimes performed by employees in areas where chemicals are transferred through unlabeled pipes. Prior to starting work in these areas, such employees must contact [Name or Position] for information regarding:

- Chemicals in the pipes
- Potential hazards
- Required safety precautions

(Include here the chemical list developed during the inventory; arrange the list so the chemicals can be cross-reference with the MSDS file and labels on the containers. Additional useful information, such as the manufacturer’s telephone number, emergency numbers, scientific name, CAS number, and associated tasks, can also be included.)

Program Availability — A copy of this program will be made available, upon request, to employees and their representatives.
APPENDIX K. OVERVIEW OF NFPA 1600, MANAGING EMERGENCIES

1. Program to manage disasters and emergencies — Develop an emergency program to address hazards that promotes an integrated approach to mitigate, prepare for, respond to, and recover from disasters or emergencies.

2. Laws and authorities that govern disasters and emergencies — Be sure the plan complies with the official expectations that govern operation of the program. Implement a strategy to review and revise the official expectations that govern the program.

3. Hazard identification, risk assessment, and impact analysis — Develop the plan by performing a risk assessment that considers all viable or serious hazards. Perform an impact analysis to further determine the extent of the hazard on operations.

4. Hazard mitigation — Develop a strategic plan to mitigate hazards by using information based on knowledge and experience. Be sure the mitigation strategy is both comprehensive and effective.

5. Resource management capability — Define resource objectives that address the need to support the program objectives. Identify key program resource deficiencies, inventory available resources, and develop policies to effectively manage voluntary resource donations.


7. Program plans — Complete the process by developing plans to meet anticipated contingencies. Be sure to include the basic and common planning elements.

8. Incident coordination capability — Develop response and recovery capability planning documents that address the incident command system. Provide details about the control and coordination aspects of incident command structures.

9. Communications capability — Plan for an effective communication system that possesses an emergency alert capability. Ensure the availability of an emergency warning system and operational capability of the entire system.

10. Operational procedures — Create procedures to support program objectives, including mechanisms to protect people, property, and the environment. Operational procedures must address dealing with hazards and further mitigation actions. Plan for support recovery and succession procedures.

11. Logistical capability — Ensure the availability of all necessary logistics to support emergency operations. Plan to provide for adequate support facilities.

12. Education and training — Develop learning objectives and a curriculum that support the program. Define the extent of all training and education activities. Provide education and training on the incident management system. Outline training documentation requirements.

14. Improve the program — Establish evaluation parameters. Conduct exercises and take corrective actions with regard to deficiencies.

15. Crisis communications capabilities — Establish procedures to maintain communications during a crisis.

APPENDIX L. WORKER SAFETY PERCEPTION SURVEY

1. Did you receive adequate job related training prior to assuming your current position?
2. Do supervisors discuss accidents, incidents, and injury events with involved workers?
3. Do supervisors enforce safety rules fairly and correct unsafe behaviors?
4. Do supervisors take appropriate disciplinary action when work rules are not followed?
5. Do you perceive the major cause of accidents to be unsafe work conditions?
6. Does the organization actively promote safety and encourage employees to work safely?
7. Do you think safety is considered important by senior organizational leadership?
8. Do supervisors seem more concerned with their personal records than with accident prevention?
9. Would some type of safety incentive program motivate you to work more safely?
10. Does the organization conduct required hazard surveys thoroughly?
11. Do you feel that supervisors receive adequate safety and health training?
12. Do supervisors provide training on personal protective equipment?
13. Do you understand what a performance-based OSHA standard means?
14. Have you received any safety-related training since your orientation or follow-up training?
15. Does the organization keep records of safety inspections and identified hazards?
16. Do you feel that employees are influenced by the organizational safety efforts?
17. Are you provided with information about the cost, frequency, type, and causes of accidents?
18. Do you feel accident investigations are conducted to place blame?
19. Do you feel that the organization deals with problems caused by alcohol or drug abuse?
20. Does the organization conduct post-accident drug testing for all involved workers?
21. Do safety leadership personnel and supervisors conduct unscheduled safety surveys and inspections?
22. Do you understand how the worker's compensation system works?
23. Does the organization provide special education and training for all shift workers?
24. Does the organization make safety a part of all job reviews or evaluations?
25. Do you think injured workers should participate in an “early return to work” program?
26. Is off-the-job safety an integral part of the overall safety and health program?
27. Do supervisors report accidents promptly?
28. Are you interested in the facility safety record and how it compares with other facilities?
29. Do you feel your co-workers support the safety program?
30. Do supervisors take safety seriously?
31. Does the organization take a proactive or reactive role in dealing with safety?
32. Are workers recognized by supervisors for working safely?
33. Are workers involved in developing safe work practices?
34. Do you feel workers play an important role in safety decisions?
35. Are supervisors supported by senior managers when making decisions affecting safety?
36. Do co-workers understand the relationship between their job tasks and safety?
37. Do you know where to access the bloodborne pathogens exposure control plan?
38. Do you know where to access the hazard communication program?
39. Do you feel that you received appropriate safety training to do all your required job tasks?
40. Do you feel that the company has too many rules governing safety and health issues?
41. Are safety rules enforced in the same manner as other job-related rules?
42. Does the organization set safety-related goals on an annual basis?
43. Are safety goals communicated to all workers in the organization?
44. Do employees participate in setting safety goals?
45. Who do you feel is the key person in the safety management program?
46. Do you feel the organization quickly evaluates hazards and takes appropriate actions?
47. Can supervisors reward workers for good safety performance?
48. Do you think alcohol and drugs increase the risk of an accident?
49. Do worker caution others about unsafe conditions and behaviors?
50. Do you initiate actions to correct an unsafe situation?
51. Do you know how to report an unsafe condition, hazard, or behavior?
52. Do workers have a fear of reprisal when reporting safety deficiencies?
53. Do you feel safety issues receive the same priority as other organizational issues?
54. Do you feel that safety is promoted only to meet accreditation and compliance standards?
55. Do supervisors model safe behaviors to their workers?
56. Do supervisors promote safety with statements such as, “This is management’s idea”?
57. Do all employees receive an adequate safety orientation?
58. Do you feel the safety orientation program adequately prepares you to work safely?
59. Does senior management recognize safe work behaviors?
60. Do safety meetings have a favorable impact upon safety performance?
61. Do workers have the opportunity to attend safety meetings and training classes?
62. Do supervisors handle workers with personal problems in an effective manner?
63. Do you feel that your job is stressful?
64. Do you know your organizational or departmental safety goals?
65. Do supervisors require personal protective equipment use?
66. Are employees who use alcohol or drugs able to work without detection?
67. Do supervisors overlook risks taken to get the job done?
68. Do workers serve on the safety or environment of care committees?
69. Do you know the name of the organizational safety officer or manager?
70. Does compliance with established safety rules hinder job accomplishment?
71. Do you feel overworked?
72. Do you feel pushed on the job?
73. Are you required to work overtime?
74. Do you feel satisfied with your job?
75. Do you feel that you can achieve the goals of your job?
76. Are you recognized for doing a good job?
77. Are you given enough responsibility?
78. Do you feel that you have been given too much responsibility?
79. Do you enjoy your job?
80. Does your immediate supervisor ask you for input?
81. Do you consider yourself loyal to the organization?
82. Do you feel that the organization is loyal to you?
83. Do you believe that teamwork is important in your department?
84. Does the organization provide you with adequate job-related training?
85. Are you judged by things beyond your control?
86. Is job security important to you?
87. Do organizational rules and regulations protect the employee?
88. Do you believe that accidents will just happen?
89. Can accidents truly be prevented?
90. Do workers feel free to discuss accident causal factors with investigators?
91. Do you feel healthcare organizations have more hazards than other industries?
92. Do you understand the job safety analysis process?
93. Do you understand your responsibilities during a disaster?
94. Do you have enough authority to accomplish your job in a safe manner?

Specific Safety Program Feedback

What are your greatest safety concerns?

______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________

How would you improve the safety program?

______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________

Suggestions to increase senior management involvement and employee participation in the safety program:

______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
## APPENDIX M. SAFETY EVALUATION PROFILE (SEP)

### I. Management Leadership and Employee Participation

<table>
<thead>
<tr>
<th>A</th>
<th>Score</th>
</tr>
</thead>
</table>
| Safety and Health Policy | (4) Workforce accepts, can explain, and fully understands the safety and health policy.  
(3) Majority of personnel can explain policy.  
(2) Some personnel can explain policy.  
(1) There is a written (or oral, where appropriate) policy.  
(0) No such policy exists. |
| Comments: | |

<table>
<thead>
<tr>
<th>B</th>
<th>Score</th>
</tr>
</thead>
</table>
| Goals and Objectives | (4) Workforce is involved in goal development, and all personnel can explain desired results and measures.  
(3) Majority of personnel can explain desired results and measures for achieving them.  
(2) Some personnel can explain desired results and measures for achieving them.  
(1) There are written (or oral, where appropriate) goals and objectives.  
(0) No safety and health goals and objectives exist. |
| Comments: | |

<table>
<thead>
<tr>
<th>C1</th>
<th>Score</th>
</tr>
</thead>
</table>
| Safety Leadership | (4) All personnel acknowledge that top management provides essential safety and health leadership.  
(3) Majority of personnel see top management as active safety and health leaders and participants.  
(2) Top management is visible through safety and health videos, training, and documents.  
(1) Evidence exists that top management is committed to safety and health.  
(0) Safety and health do not appear to be top management priorities. |
<p>| Comments: | |</p>
<table>
<thead>
<tr>
<th>Score</th>
<th>C2</th>
<th>Leader Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>(0)</td>
<td>Top management does not appear to follow the basic safety and health rules set for others.</td>
<td></td>
</tr>
<tr>
<td>(1)</td>
<td>Evidence exists that top management generally says and does the right things in support of safety.</td>
<td></td>
</tr>
<tr>
<td>(2)</td>
<td>Top management can generally be seen modeling positive safety and health behavior.</td>
<td></td>
</tr>
<tr>
<td>(3)</td>
<td>Majority of personnel credit top management for setting positive examples for safety and health.</td>
<td></td>
</tr>
<tr>
<td>(4)</td>
<td>All personnel acknowledge that top management always sets positive safety and health examples.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Score</th>
<th>D</th>
<th>Worker Involvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>(0)</td>
<td>Employee involvement in safety and health issues is not encouraged or rewarded.</td>
<td></td>
</tr>
<tr>
<td>(1)</td>
<td>Employees generally feel that their safety and health input will be considered by supervision.</td>
<td></td>
</tr>
<tr>
<td>(2)</td>
<td>Some personnel feel they have a positive impact on safety and health.</td>
<td></td>
</tr>
<tr>
<td>(3)</td>
<td>Majority of personnel feel they have a positive impact on identifying and resolving safety and health issues.</td>
<td></td>
</tr>
<tr>
<td>(4)</td>
<td>All personnel are responsible for actively identifying and resolving safety and health issues.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Score</th>
<th>E</th>
<th>Safety and Health Responsibilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>(0)</td>
<td>Specific job safety and health responsibilities and performance expectations are generally unknown or difficult to find.</td>
<td></td>
</tr>
<tr>
<td>(1)</td>
<td>Performance expectations, including safety and health elements, are spelled out for all.</td>
<td></td>
</tr>
<tr>
<td>(2)</td>
<td>Some personnel can explain what performance is expected of them.</td>
<td></td>
</tr>
<tr>
<td>(3)</td>
<td>Majority of personnel can explain what performance is expected of them.</td>
<td></td>
</tr>
<tr>
<td>(4)</td>
<td>All personnel can explain what performance (including safety and health) is expected of them.</td>
<td></td>
</tr>
<tr>
<td>Score</td>
<td>Resources and Authority</td>
<td></td>
</tr>
<tr>
<td>-------</td>
<td>-------------------------</td>
<td></td>
</tr>
<tr>
<td>(4)</td>
<td>All personnel believe they have the necessary authority and resources to meet their responsibilities.</td>
<td></td>
</tr>
<tr>
<td>(3)</td>
<td>Majority of personnel believe they have the necessary authority and resources to do their job.</td>
<td></td>
</tr>
<tr>
<td>(2)</td>
<td>Authority and resources are spelled out for all, but there is often a reluctance to use them.</td>
<td></td>
</tr>
<tr>
<td>(1)</td>
<td>Authority and resources exist, but most are still controlled by supervisors.</td>
<td></td>
</tr>
<tr>
<td>(0)</td>
<td>All authority and resources come from supervision and are not delegated.</td>
<td></td>
</tr>
</tbody>
</table>

Comments:  

<table>
<thead>
<tr>
<th>Score</th>
<th>Program Effectiveness</th>
</tr>
</thead>
<tbody>
<tr>
<td>(4)</td>
<td>Safety and health performance for all is measured against goals, clearly displayed, and rewarded.</td>
</tr>
<tr>
<td>(3)</td>
<td>Personnel are held accountable for safe performance with appropriate rewards and consequences.</td>
</tr>
<tr>
<td>(2)</td>
<td>Accountability systems are in place, but rewards and consequences do not always follow performance.</td>
</tr>
<tr>
<td>(1)</td>
<td>Personnel are generally held accountable, but consequences tend to be negative rather than positive.</td>
</tr>
<tr>
<td>(0)</td>
<td>Accountability is generally hit or miss and is prompted by serious negative events.</td>
</tr>
</tbody>
</table>

Comments:  

<table>
<thead>
<tr>
<th>Score</th>
<th>Quality Review</th>
</tr>
</thead>
<tbody>
<tr>
<td>(4)</td>
<td>In addition to a comprehensive review, a process is used that drives continuous correction.</td>
</tr>
<tr>
<td>(3)</td>
<td>A comprehensive review is conducted at least annually and drives appropriate program modifications.</td>
</tr>
<tr>
<td>(2)</td>
<td>A program review is conducted, but does not appear to drive all necessary program changes.</td>
</tr>
<tr>
<td>(1)</td>
<td>Changes in programs are driven by events such as accidents or compliance activities.</td>
</tr>
<tr>
<td>(0)</td>
<td>No evidence of any program review process exists.</td>
</tr>
</tbody>
</table>

Comments:
## II. Hazard and Behavior Analysis

<table>
<thead>
<tr>
<th>A1</th>
<th>Score</th>
</tr>
</thead>
</table>
| Quality Review | (4) In addition to corrective action, regular expert surveys result in updated hazard inventories.  
(3) Comprehensive expert surveys are conducted periodically and drive appropriate corrective action.  
(2) Comprehensive expert surveys are conducted, but updates and corrective action sometimes lag.  
(1) Qualified safety or health experts conduct a survey in response to accidents, complaints, or compliance activities.  
(0) No evidence exists of any comprehensive expert hazard survey having been conducted. |

Comments:

<table>
<thead>
<tr>
<th>A2</th>
<th>Score</th>
</tr>
</thead>
</table>
| Hazard Review | (4) Every planned or new facility, process, material, or equipment is fully reviewed by competent personnel.  
(3) A hazard review of each planned or new facility, process, material, or equipment is conducted by experts.  
(2) Planned or new facilities, processes, materials, and equipment that are considered high hazards are reviewed.  
(1) Hazard reviews of new facilities, processes, materials, and equipment are problem driven.  
(0) No system or requirement exists for hazard review of planned or new operations. |

Comments:

<table>
<thead>
<tr>
<th>A3</th>
<th>Score</th>
</tr>
</thead>
</table>
| Job Safety Analysis | (4) Employees are involved in the development of current hazard analysis on their jobs.  
(3) A current hazard analysis program exists for appropriate jobs and processes and is understood by affected employees.  
(2) A hazard analysis program exists for appropriate jobs and processes and is understood by affected employees.  
(1) A hazard analysis program exists, but few employees are involved and most are not aware of the results.  
(0) No routine hazard analysis system is in place at this facility. |

Comments:
<table>
<thead>
<tr>
<th>Score</th>
<th>A4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Self-Inspection</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Program</strong></td>
</tr>
<tr>
<td>(4)</td>
<td>Employees and supervisors are well trained and conduct routine joint inspections, and all items are corrected.</td>
</tr>
<tr>
<td>(3)</td>
<td>All employees are trained in inspection techniques and all routinely participate in workplace inspections.</td>
</tr>
<tr>
<td>(2)</td>
<td>Routine inspections conducted by selected personnel drive appropriate corrective actions.</td>
</tr>
<tr>
<td>(1)</td>
<td>An inspection program exists, but few employees are involved and coverage and corrective action are not complete.</td>
</tr>
<tr>
<td>(0)</td>
<td>No routine inspection program is in place at this facility.</td>
</tr>
<tr>
<td></td>
<td><strong>Comments:</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Score</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Hazard Reporting</strong></td>
</tr>
<tr>
<td></td>
<td><strong>and Correction</strong></td>
</tr>
<tr>
<td>(4)</td>
<td>Employees are empowered to correct any hazards identified on their own initiative.</td>
</tr>
<tr>
<td>(3)</td>
<td>A comprehensive system for gathering hazard information exists and is positive, rewarding, and effective.</td>
</tr>
<tr>
<td>(2)</td>
<td>A system exists for hazard reporting and employees feel they can use it, but it may be slow to respond.</td>
</tr>
<tr>
<td>(1)</td>
<td>A system exists for hazard reporting, but employees may find it unresponsive or be unclear on its use.</td>
</tr>
<tr>
<td>(0)</td>
<td>No hazard reporting system exists or employees do not appear comfortable reporting hazards.</td>
</tr>
<tr>
<td></td>
<td><strong>Comments:</strong></td>
</tr>
</tbody>
</table>
### C Score

<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>All loss-producing incidents and near misses are investigated.</td>
</tr>
<tr>
<td>3</td>
<td>All OSHA-reportable incidents are investigated and effective prevention is implemented.</td>
</tr>
<tr>
<td>2</td>
<td>OSHA-reportable incidents are generally investigated; cause identification and correction may be inadequate.</td>
</tr>
<tr>
<td>1</td>
<td>Some investigation of incidents takes place, but the root cause is seldom identified and correction is spotty.</td>
</tr>
<tr>
<td>0</td>
<td>Incidents are either not investigated or investigation is limited to report writing required for compliance.</td>
</tr>
</tbody>
</table>

**Comments:**

### D Score

<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>All employees are fully aware of incident trends, causes, and means of prevention.</td>
</tr>
<tr>
<td>3</td>
<td>Trends are fully analyzed and displayed, common causes are communicated, management ensures prevention.</td>
</tr>
<tr>
<td>2</td>
<td>Data are collected and analyzed centrally, and common causes are communicated to concerned supervisors.</td>
</tr>
<tr>
<td>1</td>
<td>Data are centrally collected and analyzed but are not widely communicated for prevention.</td>
</tr>
<tr>
<td>0</td>
<td>Little or no effort is made to analyze data for trends, causes, and prevention.</td>
</tr>
</tbody>
</table>

**Comments:**
III. Hazard Prevention

<table>
<thead>
<tr>
<th>A</th>
<th>Score</th>
</tr>
</thead>
</table>
| Hazard Control Program | (4) Hazard controls are fully in place that concentrate on engineering controls and on reinforced and enforced safe work procedures and are known to the workforce.  
(3) Hazard controls are fully in place that give priority to engineering controls, safe work procedures, administrative controls, and personal protective equipment (in that order).  
(2) Hazard controls are fully in place, but the order of priorities is variable.  
(1) Hazard controls are generally in place, but priorities and completeness vary.  
(0) Hazard controls are not considered complete, effective, or appropriate in this workplace. |

Comments: |

<table>
<thead>
<tr>
<th>B</th>
<th>Score</th>
</tr>
</thead>
</table>
| Preventive Maintenance | (4) Operators are trained to recognize maintenance needs and to perform or order timely maintenance.  
(3) An effective preventive maintenance schedule is in place and applicable to all equipment.  
(2) A preventive maintenance schedule is in place and is usually followed except for higher priorities.  
(1) A preventive maintenance schedule is in place but is often allowed to slide.  
(0) Little or no attention is paid to preventive maintenance. |

Comments: |

<table>
<thead>
<tr>
<th>C1</th>
<th>Score</th>
</tr>
</thead>
</table>
| Emergency Planning | (4) All personnel know immediately how to respond as a result of effective planning, training, and drills.  
(3) Most employees have a good understanding of their responsibilities with regard to emergency planning, training, and drills.  
(2) There is an effective emergency response team, but others may be uncertain of their responsibilities.  
(1) There is an effective emergency response plan, but training and drills are weak and roles may be unclear.  
(0) Little effort is made to prepare for emergencies. |

Comments: |
<table>
<thead>
<tr>
<th>C2</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emergency Planning (Equipment)</td>
<td>(4) Facility is fully equipped for emergencies, all systems and equipment are in place and regularly tested, and all personnel know how to use equipment and communicate during emergencies.</td>
</tr>
<tr>
<td></td>
<td>(3) Facility is well equipped with appropriate emergency phones and directions, and most people know what to do.</td>
</tr>
<tr>
<td></td>
<td>(2) Emergency phones, directions, and equipment are in place, but only emergency teams know what to do.</td>
</tr>
<tr>
<td></td>
<td>(1) Emergency phones, directions, and equipment are in place, but employees show little awareness.</td>
</tr>
<tr>
<td></td>
<td>(0) Little evidence exists of an effective effort at providing emergency equipment and information.</td>
</tr>
<tr>
<td>Comments:</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>D1</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medical Surveillance</td>
<td>(4) Occupational health providers are available onsite and are fully involved in hazard identification and training.</td>
</tr>
<tr>
<td></td>
<td>(3) Occupational health providers are there when needed and are generally involved in assessment and training.</td>
</tr>
<tr>
<td></td>
<td>(2) Occupational health providers are frequently consulted about significant health concerns.</td>
</tr>
<tr>
<td></td>
<td>(1) Occupational health providers are available but normally concentrate on clinical issues.</td>
</tr>
<tr>
<td></td>
<td>(0) Occupational health provider assistance is rarely requested or provided.</td>
</tr>
<tr>
<td>Comments:</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>D2</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Injury Response</td>
<td>(4) Personnel fully trained in emergency medicine are always available onsite.</td>
</tr>
<tr>
<td></td>
<td>(3) Personnel with basic first aid skills are always available onsite, and emergency care is close by.</td>
</tr>
<tr>
<td></td>
<td>(2) Personnel with basic first aid skills are usually available and community assistance is nearby.</td>
</tr>
<tr>
<td></td>
<td>(1) Either onsite or nearby community aid is always available.</td>
</tr>
<tr>
<td></td>
<td>(0) Onsite or community aid cannot be ensured at all times.</td>
</tr>
<tr>
<td>Comments:</td>
<td></td>
</tr>
</tbody>
</table>
### IV. Safety and Health Training

<table>
<thead>
<tr>
<th>Year</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td></td>
</tr>
</tbody>
</table>
| Employee Training | (4) Employees are involved in hazard assessment and help develop and deliver training, and all are trained.  
(3) Facility is committed to high-quality employee hazard training, requires everyone to participate, and provides regular updates.  
(2) Facility provides legally required training and makes an effort to include all personnel.  
(1) Training is provided when the need is apparent, and experienced personnel are assumed to know the material.  
(0) Facility depends on experience and informal peer training to meet needs. |

Comments:

<table>
<thead>
<tr>
<th>B1</th>
<th>Score</th>
</tr>
</thead>
</table>
| Supervisor Training | (4) All supervisors assist in worksite analysis, ensure physical protection, reinforce training, enforce discipline, and can explain work procedures.  
(3) Most supervisors assist in worksite analysis, ensure physical protection, reinforce training, enforce discipline, and can explain work procedures.  
(2) Supervisors have received basic training in, appear to understand, and can demonstrate the importance of worksite analysis, physical protection, training reinforcement, discipline, and procedures.  
(1) Supervisors make reasonable efforts to meet their safety and health responsibilities but have limited training.  
(0) No formal effort to train supervisors in safety and health responsibilities is apparent. |

Comments:
### B2 Score

#### Top Management Education

- **Score**
  - (4) All managers have received formal training in safety and health management and demonstrate a full understanding of the material.
  - (3) All managers follow and can explain their roles in safety and health program management.
  - (2) Managers generally show a good understanding of their safety and health management role and usually model it.
  - (1) Managers are generally able to describe their safety and health role but often have trouble modeling it.
  - (0) Managers generally show little understanding of their safety and health management responsibilities.

#### Comments:

<table>
<thead>
<tr>
<th>Safety and Health Program Element</th>
<th>Possible Score</th>
<th>Actual Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Management Leadership</td>
<td>36</td>
<td></td>
</tr>
<tr>
<td>Workplace Analysis</td>
<td>28</td>
<td></td>
</tr>
<tr>
<td>Hazard Prevention and Control</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td>Safety and Health Training</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100</strong></td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX N. OSHA GENERAL INDUSTRY TRAINING REQUIREMENTS FOR HEALTHCARE

The following training requirements have been excerpted from Title 29, Code of Federal Regulations, Part 1910. Note that additional training requirements may appear in certain other standards such as those published by ANSI or NFPA and adopted by reference in Part 1910 and are therefore mandatory.

Employee Emergency Plans and Fire Prevention Plans (29 CFR 1910.38) — Before implementing the emergency action plan, the employer shall designate and train a sufficient number of persons to assist in the safe and orderly emergency evacuation of employees. The employer shall review the plan with each employee covered by the plan at the following times: initially when the plan is developed, whenever the employee’s responsibilities or designated actions under the plan change, and whenever the plan is changed. The employer shall review with each employee upon initial assignment those parts of the plan which the employee must know to protect the employee in the event of an emergency. The written plan shall be kept at the workplace and made available for employee review. For those employers with 10 or fewer employees the plan may be communicated orally to employees and the employer need not maintain a written plan. The employer shall apprise employees of the fire hazards of the materials and processes to which they are exposed. The employer shall review with each employee upon initial assignment those parts of the fire prevention plan which the employee must know to protect the employee in the event of an emergency. The written plan shall be kept in the workplace and made available for employee review. For those employers with 10 or fewer employees, the plan may be communicated orally to employees and the employer need not maintain a written plan.

Hearing Protection Training Program (29 CFR 1910.95) — The employer shall provide training in the use and care of all hearing protectors provided to employees. The employer shall institute a training program for all employees who are exposed to noise at or above an 8-hour time weighted average of 85 decibels, and shall ensure employee participation in such program. The training program shall be repeated annually for each employee included in the hearing conservation program. Information provided in the training program shall be updated to be consistent with changes in protective equipment and work processes. The employer shall ensure that each employee is informed of the following: the effects of noise on hearing; the purpose of hearing protectors; the advantages, disadvantages, and attenuation of various types of hearing protectors; instructions on their selection, fitting, use, and care; the purpose of audiometric testing, and an explanation of the test procedures.

Flammable and Combustible Liquids (29 CFR 1910.106) — The detailed printed instructions of what to do in flood emergencies are properly posted. The station operators and other employees depended upon to carry out such instructions are thoroughly informed as to the location and operation of such valves and other equipment necessary to effect these requirements.

Hazardous Waste Operations and Emergency Response (29 CFR 1910.120)

General — All employees working onsite who are exposed to hazardous substances, health hazards, or safety hazards, as well as their supervisors and management responsible for the site, shall receive training meeting the requirements of this paragraph before they are permitted to engage in hazardous waste operations that could expose them to hazardous substances, safety, or health hazards, and they shall receive review training as specified in
this paragraph. Employees shall not be permitted to participate in or supervise field activities until they have been trained to a level required by their job function and responsibility. Elements to be covered include: names of personnel and alternates responsible for site safety and health; safety, health, and other hazards present on the site; use of personal protective equipment; work practices by which the employee can minimize risks from hazards; safe use of engineering controls and equipment on the site; medical surveillance requirements, including recognition of symptoms and signs which might indicate overexposure to hazards; and the contents of paragraphs (G) through (J) of the site safety and health plan set forth in paragraph (b)(4)(ii) of this section.

Personal Protective Equipment (29 CFR 1910.132)

Training — The employer shall provide training to each employee who is required by this section to use PPE. Each such employee shall be trained to know at least the following:

- When PPE is necessary
- What PPE is necessary
- How to properly don, doff, adjust, and wear PPE
- The proper care, maintenance, useful life, and disposal of the PPE

Each affected employee shall demonstrate an understanding of the training and the ability to use PPE properly before being allowed to perform work requiring use of PPE. When the employer has reason to believe that any affected employee who has already been trained does not have the understanding and skill required, the employer shall retrain each such employee. Circumstances where retraining is required include, but are not limited to, situations where:

- Changes in the workplace render previous training obsolete, or
- Changes in the types of PPE to be used render previous training obsolete, or
- Inadequacies in an affected employee's knowledge or use of assigned PPE indicate that the employee has not retained the requisite understanding or skill.

The employer shall verify that each affected employee has received and understands the required training through a written certification that contains the name of each employee trained and the date(s) of training and identifies the subject of the certification.

Respiratory Protection (29 CFR 1910.134) — The employer shall ensure that each employee can demonstrate knowledge of at least the following:

- Why the respirator is necessary
- How improper fit, usage, or maintenance can compromise the protective effect
- Respirator limitations and capabilities
- How to use the respirator effectively in emergency situations, including malfunctions
- How to inspect, put on and remove, use, and check the seals of the respirator
- Maintenance and storage procedures
- How to recognize medical signs and symptoms that may limit or prevent the effective use

Training shall be conducted in a manner that is understandable to the employee. The employer shall provide the training prior to requiring the employee to use a respirator in the workplace. Retraining shall be administered annually and when changes in the workplace or the type of respirator render previous training obsolete. Retraining is necessary if the employer becomes aware of inadequacies in the employee's knowledge or use of the respirator indicates that the employee has not mastered the requisite understanding or skill.
Accident Prevention Signs and Tags (29 CFR 1910.145) — All employees shall be instructed that danger signs indicate immediate danger and that special precautions are necessary. All employees shall be instructed that caution signs indicate a possible hazard against which proper precautions should be taken. Safety instruction signs shall be used where there is a need for general instructions and suggestions relative to safety measures.

Permit-Required Confined Spaces (29 CFR 1910.146) — The employer shall provide training so that all employees whose work is regulated by this section acquire the understanding, knowledge, and skills necessary for the safe performance of the duties assigned under this section. Training shall be provided to each affected employee before the employee is first assigned duties under this section or there is a change in assigned duties. Train whenever there is a change in permit space operations that presents a hazard about which an employee has not previously been trained. Train whenever the employer has reason to believe that there are deviations from the permit space entry procedures or inadequacies in the employees' knowledge or use of these procedures. The training shall establish employee proficiency in the duties required by this section and shall introduce new or revised procedures, as necessary, for compliance with this section. The employer shall certify that the training required has been accomplished. The certification shall contain each employee's name and the signatures or initials of the trainers, employees, and authorized representatives.

The Control of Hazardous Energy (29 CFR 1910.147) — The employer shall provide training to ensure that the purpose and function of the energy control program are understood by employees and that the knowledge and skills required for the safe application, usage, and removal of energy controls are required by employees. The training shall include the following:

- Each authorized employee shall receive training in the recognition of applicable hazardous energy sources, the type and magnitude of energy available in the workplace, and the methods and means necessary for energy isolation and control.
- Each affected employee shall be instructed in the purpose and use of the energy control procedure.
- All other employees whose work operations are or may be in an area where energy control procedures may be utilized shall be instructed about the procedure and prohibitions relating to attempts to restart or re-energize machines or equipment that are locked out or tagged out.

Retraining shall be provided for all authorized and affected employees whenever there is a change in their job assignments; a change in machines, equipment, or processes that present a new hazard; or a change in the energy control procedures. Additional retraining shall also be conducted whenever a periodic inspection reveals, or whenever the employer has reason to believe, that there are deviations from or inadequacies in the knowledge or use of the energy control procedures. The retraining shall re-establish employee proficiency and introduce new or revised control methods and procedures, as necessary. The employer shall certify that employee training has been accomplished and is being kept up to date. The certification shall contain each employee's name and dates of training.
Medical Services and First Aid (29 CFR 1910.151) — The employer shall ensure the ready availability of personnel for advice and consultation on matters of plant health. In the absence of an infirmary, clinic, or hospital in near proximity to the workplace that can be used for the treatment of all injured employees, a person or persons adequately trained to render first aid should be available. First aid supplies approved by the consulting physician should also be readily available.

Fire Protection (29 CFR 1910.155) — Training in fire protection requires making employees proficient through instruction and hands-on practice in the operation of equipment, including respiratory protection equipment, that is expected to be used in the performance of assigned duties.

Portable Fire Extinguishers (29 CFR 1910.157) — Where the employer has provided portable fire extinguishers for employee use in the workplace, the employer shall also provide an educational program to familiarize employees with the general principles of fire extinguisher use and the hazards involved with incipient-stage firefighting. The employer shall provide the training upon initial assignment to the designated group of employees and at least annually thereafter. The employer shall designate trained persons to conduct all inspections required under this section.

Fixed Extinguishing Systems (29 CFR 1910.160) — The employer shall train employees designated to inspect, maintain, operate, or repair fixed extinguishing systems and annually review their training to keep them up to date in the functions they are to perform.

Welding, Cutting, and Brazing (29 CFR 1910.252) — Management shall recognize its responsibility for the safe usage of cutting and welding equipment on its property and insist that cutters or welders and their supervisors are suitably trained in the safe operation of their equipment and safe use of the process.

Oxygen Fuel Welding and Cutting (29 CFR 1910.253) — Workmen in charge of the oxygen or fuel-gas supply equipment, including generators, and oxygen or fuel-gas distribution piping systems shall be instructed by their employers for this important work before being left in charge. Rules and instructions covering the operation and maintenance of oxygen or fuel-gas supply equipment, including generators, and oxygen or fuel-gas distribution piping systems shall be readily available.

Arc Welding and Cutting (29 CFR 1910.254) — Workmen designated to operate arc welding equipment shall have been properly instructed and qualified to operate such equipment as specified in paragraph (d) or this section.

Commercial Laundry Machinery Operating Rules (29 CFR 1910.264) — Employees shall be properly instructed as to the hazards of their work and be instructed in safe practices, by bulletins, printed rules, and verbal instructions.
Healthcare Hazard Control and Safety Management

Asbestos (29 CFR 1910.1001) — The employer shall institute a training program for all employees who are exposed to airborne concentrations of asbestos, tremolite, anthophylite, actinolite, or a combination of these minerals at or above the action level and ensure their participation in the program. Training shall be provided prior to or at the time of initial assignment and at least annually thereafter. The training program shall be conducted in such a manner that the employee is able to understand the material. The employer shall ensure that each employee is informed of the following:

- The health effects associated with asbestos exposure
- The relationship between smoking and exposure
- The quantity, location, manner of use, release, and specific nature of operations that could result in exposure to asbestos
- The engineering controls and work practices associated with the employee’s job assignment
- The specific procedures implemented to protect employees from exposure to asbestos, such as appropriate work practices, emergency and clean-up procedures, and personal protective equipment to be used
- The purpose, proper use, and limitations of respirators and protective clothing
- The purpose and a description of the medical surveillance program
- The content of this standard

Lead (29 CFR 1910.1025) — Each employer who has a workplace in which there is a potential exposure to airborne lead at any level shall inform employees of the content of Appendices A and B of this regulation. The employer shall institute a training program for and ensure the participation of all employees who are subject to exposure to lead at or above the action level or for whom the possibility of skin or eye irritation exists. The employer shall provide initial training within 180 days of the effective date. The training program shall be repeated at least annually for each employee. The employer shall ensure that each employee is informed of the following:

- The content of this standard and its appendices
- The specific nature of operations that could result in exposure to lead
- The purpose, proper selection, fitting, use, and limitations of respirators
- The purpose and a description of the medical surveillance program and the medical removal protection program, including information concerning the adverse health effects associated with excessive exposure to lead including reproductive effects
- The engineering controls and work practices associated with the employee’s job assignment
- The contents of any compliance plan in effect

Employees should be instructed that chelating agents should not routinely be used to remove lead from their bodies and should not be used at all except under the direction of a licensed physician. The employer shall make readily available to all affected employees a copy of this standard and its appendices. The employer shall provide, upon request, all materials relating to the employee information and training program.
**Cadmium (29 CFR 1910.1027)** — The employer shall institute a training program for all employees who are potentially exposed to cadmium, ensure employee participation in the program, and maintain a record of the contents of such a program. Training shall be provided prior to or at the time of initial assignment to a job involving potential exposure to cadmium and at least annually thereafter. The employer shall make the training program understandable to the employee and ensure that each employee is informed of the following:

- The health hazards associated with cadmium exposure
- The quantity, location, manner of use, release, and storage of cadmium in the workplace
- Information on specific operations that could result in exposure to cadmium
- The engineering and work practices associated with the employee’s job assignment
- The measures employees can take to protect themselves from exposure to cadmium
- The purpose, proper selection, fitting, proper use, and limitations of respirators and protective clothing
- The purpose and a description of the medical surveillance program
- The contents of the training section and the appendices of the cadmium standard
- The employees’ rights of access to records under the Access to Employee Exposure and Medical Records rule (29 CFR 1910.20)

**Benzene (29 CFR 1910.1028)** — The employer shall provide employees with information and training at the time of their initial assignment to a work area where benzene is present. If exposures are above the action level, employees shall be provided with information and training at least annually thereafter. The training program shall be in accordance with the requirements of 29 CFR 1910.1200(h)(1) and (2) and shall include specific information on benzene for each category of information included in that section. In addition to the information required under 29 CFR 1910.1200, the employer shall provide employees with an explanation of the contents of this section, including Appendices A and B, and indicate to them where the standard is available. Employers should describe the medical surveillance program and explain the information contained in Appendix C.

**Bloodborne Pathogens (29 CFR 1910.1030)** — Refer to Appendix D for general training requirements. This section contains the additional training requirements for workers in HBV/HIV research facilities. Additional initial training is required for employees in HIV and HBV laboratories and production facilities. Employees in HIV or HBV research laboratories and HIV or HBV production facilities shall receive the following initial training in addition to the above training requirements:

- The employer shall ensure that employees demonstrate proficiency in standard microbiological practices and techniques and in the practices and operations specific to the facility before being allowed to work with HIV or HBV.
- The employer shall ensure that employees have prior experience in the handling of human pathogens or tissue cultures before working with HIV or HBV.
- The employer shall provide a training program to employees who have no prior experience in handling human pathogens. Initial work activities shall not include the handling of infectious agents. A progression of work activities shall be assigned as techniques are learned and proficiency is developed.
- The employer shall ensure that employees participate in work activities involving infectious agents only after proficiency has been demonstrated.
Ethylene Oxide (EtO) (29 CFR 1910.1047) — The employer shall provide employees who are potentially exposed to EtO at or above the action level with information and training on EtO at the time of initial assignment and at least annually thereafter. Employees shall be informed of the requirements of this standard with an explanation of its contents, including Appendices A and B. Employees shall receive information on any operations in their work area where EtO is present and the location and availability of the written EtO standard. Employers shall inform workers about the medical surveillance program and an explanation of the information in Appendix C. Training shall include at least:

- Methods and observations that may be used to detect the presence or release of EtO in the work area
- The physical and health hazards of EtO
- The measures employees can take to protect themselves from hazards associated with EtO exposure, including specific procedures the employer has implemented to protect employees from exposure to EtO
- The details of the hazard communication program, including an explanation of the labeling system and how employees can obtain and use the appropriate hazard information

Formaldehyde (29 CFR 1910.1048) — The employer shall ensure that all employees who are assigned to workplaces where there is exposure to formaldehyde participate in a training program, except where the employer can show, using objective data, that employees are not exposed to formaldehyde at or above 0.1 ppm. Employers shall provide such information and training to employees at the time of initial assignment, and it shall be repeated at least annually. The training program shall be conducted in such a manner that the employee is able to understand and shall include a description of the potential health hazards associated with exposure to formaldehyde and a description of the signs and symptoms of exposure to formaldehyde. Instruct workers to immediately report to the employer the development of any adverse signs or symptoms that the employee suspects is attributable to formaldehyde exposure. Provide a description of operations in the work area where formaldehyde is present and an explanation of the safe work practices appropriate for limiting exposure. Train workers on the purpose, use, and limitations of personal protective clothing and equipment. Provide instruction on the handling of spills, emergencies, and clean-up procedures. Provide an explanation of the importance of engineering and work practice controls for employee protection and any necessary instruction in the use of these controls. Provide a review of emergency procedures, including the specific duties or assignments of each employee, in the event of an emergency.

Ionizing Radiation (29 CFR 1910.1096) — All individuals working in or frequenting any portion of a radiation area shall be informed of the occurrence of radioactive materials or of radiation in such areas. Instruct personnel in the safety problems associated with exposure to such materials or radiation and in the precautions to take or devices to use to minimize exposure. Employers shall instruct workers about the applicable provisions of the standard.
Hazard Communication (29 CFR 1910.1200) — Refer to Appendix J.

Hazardous Chemicals in Laboratories (29 CFR 1910.1450) — The employer shall provide employees with information and training to ensure that they are apprised of the hazards of chemicals present in their work area.
APPENDIX O. KEY OSHA COMPLIANCE ISSUES FOR DENTAL/MEDICAL OFFICES

Bloodborne Pathogens Standard (29 CFR 1910.1030) — This is the most frequently requested and referenced OSHA standard affecting medical and dental offices. Some basic requirements of the OSHA Bloodborne Pathogens standard include:

- A written exposure control plan, to be updated annually
- Use of universal precautions
- Consideration, implementation, and use of safer engineered needles and sharps
- Use of engineering and work practice controls and appropriate personal protective equipment (gloves, face and eye protection, gowns)
- Hepatitis B vaccine provided to potentially exposed employees at no cost
- Medical follow-up in the event of an exposure incident
- Use of labels or color-coding for items such as sharps disposal boxes and containers for regulated waste, contaminated laundry, and certain specimens
- Employee training and proper containment of all regulated waste

This regulation applies to all individuals who may reasonably anticipate contact with blood or other potentially infectious bodily fluids in the course of their employment. This includes contact with skin, eyes, and mucous membranes or due to nonintact skin. The focus of the regulation is the creation of a written exposure control plan, which describes how the employer will protect employees from exposure.

Hazard Communication (29 CFR 1910.1200) — The Hazard Communication standard is sometimes referred to as the “employee right-to-know” standard, as it requires employee access to hazard information. The basic requirements include:

- A written hazard communication program
- A list of hazardous chemicals (such as alcohol, disinfectants, anesthetic agents, sterilants, or mercury) used or stored in the office
- A copy of the Material Safety Data Sheet (MSDS) for each chemical used or stored in the office
- Employee training

Ionizing Radiation (29 CFR 1910.1096) — This standard applies to facilities that have an x-ray machine and requires the following:

- A survey should be made of the types of radiation used in the facility, including x-rays.
- Restricted areas should be established to limit employee exposures.
- Employees working in restricted areas must wear personal radiation monitors such as film badges or pocket dosimeters.
- Rooms and equipment may need to be labeled and equipped with caution signs.

Exit Routes (29 CFR, Subpart E, 1910.35–1910.39) — These standards include the requirements for providing safe and accessible building exits in case of fire or other emergency. It is important to become familiar with the full text of these standards because they provide details about signs and other issues. OSHA consultation services can provide assistance, or insurance companies or local fire and police services may be able to offer assistance. The basic responsibilities include making sure that exit routes are sufficient for the number of employees in any occupied space and posting diagrams of evacuation routes in visible locations.
Electrical (Subpart S, 29 CFR 1010.301–1910.399) — These standards address electrical safety requirements to safeguard employees. OSHA electrical standards apply to electrical equipment and wiring in hazardous locations. If you use flammable gases, you may need special wiring and equipment installation.

Personal Protective Equipment (PPE) (29 CFR 1910.132) — Employers must assess the workplace to determine if hazards are present or are likely to be present that would require the use personal protective equipment. If the assessment determines that hazards or likely hazards exist, the employer must:

- Select and have each affected employee use PPE that will protect him or her from the identified hazards.
- Inform all affected employees of the PPE selection decision.
- Select PPE that properly fits each affected employee.
- Document that the hazard assessment has been performed through a written certification that identifies the workplace evaluated, the person certifying that the evaluation has been performed, and the date of the hazard assessment.

Respiratory Protection Program (29 CFR 1910.134) — This program ensures that all employees are properly protected from respiratory hazards. Creating and maintaining an individualized written respiratory protection program is the responsibility of all employers who provide respirators to their employees. The program must be administered by a suitably trained program administrator.

Other Possibly Applicable OSHA Standards
29 CFR 1910.105, Nitrous Oxide
29 CFR 1910.151, Medical Services and First Aid
29 CFR 1910.157, Portable Fire Extinguishers
29 CFR 1910.1047, Ethylene Oxide
29 CFR 1910.1048, Formaldehyde
29 CFR 1910.1450, Occupational Exposure to Hazardous Chemicals in Laboratories

OSHA Poster — Every workplace must display the OSHA poster (OSHA Publication 3165) or state plan equivalent.
Emergency Drill Evaluation Tools — The Agency for Healthcare Research and Quality (AHRQ) offers a free tool to help hospitals evaluate their disaster training drills. Developed by the Evidence-Based Practice Center at The Johns Hopkins University, the tool helps hospitals identify their strengths and weaknesses during a disaster drill and improve their ability to meet required emergency management plans. Areas assessed include pre-drill planning, incident command, decontamination, triage, and treatment. The tool also includes checklists to help hospitals tailor drills to specific health threats, such as biological or radiation incidents, and a spreadsheet to track and compare drill performance among hospital units or hospitals. Evaluation of Hospital Disaster Drills: A Module-Based Approach and accompanying CD-ROM can be obtained from the agency by calling (800) 358-9295 and referencing AHRQ Publ. No. 04-0032. It also can be downloaded online at www.ahrq.gov/research/hospdrills/hospdrill.htm.

Medical–Surgical Supply Formularies by Disaster Scenario — Developed by the Association for Healthcare Resource and Materials Management in 2003, the Health Industry Distributors Association, and the Health Industry Group Purchasing Association, this project provides a blueprint for planning and coordinating medical and surgical supplies for hospitals in the case of a large-scale chemical, biological, radiological, nuclear, and explosive (CBRNE) or natural disaster. The supply formularies were created based on information from multiple hospitals and healthcare systems. The formularies are intended as benchmarks for supply preparedness and can be customized to fit the needs of each hospital and community by working with internal staff and suppliers. The formularies focus on adult and pediatric patient needs and provide a targeted supply list for each of the CBRNE events. The formularies do not cover radiology or pharmacy.

AABB Disaster Operations Handbook: Hospital Supplement Coordinating the Nation’s Blood Supply During Disasters and Biological Events — Developed in 2003 by the American Association of Blood Banks (AABB) Inter-Organizational Task Force on Domestic Disasters and Acts of Terrorism, this handbook can assist blood centers, hospital blood banks, and transfusion services in preparing for and responding to future domestic disasters and acts of terrorism affecting the blood supply. It addresses the hospital’s role in ensuring that blood for transfusion will be available. It does not address internal hospital transfusion policies that will be needed in the event of a disaster except to establish that all blood provided will be type O.

Proceedings of the National Symposium on Hospital Disaster Readiness — These proceedings, published by the AHA Section for Metropolitan Hospitals, include summaries and other information shared at the 2002 National Symposium on Hospital Disaster Readiness. Over 70 metropolitan hospital executives learned how hospitals near Ground Zero and the Pentagon responded to the immediate tragedies on September 11, 2001, as well as strategies related to ongoing readiness preparations in the event of future biological, and chemical, and natural disasters.
JCAHO Guide to Emergency Management Planning in Health Care — This comprehensive guide to emergency management planning gives healthcare systems advice on designing, revising, and implementing an emergency management plan.


Perspectives: Special Edition on Emergency Management Planning — The Joint Commission on Accreditation of Health Care Organizations' special 24-page issue of Perspectives (2001) provides guidance to healthcare organizations in preparing for terrorists attacks that may involve nuclear, biological, and/or chemical incidents.

Hazard Vulnerability Analysis Tool — Susan McLaughlin, SBM Consulting, Ltd., addresses the JCAHO requirement that hospitals must have emergency management plans and provides a process for identifying specific procedures in response to a variety of disasters based on a hazard vulnerability analysis performed by the hospital.

Chemical and Bioterrorism Preparedness Checklist — This checklist, published by the AHA in 2001, is available to hospitals to help them describe and assess their current state of preparedness for chemical and biological incidents.

Mass Casualty Disaster Plan Checklist: A Template for Healthcare Facilities — The Association for Professionals in Infections Control and Epidemiology have developed this checklist to provide facilities with questions that stimulate assessment and dialogue with key stakeholders, both within the facility and at the local level and beyond.

Bioterrorism Readiness Plan: A Template for Healthcare Facilities — This plan, which is made available through a partnership between the Association for Professionals in Infection Control and Epidemiology (APIC) and the Centers for Disease Control (CDC), outlines the steps necessary for responding to the biological agents most likely to be employed in any future biological attack: smallpox, botulism toxin, anthrax, and plague. The plan provides information on the unique characteristics, specific recommendations, management, and follow-up appropriate for each of these biological agents.

Hospital Disaster Plan — Compiled by the Wisconsin Department of Health and Family Services Licensing, this planning document is intended to provide policy for response to both internal and external disaster situations that may affect hospital staff, patients, visitors, and the community; identify responsibilities of individuals and departments in the event of a disaster situation; and identify standard operating guidelines for emergency activities and responses.
Hospital Disaster Preparedness: Meeting a Requirement or Preparing for the Worst? — Written by Paul V. Richter, Risk Management Coordinator for Support Services, South Carolina Hospital Association, this article addresses issues of hospital preparedness that go beyond just meeting accreditation requirements. Appendix A includes a disaster-planning checklist that can help hospitals evaluate their existing disaster plan.

Hospital Emergency Incident Command System (HEICS) — Developed by the San Mateo County Department of Health Services, Emergency Medical Services Agency (1998), this is an emergency management system that employs a logical management structure, defined responsibilities, clear reporting channels, and a common nomenclature to help unify hospitals with other emergency responders. Based upon public safety’s Incident Command System, HEICS has already proved valuable in helping hospitals serve their communities during a crisis and resume normal operations as soon as possible. HEICS is fast becoming a standard for healthcare disaster response.

Guidance for Protecting Building Environments from Airborne Chemical, Biological, or Radiological Attacks — The Department of Health and Human Services, Centers for Disease Control and Prevention, and National Institute for Occupational Safety and Health has developed guidelines to address disaster readiness for protecting ventilation systems in commercial and government buildings from chemical, biological, and radiological attacks, including the physical security of ventilation systems, airflow and filtration, systems maintenance, program administration, and maintenance staff training.

CDC Interim Recommendations for Protecting Workers from Exposure to Bacillus anthracis in Worksites Where Mail Is Handled or Processed — Health Alert Network, October 31, 2001 (http://www.bt.cdc.gov/DocumentsApp/Anthrax/10312001/han51.asp).


Talking About Disaster, American Red Cross — This guide has been developed to assist anyone providing disaster safety information to the public. Users of this guide may include emergency managers, meteorologists, teachers, disaster and fire educators, public affairs/public relations personnel, mitigation specialists, media personnel, or any other person in the severe-weather, earthquake, disaster, or communications communities. The safety information is intended for dissemination to the general public.
APPENDIX Q. BACK INJURY PREVENTION
WORKPLACE EVALUATION TOOLS*

Healthcare Lifting Task Evaluation Tools — Involve the employees performing the work when evaluating problems and coming up with potential solutions. Use the following assessment tools to help you conduct your work task evaluations:

1. Patient and Resident Identification Handling
2. Task Analyzer
3. Equipment Evaluation
4. Facility Design Assessment
5. Administrative Issues Determination
6. Determining Solutions

Tasks To Evaluate — Begin with Tool 1 by selecting tasks required by the activity being evaluated. Tool 1 provides guidance for the following tasks:

- Transfers
- Ambulating, repositioning, manipulating
- Transporting or moving
- Medically related activities
- Performing activities of daily living

Specific Tasks — Make sure that typical work practices and equipment are used as you evaluate the work. Watch individuals perform each task long enough to evaluate any changes in work activities. Analyze separately each of the tasks you previously evaluated using the evaluation sheet. List one specific task in the space provided. For example:

- Bed-to-gurney transfer
- Manipulating extremities for wound care
- Moving room furniture
- Bed-to-chair transfer

Using the Tools — As you observe the task, simply place a check mark in the appropriate boxes and fill in your comments. Check as many boxes as may apply. Save your results for review when you are considering improvement options. Complete Tool 1 for each activity to be evaluated, and make additional copies as needed. Use observers or employees performing the task to complete the form. Use Tools 2 through 5 to assess and evaluate all contributing factors. Tool 6 provides guidance on determining appropriate improvement solutions.

<table>
<thead>
<tr>
<th>Activity</th>
<th>How Often?</th>
<th>How Hard?</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Often</td>
<td>Sometimes</td>
<td>Hard</td>
</tr>
</tbody>
</table>

(A) Transfers

1. Bed, to and from:

- Chairs (e.g., regular, cardiac, geriatric, wheel, shower)
- Gurneys
- Floors
- Other beds
- Walker
- Shower
- Toilet/bedside commode
- Bathtub
- Other

2. Chairs, to and from:

- Chairs (e.g., regular, cardiac, geriatric, wheel, shower)
- Gurneys
- Floors
- Walker
- Shower
- Toilet
- Bathtub
- Other

(B) Ambulating, Repositioning, Manipulating

1. Repositioning, turning, holding:

- Whole body (e.g., placing epidurals)
- Extremities (e.g., exercising)

2. Hand-cranking beds/equipment

3. Assisting with ambulation

(C) Transporting or Moving

1. Beds or gurneys

2. Wheelchairs, geriatric chairs, cardiac chairs, etc.
<table>
<thead>
<tr>
<th>Activity</th>
<th>How Often?</th>
<th>Sometimes</th>
<th>Hard</th>
<th>Easy</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>3. Room furniture</td>
<td>Often</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Carts (e.g., linen, food, surgical)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Monitors or equipment (e.g., e-ray, operating tables)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Other</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>(D) Medically Related Activities</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Weighing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Replacing oxygen tanks on gurneys</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Changing IV tubes or bags</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Wound care</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Replacing tape (e.g., endotracheal tubes)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Manually holding retractors</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Handling surgical instrument sets (trays)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Other (e.g., taking vitals, inserting catheter)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>(E) Performing Activities of Daily Living</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Handling food trays or feeding</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Bathing in bed or bathtub, showering</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Performing personal hygiene</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Dressing and undressing, placing and removing prosthesis or braces</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Changing diapers</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Making beds with patients/residents in them</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Replacing draw sheets or incontinence pads</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Toilet activities</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Other</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Tool 2. Work Task Analyzer

Task _______________________________

Contributing Factors

[ ] Bending or twisting
[ ] Reaching out/up
[ ] Prolonged holding, sitting, standing, stooping
[ ] Too much force (e.g., heavy patients, holding retractors, restraining patients or residents)
[ ] Abrupt motions (e.g., stopping falls)

Equipment Used

[ ] None
[ ] Mechanical lift-assist equipment
[ ] Gait or transfer belt with handles
[ ] Slide board
[ ] Draw sheets or incontinence pads
[ ] Low-friction mattress covers
[ ] Slippery sheets or plastic bags
[ ] Transfer mats
[ ] Roller boards or mats
[ ] Transfer or pivot discs
[ ] Shower or toilet chair
[ ] Shower cart or gurney
[ ] Pelvic lift device
[ ] Other ________________________________________________

Patient or Resident Assessment Prior to Handling?

[ ] Yes
[ ] No

Methods and Activities

[ ] Working alone
[ ] Help used (number of people ____)
[ ] Manual lifting
[ ] Manual repositioning:
  [ ] Scooting up
  [ ] Sitting up
  [ ] Other ________________________________________________
[ ] Log rolling
[ ] Turning
[ ] Sliding
[ ] Stand/pivot
[ ] Assisted walking
[ ] Manipulating extremities
[ ] Other ________________________________________________
[ ] Not applicable
Comments
Equipment Factors
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
Work Space
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
Other
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
Evaluator
______________________________________________________________________________
Location
______________________________________________________________________________
Date
________________________________
### Tool 3. Equipment Evaluation

Place a check mark in the appropriate row or column to help identify problems with your equipment.

<table>
<thead>
<tr>
<th>Factor</th>
<th>Carts</th>
<th>Medical Equipment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Faulty brakes</td>
<td>Bed</td>
<td>Gurney</td>
</tr>
<tr>
<td>Takes too long or is difficult to adjust</td>
<td></td>
<td>Medicine</td>
</tr>
<tr>
<td>Casters/wheels do not roll easily</td>
<td></td>
<td>Surgery</td>
</tr>
<tr>
<td>Too low or high</td>
<td></td>
<td>Food</td>
</tr>
<tr>
<td>Too heavy, wide, big, unstable</td>
<td></td>
<td>Laundry</td>
</tr>
<tr>
<td>Controls or handles in awkward position</td>
<td></td>
<td>Monitor</td>
</tr>
<tr>
<td>Handles missing</td>
<td></td>
<td>X-Ray</td>
</tr>
<tr>
<td>Storage of items too low, high, awkward, far away, hard to find</td>
<td></td>
<td>Other</td>
</tr>
<tr>
<td>Difficult to steer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Design not appropriate for patient or resident condition</td>
<td></td>
<td>Comments</td>
</tr>
<tr>
<td>Armrests or foot pads not removable or adjustable</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Items missing (e.g., slings, IV/med poles)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Factor</td>
<td>Life Devices</td>
<td>IV/Med Poles</td>
</tr>
<tr>
<td>--------------------------------------------------</td>
<td>--------------</td>
<td>--------------</td>
</tr>
<tr>
<td>Faulty brakes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Takes too long or is difficult to adjust</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Casters/wheels do not roll easily</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Too low or high</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Too heavy, wide, big</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Controls or handles in awkward position</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Handles missing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Storage of items too low, high, awkward, far away, difficult to find</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Evaluator:  
Date:
## Tool 4. Facility Design Evaluation

Place a check mark in space next to each item you feel may be a problem in your facility.

<table>
<thead>
<tr>
<th>Factor</th>
<th>Problem</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>High thresholds or obstructions in entry ways of bathrooms, showers, hallways, etc. prevent access for assist equipment</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Steep ramp (greater than 10 degrees)</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Small or cluttered rooms, bathrooms, hallways, or other spaces</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Door handles catch on bed, gurneys, etc.</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Floors slippery, uneven, cluttered</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Storage areas too high, low, awkward to reach</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Bedside medical and electrical outlets too low or only on one side</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Inadequate storage space</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>No grab rails by toilets or in bathtubs or showers</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Toilet seats too low</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Other</td>
<td></td>
</tr>
</tbody>
</table>

Evaluator:  
Location:  
Date:  
**Tool 5. Administrative Factors**

Based on observations in your facility, place a check mark in the “No” column to help identify areas that may require a closer look.

<table>
<thead>
<tr>
<th>Factor</th>
<th>Yes</th>
<th>No</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Systematic patient or resident assessment is conducted.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Formal policies or criteria exist for:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Getting help or using assist devices</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Early reporting of problems</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Guiding instead of stopping falls</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Equipment maintenance:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Standardized tags</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Short turnaround time</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Effective tracking systems</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Equipment purchasing/distribution:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flexible contracts</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Systematic end-user reviews</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sufficient quantities ordered</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adequate storage</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Communication with employees is by:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Meetings</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bulletin boards or memos</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>In-service or training sessions</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other means (specify)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Job expectations are clearly communicated.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Training:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All employees are trained</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hands-on practice</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Opportunity for feedback</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Content is comprehensive</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Demonstrated in competency</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Systematically reinforced</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other (please specify)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Where possible, physically difficult work tasks are distributed equally among employees or shifts.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Where possible, scheduling avoids requiring employees to perform unaccustomed physical work.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Other (e.g., effective early reporting)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Evaluator:  
Location:  
Date:
Tool 6. Identifying Solutions — Once problem work activities have been identified and evaluated, how do you decide which ones to address first and what changes are appropriate? Review the information you have gathered up to this point to guide your choices. Talk to the affected employees to get their ideas on how to improve their work activities. Coordinate the knowledge and expertise of in-house staff to identify and try out solutions. Depending on the nature and severity of the problems, it may be useful to consult with:

- Nursing administration and supervision
- Health and safety committees
- Purchasing
- Maintenance
- Quality assurance
- Human resources
- Organized labor representatives
- Physical and occupational therapy
- Employee health
- Workers' compensation
- Risk management
- Finance

Recognize what is working well and try to key in on specific changes to make. Keep in mind that many problems, once identified, can be solved by quick fixes or simple, commonsense improvements. Remember to start small and pick options you can realistically put into place. As you progress, build on your early successes. Talk to the affected employees to get suggestions on how to modify improvements. Some institutions have found the following improvement options to be effective at reducing or preventing back injuries:

- Patient or resident assessment
- Assist equipment and devices
- Proper work practices
- Lift teams
- Other measures
  - Institutional equipment and facilities
  - Maintenance
  - Administrative measures
  - Exercise
  - Safety gear

*Note:* These suggestions are not the only ones possible and may need to be altered to fit your particular situation.
APPENDIX R. PATIENT AND RESIDENT MOVING GUIDELINES

Guideline 1. Lifting and Lateral Transfers

Lifting — Use upright, neutral working postures and proper body mechanics:

- Bend your legs, not your back. Use your legs to do the work.
- When lifting or moving people, always face them
- Do not twist when turning. Pick up your feet and pivot your whole body in the direction of the move
- Try to keep the person you are moving, equipment, and supplies close to the body. Keep handholds between your waist and shoulders.
- Move the person toward you, not away from you.
- Use slides and lateral transfers instead of manual lifting.
- Use a wide, balanced stance with one foot slightly ahead of the other.
- Lower the person slowly by bending your legs, not your back. Return to an erect position as soon as possible.
- Use smooth movements and do not jerk. When lifting with others, coordinate lifts by counting down and synchronizing the lift.

Lateral Transfers

- Position surfaces (e.g., bed and gurney, bed and cardiac chair) as close as possible to each other. Surfaces should be at approximately waist height, with the receiving surface slightly lower to take advantage of gravity
- Lower the rails on both surfaces (e.g., beds and gurneys)
- Use draw sheets or incontinence pads in combination with friction-reducing devices (e.g., slide boards, slippery sheets, plastic bags, low-friction mattress covers, etc.)
- Get a good hand-hold by rolling up draw sheets and incontinence pads or use other assist equipment such as slippery sheets with handles.
- Kneel on the bed or gurney to avoid extended reaches and bending of the back
- Have team members on both sides of the bed or other surfaces. Count down and synchronize the lift. Use a smooth, coordinated push-pull motion. Do not reach across the person you are moving

Guideline 2. Ambulating, Repositioning, and Manipulating — When using gait or transfer belts with handles:

- Keep the individual as close as possible.
- Avoid bending, reaching, or twisting your back when:
  - Attaching or removing belts (e.g., raise or lower beds, bend at the knees)
  - Lowering the individual down
  - Assisting with ambulation
- Pivot with your feet to turn.
- Use a gentle rocking motion to take advantage of momentum.

Stand/pivot type transfers are used for transferring an individual from bed to chair, for example, or to help an individual get up from a sitting position:

- Use transfer discs or other assists when available. If using a gait or transfer belt with handles, follow the above guidelines.
- Keep feet at least a shoulder width apart.
- If the patient or resident is on a bed, lower the bed so the individual can place his or her feet on the floor to stand.
• Place the receiving surface (e.g., wheelchairs) on the individual’s strong side (e.g., for stroke or hemiparalysis conditions) so the individual can help in the transfer.
• Get the person closer to the edge of bed or chair and ask him or her to lean forward when trying to stand (if medically appropriate).
• Block the individual’s weak leg with your legs or knees (this may place your leg in an awkward, unstable position; an alternative is to use a transfer belt with handles and straddling your legs around the weak leg of the patient or resident).
• Bend your legs, not your back.
• Pivot with your feet to turn.
• Use a gentle, rocking motion to take advantage of momentum.

Lifting or Moving Tasks with the Patient or Resident in Bed — Some common methods include scooting up or repositioning individuals using draw sheets and incontinence pads in combination with a log roll or other techniques:

• Adjust beds, gurneys, or other surfaces to waist height and as close to you as possible.
• Lower the rails on the bed, gurney, etc., and work on the side where the individual is closest.
• Place equipment or items close to you and at waist height.
• Get help and use teamwork.

Guideline 3. Transporting Patients, Residents, and Equipment — It is often necessary to transport people in gurneys, wheelchairs, or beds or handle various types of carts, monitors, instrument sets, and other medical equipment:

• Decrease the load or weight of carts, instrument trays, etc.
• Store items and equipment between waist and shoulder height.
• Use sliding motions or lateral transfers instead of lifting.
• Push, don’t pull. Keep loads close to your body. Use an upright, neutral posture and push with your whole body, not just your arms.
• Move down the center of corridors to prevent collisions.
• Watch out for door handles and high thresholds that can cause abrupt stops.

Guideline 4. Performing Activities of Daily Living — Cramped showers, bathrooms, or other facilities in combination with poor work practices may cause providers to assume awkward positions or postures or use forceful exertions when performing activities of daily living (ADLs):

• Use upright, neutral working postures and proper body mechanics. Bend your legs, not your back.
• Eliminate bending, twisting and long reaches by:
  • Using long-handled extension tools (e.g., hand held shower heads, wash and scrub brushes).
  • Wheeling people out of showers or bathrooms and turning them around to wash hard-to-reach places.
• Use shower-toilet chairs that are high enough to fit over toilets. This eliminates additional transfers to and from wheelchairs, toilets, etc.
• Use shower carts or gurneys, bath boards, pelvic lift devices, bathtub and shower lifts, and other helpful equipment
• When providing in-bed medical care or other services, follow the guidelines listed previously.
Guideline 5. Transferring from the Floor — When it is medically appropriate, use a mechanical assist device to lift people from the floor. If assist devices are not readily available or appropriate, you may have to perform a manual lift. When placing slings, blankets, draw sheets, or cots under the person:

- Position at least two providers on each side of the person. Get additional help for large patients or residents.
- Bend at your knees, not your back. Do not twist.
- Roll the person onto his or her side without reaching across the person.
- If using hoists, lower the hoist enough to attach slings without strain.
- If manually lifting, kneel on one knee, and grasp the blanket, draw sheet, or cot. Count down and synchronize the lift. Perform a smooth lift with your legs as you stand up. Do not bend your back.

Guideline 6. Assisting in Surgery

- Use retractor rings instead of prolonged manual holding of retractors.
- Position operating tables or other surfaces at waist height.
- Stand on lifts or stools to reduce reaching.
- Frequently shift position or stretch during long operations.
- Avoid prolonged or repeated bending of the neck or the waist.
- Stand with one foot on a lift and frequently alternate feet to reduce pressure on the back.
- Reduce the number of instrument sets (trays) on a case cart.
- Store instrument sets (trays) in racks between the waist and shoulders.
- Use stands or fixtures to hold extremities.
- Get help from coworkers as needed to:
  - Position legs or extremities in stirrups
  - Move heavy carts, microscopes, monitors, alternate operating tables, equipment, or fixtures
APPENDIX S. PARTIAL LIST OF NFPA
STANDARDS RELEVANT TO HEALTHCARE

NFPA 1, Uniform Fire Code
NFPA 10, Standard for Portable Fire Extinguishers
NFPA 12, Standard for Carbon Dioxide Extinguishing Systems
NFPA 13, Standard for the Installation of Sprinkler Systems
NFPA 30, Flammable and Combustible Liquids Code
NFPA 45, Standard for Fire Protection for Laboratories Using Chemicals
NFPA 50, Standard for Bulk Oxygen Systems
NFPA 51B, Standard for Fire Prevention During Welding, Cutting, and Other Hot Work
NFPA 55, Standard for the Storage, Use, and Handling of Compressed Gases
NFPA 70, National Electrical Code®
NFPA 70B, Recommended Practice for Electrical Equipment Maintenance
NFPA 70E, Standard for Electrical Safety Requirements for Employee Workplaces
NFPA 72, National Fire Alarm Code
NFPA 77, Recommended Practice on Static Electricity
NFPA 80, Standard for Fire Doors and Fire Windows
NFPA 85, Boiler and Combustion Systems Hazards Code
NFPA 90A, Standard for the Installation of Air-Conditioning and Ventilating Systems
NFPA 90B, Standard for the Installation of Warm Air Heating and Air-Conditioning Systems
NFPA 92A, Recommended Practice for Smoke-Control Systems
NFPA 99, Standard for Health Care Facilities
NFPA 99B, Standard for Hypobaric Facilities
NFPA 99C, Standard for Gas and Vacuum Systems
NFPA 101A, Guide on Alternative Approaches to Life Safety
NFPA 105, Standard for the Installation of Smoke Door Assemblies
NFPA 110, Standard for Emergency and Standby Power Systems
NFPA 111, Standard for Stored Electrical Energy Emergency and Standby Power Systems
NFPA 115, Standard for Laser Fire Protection
NFPA 170, Standard for Fire Safety Symbols
NFPA 220, Standard for Types of Building Construction
NFPA 221, Standard for Fire Walls and Fire Barrier Walls
NFPA 418, Standard for Heliports
NFPA 434, Code for the Storage of Pesticides
NFPA 450, Guide for Emergency Medical Services and Systems
NFPA 801, Standard for Fire Protection for Facilities Handling Radioactive Materials
NFPA 900, Building Energy Code
NFPA 1600, Standard for Disaster/Emergency Management
NFPA 1994, Standard for Protective Ensembles for Chemical/Biological Terrorism Incidents
NFPA 1999, Standard for Protective Clothing for Emergency Medical Operations
NFPA 5000, Building Construction and Safety Code
APPENDIX T. OVERVIEW OF DOT-REGULATED MEDICAL WASTE STANDARDS

Introduction — Microbiology and pathology laboratories are the major shippers of risk group 1, 2, or 3 waste cultures or stocks of an infectious substance. It is the lab director's duty to identify levels. Materials should be packaged in a UN standard package (as required by 49 CFR 173.197) and should bear the biohazard label and markings for regulated medical waste (UN 3291, PG II). The exception under 49 CFR 173.134 allows packaging of waste infectious substances in a standard heavy-duty box with an inner liner that prevents leakage; place closure end upright.

Civil Penalties — Civil penalties apply to violations of a requirement as it relates to the transporting or shipment of a hazardous material, manufacture, fabrication, marking, maintenance, repair, reconditioning, or testing of a hazardous materials packaging. Fines can range from $250 to $27,500 per violation per day. Violations include willfully violating the hazardous materials regulations, including unlawful altering, removal, defacing, destroying, or otherwise tampering with any marking, labeling, placarding, or packaging requirement. Violators are subject to fines and a maximum of 5 years imprisonment.

Hazard Communication
- Shipping papers
- Regulated medical waste (6.2, UN3291, PG II)
- Marking: “Regulated Medical Waste” (UN3291)
- Labeling: “Biohazard Symbol”
- Emergency response information

Training
- Complete HazMat training
- General awareness and safety (function specific)
- Testing
- Commensurate with duties performed
- Employer certification of HazMat employees
- Records complete, current, and function specific

Definitions (49 CFR 173.134)
Regulated Medical Waste — Regulated medical waste is a waste or reusable material, other than a culture or stock of an infectious substance, that contains or is suspected of containing, an infectious substance and is generated in:
- The diagnosis, treatment, or immunization of humans or animals
- Research pertaining to the above
- The production or testing of biological products

Infectious Substances — An infectious substance is a viable microorganism, or its toxin, that causes or may cause disease in humans or animals; includes agents listed in 42 CFR 72.3 (fatal or disabling); risk group 1, 2, or 3. “Infectious substance” and “etiologic agent” are synonymous.

Nonbulk — A receptacle with a capacity of 119 gallons or less.
Bulk — A receptacle with a capacity greater than 119 gallons.

UN Standard Package — A package conforming to the standards in the UN Recommendations on the Transportation of Dangerous Goods which has been tested and conforms to the packaging specifications in 49 CFR 178.

Shipper/Generator Responsibilities (49 CFR173.22) — The shipper shall class and describe the hazardous material. The shipper shall determine that the packaging or container is an authorized packaging. The shipper shall determine that the packaging has been manufactured, assembled, and marked as required by 49 CFR or Exemptions issued. For UN standard packaging subject to the regulations, the shipper shall perform all necessary functions (closure) to bring that package into compliance, as when tested. Per 49 CFR 172.205, the shipper shall prepare the shipping manifest.

Packaging Requirements for Regulated Medical Wastes

- Exceptions: 49 CFR 173.134
- Nonbulk: 49 CFR 173.197
- Bulk: None allowed (exempted containers)

Packaging Exceptions (49 CFR 173.134) — Packaging exceptions pertain to regulated medical waste that possibly or does contain an infectious substance as determined by the shipper or generator. A regulated medical waste that is transported by a private or contract carrier is exempted from bearing an “infectious substance” label if the outer packaging has a “Biohazard” marking. For other than a waste culture or stock of an infectious substance, regulated medical waste is exempted from specific packaging requirements of 49 CFR 173.197. If packaged in a rigid, nonbulk package conforming to 49 CFR 173.24 and 173.24(a) and 29 CFR 1910.1030 requirements, a waste infectious substance may be transported as a regulated medical waste when the culture or stock:

- Conforms to biosafety level 1, 2, or 3 regulations.
- Is packaged per 49 CFR173.197.
- Is transported by a private or contract carrier using a dedicated vehicle.

Regulated Medical Waste Packaging (49 CFR 173.197)

- Rigid and leak resistant
- Impervious to moisture or of sufficient strength to prevent tearing or bursting under normal conditions of use and handling
- Sealed to prevent leakage and puncture resistant for sharps
- Break resistant for fluids over 20 cc

Nonbulk Packaging

- Limited to a maximum 119-gallon container
- No identifiable leakage
- Effectiveness of the package not substantially reduced by temperature changes or weather conditions
- Inner packaging (bags) secured to prevent leakage and packed so closures are upright
Specifications Under Standard Packaging, 49 CFR — Packaging must pass drop, leakproof, hydrostatic pressure, stacking, Cobb water absorption, and cooperage tests, as applicable to the package. It must be marked with UN standard markings:

- Fiberboard box: 4G/Yxx/S/99/USA/xxxx
- PSN/ID Number: Regulated Medical Waste (UN3291)
- Label: Biohazard

Bulk Packaging and Exemption Containers — Roll-off containers, large dumpster type, and carts (usually metal or plastic on wheel casters); samples include:

- DOT E - 10821 Steel Roll-Off Container
- DOT E - 11854 211 Gallon Plastic Bin
- DOT E - 10874 200 Gallon Metal Cart
- DOT E - 10826 132 Gallon Plastic Cart

Regulated Medical Waste Summary — Department of Transportation standard 49 CFR 173.196 applies to an infectious substance shipped as a division 6.2 (Not Regulated Medical Waste) waste. OSHA 29 CFR 1910.1030 requires placing all sharps into an authorized sharps container prior to disposal. For DOT purposes, for “infectious substances” in sharps containers, the sharps container is usually not a strong enough outer package with appropriate closures to prevent release of the hazardous material incident to transportation. The container also does not have an inner package to prevent leakage. Such substances must be appropriately packaged (49 CFR 173.24, 173.24(a)) or placed in a UN standard package. A material, including waste, that previously contained an infectious substance and has been treated by steam sterilization, chemical disinfection, or other appropriate method, so it no longer poses the hazard of an infectious substance, is exempted from DOT regulations. Shippers may package nonregulated waste any way they wish. If it is infectious, DOT regulates the transportation of it. Always package infectious cultures and stocks as required by 49 CFR 173.197 (Certified UN Packaging). Remember that the exception rule in 49 CFR 173.134(b) requires packaging infectious wastes in strong outer packaging with inner liners securely closed per 49 CFR 173.24 and 173.24(a). Minimum marking is the “Biohazard” label.

APPENDIX U. CDC HAND HYGIENE RECOMMENDATIONS CHART

Recommendations — Part II of the guidance lists recommendations based on a five-point rating scale: Category IA (do this); Category IB (can do this); Category IC (must do); Category II (suggested); and no recommendation, no consensus reached. The following priority list is a condensed version using the actual number before each recommendation as identified in the guideline.

<table>
<thead>
<tr>
<th>Category IC. Must Do</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wear gloves for bodily fluid contact.</td>
</tr>
<tr>
<td>Store alcohol hand rubs in flammable materials cabinets.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Category IB. Can Do This</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wash hands with antimicrobial soap and water, if not using alcohol hand rubs.</td>
</tr>
<tr>
<td>Decontaminate hands before patient contact.</td>
</tr>
<tr>
<td>Decontaminate hands before donning sterile gloves for central IV catheter insertions.</td>
</tr>
<tr>
<td>Decontaminate hands before urinary, IV, and other nonsurgical catheter insertions.</td>
</tr>
<tr>
<td>Decontaminate hands after patient contact.</td>
</tr>
<tr>
<td>Decontaminate hands after glove removal.</td>
</tr>
<tr>
<td>Wash hands with soap and water before eating and after using restroom.</td>
</tr>
<tr>
<td>Antimicrobial towelettes are a substitute for soap and water cleansing only.</td>
</tr>
<tr>
<td>Apply alcohol hand rubs to palm, rubbing over entire hand surface until dry.</td>
</tr>
<tr>
<td>Wet hands with water, apply recommended product does, rub vigorously 15 seconds over surface, rinse with water, dry thoroughly with paper towel; turn faucet off with towel. Avoid hot water, which increases dermatitis risk.</td>
</tr>
<tr>
<td>Use antimicrobial soap or alcohol hand rub for surgical scrub before donning sterile gloves.</td>
</tr>
<tr>
<td>Perform surgical scrub with antiseptic and water for manufacturer’s stated 2 to 6 minutes time only.</td>
</tr>
<tr>
<td>Use alcohol surgical hand scrubs per manufacturer’s instruction. Pre-wash with soap and water and dry thoroughly before alcohol surgical scrub; dry thoroughly before donning sterile gloves.</td>
</tr>
<tr>
<td>Provide workers with effective, low irritant hand hygiene products.</td>
</tr>
<tr>
<td>Obtain workers input on products regarding feel, fragrance, and skin tolerance; cost is not a primary factor in product selection.</td>
</tr>
<tr>
<td>Solicit manufacturer information on interactions among hand lotions, creams, alcohol rubs, and antimicrobial soaps used in the facility.</td>
</tr>
<tr>
<td>Remove gloves after each patient; do not reuse or wash gloves.</td>
</tr>
<tr>
<td>Make hand hygiene adherence a priority in the facility, providing administrative support and finances.</td>
</tr>
<tr>
<td>Implement multidisciplinary program for workers’ compliance to hand hygiene practices.</td>
</tr>
</tbody>
</table>
### Category IA. Do This

<table>
<thead>
<tr>
<th>Task</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wash visibly dirty hands with soap and water.</td>
</tr>
<tr>
<td>Use alcohol hand rubs to clean hands.</td>
</tr>
<tr>
<td>Decontaminate hands after body fluid contact if hands are not visibly soiled.</td>
</tr>
<tr>
<td>Prevent topping off partially empty soap dispensers.</td>
</tr>
<tr>
<td>Provide workers with hand lotions/creams for dermatitis.</td>
</tr>
<tr>
<td>No artificial fingernails or extenders in ICUs or ORs.</td>
</tr>
<tr>
<td>Monitor worker compliance and give feedback on hand hygiene practices.</td>
</tr>
<tr>
<td>Provide worker with alcohol hand rubs.</td>
</tr>
<tr>
<td>Provide alcohol hand rubs at entrance to patient’s room, bedside, and for HCW pocket.</td>
</tr>
</tbody>
</table>

### Category II. Suggested

<table>
<thead>
<tr>
<th>Task</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decontaminate hands if moving from contaminated to clean body site.</td>
</tr>
<tr>
<td>Decontaminate hands after contact with inanimate objects near patients.</td>
</tr>
<tr>
<td>Wash hands with plain or antimicrobial soap and water for <em>Bacillus anthracis</em> (anthrax) spore exposure.</td>
</tr>
<tr>
<td>Liquid, bar, leaflet, or powdered plain soap are acceptable nonantimicrobial forms for washing hands. Use soap racks for bar soap; use small bars.</td>
</tr>
<tr>
<td>Eliminate multiple-use hanging or roll cloth towels in healthcare facilities.</td>
</tr>
<tr>
<td>Remove rings, watches, and bracelets before doing surgical hand scrub.</td>
</tr>
<tr>
<td>Remove debris underneath fingernails with a nail cleaner under running water.</td>
</tr>
<tr>
<td>Solicit manufacturer information regarding interactions among hand cleansing products, skin care products, and glove types used in the facility.</td>
</tr>
<tr>
<td>Evaluate dispenser systems for function and dosing prior to purchase.</td>
</tr>
<tr>
<td>Keep natural nail tips less than 1/4 inch long.</td>
</tr>
<tr>
<td>Change gloves if moving from contaminated to clean body site during patient care.</td>
</tr>
<tr>
<td>Educate workers about hand contamination activities and pros and cons of cleansing methods.</td>
</tr>
<tr>
<td>Encourage patients and families to remind workers about decontaminating their hands.</td>
</tr>
</tbody>
</table>

**No Recommendation, No Consensus Reached**

<table>
<thead>
<tr>
<th>Task</th>
</tr>
</thead>
<tbody>
<tr>
<td>Routine use of nonalcohol hand rubs for hand hygiene in healthcare</td>
</tr>
<tr>
<td>Wearing rings in healthcare</td>
</tr>
</tbody>
</table>
## Performance Indicators: Four Ways To Measure Worker Hand Hygiene Compliance

1. Survey compliance of performance quantity over quantity of opportunities by ward or by service, providing feedback to workers.

2. Calculate the volume of alcohol product used per 1000 patient days.

3. Monitor artificial nail wearing compliance during outbreaks.


**Note:** The 2002 HICPAC Guideline on Hand Hygiene espouses the advent of alcohol gels as the answer to worker compliance deficits while requesting statistical research data for strengthening evidence-based references for alcohol-based hand hygiene practices. It behooves anyone who has implemented or is about to implement this guidance to thoroughly and thoughtfully read this entire document. Employ critical thinking skills when assessing its intent and its recommendations as they apply to the unique healthcare delivery system or facility. Conducting objective product evaluations within the facility with a multidisciplinary group provides a systematic method for informed decision making. Instruct workers and adhere to the labeling and storage requirements of the products selected. Remember that hand cleansing and disinfecting with skin care and antiseptic products require multiple steps, mechanical friction being the most important to rid the surface of microbes.
APPENDIX V. SAMPLE PERMIT-REQUIRED
CONFINED SPACE PROGRAM ELEMENTS

Introduction — Conduct a facility survey, inventory, and evaluation to determine permit-required confined spaces. Post appropriate signs and provide training to individuals with regard to not entering permit-required confined spaces unless authorized in writing for a specific time and day. Develop written entry practices and procedures and establish atmospheric testing requirements. Implement a permit system to control and monitor entry into permit-required confined spaces. The engineering or maintenance director will

• Monitor the overall effectiveness of the permit system.
• Provide centralized recordkeeping.
• Assist with atmospheric testing and equipment selection as needed.
• Assist with employee training.
• Provide technical assistance to plant operations zone teams as needed.

Confined Space — A confined space is one that is large enough for an employee to enter and perform assigned work but has limited or restricted means for entry or exit. It is not designed for continuous occupancy. A permit-required confined space has at least one of the following characteristics:

• Contains or has the potential to contain a hazardous atmosphere.
• Contains a material that has the potential for engulfing an entrant.
• Has organic materials that can produce methane or hydrogen sulfide.
• Contains any other recognized serious safety or health hazard such as chemicals, noise, electricity, radiation, or moving parts of machinery.

Identification of Permit-Required Spaces — A survey of the hospital should be conducted to identify, inventory, and assess all potential permit-required confined spaces. The safety manager, in cooperation with the maintenance department, will conduct the survey. The inventory will be maintained and updated as needed. The inventory will include an assessment of the hazards associated with each permit-required space. The current inventory will be included in Appendix B of this document, which shall be maintained current by the safety manager. A permit-required space that could inadvertently be entered must be labeled or stenciled to indicate that it is a permit-required confined space. Obvious confined spaces, such as manholes, or confined spaces that are not permit required will not be labeled. Signs should read as follows: “Danger. Permit-Required Confined Space. Do Not Enter.”

General Training Requirements — All personnel involved in confined space work will receive appropriate training in hazard recognition, personal protective equipment, safety equipment, test equipment, communications equipment, procedures for calling rescue services, and proper use of rescue equipment. Training is to be performed before the employee is assigned duties in permit-required confined spaces. Training will be conducted under the coordination and supervision of the safety manager. Retraining will be performed at least annually. Training records shall include the dates of the training program, the names of the training program instructors, a copy of the written material presented, and the names of the employees to whom the training was given.

Hazardous Atmospheres — The lack of natural ventilation; the presence of stored or decaying materials such as chemicals, sewage, or leaves; or the work process to be performed in a confined space can create a hazardous environment:
• An oxygen-deficient atmosphere has less than 19.5% available oxygen. Any atmosphere with less than 19.5% oxygen must not be entered without approved self-contained breathing apparatus.
• The oxygen level can decrease due to welding, cutting or brazing, certain chemical reactions, or the bacterial action of decaying sewage or old leaf wastes.
• Oxygen levels can also decrease if oxygen is displaced by another gas.
• Flammable atmosphere must have oxygen and a flammable gas, vapors, or dust present in the proper proportion.
• Toxic atmospheres can include liquids, vapors, gases, mists, solid materials, and dusts that pose a hazard in a confined space.

Entry-Related Work Activities — The atmosphere in all permit-required confined spaces must be tested for oxygen concentration and the presence of combustible gases prior to entry. A properly calibrated direct reading gas monitor should be used. Direct reading gas detector tubes or other acceptable means may also be used to test potentially toxic atmospheres. Each atmospheric testing instrument should be calibrated on a schedule and in the manner recommended by the manufacturer except:

• Any atmospheric testing instrument that has not been used within 30 days must be recalibrated prior to use.
• Each atmospheric testing instrument must be factory calibrated at least every 6 months.
• Copies of calibration records should be forwarded to the safety manager.

Atmospheric Testing — Each atmospheric testing instrument will be field checked immediately prior to use to ensure that it is operating properly. A person qualified by the safety coordinator will perform atmospheric testing. Initial air sampling will be conducted from outside the structure and will be performed when possible at various levels within the confined space (e.g., at least top, middle, and bottom) and around all conduits, pipes, or cables. Where possible, sampling will be started at the top of the vessel or space to detect the presence of lighter than air combustibles and toxins. Sampling may be performed with a remote probe. The atmosphere will be tested in the following order: oxygen concentration and combustible gases. Results will be written on the entry permit. Continuous air monitoring will be performed if the potential for a hazardous atmosphere exists.

The entry person will wear a monitor on his or her belt. An atmospheric testing device capable of simultaneously detecting and measuring the airborne concentrations of oxygen, carbon monoxide, flammable gases, and hydrogen sulfide will be carried, for example, by the lead supervisor during entry into sewers and during welding operations in confined spaces. This device should be equipped with an audible alarm. If more than 15 minutes have elapsed between the pre-entry atmospheric test and the actual entry, the test must be performed again and noted on the permit. Retests should be conducted any time the confined space has been vacated for more than 15 minutes. All atmospheric test results must be recorded on the entry permit. The safety manager must be notified immediately if atmospheric conditions are unacceptable. Entry will be prohibited until conditions are brought into acceptable limits by purging, cleaning, or ventilating the space or until appropriate respiratory equipment is worn. The safety coordinator must approve the respirator protection proposed for the entry. Retesting is required after purging of the space and before entry will be allowed.

Unacceptable Atmospheric Conditions

• Oxygen levels are less than 19.5% or greater than 23.5% by volume.
• A combustible gas is present at greater than 10% of its lower explosive limit (LEL).
• An airborne combustible dust obscures vision to 5 feet or less.
• Any atmospheric condition recognized as immediately dangerous to life or health (IDLH) is present.

Isolation — Electrical and mechanical sources in a confined space that could be hazardous will be tagged and locked out at the source by each individual or group prior to entry. Belt and chain drives and mechanical linkages on shaft driven equipment will be disconnected when possible. Mechanical moving parts within a confined space will be secured with latches, chains, chocks, blocks, or other devices. All pumps or lines that convey flammable, injurious, toxic, or oxygen-displacing gases into a confined space will be disconnected or effectively isolated to prevent the introduction of a hazard into the space.

Ventilation — Continuous forced-air mechanical ventilation must be used in all permit-required confined spaces that contain a known or potential atmospheric hazard. Mechanical ventilation must be used regardless of initial monitoring results if the potential for development of a hazardous atmosphere exists. The supervisor in consultation with the safety manager will determine the potential for a hazardous atmosphere to develop. If a hazardous atmosphere is detected, employees must not enter the space until the hazardous atmosphere has been eliminated by continuous forced-air ventilation. Ventilation will continue until all employees have left the space. If mechanical ventilation should fail during entry operations, all employees should immediately evacuate the space until ventilation is restored and retesting indicates acceptable entry conditions. The method or equipment selected will depend on the size of the confined space, the opening, gases exhausted, and source of makeup air. Ventilation systems used in flammable atmosphere will be explosion proof and appropriately rated for the hazard. Local exhaust ventilation must be used during welding, cutting, or other similar operations in confined spaces as necessary to remove harmful gases, smoke, and fumes. The confined space will be continuously ventilated if a toxic solvent is used. Oxygen will not be used to ventilate a confined space.

Permit Spaces — Workers entering a permit space containing a hazardous atmosphere or other uncontrolled serious health or safety hazard will wear full retrieval equipment except as allowed otherwise in this document. Full retrieval equipment must be worn if it is likely that a hazardous atmosphere will develop or return. Retrieval equipment will be secured to an anchor point or lifting device outside of the entry portal. The anchor point will not be a motor vehicle. When vertical retrieval may be necessary, a lifting device such as a tripod equipped with either a powered hoist or a manual hoist should be used. Where a manual hoist is used, the hoist should offer at least a three-to-one pull ratio. The rescue team will be notified prior to entry.

Entry Permits — A qualified person, prior to entry into a permit-required confined space, will prepare a fully completed entry permit. The qualified person will be in charge of the entry. The maintenance manager and the safety manager must approve the qualified person. The qualified person will ensure that the permit specifies the location, type of work, personal protective measures, authorized entrants, monitoring equipment, hazards of the permit space, and control measures. If rescue equipment is required, it will be so noted on the permit. The procedure for contacting rescue services will also be included on the permit. The permit will be dated and carry an expiration time limiting the work to one shift. The permit will be updated for each shift and may be extended to each shift if entry conditions are still acceptable. The person in charge will sign the permit prior to allowing entry and ensure that entry operations remain consistent with the terms on the permit. The entry will be terminated if a potential hazardous situation occurs that exceeds the conditions authorized.
on the permit. The permit will be available at the worksite outside the confined space. All confined space entry permits will be turned in to the departmental supervisor after the work is completed. A copy of these permits will be provided to the safety coordinator and the maintenance department. The safety coordinator will keep the permits and related information for a minimum of 3 years. Hot work (potential ignition sources) will be authorized on a separate hot-work permit and attached and noted on the entry permit. Individuals authorizing entry into the confined space may also serve as entrants or attendants if they receive the proper training. After entry has been completed, the entry supervisor will cancel the permit. Cancellation of the permit indicates that the space is ready to be returned to its normal operation. A copy of the cancelled permit will be provided to the safety coordinator. The maintenance department and the safety manager will review entry permits yearly. The program will be revised as necessary to ensure that the health and safety of employees is not compromised.

**Duties of the Entry Supervisor** — The entry supervisor will receive training as for the attendant (see above) and additional training as required to evaluate confined space hazards. The entry supervisor will know the hazards that may be faced during entry, including the mode, signs or symptoms, and consequences of the exposure. This information will be contained on the permit-required confined space evaluation form for the space in question. The entry supervisor will:

- Verify, by checking, that two entry persons and an attendant are present.
- Make sure that appropriate entries have been made on the permit, that all tests specified by the permit have been conducted, and that all procedures and equipment specified by the permit are in place before endorsing the permit and allowing entry to begin.
- Terminate the entry and cancel the permit when either the entry operations covered by the entry permit have been completed or a condition that is not allowed under the entry permits arises in or near the permit space.
- Verify that rescue services are available and that the means for summoning them are operable.
- Remove unauthorized entrants.
- Whenever responsibility for a permit space entry operation is transferred and at intervals dictated by the hazards and operations performed within the space, determine that entry operations remain consistent with the terms of the entry permit and that acceptable entry conditions are maintained.

**Duties of the Authorized Entrant** — All personnel involved in entry into permit-required confined spaces will receive appropriate training that includes:

- The requirements of this program and the conditions that must be met for entry into a permit-required confined space.
- The conditions or work practices that may produce a hazard in a no-permit confined space that may require that the space be reevaluated by the supervisor prior to entry.
- Hazard recognition and use of atmospheric testing devices, including information on the mode, signs or symptoms, and consequences of exposure.
- Entry procedures and precautions.
- Maintaining communication with the attendant as necessary to enable the attendant to monitor entrant status and to enable the attendant to alert entrants of the need to evacuate the space.
- Alerting the attendant whenever the entrant recognizes any warning sign or symptoms of exposure to a dangerous situation, or the entrant detects a prohibited condition.
• Requirement to evacuate whenever so ordered by the entry supervisor or attendant, whenever the entrant recognizes any warning sign or symptom of exposure to a dangerous situation, if the entrant detects a prohibited condition, or whenever an evacuation alarm is activated.

• Emergency and nonentry rescue methods and procedures for calling rescue services. At least two entry persons and one outside attendant should be present. The attendant will receive training on the hazards that may be faced during entry and the mode, signs, or symptoms and consequences of exposure, including possible behavioral effects due to exposure to hazards. The attendant will not be assigned any other duties. The attendant’s primary duties are to:
  • Continuously maintain an accurate count of authorized entrants in the permit space and ensure that the means used to identify authorized entrants accurately identifies who is in the permit space.
  • Remain outside the permit space during entry operations until relieved by another attendant.
  • Communicate with authorized entrants as necessary to monitor entrant status and to alert entrants of the need to evacuate the space.
  • Summon rescue and other emergency services as soon as the attendant determines that authorized entrants may need assistance to escape from permit space hazards.
  • Warn unauthorized persons to stay away from the permit space, advise unauthorized persons that they must exit immediately if they have entered the permit space, and inform authorized entrants and the entry supervisor if unauthorized persons have entered the permit space.
  • Perform nonentry rescues as specified herein.
  • Perform no duties that might interfere with the attendant’s primary duty to monitor and protect the authorized entrants.
  • Monitor activities inside and outside the space to determine if it is safe for entrants to remain in the space and order authorized entrants to evacuate the permit space immediately under any of the following conditions:
    • The attendant detects a prohibited condition.
    • The attendant detects behavioral effects of hazard exposure in the authorized entrants.
    • The attendant detects a situation outside the space that could endanger the authorized entrant.
    • The attendant can not effectively and safely perform the requirements.

Attendants — An attendant will be assigned to remain outside the permit-required confined space at all times during entry operations. The attendant will remain in constant communication with the entrants and order the workers to leave if a suspected hazard occurs or a toxic reaction is observed in a worker. The attendant will also warn unauthorized persons not to enter the confined space. The attendant will be equipped with a communications radio and know whom to contact in an emergency. Attendants will receive training in hazard recognition and rescue procedures. The safety coordinator will supervise training. The attendant will notify the safety manager prior to a permit-required confined space entry and when the work is completed. The base operator will notify the assigned rescue team prior to a confined space entry. The attendant will not enter the confined space for rescue purposes until help has arrived.

Contractor Awareness, Duties and Responsibilities — When the hospital maintenance department arranges to have employees of another employer perform work that involves permit-required confined space entry, the hospital safety coordinator will inform the contractor in writing that the workplace contains permit-required spaces.
Entry Procedures — The safety manager must be notified prior to anyone entering the permit-required confined space. A qualified person, prior to entry into the permit-required confined space, will properly complete an entry permit. Only properly trained and authorized individuals will be allowed to enter a permit-required confined space. Authorized entrants will maintain contact with the attendant. Each individual entering a permit-required confined space will, whenever practical, have a safety or retrieval line attached to a body harness. The other end of the line will be secured to an anchor point or lifting device outside the entry portal. The anchor point will not be secured to a motor vehicle in a manner that would pull the line out of the space if the vehicle moved. A retrieval line is not required if:

- A permit space has obstructions or turns that would prevent pull on the retrieval line from being transmitted to the entrant.
- A permit space from which an employee is being rescued with the retrieval system has projections that would injure the employee if forcefully contacted.
- An entrant using an air-supplied respirator entered a permit space and retrieval lines, if used, could not be controlled so as to prevent an entanglement hazard.

Any entry into a permit-required confined space will require atmospheric testing for oxygen content and flammable gases by a properly trained individual. Each individual may be required to wear an air-monitoring instrument if the confined space is large enough or has a potentially hazardous atmosphere. During any confined space entry, all safety rules and procedures will be followed. Metal ladders will not be used when working around electrical equipment. No smoking will be allowed in a confined space. Any use of chemicals, welding, soldering, or cutting must be preapproved by the safety manager and maintenance manager. Adequate lighting will be provided. Personal protective equipment, including respirators, will be provided to workers as necessary for safe entry into the permit-required confined space. The safety manager must approve all PPE. Electrical equipment used in the confined space will be appropriate for the hazard and meet the requirements of the National Electric Code (NFPA 70) if a hazardous atmosphere is present. Any condition making it unsafe to remove an entrance cover will be eliminated before the cover is removed. When the cover has been removed, the opening will be promptly guarded to prevent accidental falls into the opening and to prevent objects from falling into the opening. Appropriate vehicle and pedestrian barriers will be used to protect workers. Contractors who send their employees into confined spaces under the control of their own management will be informed of the potential hazards, safety rules, and emergency procedures in effect at the facility. Contractors are expected to fully comply with safety and health standards.

Atmosphere-Controlled Permit-Required Confined Spaces — If the only hazard posed by the permit space is an actual or potentially hazardous atmosphere that can be controlled by continuous forced air ventilation alone, then workers may enter the space without retrieval equipment. Flammable and toxic air contaminants must be less than 50% of a “hazardous atmosphere” to qualify as an atmosphere-controlled space. Continuous monitoring must be performed. Monitoring results must be documented on the entry permit every hour. No hazardous atmosphere may be within the space whenever any employee is inside of the space. If a hazardous atmosphere is detected during entry, then each employee must leave the space immediately. The space must be evaluated to determine how the hazardous atmosphere developed. Measures will be implemented to protect employees from the hazardous atmosphere before any subsequent entry takes place. The entry supervisor will verify that the space is safe for entry, document pre-entry safety precautions taken and air monitoring results, and complete the form provided. This certification will be made prior to entry and will be made available to each employee entering the space.
Reclassification of a Permit-Required Confined Space — A permit-required confined space may be entered as a no-permit confined space if the permit space contains no actual or potential atmospheric hazard and all other hazards within the space can be eliminated without entry into the space. If hazards arise within a permit space that has been declassified to a no-permit space, each employee shall exit the space. The maintenance and safety managers will then reevaluate the space and determine whether it must be reclassified as a permit space. The permit space may be reclassified as a no-permit confined space for as long as the nonatmospheric hazards remain eliminated.

Reclassification of a Confined Space to a Permit-Required Confined Space — Reclassification would be required during application of solvents, paints, chemicals, or other materials that could potentially create a hazardous atmosphere in a confined space (e.g., during welding, cutting, brazing, or soldering in some confined spaces with limited ventilation). The maintenance and safety managers will reevaluate and reclassify confined spaces as necessary depending upon the work activities to be performed in these spaces.

Rescue Procedures — If it is necessary to rescue workers from a permit-required confined space, the attendant will immediately notify rescue personnel that a permit-required confined space emergency has occurred. The fire chief will coordinate the rescue effort. After notifying the base operator, the attendant will attempt to retrieve the worker using the retrieval line. Under no circumstance will any hospital personnel enter the confined space until rescue has arrived. Entry can only be done with the proper rescue equipment and if requested by the on-scene commander.

Permit Confined Space Evaluation Questions

Why is entry necessary?
Have instruments used in atmospheric testing properly calibrated?
Check oxygen level — is it at least 19.5% and not more than 23.5%?
Were flammable or oxygen-displacing gases or vapors present?
   LEL reading _____________ Oxygen reading _____________
Is the atmosphere in the space to be continuously monitored while work is going on?
Has the space been ventilated before entry?
Will ventilation be continued during entry?
Is the air intake for the ventilation system located in an area that is free of combustible dusts, vapors, and toxic substances?
If atmosphere was found unacceptable and then ventilated, was it retested before entry?
Has the space been isolated from other systems or energy sources?
Has electrical equipment been locked out?
Have disconnects been used where possible?
Has mechanical equipment been blocked, chocked, and disengaged where necessary?
Have lines under pressure been blanked and bled?
Is special clothing such as boots, chemical suits, or glasses required?
Is special equipment required, such as rescue or communications?
Are special tools required?
Are NIOSH-approved respirators of the proper type available at the work site?
Is respiratory protection required (e.g., self-contained breathing apparatus)?
   If so, specify type: ____________________________
Have you been trained in proper use of a respirator?
Have you received first aid/CPR training?
Have you been trained in confined space entry and do you know what to look for?
Will a standby person be positioned on the outside in constant visual or auditory communication with the person on the inside? (This person will be assigned no other duties.)
Will the standby person be able to see or hear the person inside at all times?
Has the standby person been trained in rescue procedures?
Will safety lines and a harness be required to remove a person?
Do you know who to notify and how in the event of an emergency?
Has a confined space entry permit been issued?
Does the permit include a list of emergency telephone numbers?
*Note:* The permit is an authorization in writing that states that the space has been tested by a qualified person; that the space is safe for entry; what precautions, equipment, etc. are required; and what work is to be done.
APPENDIX W. PATIENT SAFETY PLAN
DEVELOPMENT CONSIDERATIONS

Purpose — The patient safety plan must direct actions to improve healthcare safety and reduce risk to patients through a culture that encourages:

- Recognizing and reporting risks to patient safety and medical errors
- Reviewing reported risks to identify causal factors and process changes necessary to improve systems
- Determining and initiating the best solutions for eliminating and reducing identified risks, hazards, or behaviors
- Internal reporting of identified risks and details of all corrective and improvement actions
- A continuing focus on all procedures, processes, and systems
- Minimizing individual blame or retribution for involvement in a medical or care error
- Analyzing selected healthcare services prior to an adverse event occurrence to identify the system or processes that require redesign
- Ongoing organizational learning about medical and health care errors
- Sharing that knowledge and information to impact behavioral changes within all levels of the organizational structure

Approach — The patient safety plan must provide a systematic, coordinated, and continuous approach to all improvement efforts. The plan must encourage establishment of mechanisms to promote effective responses to actual events. The plan should also encourage an ongoing proactive reduction in medical, medication, and care errors by integrating patient safety objectives into all new and existing processes. Maintaining and improving patient safety must be coordinated and a collaborative effort. Achieving optimal results depends on the existence of a total safety culture. Patient safety must be an integral part of all departments and disciplines within the organization. It is important to develop plans, processes, and mechanisms for all activities identified by the interdisciplinary team.

Adverse Events — Adverse events are untoward incidents, therapeutic misadventures, iatrogenic injuries, or other adverse occurrences directly associated with care or services provided. Adverse events may result from acts of commission or omission. Adverse events can include patient falls, medication errors, procedural errors or complications, suicides, and missing patients. An adverse event can also be categorized as either a sentinel event or near miss.

Sentinel Event — A sentinel event is an unexpected occurrence involving death or serious physical or psychological injury, or the risk thereof. Serious injury specifically includes loss of limb or function. The phrase “or the risk thereof” includes any process variation for which a recurrence would carry a significant chance of serious adverse outcome.

Near Misses — A near miss is an event or situation that could have resulted in an accident, injury or illness, but did not, either by chance or through timely intervention. Near misses are opportunities for learning and afford the chance to develop preventive strategies and actions. Near misses should receive the same level of scrutiny as adverse events that result in actual injury.

Root-Cause Analysis — A root-cause analysis (RCA) process can identify causal factors that feed adverse or near-miss events. Such an analysis focuses on improving systems and processes, not on individuals. A good analysis must go beneath the surface by asking probing
questions regarding the *what* and *why*. This approach allows the discovery of immediate and contributing causal factors. The analysis permits the team to identify problems and develop changes for systems and processes. Improvements through redesign or development of new processes will help reduce the risk of event recurrence. A root-cause analysis looks at human and other factors most directly associated with the event, as well as all causal factors related to the event. Analysis of the contributing causes helps identify risks and their potential contributions to the event. A credible root-cause analysis must include participation by the leadership of the organization, be internally consistent, and include consideration of relevant literature. The root cause team must have members that understand the event being analyzed.

**Patient Safety Program Scope** — The patient safety program must include the development of a continuous assessment process to prevent error occurrence. Event information from data and incident occurrence reports should be reviewed by the multidisciplinary team to prioritize organizational efforts. Sources of data could include incident reports, medication errors, adverse drug reactions, transfusion reactions, sentinel events, and other adverse events. The patient safety program encompasses the patient population, visitors, volunteers, physicians, and staff and addresses improvement issues in every department. Senior leadership must be responsible for ensuring full implementation of the program, with an emphasis on the following functions:

- Patient rights and assessment
- Patient and continuum of care
- Patient/family education
- Leadership and improving organization performance
- Information and human resource management
- Environment of care management and infection control

**Methodology** — The multidisciplinary team should represent leadership from throughout the organization and provide oversight for the patient safety program. All patient care and nonpatient care departments must report safety events and potential occurrences. The report will contain aggregated information related to the type of occurrence, severity of occurrence, number and type of occurrences per department, and impact on the patient. The team will:

- Analyze this information to determine the need for further safety activities.
- Conduct a data review of all internal and external reports, including JCAHO sentinel event reports, ORYX and Core Measure performance data, and any reporting information from state and federal sources, including current literature.
- Select at least one high-risk safety process for proactive risk assessment annually.

The proactive risk assessment requires the team to:

- Assess the intended and actual implementation of the process to identify the steps in the process where there is, or may be, undesirable variation.
- Identify the possible effects of the undesirable variation on patients and how serious the possible effect on the patient could be.
- For the most critical effects, conduct a root-cause analysis to determine why the undesirable variation leading to that effect may occur.
- Redesign the process or underlying systems to minimize the risk of that undesirable variation or to protect patients from the effects of that undesirable variation.
- Test and implement the redesigned process.
- Identify and implement measures of the effectiveness of the redesigned process.
• Implement a strategy for maintaining the effectiveness of the redesigned process over time.
• Describe the mechanisms necessary to ensure that all components of the healthcare organization are integrated into and participate in the organization-wide program.

**Patient Care Provider Actions** — In the event of a medical error:

• Perform necessary healthcare interventions to protect and support the patient’s clinical condition.
• Perform necessary healthcare interventions to contain the risk to others.
• Contact the patient’s attending physician and other physicians, as appropriate, to report the error, carrying out any physician orders as necessary.
• Preserve any information related to the error including physical evidence; preservation of information includes documenting the facts regarding the error on an adverse drug event or occurrence report.
• Report the medical error to the staff member’s immediate supervisor.
• Submit an occurrence or adverse drug event report per organizational policy.

**Reporting of Events** — An effective patient safety program cannot exist without optimal reporting of medical or healthcare errors and occurrences. The organization should adopt a nonpunitive approach in its management of errors and occurrences. Personnel must be able to report suspected or identified medical or healthcare errors without the fear of reprisal in relationship to their employment. Organizations must support the concept that errors occur due to a breakdown in systems and processes. Improvement will be achieved by focusing on systems and processes rather than disciplining those involved in adverse events. Focusing on remedial actions and individual development assists rather than punishes organizational members.

**Informing Patient and Family Members** — The patient safety program should include an annual survey of patients, their families, and staff about their perceptions of risks to patients. The survey should solicit opinions and suggestions for improvement. It is important to make sure that patients, and when appropriate, their families are informed about the outcomes of care; brief patients about unanticipated outcomes or when the outcomes differ significantly from the anticipated outcomes. When a healthcare error leads to injury, the patient and family should receive a truthful and compassionate explanation about the error, including remedies available to the patient. They should be informed that the factors involved in the injury are being investigated so steps can be taken to reduce the likelihood of similar injury to other patients. Staff should educate patients and their families about their role in helping to facilitate the safe delivery of care.
APPENDIX X. SAMPLE CONSTRUCTION INFECTION CONTROL PROGRAM ELEMENTS

Definitions of Construction Activity

- Define the activity by the amount of dust generated, the duration of the work, and the amount that could enter HVAC systems.
- Recommend excluding routine maintenance activities not generating dust from the formal policy.
- Communicate with contractors for clarification and additional information.
- Consider the following classifications as only a guide.

Inspection and Noninvasive Work — Activities not generating dust, requiring the cutting of walls, or accessing ceilings for visual inspection could include but are not limited to:

- Visually inspecting ceiling tiles (limit the number removed for visual inspection)
- Painting wall covering
- Conducting minimal (hand) sanding
- Carrying out electrical trim work
- Doing minor plumbing
- Conducting short-duration cable installation or removal
- Cutting walls or ceilings when dust migration can be controlled

Work Generating High Levels of Dust — This category includes demolition or removal of any fixed building components or assemblies. These activities include but are not limited to:

- Mechanical sanding of walls
- Removing floor coverings
- Doing ceiling tile and casework
- Constructing new walls
- Conducting minor duct work
- Accomplishing electrical work above ceilings
- Installing major amounts of cable
- Working on activities that cannot be completed within a single work shift
- Carrying out any major demolition and construction projects
- Performing any construction or renovation activities

High-Risk Areas — Patients in areas considered at high risk for experiencing adverse outcomes if exposed to construction-related dust include:

- Transplant clinic and all operating rooms
- Delivery rooms and catheter labs
- Cancer clinics and infusion rooms
- Bone marrow transplant unit (adult and pediatric)
- Intensive-care units and dialysis units
- Oncology clinics and transplant units
- Central supply and sterile processing areas
- Nursery and neonatal units
- Food preparation/service areas

Infection Control Department Responsibilities

- Coordinate with other departments on the extent of the work.
- Inspect or review infection controls planned for the project.
• Review and issue an infection control construction control permit prior to work beginning.
• Provide education, oversight, and direction to promote the safety of patients.
• Conduct follow-up activities during the project to ensure safety of patients.

**Plant Operations and Engineering Responsibilities**

• Evaluate the extent and risk of construction and renovation activities in patient care and other high risk areas before, during, and after project completion.
• Coordinate with the infection control department to maintain patient safety during the project.
• Communicate with construction personnel on a daily basis on the status of controls.
• Complete and distribute the infection control construction control permit for all renovation, repair, and construction activities to be performed in high-risk areas.
• Consult with infection control and the safety department before any high-risk activities begin.
• Require general contractors to supervise and control activities of subcontractors to promote patient safety.
• Inform contractors and subcontractors about specific infection control requirements.
• Provide oversight and direction for contracted work to ensure safety.
• Perform work in patient and high-risk areas in a manner that minimizes dust generation.
• Maintain equipment and replace HEPA and other filters as necessary to ensure facility safety.

**Safety Department Responsibilities**

• Review the construction infection control permit prior to initiation of work to be sure all safety issues have been coordinated.
• Provide general oversight and direction to promote safety and ensure that infection controls remain in place.
• Make periodic visits to the worksite to assess safety practices.
• Conduct or schedule air and environmental monitoring, as necessary.
• Serve as a consultant to engineering, infection control, and contractors.
• Assist infection control personnel with the proactive risk assessment.
• Coordinate the facility reciprocal safety agreement with the general contractor.

**Contractor Responsibilities**

• Coordinate the facility reciprocal safety agreement with the safety department.
• Work with the safety department, infection control, and facility engineering to verify the accuracy of the proactive risk assessment and agreement on the hazard level assessment.
• Complete and distribute the construction infection control permit.
• Conduct safety and infection control education for workers and subcontractors.
• Appoint someone with responsibility for ensuring safety work performance.
• Maintain all equipment used in the project correctly.
• Direct safety or infection control questions to the appropriate departments.
• Submit construction safety reports to the safety department as required.
• Replace HEPA and other filters as necessary.
• Make sure all subcontractors follow established procedures.
• Remove anyone from the site who fails to maintain safety in patient or high-risk areas.
Department or Unit Manager Responsibilities

- Provide a safe environment for the patient and staff.
- Coordinate with safety, infection control, plant engineering, and contractors to isolate construction activities from patient care activities.
- Report any problems to the safety department or plant engineering.
- Educate workers and care staff about the construction project.

Construction Infection Control Permit

- Permits are issued when planned construction, renovation, or repair work may impact patient care or identified high-risk areas.
- No work can begin until the site supervisor has a fully completed and coordinated the work permit issued by the infection control department.
- The responsible contractor or job supervisor must coordinate the job requirement as indicated in the permit.
- For work in patient care or high-risk areas, the project manager must complete, coordinate, and distribute a construction infection control matrix at least 72 hours prior to beginning the job.
- Copies of the completed permit are sent to infection control, safety, and plant engineering personnel.
- The completed construction matrix form is sent to the safety department.

Noninvasive Activities — Work will not begin in an occupied patient room or in clinical areas unless the supervisor or contractor provides an active means to prevent airborne dust from dispersing into atmosphere. Also, it will be necessary to:

- Contain dust by closing doors and applying masking tape to the doorframes.
- Immediately replace any ceiling tile displaced for visual inspection.
- Wipe work surfaces with disinfectant.
- Clean up dust from project.
- Remove debris in tightly covered containers.

High-Risk Activities — Prior to beginning any construction, infection control, safety, and plant engineering personnel should request a meeting with the contractor's onsite management team. The contractor must:

- Display the infection control matrix entrances to work areas during the entire construction period.
- Isolate the HVAC system in areas where work is being done to prevent contamination of duct system.
- Block off all existing ventilation ducts within the construction area (duct capping must be dust tight and able to withstand airflow).
- Maintain negative air pressure within the work site by utilizing HEPA-equipped air filtration units:
  - HEPA-equipped air filtration machines must provide air flow out of construction areas greater than 4 air changes per hour.
  - HEPA-equipped air filtration machines must run continuously.
- Complete all critical dust control barriers before construction begins.
- Construction activities causing disturbance of existing dust, or creating new dust, must be conducted in tight enclosures cutting off any flow of particles into patient areas.
- Contain dust by closing the door and applying masking tape over the doorframe.
When construction, demolition, or reconstruction cannot be contained within a single room:

- Use airtight plastic or drywall barriers that extend from floor to ceiling.
- Seal seams and joints with duct tape to prevent dust and debris from escaping.
- Seal all penetrations to provide an airtight barrier.
- Place barriers at penetrations of ceiling envelopes, chases, and ceiling spaces to stop movement of air and debris.

Construction, demolition, or reconstruction that cannot be contained within a single room must have the following additional barrier measures:

- Anteroom or double entrance openings that allow workers to remove protective clothing or vacuum off existing clothing
- Overlapping flap, minimum 2 feet wide, at polyethylene enclosures for personnel access.
- HEPA-equipped air filtration machines

Any ceiling access panels opened for investigation beyond sealed areas must be replaced when they will be unattended. Also,

- Thoroughly clean existing surfaces that become exposed to dust.
- Allow the use of control cubes (heavy-duty, flexible, vinyl, portable, ceiling access modules) for limited ceiling access.
- Be sure construction workers understand the requirements and procedures for dust control.
- Require construction personnel to wear shoe covers in the work area.
- Require construction personnel to remove protective clothing such as coveralls and shoe covers or vacuum off existing clothing in the anteroom area prior to leaving the work area.
- Require the performance of housekeeping and dust control by the individual or group performing the construction.
- Immediately clean any dust tracked outside of the construction barrier.
- Vacuum using a HEPA-filtered vacuum or damp mop with hospital-approved disinfectant.
- Remove debris in tightly covered containers.
- Contain construction waste before transport.
- Keep adhesive mats or carpets located at barricade entrances and in the anteroom clean, and change them daily, or more frequently, as necessary to prevent accumulation of dust.
- Stop all work on the project whenever a hazardous infection control situation exists.
- Have the contractor or plant engineering take immediate action to correct any deficiencies.
- Do not remove barriers for contained work areas until the completed project is inspected by the safety department and thoroughly cleaned by environmental services.

Removal of construction barriers and ceiling protection may require temporary dust protection, to be determined at the final project review.
APPENDIX Y. OSHA RECORDING OF WORK-RELATED INJURIES AND ILLNESSES

Log of Work-Related Injuries and Illnesses (Form 300) — Use the log to classify work-related injuries and illnesses and to note the extent and severity of each case. When an incident occurs, use the log to record specific details about what happened and how it happened.

The Summary (Form 300A) — This form shows the totals for the year in each category. At the end of the year, post the summary in a visible location so employees are aware of the injuries and illnesses occurring in their workplace.

Employer Requirements — Keep a log for each establishment or site. If you have more than one establishment, you must keep a separate log and summary for each physical location that is expected to be in operation for 1 year or longer. Note that your employees have the right to review your injury and illness records. For more information, see 29 CFR 1904.35 (Employee Involvement). Cases listed on the log of work-related injuries and illnesses (Form 300) are not necessarily eligible for worker's compensation or other insurance benefits. Listing a case on the log does not mean that the employer or worker was at fault or that an OSHA standard was violated.

Work-Related Events — An injury or illness is considered work related if an event or exposure in the work environment caused or contributed to the condition or significantly aggravated a pre-existing condition. Work-relatedness is presumed for injuries and illnesses resulting from events or exposures occurring in the workplace, unless an exception specifically applies. Refer to 29 CFR Part 1904.5(b)(2) for the exceptions. The work environment includes the establishment and other locations where one or more employees are working or are present as a condition of their employment (29 CFR Part 1904.5(b)(1)). Record those work-related injuries and illnesses that result in:

- Death
- Loss of consciousness
- Days away from work
- Restricted work activity or job transfer
- Medical treatment beyond first aid

Record work-related injury or illness that is diagnosed by a physician or other licensed healthcare professional. You must record any work-related case involving cancer, chronic irreversible disease, a fractured or cracked bone, or a punctured eardrum (29 CFR 1904.7). Record the following conditions when they are work related:

- Any needlestick injury or cut from a sharp object that is contaminated with another person's blood or other potentially infectious material
- Any case requiring an employee to be medically removed under the requirements of an OSHA health standard
- Tuberculosis infection as evidenced by a positive skin test or diagnosis by a physician or other licensed healthcare professional after exposure to a known case of active tuberculosis

Medical Treatment — This includes managing and caring for a patient for the purpose of combating disease or disorder. The following are not considered medical treatments and are not recordable:
• Visits to a doctor or healthcare professional solely for observation or counseling
• Diagnostic procedures, including administering prescription medications that are used solely for diagnostic purposes
• Any procedure that can be labeled first aid

**First Aid** — If the incident required only the following types of treatment, consider it first aid. Do not record the case if it involves only:

• Using over-the-counter medications at nonprescription strength
• Administering tetanus immunizations
• Cleaning, flushing, or soaking wounds on the skin surface
• Using wound coverings, such as adhesive bandages, gauze, sterile strips, or butterfly bandages
• Using hot or cold therapy
• Using any totally nonrigid means of support, such as elastic bandages, wraps, or nonrigid back belts
• Using temporary immobilization devices while transporting an accident victim (splints, slings, neck collars, or back boards)
• Drilling a fingernail or toenail to relieve pressure or draining fluids from blisters
• Using eye patches
• Using simple irrigation or a cotton swab to remove foreign bodies not embedded in or adhered to the eye
• Using irrigation, tweezers, cotton swab, or other simple means to remove splinters or other foreign material from areas other than the eye
• Using finger guards
• Using massages
• Drinking fluids to relieve heat stress

**Restricted Work Activity** — Restricted work activity arises when, as the result of a work-related injury or illness, an employer or healthcare professional keeps, or recommends keeping, an employee from doing the routine functions of his or her job or from working the full workday that the employee would have been scheduled to work before the injury or illness occurred. Count the number of calendar days the employee was on restricted work activity or was away from work as a result of the recordable injury or illness. Do not include the day on which the injury or illness occurred in this number; begin counting days from the day after the incident occurs. If a single injury or illness involved both days away from work and days of restricted work activity, enter the total number of days for each. You may stop counting days of restricted work activity or days away from work once the total of either or the combination of both reaches 180 days.

**Privacy Considerations** — The following types of injuries or illnesses are considered to be privacy concern cases:

• An injury or illness to an intimate body part or to the reproductive system
• An injury or illness resulting from a sexual assault
• A mental illness
• A case of HIV infection, hepatitis, or tuberculosis
• A needlestick injury or cut from a sharp object that is contaminated with blood or other potentially infectious material (see 29 CFR Part 1904.8 for definition)
• Other illnesses, if the employee independently and voluntarily requests that his or her name not be entered on the log
Privacy Logging Procedures — Do not enter the employee’s name on the OSHA 300 log for these cases. Instead, enter “privacy case” in the space normally used for the employee’s name. Keep a separate, confidential list of the case numbers and employee names for the privacy concern cases. If it is reasonable to believe that information describing the privacy concern case may be personally identifiable even though the employee’s name has been omitted, use discretion in describing the injury or illness on both the OSHA 300 and 301 forms. Enter enough information to identify the cause of the incident and the general severity of the injury or illness, but do not include details of an intimate or private nature. If the outcome or extent of an injury or illness changes after you have recorded the case, simply draw a line through the original entry or delete or white-out the original entry. Then write the new entry where it belongs. Record the most serious outcome for each case.

Injuries — An injury is any wound or damage to the body resulting from an event in the work environment. Examples include a cut, puncture, laceration, abrasion, fracture, bruise, contusion, chipped tooth, amputation, insect bite, electrocution, or thermal, chemical, electrical, or radiation burn. Sprain and strain injuries to muscles, joints, and connective tissues are classified as injuries when they result from a slip, trip, fall, or other similar accidents.

Classifying Illnesses — Skin diseases or disorders are illnesses involving the worker’s skin that are caused by work exposure to chemicals, plants, or other substances. Examples include contact dermatitis, eczema, or rash caused by primary irritants and sensitizers or poisonous plants; oil acne; friction blisters; chrome ulcers; and inflammation of the skin. Respiratory conditions are illnesses associated with breathing hazardous biological agents, chemicals, dust, gases, vapors, or fumes at work. Examples include silicosis, asbestosis, pneumonitis, pharyngitis, rhinitis, or acute congestion; farmer’s lung; beryllium disease; tuberculosis; occupational asthma; reactive airways dysfunction syndrome (RADS); chronic obstructive pulmonary disease (COPD); hypersensitivity pneumonitis; and toxic inhalation injury, such as metal fume fever, chronic obstructive bronchitis, and other pneumoconioses.

Poisoning — Poisoning includes disorders evidenced by abnormal concentrations of toxic substances in blood, other tissues, other bodily fluids, or the breath that are caused by ingestion or absorption of toxic substances into the body. Examples include poisoning by lead, mercury, cadmium, arsenic, or other metals; poisoning by carbon monoxide, hydrogen sulfide, or other gases; poisoning by benzene, benzol, carbon tetrachloride, or other organic solvents; poisoning by insecticide sprays, such as parathion or lead arsenate; and poisoning by other chemicals, such as formaldehyde.

Other Occupational Illnesses — Examples include heatstroke, sunstroke, heat exhaustion, heat stress, and other effects of environmental heat; freezing, frostbite, and other effects of exposure to low temperatures; decompression sickness; effects of ionizing radiation (welding flash, ultraviolet rays, lasers); anthrax; bloodborne pathogenic diseases, such as AIDS, HIV, hepatitis B or hepatitis C; brucellosis; malignant or benign tumors; histoplasmosis; and coccidioidomycosis.

Post the Summary — Post only the summary OSHA Form 300A and not the log. Post by February 1 of the year following the year covered by the form and keep it posted until April 30 of that year. Keep the log and summary for 5 years following the year to which they pertain. Do not send the completed forms to OSHA unless specifically asked to do so.
**Recording Requirements** — Within 7 calendar days after you receive information about a case, decide if the case is recordable under the OSHA recordkeeping requirements. Determine whether the incident is a new case or a recurrence of an existing one. Establish whether the case was work-related. If the case is recordable, decide which form you will fill out as the injury and illness incident report.

**OSHA Form 301**

- Use OSHA's Form 301 (Injury and Illness Incident Report) or an equivalent form. Some state worker's compensation, insurance, or other reports may be acceptable substitutes, as long as they provide the same information as the OSHA 301.
- Identify the employee involved unless it is a privacy concern case.
- Identify when and where the case occurred.
- Describe the case as specifically as you can.
- Classify the seriousness of the case by recording the most serious outcome associated with the case, with column J (Other Recordable Cases) being the least serious and column G (Death) being the most serious.
- Identify whether the case is an injury or illness. If the case is an injury, check the injury category; if the case is an illness, check the appropriate illness category.
APPENDIX Z. KEY OSHA COMPLIANCE STANDARDS FOR FUNERAL HOMES

Introduction — More than 22,100 funeral homes are operating in the United States; they employ approximately 35,000 licensed funeral directors and embalmers and an additional 89,000 funeral service and crematory personnel. As with any workplace, funeral homes present a variety of occupational hazards. Funeral home operators must be aware of the following regulations in order to stay compliant.

Hazard Communication Standard (29 CFR 1910.1200) — The purpose of this standard is to ensure that chemical hazards in the workplace are identified and evaluated and that the information concerning these hazards is communicated to both employers and employees. This transfer of information is to be accomplished by means of a comprehensive hazard communication program that includes container labeling and other forms of warning, including Material Safety Data Sheets (MSDSs) and employee training.

Bloodborne Pathogens Standard (29 CFR 1910.1030) — This regulation applies to all individuals who may reasonably anticipate contact with blood or other potentially infectious bodily fluids in the course of their employment. This includes contact with skin, eyes, or mucous membranes or contact due to nonintact skin. The focus of the regulation is the creation of a written exposure control plan that describes how the employer will protect employees from exposure.

Personal Protective Equipment — In 1994, the PPE standards were revised and now encompass General Requirements (29 CFR 1910.132), Eye and Face Protection (29 CFR 1910.133), Head Protection (29 CFR 1910.135), Foot Protection (29 CFR 1910.136), and Hand Protection (29 CFR 1910.138). A key component of the PPE standard is the hazard assessment of the work area required by 29 CFR 1910.132(d). Employers must assess the workplace to determine if hazards are present or are likely to be present that require the use of personal protective equipment. Based on the results of the survey, the employer will:

- Select and have affected employees use PPE that will protect them from the identified hazards.
- Inform each affected employee of the selection decision.
- Select PPE that properly fits each affected employee.
- Document that the hazard assessment has been performed through a written certification that identifies the workplace evaluated, the person certifying that the evaluation has been performed, and the date of the hazard assessment.

Respiratory Protection Program — The respiratory protection program ensures that all employees are properly protected from respiratory hazards. According to 29 CFR 1910.134, creating and maintaining an individualized written respiratory protection program are the responsibilities of all employers who provide respirators to their employees. The program must be administered by a suitably trained program administrator.

Cold Sterilants — Formaldehyde and glutaraldehyde are the two most common hazardous materials used in funeral homes.

Formaldehyde — Formaldehyde use is regulated under a specific OSHA standard (29 CFR 1910.1048) and was established to protect workers from occupational exposures to formaldehyde. The standard defines an action level, a permissible exposure limit (PEL), and a short-term exposure limit (STEL) for formaldehyde exposure in the workplace. The following are the established airborne concentrations for each of these levels:
• **Action level** — Airborne concentration of 0.5 parts per million (ppm) formaldehyde. If this level is exceeded, the employer must perform periodic air monitoring until the levels can be reduced below this point in accordance with 29 CFR 1910.1048(b).

• **PEL** — Airborne concentrations of 0.75 ppm formaldehyde as an 8-hour time-weighted average as required in 29 CFR 1910.1048(c)(1).

• **STEL** — Airborne concentration of 2 ppm formaldehyde over a 15-minute time interval per 29 CFR 1910.1048(c)(2).

All employers who have any form of formaldehyde in the workplace must monitor employee exposure unless they can objectively document that the presence of airborne formaldehyde will not exceed the action level or STEL under foreseeable conditions as outlined in 29 CFR 1910.1048(d)(1). If this cannot be done, the employer must begin monitoring. Initial monitoring is accomplished by identifying all employees who potentially have an exposure at or above the action level or STEL. Each potentially exposed employee may be monitored or a representative sampling plan implemented for each job classification and work shift. Monitoring must occur each time a change in equipment, process, production, personnel, or control measures is instituted. If formaldehyde concentrations are found to be at or in excess of the action level, monitoring must be repeated every 6 months. If the monitoring shows levels at or above the STEL, annual monitoring is required. Monitoring can be discontinued if after two consecutive sampling periods taken at least 7 days apart the airborne concentrations are below both the action level and STEL.

**Glutaraldehyde** — Glutaraldehyde is not covered by an OSHA standard of exposure limit; however, the recommended exposure limit (REL) is a ceiling limit of 0.2 ppm. This exposure level should not be exceeded at any time. The American Conference of Governmental Industrial Hygienists (ACGIH) has reduced their ceiling limit to a more conservative level of 0.05 ppm.

**Eye/Face and Wash/Shower Requirements** — Funeral homes fall under the general requirements of OSHA's First Aid standard (29 CFR 1910.151(c)), which requires that suitable facilities for quick drenching or flushing of the eyes and body be provided within the area for immediate emergency use in any area where the eyes or body of any person may be exposed to injurious corrosive materials. The performance guideline for emergency drenching equipment that OSHA recognizes is the American National Standards Institute's Emergency Eye Shower and Wash Equipment standard (ANSI Z358.1-1998), which aids employers in selecting and installing emergency equipment to meet OSHA requirements.

**Medical and First Aid Regulations** — Workplaces not near an infirmary, clinic, or hospital must ensure that a person or persons are trained to render first aid. Adequate first aid supplies must be readily available. Refer to ANSI Z308.1 (Minimum Requirements for Industrial Unit-Type First Aid Kits).

**Chemical Storage** — Proper storage information can usually be found in the MSDS of a chemical. Proper segregation of chemicals is necessary to prevent incompatible materials from inadvertently coming into contact with each other. If incompatible materials come into contact, a fire, explosion, violent reaction, or creation of toxic gases can result. Acids should not be stored with bases, and oxidizers should not be stored with reducing agents or organic materials. A physical barrier or distance is effective for proper segregation. If cabinets are used to segregate chemicals, consider the compatibility of the chemicals with the cabinet itself; for example, corrosives such as strong acids and caustics will corrode most metal cabinets. Nonmetallic or epoxy-painted cabinets are available that will provide a better service life with these corrosive materials. Safety cabinets are specifically made to
maintain flammable and combustible materials. It is important to be aware of maximum allowable container size and maximum quantities for storage in cabinets based on the class of the flammable. The class of a flammable or combustible is determined by its flash point and boiling point.
Warning: The checklists provided in this chapter are designed to serve as only a guide for a particular topic or department. These checklists must be used by trained personnel only. They provide the foundation for users to develop their own local checklists.
### CHECKLIST 1  General Safety Overview

<table>
<thead>
<tr>
<th>Topics</th>
<th>Yes</th>
<th>No</th>
<th>N/A</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Planned and systematic written safety program in place?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Safety or EC committee established?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Committee responsibilities and authorities defined?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Safety program approved by senior leadership?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Medical professionals involved in the safety program?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Departmental and specific safety policies and procedures reviewed as needed or every 3 years?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Risk management monitors and reports on a regular basis?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Quality assurance monitors and reports on a regular basis?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Infection control monitors and reports on a regular basis?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Facility-wide hazard surveillance program developed?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Environmental tours or surveys conducted in each clinical area semiannually and annually elsewhere?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Patient care equipment inspected and results documented?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Patient care equipment failures reported on a regular basis to the committee and to meet Safe Medical Device Act requirements?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. Incidents and accidents involving patients, visitors, and guests reported on a regular basis?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. Safety committee meets as required?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16. Safety committee membership includes personnel from administration, clinical, and support service areas?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17. Safety committee reports to governing board, administration, and department managers as required?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Topics</td>
<td>Yes</td>
<td>No</td>
<td>N/A</td>
<td>Comments</td>
</tr>
<tr>
<td>--------</td>
<td>-----</td>
<td>----</td>
<td>-----</td>
<td>----------</td>
</tr>
<tr>
<td>18. New employee orientation and training conducted?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19. Annual safety training conducted and documented?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20. Hazardous materials program reviewed annually with all employees?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21. Education/training director reports on a regular basis?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22. Emergency management drills conducted at least once each 6 months using hazard vulnerability analysis priorities?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23. Emergency management plan updated regularly?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24. Emergency drills evaluated, critiqued, and documented?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25. Fire drills conducted quarterly on all shifts?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>26. Regular environmental testing being performed as required?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>27. Security program reviewed and approved?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28. Product recalls monitored, reported, and documented?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>29. Fire prevention plan reviewed and approved?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30. Documentation of inspections by outside regulatory agencies maintained?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>31. Radiation safety committee reports on a regular basis?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>32. Laser safety committee reports on a regular basis?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>33. Interim life safety inspections and corrective actions reported on a regular basis?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>34. Equipment management issues reported on a regular basis?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>35. Utilities management issues reported on a regular basis?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>36. Corrective actions documented for utilities management reports?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Topics</td>
<td>Yes</td>
<td>No</td>
<td>N/A</td>
<td>Comments</td>
</tr>
<tr>
<td>------------------------------------------------------------------------</td>
<td>-----</td>
<td>----</td>
<td>-----</td>
<td>----------</td>
</tr>
<tr>
<td>37. All ADA issues reported to risk management?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>38. Environmental issues handled correctly?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>39. Medical devices act safety plan in place?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40. Safe Medical Device Act corrective actions documented?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>41. EOC management plans reviewed annually for effectiveness?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>42. Needlestick log maintained as required by OSHA?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>43. Bloodborne training covers local procedures and a qualified trainer is available to answer questions during the session?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>44. Facility maintains an OSHA multiple-employer citation risk management policy?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>45. <em>Per diem</em>, contract, temporary, and noncompensated workers trained to meet OSHA standards?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>46. Facility construction safety policies developed and followed by all contractors?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>47. Infection control coordinates with facility personnel to ensure construction dust control?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>48. Personnel encouraged to obtain certification?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Topic</td>
<td>Yes</td>
<td>No</td>
<td>N/A</td>
<td>Comments</td>
</tr>
<tr>
<td>-------</td>
<td>-----</td>
<td>----</td>
<td>-----</td>
<td>----------</td>
</tr>
<tr>
<td>1. All rooms where medications are prepared properly lit to prevent errors?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Floors free from breaks, loose tiles or linoleum, or any obstructions that might cause people to stumble or fall?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Medicine cabinets/carts locked when unattended?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Employees fully instructed in the proper manner of lifting and moving patients and residents?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Needles and other sharps discarded only in designated containers and containers emptied as appropriate?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Facility evaluates the use of safer needle devices? Nurses surveyed?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Hazardous substances properly labeled, stored, and handled?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Staff familiar with MSDS file location and how to find information?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Staff familiar with chemical spill response and procedures?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Staff properly instructed regarding any hazards related to required work?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Plastic liners used in all garbage containers?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Red bags used for medical wastes at generation points?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. All liquid containers clearly labeled with type of contents?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. Storerooms well lit?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. Exits and aisles of storerooms uncluttered?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16. Rubbish, empty cartons, and paper disposed of immediately?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17. Spillage items stored below eye level?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18. Heavy items stored on lower shelves?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19. Stored materials clear of both sprinkler heads (at least 18 inches) and other firefighting equipment?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Topic</td>
<td>Yes</td>
<td>No</td>
<td>N/A</td>
<td>Comments</td>
</tr>
<tr>
<td>-------</td>
<td>-----</td>
<td>----</td>
<td>-----</td>
<td>----------</td>
</tr>
<tr>
<td>20. Flammable liquids are:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stored in approved containers?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stored in safe quantities?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stored in approved cabinets?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21. Storage shelves adequate for the weight involved?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22. Stepladders rather than “makeshifts” used for climbing?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23. Nursing personnel practice and promote electrical safety?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note: Add items as appropriate for unit.*
<table>
<thead>
<tr>
<th>Description</th>
<th>Yes</th>
<th>No</th>
<th>N/A</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Aisles, halls, passageways clear?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Aisles, halls, and walkways marked as appropriate?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Wet surfaces properly signed or roped off?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Holes in floors, sidewalks, or other walking surfaces repaired properly, covered, or otherwise made safe?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Materials or equipment stored in such a way that hazards do not interfere with the walkway?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Changes of direction or elevations readily identifiable?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Adequate headroom provided for the entire length of any aisle or walkway?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Steps, stairs, and stairways designed or provided with a surface that renders them slip resistant?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Where stairs or stairways exit directly into any area where vehicles may be operated, adequate barriers and warnings provided to keep employees from stepping into the path of traffic?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Surfaces elevated more than 30 inches above the floor or ground provided with guardrails?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Permanent means of access and egress provided to elevated storage and work surfaces?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Materials on elevated surfaces piled, stacked, or racked in a manner to prevent tipping, falling, collapsing, rolling, or spreading?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Floor openings guarded by a cover, guardrail, or equivalent on all sides (except at entrances to stairways or ladders)?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. Grates or similar types of covers installed over floor openings such as floor drains of such a design that foot traffic or equipment not affected by the grate spacing?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. Wet floor signs removed when area is dry?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Description</td>
<td>Yes</td>
<td>No</td>
<td>N/A</td>
<td>Comments</td>
</tr>
<tr>
<td>-----------------------------------------------------------------------------</td>
<td>-----</td>
<td>----</td>
<td>-----</td>
<td>----------</td>
</tr>
<tr>
<td>16. Hallways mopped one side at a time?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17. Warning signs used to identify hazards?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18. Wet-floor signs 32 to 36 inches high?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19. Facility uses proper nonskid floor waxes or polishes?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20. Exits marked with exit signs and illuminated by reliable light sources?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21. Directions to exits, where not immediately apparent, marked with visible signs?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22. Sidewalks, curbs, and driveways in good condition?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23. Doors, passageways, or stairways that are not exits properly marked “Not an Exit,” “To Basement,” “Storeroom,” etc.?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23a. Do signs with the word “EXIT” have lettering at least 5 inches high and the stroke of the lettering at least 1/2 inch wide?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24. Special precautions taken to protect employees during construction and repair operations?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25. Doors serving as exits designed and constructed so the exit route is obvious and direct?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>26. Windows or glass that could be mistaken for exit doors made inaccessible by means of barriers or railings or markings?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>27. Do extension cords run across pathways?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28. Employees instructed not to carry items in a way that impairs vision?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>29. Spilled materials, trash, and debris cleaned up immediately?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30. Employees instructed not to run in hallways or on stairways?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>31. Workers instructed not to stand on chairs or other makeshift ladders?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>32. Personnel prohibited from using makeshift platforms?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>33. Tripping hazards and unsafe conditions reported and corrected immediately?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### CHECKLIST 3  Slip, Trip, and Fall Prevention (cont.)

<table>
<thead>
<tr>
<th>Description</th>
<th>Yes</th>
<th>No</th>
<th>N/A</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>34. Employees wear nonslip shoes correct for their jobs and work areas?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>35. During winter weather areas prone to be hazardous (due to ice, snow, etc.) communicated to all employees?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>36. Each department trains their personnel on specific fall, slip, and trip hazards found in their work areas?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>37. The facility has identified slip, trip, and fall trends affecting patients and visitors?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>38. Procedures developed to evaluate patient fall hazards in various departments?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>39. Parking areas evaluated regularly to identify hazardous conditions?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40. Areas prone to slips and falls (e.g., entrance ways, dining rooms, kitchens) inspected at least monthly?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>41. Housekeeping and cleaning processes evaluated on a regular basis?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>42. Procedures developed to monitor water accumulating around drinking fountains?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>43. Housekeeping keeps water cleaned up around doors on rainy days?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>44. Caution or warning signs used to identify areas with tripping hazards?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>45. Broken tiles, soiled through rugs, and carpet tears corrected immediately?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>46. Elevator floors slip resistant and level with landings?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>47. Wheelchairs inspected regularly?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>48. Grab bars securely attached and low-enough for easy reach around tubs, showers, and toilets?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>49. Tubs, showers, and floors have nonskid strips or mats?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50. Facility personnel understand the basic causes of falls:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equipment or other material in walkway?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poor housekeeping, type and condition of floor?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Description</td>
<td>Yes</td>
<td>No</td>
<td>N/A</td>
<td>Comments</td>
</tr>
<tr>
<td>-----------------------------------------------------------------------------</td>
<td>-----</td>
<td>----</td>
<td>-----</td>
<td>----------</td>
</tr>
<tr>
<td>Inadequate illumination?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Human inattention, person’s age, illness, emotional state, fatigue, or poor vision?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>51. The facility uses flush, floor-level mats and runners of sufficient length?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>52. Procedures developed for placing, removing, cleaning, and storing mats?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
CHECKLIST 4  Emergency Drill Evaluation

Facility _____________________________________________________________

Date ________________________________________________________________

Evaluator Name/Title _________________________________________________

Describe specific functional areas evaluated:
____________________________________________________________________
____________________________________________________________________
____________________________________________________________________

Describe type and purpose of drill:
____________________________________________________________________
____________________________________________________________________
____________________________________________________________________

Time and date of drill observations ______________________________________

Number of physicians participating _______________________________________

Number of nursing personnel participating ________________________________

Number of other hospital personnel participating __________________________

Triage area established (yes/no)? ___________

Describe incident command system activation and effectiveness:
____________________________________________________________________
____________________________________________________________________
____________________________________________________________________

Number of casualties (if any) received: ___________

Kind of casualties received:
____________________________________________________________________
____________________________________________________________________

Describe decontamination of casualties if required:
____________________________________________________________________
____________________________________________________________________
____________________________________________________________________

Time first disaster alert was received ___________

Time disaster message authenticated ___________

Time first casualties arrived in Emergency Department ___________

Time first casualties seen by Emergency Department physician ___________

Time last casualties arrived ___________

Time last casualties seen by a physician ___________

Summary of observation and additional comments:
<table>
<thead>
<tr>
<th>Topic</th>
<th>Yes</th>
<th>No</th>
<th>N/A</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Triage layout physically arranged to facilitate expedient casualty flow?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Emergency first aid administered in the triage area?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Casualties classified and moved quickly?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Casualties’ personal belongings properly secured?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Triage area ready when the first casualties arrived?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. How many physicians were working in the triage area?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Number of nursing personnel working in the triage area?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Did personnel remain calm?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Did personnel follow their roles as laid out in the emergency preparedness plan?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. How many clergymen in the Emergency Department area?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Problem with too many personnel showing up onsite?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Personnel resources adequate?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Those in authority properly identified?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. Physicians assigned to the following areas:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Triage/decontamination screening?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Major treatment area?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minor treatment area?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating room?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. Did personnel seem sincere in their involvement?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16. Did observers cause any problems?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17. Did the command center carry out assigned responsibilities?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18. Personnel recall system used for this drill?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19. Physician recall system used for this drill?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Topic</td>
<td>Yes</td>
<td>No</td>
<td>N/A</td>
<td>Comments</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>-----</td>
<td>----</td>
<td>-----</td>
<td>----------</td>
</tr>
<tr>
<td>20. Disaster message from the site accurately transmitted and received?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21. Vehicle traffic control system operate as planned?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22. Police department informed of the casualty list?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23. Problems with the internal communications system?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24. What kind of communication systems were used in this drill?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Radio?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Telephone?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Walk-around radios?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Messengers?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>911?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25. Disaster supplies ready and transported to proper locations?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>26. Enough stretchers brought to the disaster areas by nursing personnel?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>27. Enough respiratory therapy personnel onsite?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28. Registered pharmacist on site to prepare intravenous fluids?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>29. Laboratory personnel onsite?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30. Resources lacking?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Comments (if yes):</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>31. Observers assigned to key areas?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>32. Critique personnel and observers in place at the time of the drill?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>33. Critique session held after the drill?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>34. People assigned the task of identifying deficiencies and getting them corrected?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>35. Results of the drill been reported to the Safety Committee?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## CHECKLIST 5  Facility and Design Electrical Safety

<table>
<thead>
<tr>
<th>Topic</th>
<th>Yes</th>
<th>No</th>
<th>N/A</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Compliance with OSHA specified for all contract electrical work?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Employees required to report as soon as practicable any obvious hazard to life or property observed in connection with electrical equipment or lines?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Employees instructed to make preliminary inspections and appropriate tests to determine what conditions exist before starting work on electrical equipment or lines?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. When electrical equipment or lines are to be serviced, maintained, or adjusted, necessary switches opened, locked-out, and tagged whenever possible?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Portable electrical tools and equipment grounded or of the double-insulated type?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Electrical appliances such as vacuum cleaners, polishers, vending machines, etc. grounded?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Extension cords have grounding conductors?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Multiple plug adaptors prohibited?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Ground-fault circuit interrupters installed on each temporary 15- or 20-ampere, 120-volt, AC circuit at locations where construction, demolition, modifications, alterations, or excavations are being performed?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Temporary circuits protected by suitable disconnecting switches or plug connectors at the junction with permanent wiring?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Electrical installations in hazardous dust or vapor areas meet the National Electrical Code (NEC) for hazardous locations?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Exposed wiring and cords with frayed or deteriorated insulation repaired or replaced promptly?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Flexible cords and cables free of splices or taps?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### CHECKLIST 5  Facility and Design Electrical Safety (cont.)

<table>
<thead>
<tr>
<th>Topic</th>
<th>Yes</th>
<th>No</th>
<th>N/A</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>14. Clamps or other securing means provided on flexible cords or cables at plugs, receptacles, tools, equipment, etc. and the jacket securely held in place?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. Cord, cable, and raceway connections intact and secure?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16. In wet or damp locations, electrical tools and equipment appropriate for that type of use or location or otherwise protected?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17. Locations of electrical power lines and cables (overhead, underground, underfloor, other side of walls, etc.) determined before digging, drilling, or similar work begun?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18. 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?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19. Use of metal ladders prohibited in areas where the ladder or person using the ladder could come in contact with energized parts of equipment, fixtures, or circuit conductors?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20. Disconnecting switches and circuit breakers labeled to indicate their use or equipment served?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21. A disconnecting means always opened before fuses replaced?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22. Interior wiring systems include provisions for grounding metal parts of electrical raceways, equipment, and enclosures?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23. Electrical raceways and enclosures securely fastened in place?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24. Energized parts of electrical circuits and equipment guarded against accidental contact by approved cabinets or enclosures?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25. Sufficient access to and working space around provided and maintained for all electrical equipment to permit ready and safe operation and maintenance?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### CHECKLIST 5  Facility and Design Electrical Safety (cont.)

<table>
<thead>
<tr>
<th>Topic</th>
<th>Yes</th>
<th>No</th>
<th>N/A</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unused openings (including conduit knockouts) in electrical enclosures and fittings closed with appropriate covers, plugs, or plates?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electrical enclosures such as switches, receptacles, junction boxes, etc. provided with tight-fitting covers or plates?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electrical cords in good condition and properly used and no “permanent” extension cords being substituted for fixed wiring?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Switches guarded properly to prevent inadvertent or accidental starting?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adequate lighting provided throughout the facility, especially at stairs and other hazardous areas?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Any live but empty light sockets or live but damaged switches?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fuses (or circuit breakers) on lighting and small appliance circuits are of proper capacity, and the use of multiple plugs monitored to prevent overloading of circuits?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Switches for electrical equipment located so they can be reached easily in the event of an emergency, without having to lean on or against metal equipment?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Topic</td>
<td>Yes</td>
<td>No</td>
<td>N/A</td>
<td>Comments</td>
</tr>
<tr>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>-----</td>
<td>----</td>
<td>-----</td>
<td>-------------------------------------------</td>
</tr>
<tr>
<td>1. Hazard communication program — The program is in writing and:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. Describes how hazards will be evaluated (employers may rely on the chemical manufacturer or importers)?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. Tests all hazardous materials in the workplace (employers may rely on the chemical manufacturer or importers)?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. Describes labeling system in use?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. Lists hazardous chemicals referenced on MSDSs for all hazardous materials used in the workplace?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>e. Describes employee education and training program?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>f. Describes hazards of nonroutine tasks?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>g. Describes how hazards of unlabeled pipes will be handled?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>h. Includes procedures for informing on-site contractors of hazardous substances in the workplace to which their employees may be exposed?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>i. Makes the program available to employees, their designated representatives, the Assistant Secretary of Labor for OSHA, and the director of NIOSH?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. List of hazardous materials in the workplace contains all hazardous chemicals, including, but not limited to:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. Raw materials?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. Both isolated and nonisolated intermediates?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. Final products?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. Cleaning and maintenance chemicals?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>e. Laboratory chemicals for which MSDS information has been received?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>f. Waste products not regulated under RCRA but which are hazardous under this standard?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>g. Impurities and byproducts?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>h. Waste treatment and products?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Checklist 6  Hazard Communication Evaluation (cont.)

<table>
<thead>
<tr>
<th>Topic</th>
<th>Yes</th>
<th>No</th>
<th>N/A</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>3. Hazardous materials labeling:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. All products containing hazardous materials are labeled?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. Stationary containers are labeled?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. Temporary containers used between workshifts or by different workers are labeled?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. Methods are established to ensure that labels correct and up to date?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>e. Chemical name coincides with name on MSDS?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>f. Hazards are identified by words (in English), pictures, or symbols?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>g. Hazards of immediate and direct consequences of mishandling are noted?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>h. Information does not conflict with DOT regulations?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>i. Other OSHA standards apply, if material already regulated?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>j. Name and address of a responsible party (or parties) are provided?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>k. The labels on incoming containers have not been removed or defaced unless immediately replaced with labels?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>l. The hazards in pipelines are identified, although they do not have to be labeled under this standard?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>m. Labels are legible and in English?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>4. Material Safety Data Sheets:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. Are available for all hazardous materials in use, including drugs not in final form for oral dispensing (includes crushing of drugs)?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. Are readily accessible to exposed employees in the various work areas throughout their shifts?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### CHECKLIST 6  Hazard Communication Evaluation (cont.)

<table>
<thead>
<tr>
<th>Topic</th>
<th>Yes</th>
<th>No</th>
<th>N/A</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>5. Procedures have been established for:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. Updating MSDSs (or receiving updated copies from suppliers)?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. Taking appropriate action if a shipment received without an MSDS?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. Getting new and updated MSDSs to employees handling the materials?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. Advising employees of any changes in the MSDSs?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>e. Documenting efforts to obtain MSDSs from suppliers (recommended practice but not required by this standard)?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Hazards of nonroutine tasks — Procedures have been established to assess the hazards of nonroutine tasks as follows:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. All nonroutine tasks involving the use or exposure to hazardous materials are identified?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. The hazards involved in the performance of nonroutine tasks are described in writing?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. An MSDS is prepared or obtained for hazardous materials involved in these nonroutine tasks?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. A labeling system or written operating procedure has been established to identify the hazardous substances and their hazards involved in nonroutine tasks?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>e. Special training has been established for the performance of nonroutine tasks, including written operating procedures?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Employee education and training — Procedures have been established to:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. Cover all manufacturing, quality control, plant service, and R&amp;D employees who may be exposed to hazardous materials?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. Teach employees the requirements of the Hazard Communication standard?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Topic</td>
<td>Yes</td>
<td>No</td>
<td>N/A</td>
<td>Comments</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>-----</td>
<td>----</td>
<td>-----</td>
<td>----------</td>
</tr>
<tr>
<td>c. Identify operations where hazardous materials present?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. Make readily available the written hazard communication program, including the hazardous chemical list and MSDSs?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Procedures for training employees include:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. Information about physical and health hazards of chemicals in the work area?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. Detecting the presence of hazardous materials (e.g., monitoring procedures, odors, visibility)?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. Proper use and selection of personal protective equipment?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. Emergency procedures in the event of accidental exposure to hazardous materials, including emergency phone numbers and locations of eye washes and safety showers?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>e. How to determine hazards by reading a label?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>f. The location of MSDSs and procedure for reviewing them or obtaining a copy?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>g. How to obtain the correct MSDS for a hazardous substance (e.g., use of the trade name as a key identifier)?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>h. How the MSDS updated or the procedure for obtaining updated copies from the chemical manufacturer, importer, or distributor?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>i. The significance to the employee of each section of information on the MSDS, how to read it, and what it means?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>j. Measures employees can take to protect themselves from chemical exposure (e.g., eye washes, face shields, respirators)?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>k. Training done prior to the handling of the hazardous chemical, including employees who may only temporarily do this work?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### CHECKLIST 6  Hazard Communication Evaluation (cont.)

<table>
<thead>
<tr>
<th>Topic</th>
<th>Yes</th>
<th>No</th>
<th>N/A</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>l. Updated training conducted when the employee has transferred jobs or departments?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>m. Updated training considered when significant changes in chemicals or operations have occurred?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
CHECKLIST 7  Basic Control of Hazardous Energy (Lockout/Tagout)

<table>
<thead>
<tr>
<th>Topic</th>
<th>Yes</th>
<th>No</th>
<th>N/A</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Does the facility have a written program that outlines procedures for lockout/tagout?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Does the program address authorized maintenance personnel, affected employees who work with the equipment, and other workers who have access?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Does the lockout/tagout program include all energy types (electrical, mechanical, pneumatic, chemical, thermal, and residual) found in elevated machine parts?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Employees properly trained on all aspects of the program, including recognizing hazardous energy sources?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Does the program provide the sequence of each lockout/tagout procedure?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Does the plan provide information on procedures involving more than one person?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Are periodic inspections made to be sure that policies are being followed?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Does the company provide authorized employees with the necessary locks and tags?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Are lockouts performed only by authorized employees?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Do all locks contain the names of employees using them?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Are locks made of substantial material to preclude removal without using excessive force?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Do employees follow a checklist when restoring energy? (highly recommended)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. When outside employers perform maintenance, are procedures established for exchanging information about lockout/tagout procedures?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. When a group lockout is necessary, does a single authorized individual have primary safety responsibility for the group?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## CHECKLIST 8  Personal Protective Equipment

<table>
<thead>
<tr>
<th>Topic</th>
<th>Yes</th>
<th>No</th>
<th>N/A</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Protective goggles or face shields provided and worn where there is any danger of flying particles or corrosive materials?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Approved safety glasses required in areas where there is a risk of eye injuries such as punctures, abrasions, contusions, or burns?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Employees who need corrective lenses (glasses or contacts) in working environments having harmful exposures are required to wear only approved safety glasses or protective goggles or take other medically approved precautions?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Protective gloves, aprons, shields, or other means provided and required where employees could be cut or where there is reasonably anticipated exposure to corrosive liquids, chemicals, blood, or other potentially infectious materials? (See 29 CFR 1910.1030(b) for the definition of “other potentially infectious materials.”)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Approved respirators provided for regular or emergency use where needed?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Protective equipment maintained in a sanitary condition and ready for use?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Eyewash facilities and a quick drench shower located within work areas where employees are exposed to injurious corrosive materials?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Food or beverages consumed in areas with no exposure to toxic material, blood, or other potentially infectious materials?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Protection against the effects of occupational noise exposure provided when sound levels exceed those of the OSHA noise standard?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Adequate work procedures, protective clothing, and equipment provided and used when cleaning up spilled toxic or otherwise hazardous materials or liquids?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Topic</td>
<td>Yes</td>
<td>No</td>
<td>N/A</td>
<td>Comments</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>-----</td>
<td>----</td>
<td>-----</td>
<td>----------</td>
</tr>
<tr>
<td>11. Appropriate procedures in place for disposing of or decontaminating personal protective equipment contaminated with, or reasonably anticipated to be contaminated with, blood or other potentially infectious materials?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Personal protective clothing or equipment is of a type capable of being cleaned and disinfected easily?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Employees prohibited from interchanging personal protective clothing or equipment, unless properly cleaned?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. Machines and equipment that process, handle, or apply materials cleaned and decontaminated before being overhauled or placed in storage?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. Employees prohibited from smoking or eating in any area where contaminants could be ingested?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16. Facility conducts a hazard survey for all departments and determines appropriate PPE required?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17. An appropriate facility leader certifies the survey as required by OSHA?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Topic</td>
<td>Yes</td>
<td>No</td>
<td>N/A</td>
<td>Comments</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>-----</td>
<td>----</td>
<td>-----</td>
<td>----------</td>
</tr>
<tr>
<td>1. Did a competent person evaluate the facility with regard to the presence of confined spaces?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Written descriptions and designations of each confined space type and location maintained and updated as necessary?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Each confined space evaluated carefully for hazards within them (e.g., safe entry, descent equipment)?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Confined spaces thoroughly emptied and tested for corrosive or hazardous substances?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. All lines to a confined space containing inert, toxic, flammable, or corrosive materials valved off and blanked or disconnected and separated before entry?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Lockout required for all impellers, agitators, or other moving equipment inside confined spaces if they present a hazard?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Natural or mechanical ventilation provided before anyone enters a confined space?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Adequate illumination provided?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Atmosphere inside the confined space frequently tested or continuously monitored during work?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. An assigned, appropriately trained and equipped standby employee stationed outside the confined space when required?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Safety devices tested and working properly?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. All portable electrical equipment used inside confined spaces either grounded and insulated or equipped with ground fault protection?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Required permits documented and work orders on file, along with employee training records?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. Holes in floors, sidewalks, or other walking surfaces repaired properly, covered, or otherwise made safe?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Topic</td>
<td>Yes</td>
<td>No</td>
<td>N/A</td>
<td>Comments</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>-----</td>
<td>----</td>
<td>-----</td>
<td>----------</td>
</tr>
<tr>
<td>15. A respiratory protection program in effect and enough emergency respirators available?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16. Lockout/tagout program documented and in full use and effect for all confined space activities?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17. Written program to minimize or eliminate employee exposure available?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18. Written program reviewed and updated when necessary (but at least annually) to reflect changes? Management signs off on this document?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19. Training provided and training records maintained, including dates and summaries of training sessions?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20. Copy of regulatory text available for employees?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21. Permit-required spaces identified with proper signs?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### CHECKLIST 10 Surgical Department

<table>
<thead>
<tr>
<th>Topic</th>
<th>Yes</th>
<th>No</th>
<th>N/A</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Designated person oversees safety issues?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Employees receive safety training at time of hire and annually, as required?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Safety policies available to all employees on all shifts?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Floors well maintained and free of tripping hazards?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Floors covered with approved conductive material and tested regularly for conductivity, if necessary?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Aisles and work areas maintained in an orderly manner?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Suction lines and cords arranged to minimize tripping?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Storage no more than 24 inches from ceiling and 18 inches from a sprinkler head?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Computer areas ergonomically correct with adjustable keyboards and screens, adjustable chairs, and glare-free monitors?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Lighting adequate in all areas?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Humidity and temperature monitored and properly maintained?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Air exchange at least 25 exchanges per hour?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Volume of used anesthetic gases properly noted and records analyzed for leakage?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. Stable stools and ladders with safety treads available when employees need to reach files on high shelves?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. Heavy boxes and supplies stored on low shelves?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16. Hazard communication program and MSDS training completed?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17. MSDS files available to employees during all working hours?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18. List of carcinogens available?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19. Incompatible chemicals stored correctly?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Topic</td>
<td>Yes</td>
<td>No</td>
<td>N/A</td>
<td>Comments</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>-----</td>
<td>----</td>
<td>-----</td>
<td>----------</td>
</tr>
<tr>
<td>20. Separate collection containers are used for items not to be incinerated (e.g., glass, empty ether cans, aerosol cans, disposables)?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21. Flammable anesthetics stored in separate, fire-resistant locations vented to the outside?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22. Chemical spill kits and materials assembled, evaluated for proper signage, and available for use?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23. Employees trained in spill cleanup procedures, including those for mercury and formaldehyde, if applicable?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24. Periodic monitoring performed of employee breathing zones to ensure compliance with PELs and ceiling limits, and records are kept?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25. Written bloodborne pathogen program available, current, and reviewed within the last year?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>26. Personal protective equipment assessment completed and documented?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>27. Employees wear safety glasses with side shields (or goggles) in case of splash hazards?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28. Employees wear approved garments in their work areas?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>29. Garments and gloves removed before employees leave work areas and hands washed?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30. Employees trained in PPE use?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>31. Needles and sharps handled in an appropriate manner?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>32. Sponges, sharps, and instruments counted before and after open procedures?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>33. Sharps containers available and disposed of when half full?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>34. Soiled linens examined for foreign objects before being moved to the laundry (e.g., instruments, pins, needles, sharps)?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Topic</td>
<td>Yes</td>
<td>No</td>
<td>N/A</td>
<td>Comments</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>-----</td>
<td>----</td>
<td>-----</td>
<td>----------</td>
</tr>
<tr>
<td>35. Sterile supplies checked before use for outdate patency of wrapper and indications that sterilization completed?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>36. Employees trained on standard or universal precautions?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>37. Employees prohibited from eating, drinking, smoking, applying cosmetics and lipbalm, or manipulating contact lenses in work areas?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>38. Work areas disinfected with appropriate EPA-registered disinfectants at the end of each shift?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>39. Temperatures of refrigerators monitored weekly and units cleaned weekly?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40. Employees aware of fire alarm pull box locations, O₂ shutoffs, and fire alarm protocols?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>41. Proper types and number of fire extinguishers available?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>42. Employees have received fire extinguisher training, know how to respond to a fire drill, and know what evacuation route to use?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>43. Stairwells, exit doors, and emergency egresses accessible and free of obstructions?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>44. Employees understand what the acronyms PASS and RACE mean?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>45. Visible signs indicate location of an eye wash station?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>46. Eye wash in reliable condition with protective caps in place and eye covers disinfected with 10% bleach?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>47. Preventive maintenance and routine checks of eye washes well documented?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>48. Employees know locations of safety showers?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>49. All waste and potentially infectious materials disposed of properly according to federal, state, and local authorities?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Topic</td>
<td>Yes</td>
<td>No</td>
<td>N/A</td>
<td>Comments</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>-----</td>
<td>----</td>
<td>-----</td>
<td>----------</td>
</tr>
<tr>
<td>50. Infectious waste discarded in leakproof, “biohazard”-labeled containers with tight-fitting covers before transport?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>51. Light switches and coverplates are in place?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>52. All electrical equipment checked before each procedure and routinely by appropriate hospital engineering personnel?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>53. Electrical equipment grounded via use of a three-pronged plug or protected by GFCIs, and all receptacles properly wired?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>54. Electrical circuit breakers labeled and panels kept clear within 3 feet toward front?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>55. Unsafe equipment taken out of use or tagged?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>56. Tools (hand or power) inspected regularly for defects?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>57. Compressed gas cylinders handled appropriately during use, storage, and transport and gas hose connections in satisfactory condition?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>58. All trash receptacles fire rated?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>59. Employees trained in proper lifting and transferring techniques?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>60. Patients positioned to prevent pressures areas during procedures?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>61. Patient restraints correctly used during procedures if required?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>62. Operating table wheels and transport cart wheels locked when transferring patients?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>63. Near-miss and incident reports filled out when hazards or events identified?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>64. Good housekeeping practices observed in all areas?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>65. Employees know and understand what to do in case of fire?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>66. Employees know where the nearest fire extinguishers are?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>67. Employees know what to do in case of a severe storm or tornado warning?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Topic</td>
<td>Yes</td>
<td>No</td>
<td>N/A</td>
<td>Comments</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>-----</td>
<td>----</td>
<td>-----</td>
<td>----------</td>
</tr>
<tr>
<td>68. Employees know what to do in case of a bomb threat?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>69. Employees what to do when a building evacuation required?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>70. Employees know what to do if injured?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>71. Employees know where MSDS are located?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>72. Employees understand the OSHA Hazard Communication standard?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>73. Employees know when to use personal protective equipment?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>74. Employees know where the exposure control plan and have received training in it?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>75. Employees offered hepatitis B vaccines within 10 days of hire?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>76. Employees know their safety officers and safety committee representatives?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>77. Employees know the hospital emergency number?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>78. No-smoking policy reviewed and posted?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## CHECKLIST 11  Dietary Department

<table>
<thead>
<tr>
<th>Topic</th>
<th>Yes</th>
<th>No</th>
<th>N/A</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Floor surfaces clean and free of cracks and holes?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Floors kept dry?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Floors covered with nonslip material in spill hazard areas?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Docks and ramps in good condition and constructed with a minimum length-to-rise ratio of 12:1?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Ramps have handrails or curbs to prevent falls or spills from sides of ramp?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Equipment free of water leaks?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Nonslip shoes worn?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Aisles clear for employees and material movement?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Bulk storage areas cleaned and organized?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Electrical outlets, switches, and cords in good condition?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Electrical motors dirt free and well ventilated?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Extension cords properly used?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Lockout/tagout utilized when cleaning energized equipment?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. Electrical equipment grounded?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. Outlets located within 6 feet of water have GFCI protection?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16. Employees trained prior to using equipment?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17. Slicers, cutters, and processors guarded?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18. Sharp tools handled and stored safely?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19. Kitchen equipment clean?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20. Protective guards in place around light bulbs in storage areas and walk-in coolers?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21. Sufficient lighting in all work and storage areas?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22. Steam tables, kettles, and pressure cookers in good repair?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Topic</td>
<td>Yes</td>
<td>No</td>
<td>N/A</td>
<td>Comments</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>-----</td>
<td>----</td>
<td>-----</td>
<td>----------</td>
</tr>
<tr>
<td>23. Protective thermal mitts or gloves provided and used to guard against burns?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24. Handles turned away from stove front burners and pilot lights?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25. Refrigerator equipment on a regular maintenance schedule?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>26. Temperature checked daily?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>27. Food items adhere to a posted expiration schedule?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28. Inside emergency release mechanisms to open freezer or cold storage rooms functioning properly?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>29. Worktables of sufficient size?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30. Hoods, filters, and vent ducts cleaned on a regular schedule?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>31. Exhaust fans, screens, and windows kept clean and lint free?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>32. Knives sharpened regularly and secured in drawers?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>33. Fire exits marked and kept clear?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>34. Employees properly trained in the use of fire blankets and fire extinguishers?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>35. Fire extinguishers with current inspection tags accessible?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>36. Range-hood automatic fire extinguisher inspected as required?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>37. Utensils easily accessible?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>38. MSDS files available and HAZCOM training completed?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>39. Protective covers in place over garbage disposals?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40. Regular dish machine temperature checks conducted? Noise levels checked?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>41. Garbage receptacles emptied daily?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>42. Trash compactor properly guarded?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>43. Personal protective equipment available?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>44. Food-safe sanitizers used as needed?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Topic</td>
<td>Yes</td>
<td>No</td>
<td>N/A</td>
<td>Comments</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>-----</td>
<td>----</td>
<td>-----</td>
<td>----------</td>
</tr>
<tr>
<td>45. Food or cleaning items not stored under sinks?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>46. Chemicals not stored with food items?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>47. All items stored a minimum of 6 inches off floors?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>48. Open storage not within 18 inches from the ceiling?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>49. Written assignment procedures in place for dietary employees with infections and open lesions?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50. Hair nets or equivalent protection used?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>51. Employees report unsafe conditions to their supervisor?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>52. Employees trained in the proper use of kitchen equipment?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>53. Employees given training in proper lifting and handling techniques?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>54. Appropriate first aid supplies readily available?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>55. Employees know and understand what to do in case of fire?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>56. Employees know where the nearest fire extinguishers are?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>57. Employees know what to do in case of a severe storm or tornado warning?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>58. Employees know what to do in case of bomb threat?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>59. Employees know what to do if evacuation of the building is necessary?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>60. Employees know what to do if injured?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>61. Employees know where the MSDS files are kept?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>62. Employees understand what the OSHA Hazard Communication standard is about?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>63. Employees know when to use personal protective equipment?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Topic</td>
<td>Yes</td>
<td>No</td>
<td>N/A</td>
<td>Comments</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>-----</td>
<td>----</td>
<td>-----</td>
<td>----------</td>
</tr>
<tr>
<td>64. Employees know where the exposure control plan is and have received training in it?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>65. Employees offered hepatitis B vaccines?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>66. Employees know their safety officers and safety committee representatives?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>67. Employees know the hospital emergency numbers!</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## CHECKLIST 12 Storage Area Safety

<table>
<thead>
<tr>
<th>Topic</th>
<th>Yes</th>
<th>No</th>
<th>N/A</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Person appointed to inspect safety issues?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Floors free of tripping hazards and well maintained?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Aisles free of trash and other debris and work areas maintained in an orderly manner?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Adequate lighting and ventilation provided in all areas?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Area clear of prohibited items including combustible materials?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Hazard Communication program and MSDS training completed?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. MSDS files available to employees during all working hours?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Noncurrent MSDSs archived for 30 years?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Bulged or dented cans disposed of?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. All chemicals properly labeled?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Chemical storage areas locked?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Each inside storage area marked as a no-smoking area?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. All caution signs for hydrogen, bulk oxygen, storage cabinets, etc. permanently installed?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. Combustible waste material such as oily rags and paint rags stored in covered metal containers and disposed of daily?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. Piping systems, including tubing, flanges, bolting, gaskets, valves, fittings, and all pressurized parts containing flammable and combustible liquids, meet the requirements of NFPA 30? Properly identified?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16. Openings to rooms and buildings have noncombustible, liquid-tight, raised sills or ramps at least 4 inches high or otherwise designed to prevent flow of liquids to adjoining areas?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17. Personal protective equipment assessment completed and documented?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18. Proper types and number of fire extinguishers available?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Topic</td>
<td>Yes</td>
<td>No</td>
<td>N/A</td>
<td>Comments</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>-----</td>
<td>----</td>
<td>-----</td>
<td>----------</td>
</tr>
<tr>
<td>19. Door closer operable and has a positive latch?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20. Stairwells, exit doors, and emergency egresses accessible and free of obstructions?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21. Visible signs indicate location of an eye wash station?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22. Unsafe equipment taken out of use or tagged?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23. Electrical equipment grounded via use of a three-pronged plug or protected by GFCIs, and all receptacles properly wired?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24. All trash receptacles fire rated?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25. Overhead items secured and heavy objects below eye level?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>26. Storage no more than 24 inches from ceiling and 18 inches from sprinkler heads?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHECKLIST 13 Elevator Safety</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>----------------------------</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Topic</th>
<th>Yes</th>
<th>No</th>
<th>N/A</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Motors properly protected from dirt and steam?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Electrical wiring in good repair and outlets convenient on the crossheads and in the pit?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Protection provided for the electrical control panels?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Proper types and number of fire extinguishers available?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Floors and landing sills in good repair and free of tripping hazards?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Hoist-way interlocks operating and protected?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Routine inspection of hoisting and counterweight wire ropes conducted?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Elevator pit in good condition and free of debris, with a minimum of 2 feet between the lowest projection on the underside of the platform?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Access to the machine room and pit safe and convenient?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Lighting in machine room, pit, overhead space, all cars, and landings adequate?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Safe working load capacity of elevator marked?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Emergency exit provided and marked and instructions posted?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Safety devices tested and working properly?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. Elevators inspected regularly?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. Inspectors wear close-fitting clothing and do not wear gloves except when checking wire rope?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16. Fixtures free of sharp edges and in good condition?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17. Freight elevators classified and used according to load requirements?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18. Ventilation adequate?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19. Elevators stop level with each floor?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20. Confined space procedures developed and used if necessary</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### CHECKLIST 14  Anesthesiology

<table>
<thead>
<tr>
<th>Topic</th>
<th>Yes</th>
<th>No</th>
<th>N/A</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Person appointed to oversee safety issues?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Employees receive safety training at hire and annually?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Floors free of tripping hazards and well maintained?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Computer areas ergonomically correct with adjustable keyboards and screens, adjustable chairs, glare-free monitors, phones with headsets?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Foot, wrist, and mouse rests available and utilized where appropriate?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Lighting adequate in all areas of operation?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Anesthesia machines and monitors checked routinely before use?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Anesthesia machines checked and serviced by appropriate service personnel?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Oxygen and nitrous oxide tanks secured?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Scavenger system for waste anesthetic gases intact and used?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Piped gas connections tested routinely?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Hazard communication program and MSDS training complete?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. MSDS files are accessible to employees during all work hours?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. List of carcinogens available?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. All medications and chemicals properly labeled?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16. Written bloodborne pathogen program available, current, and reviewed within the last year?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17. Personal protective equipment assessment complete and documented?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18. Employees trained in the use of personal protective equipment?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19. Sharps containers available and disposed of when half full?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20. Employees trained on standard precautions?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Topic</td>
<td>Yes</td>
<td>No</td>
<td>N/A</td>
<td>Comments</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>-----</td>
<td>----</td>
<td>-----</td>
<td>----------</td>
</tr>
<tr>
<td>21. Employees aware of fire alarm pull box locations, O₂ shut offs, and fire alarm protocols?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22. Proper types and number of fire extinguishers available?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23. Employees have received fire extinguisher training and know how to respond to fire drills and what evacuation route to use?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24. Stairwells, exit doors, and emergency egresses accessible and free of obstructions?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25. Visible signs indicate location of an eye wash station?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>26. Unsafe equipment taken out of use or tagged?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>27. Trash receptacles fire rated?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28. Employees trained in proper lifting and transferring techniques?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>29. Employees know what to do in case of fire?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30. Employees know locations of fire extinguishers?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>31. Employees know what to do in case of severe weather?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>32. Employees know what to do in case of a bomb or terrorist threat?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>33. Employees know evacuation actions?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>34. Employees know location of MSDS files?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### CHECKLIST 15  Radiology Department

<table>
<thead>
<tr>
<th>Topic</th>
<th>Yes</th>
<th>No</th>
<th>N/A</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. A designated person oversees radiation safety and meeting training and education requirements?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Radiation safety committee established and meets at least quarterly?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Employees receive safety training at time of hire and annually thereafter?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Safety manual available to all employees on all shifts?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Only authorized personnel allowed in x-ray and other radiation source rooms?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Rooms and areas housing radiation sources properly posted with required signs?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Required recordkeeping maintained?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Floors free of tripping hazards and well maintained?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Aisles free of trash and other debris and work areas maintained in an orderly manner?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Storage no more than 24 inches from the ceiling and 18 inches from sprinkler heads?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Computer areas ergonomically correct with adjustable keyboards and screens, adjustable chairs, glare-free monitors, phones with headsets?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Foot, wrist, and mouse rests available and utilized where appropriate?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Lighting and ventilation in all areas of operation adequate?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. Stable stools and ladders with safety treads available when employees need to reach files on high shelves?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. Heavy boxes and supplies stored on low shelves?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16. Hazard Communication program and MSDS training complete?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17. MSDS files accessible to employees during all work hours?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18. Noncurrent MSDSs archived for 30 years?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19. List of carcinogens available?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Topic</td>
<td>Yes</td>
<td>No</td>
<td>N/A</td>
<td>Comments</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>-----</td>
<td>----</td>
<td>-----</td>
<td>----------</td>
</tr>
<tr>
<td>20. Incompatible chemicals stored separately (reference MSDSs)?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21. Drug box lock intact and expiration of drugs regularly reviewed?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22. All use of radioactive material conducted in a safe manner and in accordance with NRC regulations and conditions of the license?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23. Chemical spill kits and materials assembled, evaluated for proper signage, and available for use?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24. Employees trained in spill cleanup procedures, including those for mercury and formaldehyde, if applicable?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25. Written bloodborne pathogen program available, current, and reviewed within the last year?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>26. Personal protective equipment assessment completed and documented?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>27. Radiation monitoring badges worn by all personnel, devices managed properly, and monthly monitoring results available for employee reference?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28. Patient shielding devices readily available?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>29. Employees wear approved garments while in their work areas (e.g., lead aprons, gloves, goggles, face shield)?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30. All lead aprons, gloves, and shielding devices hung properly, without folds, to prevent cracking and radiation leakage?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>31. Garments and gloves removed before employees leave work areas and hands washed?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>32. Employees trained in use of personal protective equipment?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>33. Contaminated clothing and equipment disposed of in a proper manner?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>34. Needles and sharps appropriately handled?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>35. Sharps containers available and disposed of when half full?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Topic</td>
<td>Yes</td>
<td>No</td>
<td>N/A</td>
<td>Comments</td>
</tr>
<tr>
<td>-----------------------------------------------------------------------</td>
<td>-----</td>
<td>----</td>
<td>-----</td>
<td>----------</td>
</tr>
<tr>
<td>36. Exposure switches on fixed radiographic units cannot be activated with operator outside of the shielded area?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>37. Soiled linens examined for foreign objects before being moved to the laundry (e.g., instruments, pins, needles, sharps)?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>38. Employees trained on standard (universal) precautions?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>39. Employees refrain from eating, drinking, smoking, applying cosmetics and lip balm, or manipulating contact lenses in work areas?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40. Temperatures of refrigerators monitored and the refrigerators cleaned weekly?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>41. Employees aware of fire alarm pull box locations, O₂ shut-offs, and fire alarm protocols?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>42. Proper types and number of fire extinguishers available (e.g., CO₂ or dry chemical)?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>43. Employees have received fire extinguisher training, know how to respond to a fire drill, and what evacuation route to use?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>44. An emergency plan developed in response to any radioactive accident or incident?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>45. Stairwells, exit doors, and emergency egresses accessible and free of obstructions?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>46. Visible signs indicate location of an eye wash station?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>47. Eye wash in reliable condition, with protective caps in place and eye covers disinfected?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>48. Eyewash preventive maintenance and routine checks well documented?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>49. Employees know where safety showers are located?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50. All waste and potentially infectious materials disposed of properly according to federal, state, and local regulations?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## CHECKLIST 15  Radiology Department (cont.)

<table>
<thead>
<tr>
<th>Topic</th>
<th>Yes</th>
<th>No</th>
<th>N/A</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>51. All infectious waste discarded in leakproof, “biohazard”-labeled containers with tight-fitting covers before transport?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>52. Light switches and coverplates are in place?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>53. All main breakers shut off at night or when the department closed?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>54. All electrical equipment checked before each procedure and routinely?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>55. Electrical equipment grounded via use of a three-pronged plug or protected by GFCIs, and all receptacles properly wired?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>56. Electrical circuit breakers labeled and panels kept clear within 3 feet?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>57. Unsafe equipment taken out of use or tagged?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>58. Compressed gas cylinders handled appropriately during use, storage, and transport?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>59. All trash receptacles fire rated?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>60. Employees trained in proper lifting and transferring techniques?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>61. Near-miss and incident reports filled out when hazards or events identified?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>62. Good housekeeping practices observed in all areas?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>63. Employees know and understand fire response actions?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>64. Employees know locations of fire extinguishers?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>65. Employees know what to do in case of a severe storm or tornado warning?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>66. Employees know what to do in case of a bomb threat?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>67. Employees know what to do in case a building evacuation is necessary?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>68. Employees know what to do if injured?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>69. Employees know location of MSDS files?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Topic</td>
<td>Yes</td>
<td>No</td>
<td>N/A</td>
<td>Comments</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>-----</td>
<td>----</td>
<td>-----</td>
<td>----------</td>
</tr>
<tr>
<td>70. Employees understand the OSHA Hazard Communication standard?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>71. Employees know when to use personal protective equipment?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>72. Employees know location of the exposure control plan?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>73. Employees offered hepatitis B vaccines?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>74. Employees know their safety officers and safety committee</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>representatives?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>75. Employees know the hospital emergency number?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>76. The no-smoking policy reviewed and posted?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### CHECKLIST 16 Central Supply

<table>
<thead>
<tr>
<th>Topic</th>
<th>Yes</th>
<th>No</th>
<th>N/A</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. A designated person oversees safety issues?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Employees receive safety training at time of hire and annually thereafter?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Safety manual available on all shifts?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Floors well maintained and free of tripping hazards?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Computer areas ergonomically correct with adjustable keyboards and screens, adjustable chairs, glare-free monitors, phones with headsets?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Foot, wrist, and mouse rests available and utilized where appropriate?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Lighting and ventilation adequate in all areas of operation?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Contaminated equipment and instruments properly cleaned and disinfected before further processing or storage?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Hot pads available and used when removing autoclaved packages?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Records of all autoclave loads kept and a recall system in place?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Hazard Communication program and MSDS training complete?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. MSDS files accessible to employees during all working hours?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Noncurrent MSDSs archived for 30 years?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. Chemical containers properly labeled?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. Written bloodborne pathogen program available, current, and reviewed within the last year?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16. Personal protective equipment assessment completed and documented?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17. Employees trained on the use of personal protective equipment?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18. Sharps containers available and disposed of when half full?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19. Employees trained on standard (universal) precautions?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Topic</td>
<td>Yes</td>
<td>No</td>
<td>N/A</td>
<td>Comments</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>-----</td>
<td>----</td>
<td>-----</td>
<td>----------</td>
</tr>
<tr>
<td>20. Employees aware of fire alarm pull box locations, O₂ shut-offs, and fire alarm protocols?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21. Proper types and number of fire extinguishers available?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22. Employees have received fire extinguisher training and know how to respond to a fire drill and what evacuation route to use?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23. Stairwells, exit doors, and emergency egresses accessible and free of obstructions?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24. Visible signs indicate location of an eye wash station?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25. Unsafe equipment taken out of use or tagged?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>26. Electrical equipment grounded via use of a three-pronged plug or protected by GFCIs, and all receptacles properly wired?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>27. All trash receptacles fire rated?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28. Near-miss and incident reports filled out when hazards or events identified?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>29. Employees trained in proper lifting techniques?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30. Employees know and understand what to do in case of fire?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>31. Employees know where the nearest fire extinguishers are?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>32. Employees know what to do in case of a severe storm or tornado warning?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>33. Employees know what to do in case of a bomb threat?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>34. Employees know what to do in case an evacuation of the building is necessary?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>35. Employees know what to do if injured?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>36. Employees know where the MSDS files are located?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>37. Employees understand the OSHA Hazard Communication standard?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### CHECKLIST 16  Central Supply (cont.)

<table>
<thead>
<tr>
<th>Topic</th>
<th>Yes</th>
<th>No</th>
<th>N/A</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>38. Employees know when to use personal protective equipment?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>39. Employees know where the exposure control plan is and have received training in it?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Topic</td>
<td>Yes</td>
<td>No</td>
<td>N/A</td>
<td>Comments</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>-----</td>
<td>----</td>
<td>-----</td>
<td>----------</td>
</tr>
<tr>
<td>1. Person appointed to oversee safety issues?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Employees receive safety training at time of hire and annually thereafter?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Safety manual available on all shifts?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Floors free of tripping hazards and well maintained?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Wet-floor signs used and removed in a timely manner?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. A dry passage always maintained when mopping?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Aisles free of trash and other debris and work areas maintained in an orderly manner?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Storage no more than 24 inches from ceiling and 18 inches from sprinkler heads?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Computer areas ergonomically correct with adjustable keyboards and screens, adjustable chairs, and glare-free monitors?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Foot, wrist, and mouse rests available and utilized where appropriate?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Lighting adequate in all areas of operation?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Stable stools and ladders with safety treads available when employees need to reach files on higher shelves?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Heavy boxes and supplies stored on lower shelves?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. Hazard Communication program and MSDS training complete?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. MSDS files accessible to employees during all working hours?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16. Noncurrent MSDSs archived for 30 years?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17. Chemical spill kits and materials assembled and available for use?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18. Written bloodborne pathogen plan available, current, and reviewed within the last year?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19. Personal protective equipment assessment completed and documented?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Topic</td>
<td>Yes</td>
<td>No</td>
<td>N/A</td>
<td>Comments</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>-----</td>
<td>----</td>
<td>-----</td>
<td>----------</td>
</tr>
<tr>
<td>20. Hands washed after removing gloves and gowns and between any dirty-to-clean activity?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21. Eye wash stations available, marked with proper signage, and undergo well-documented preventive maintenance and routine checks?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22. Hearing protection available where needed?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23. Employees trained in use of personal protective equipment?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24. Sharps containers available and disposed of when half full?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25. Employees trained in standard (universal) precautions?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>26. All wastes and potentially infectious materials disposed of properly according to federal, state, and local regulations?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>27. Employees refrain from eating, drinking, smoking, applying cosmetics or lipbalm, and manipulating contact lenses in work areas and do not have any food or beverages on carts?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28. Broken glass properly disposed of in clearly marked containers?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>29. All work surfaces cleaned and decontaminated with appropriate disinfectants after use and at the end of the work shift?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30. All infectious waste discarded in leakproof, “biohazard”-labeled containers with tight-fitting covers before transport?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>31. Employees receive fire extinguisher training and know how to respond to fire drills and what evacuation routes to use?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>32. Stairwells, exit doors, and emergency egresses accessible and free from obstructions?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>33. Employees aware of fire alarm pull box locations and fire alarm protocols?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Topic</td>
<td>Yes</td>
<td>No</td>
<td>N/A</td>
<td>Comments</td>
</tr>
<tr>
<td>-------</td>
<td>-----</td>
<td>----</td>
<td>-----</td>
<td>----------</td>
</tr>
<tr>
<td>34. Proper types and number of fire extinguishers available?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>35. Extension cords properly used?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>36. Light switches and coverplates in use?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>37. Electrical equipment grounded via use of a three-pronged plug or protected by GFCIs, and all receptacles properly wired?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>38. Electrical circuit breakers labeled and panels kept clear within 3 feet in front of panels?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>39. All trash receptacles fire rated?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40. Near-miss and incident reports filled out when hazards or events identified?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>41. Employees trained in proper lifting and moving techniques?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>42. Unsafe equipment taken out of use or tagged?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>43. Equipment:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Buckets and tubs in good repair?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vacuum cleaners, buffers, and scrubbers in good repair?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ladders and stools solid and equipped with safety feet?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tools and carts placed in such a way as to prevent interference?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carts locked when in patient or resident areas?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cart keys controlled?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carts roll freely?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Appropriate tools for the job available?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>44. Good housekeeping practices observed in all areas?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>45. Non-slip shoes worn?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>46. Employees know and understand what to do in case of fire?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>47. Employees know where the nearest fire extinguishers are?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Topic</td>
<td>Yes</td>
<td>No</td>
<td>N/A</td>
<td>Comments</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>-----</td>
<td>----</td>
<td>-----</td>
<td>----------</td>
</tr>
<tr>
<td>48. Employees know what to do in case of a severe storm warning?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>49. Employees know what to do in case of a bomb threat?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50. Employees know what to do in case a building evacuation is necessary?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>51. Employees know what to do if injured?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>52. Employees know where the MSDS files are located?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>53. Employees understand the OSHA Hazard Communication standard?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>54. Employees know when to use personal protective equipment?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>55. Employees know where the exposure control plan is and have received training in it?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>56. Employees offered hepatitis B vaccines?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>57. Employees know emergency numbers and codes?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>58. The no-smoking policy reviewed and posted?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**CHECKLIST 18 Administrative Areas**

<table>
<thead>
<tr>
<th>Topics</th>
<th>Yes</th>
<th>No</th>
<th>N/A</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Work areas clean and orderly?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Aisles kept clear?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Equipment stored properly?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Telephone and electric cords out of the way and in good repair?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Floors free of tripping hazards?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. File cabinet drawers closed when not in use?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Only one file drawer opened at a time?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Illumination adequate?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Computer areas ergonomically correct with adjustable keyboards and screens, adjustable chairs, glare-free monitors, phones with headsets?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. All chairs adjustable?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Foot, wrist, and mouse rests available and utilized where appropriate?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Carpets free of holes and tears, and rugs nonslip?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Stable stools and ladders with safety treads available when employees need to reach files on high shelves?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. Heavy file boxes stored on low shelves?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. Hazard Communication program training completed?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16. Storage more than 18 inches from ceiling?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17. Confidentiality adhered to?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18. Furniture and fixtures free of sharp edges and in good condition?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19. Hot plates, coffee makers, portable heaters properly wired and turned off when not in use?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20. Stairwells and exits properly lighted?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21. Light switches and coverplates in place?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22. Unsafe equipment taken out of use or tagged?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23. Near-miss reports filled out when hazards are identified?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Topics</td>
<td>Yes</td>
<td>No</td>
<td>N/A</td>
<td>Comments</td>
</tr>
<tr>
<td>-----------------------------------------------------------------------</td>
<td>-----</td>
<td>----</td>
<td>-----</td>
<td>----------</td>
</tr>
<tr>
<td>24. Scissors, staplers, knives, and other sharp items safely stored and used?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25. All flammable materials stored in metal cabinets?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>26. Employees trained in proper lifting techniques?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>27. Proper types and number of fire extinguishers available?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28. Fire escape doors unlocked and free for exit?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>29. Glass doors frosted or contain lettering or decals?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30. Ventilation adequate?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>31. Employees know and understand what to do in case of fire?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>32. Employees know locations of fire extinguishers?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>33. Employees know what to do in case of a severe storm or tornado warning?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>34. Employees know what to do in case of a bomb threat?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>35. Employees know what to do when a building evacuation is necessary?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>36. Employees know what to do if injured?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>37. Employees know location of MSDS files?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>38. Employees understand the OSHA Hazard Communication standard?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>39. Employees know when to use personal protective equipment?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40. Employees know location of the exposure control plan?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>41. Employees know their safety officers and safety committee representatives?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>42. Employees know emergency numbers and codes?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Topic</td>
<td>Yes</td>
<td>No</td>
<td>N/A</td>
<td>Comments</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>-----</td>
<td>----</td>
<td>-----</td>
<td>----------</td>
</tr>
<tr>
<td>1. Safety/chemical hygiene officer appointed to oversee laboratory safety issues?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Employees receive safety training at the time of hire and annually thereafter?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Safety manual available to all employees on all shifts?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Lab locked when lab personnel not in the building?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Floors free of tripping hazards and well maintained?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Floors cleaned and wax stripped regularly to prevent paraffin buildup?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Aisles free of trash and other debris and work areas maintained in an orderly manner?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Storage no more than 24 inches from ceiling and 18 inches from a sprinkler head?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Computer areas ergonomically correct with adjustable keyboards and screens, adjustable chairs, glare-free monitors, phones with headsets?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Trash removed daily?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Foot, wrist, and mouse rests available and utilized where appropriate?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Lighting in all areas of operation adequate?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Stable stool and ladders with safety treads available when employees need to reach files on higher shelves?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. Heavy boxes and supplies stored on lower shelves?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. Hazard Communication plan training completed?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16. MSDS files accessible to employees during all working shifts?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17. Old MSDS files archived for 30 years?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18. List of carcinogens maintained?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19. Flammable or toxic chemicals kept in closed containers when not in use?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### CHECKLIST 19  Laboratories (cont.)

<table>
<thead>
<tr>
<th>Topic</th>
<th>Yes</th>
<th>No</th>
<th>N/A</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>20. Chemicals stored away from heat, sunlight, and reactive substances?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21. Incompatible chemicals stored properly?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22. Working supplies of chemicals limited to 1 gal/100 ft?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23. Chemical spill kits and materials assembled, evaluated for proper signage, and available for use?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24. Employees trained in spill cleanup procedures, including those for mercury and formaldehyde, if applicable?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25. With regard to other potentially toxic substances, periodic monitoring performed of employee breathing zones to ensure compliance with PELs and ceiling limits, and records kept?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>26. All safety cabinets vented to the outside?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>27. All hoods in working condition and certified annually?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28. Face velocity of a hood maintained at 100 fpm?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>29. Storage in hoods limited so the ventilation is not obstructed?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30. Loads in centrifuges balanced?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>31. Employees wear safety glasses with side shields (or goggles) in case of splash hazards?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>32. Written bloodborne pathogen program available, current, and reviewed within the last year?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>33. Personal protective equipment assessment completed and documented?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>34. Employees wear fluid-resistant, full-length lab coats or cover gowns that are closed in front and have long sleeves and knitted cuffs?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>35. Lab coats and gloves removed before employees leave work areas and hands washed?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>36. Employees trained in the use of personal protective equipment?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Topic</td>
<td>Yes</td>
<td>No</td>
<td>N/A</td>
<td>Comments</td>
</tr>
<tr>
<td>-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>-----</td>
<td>----</td>
<td>-----</td>
<td>----------</td>
</tr>
<tr>
<td>37. Sharps containers available and disposed of when half full?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>38. Employees trained in standard (universal) precautions?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>39. Employees refrain from eating, drinking, smoking, applying cosmetics and lipbalm, and manipulating contact lenses in work areas?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40. Workstations disinfected with appropriate EPA-registered disinfectants at the end of each shift?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>41. Temperatures of refrigerators monitored and units cleaned weekly?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>42. Employees aware of fire alarm pull box locations and fire alarm protocols?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>43. Proper types and numbers of fire extinguishers available?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>44. Employees have received fire extinguisher training and know how to respond to fire drills and what evacuation route to use?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>45. Stairwells, exit doors, and emergency egresses accessible and free from obstructions?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>46. Employees understand what the acronyms PASS and RACE mean?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>47. Visible signs indicate location of an eye wash station?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>48. Eyewash station in reliable condition with protective caps in place and eye covers disinfected with 10% bleach?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>49. Eyewash station preventive maintenance and routine checks well documented?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50. Employees know where the safety showers are located?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>51. All waste and potentially infectious material disposed of properly to meet federal, state, and local regulations?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>52. All infectious waste discarded in leakproof, “biohazard”-labeled containers with tight-fitting covers before transport?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>53. Light switches and coverplates are in place?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Topic</td>
<td>Yes</td>
<td>No</td>
<td>N/A</td>
<td>Comments</td>
</tr>
<tr>
<td>-------</td>
<td>-----</td>
<td>----</td>
<td>-----</td>
<td>----------</td>
</tr>
<tr>
<td>54. Electrical equipment grounded via use of a three-pronged plug or protected by GFCIs, and all receptacles properly wired?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>55. Electrical circuit breakers labeled and panels kept clear within 3 feet to front?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>56. Unsafe equipment taken out of use or tagged?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>57. Gas cylinders for blood gas machines chained and stored in an upright position and personnel instructed in how to transport gas cylinders? (Gas hose connections in satisfactory condition?)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>58. All trash receptacles fire rated?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>59. Near-miss and incident reports filled out when hazards or events have been identified?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>60. Employees trained in proper lifting techniques?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>61. Equipment checked for damage or wear and glassware inspected for chips and cracks before use?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>62. Good housekeeping practices observed in all areas?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>63. Employees know and understand what to do in case of fire?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>64. Employees know locations of fire extinguishers?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>65. Employees know what to do in case of a severe storm or tornado warning?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>66. Employees know what to do in case of a bomb threat?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>67. Employees know what to do when evacuating the building is necessary?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>68. Employees know what to do if injured?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>69. Employees know location of the MSDS files?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>70. Employees understand the OSHA Hazard Communication standard?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Topic</td>
<td>Yes</td>
<td>No</td>
<td>N/A</td>
<td>Comments</td>
</tr>
<tr>
<td>---------------------------------------------------------------------</td>
<td>-----</td>
<td>----</td>
<td>-----</td>
<td>----------</td>
</tr>
<tr>
<td>71. Employees know when to use personal protective equipment?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>72. Employees know where the exposure control plan is and have received training in it?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>73. Employees offered hepatitis B vaccines?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>74. Employees know their safety officers and safety committee representatives?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>75. Employees know the hospital emergency numbers?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Topic</td>
<td>Yes</td>
<td>No</td>
<td>N/A</td>
<td>Comments</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>-----</td>
<td>----</td>
<td>-----</td>
<td>----------</td>
</tr>
<tr>
<td>1. Person appointed to oversee safety issues?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Employees receive safety training at time of hire and annually thereafter?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Safety manual available to all employees on all shifts?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Pharmacy area locked when not occupied and only authorized personnel granted access?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Floors free of tripping hazards and well maintained?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Aisles free of trash and other debris and work areas maintained in an orderly manner?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Storage no more than 24 inches from ceiling and 18 inches from sprinkler heads?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Storage area clean, orderly, and well arranged?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Computer areas ergonomically correct with adjustable keyboards and screens, adjustable chairs, glare-free monitors, phones with headsets?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Foot, wrist, and mouse rests available and utilized where appropriate?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Lighting and ventilation adequate in all areas of operation?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Stable stool and ladders with safety treads available when employees need to reach high shelves?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Heavy boxes and supplies stored on low shelves?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. Hazard Communication program training completed?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. MSDS files accessible to employees during all working hours?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16. Old MSDS files archived for 30 years?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17. List of carcinogens available?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18. Flammable or toxic chemicals kept in closed containers when not in use?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19. Chemicals stored away from heat, sunlight, and reactive substances?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Topic</td>
<td>Yes</td>
<td>No</td>
<td>N/A</td>
<td>Comments</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>-----</td>
<td>----</td>
<td>-----</td>
<td>----------</td>
</tr>
<tr>
<td>Incompatible chemicals stored separately (refer to MSDSs)?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chemical spill kits and materials assembled and available for use?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employees trained in spill cleanup procedures, including those for</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>mercury and formaldehyde, if applicable?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Handwashing facilities with disinfectant soap and water conveniently</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>located?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>With regard to other potentially toxic substances, periodic</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>monitoring of employee breathing zones conducted to ensure</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>compliance with PELs and ceiling limits, and records kept?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>External medications separated from internal?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Monthly medication area audits done and documented?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All biological safety cabinets vented to outside?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All hoods in working condition and certified annually?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Refrigerator and laminar flow hood motors clean, lint free, and</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>well ventilated?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cultures of laminar flow hoods taken monthly and flow hoods</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>regularly inspected and serviced?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Storage in hoods limited to ensure unobstructed ventilation?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Refrigeration and room temperature records kept?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employees wear safety glasses with side shields (or goggles) in case</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>of splash hazards?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Written bloodborne pathogen program available, current, and reviewed</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>within the last year?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Personal protective equipment assessment completed and documented?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Topic</td>
<td>Yes</td>
<td>No</td>
<td>N/A</td>
<td>Comments</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>-----</td>
<td>----</td>
<td>-----</td>
<td>----------</td>
</tr>
<tr>
<td>36. Employees wear fluid-resistant, full-length lab coats or cover gowns that are closed in front and have long sleeves and knitted cuffs?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>37. Lab coats and gloves removed before employees leave work areas and hands washed?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>38. Employees trained in personal protective equipment use?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>39. Sharps containers available and disposed of when half full</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40. Employees trained in standard (universal) precautions?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>41. Employees refrain from eating, drinking, smoking, applying cosmetics and lipbalm, or manipulating contact lenses in work areas?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>42. Workstations disinfected with appropriate EPA-registered disinfectants at the end of each shift?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>43. Employees aware of fire alarm pull box locations and fire alarm protocols?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>44. Proper types and numbers of fire extinguisher available?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>45. Employees have received fire extinguisher training and know how to respond to a fire drill and what evacuation routes to use?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>46. Stairwells, exit doors, and emergency egresses accessible and free of obstructions?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>47. Visible signs indicate location of an eye wash station?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>48. Eyewash station in reliable condition with protective caps in place and eye covers disinfected with 10% bleach?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>49. Eyewash station preventive maintenance and routine checks well documented?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50. Staff knows where the safety showers are?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>51. All wastes and potentially infectious materials disposed of properly according to federal, state, and local regulations?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Topic</td>
<td>Yes</td>
<td>No</td>
<td>N/A</td>
<td>Comments</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>-----</td>
<td>----</td>
<td>-----</td>
<td>----------</td>
</tr>
<tr>
<td>52. All infectious waste discarded in leakproof, “biohazard”-labeled containers with tight-fitting covers before transport?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>53. Light switches and coverplates in place?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>54. Electrical equipment grounded via use of a three-pronged plug or protected by GFCIs, and all receptacles properly wired?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>55. Electrical circuit breakers labeled and panels kept clear within 3 feet to the front?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>56. Unsafe equipment taken out of use or tagged?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>57. Wheeled equipment in good repair?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>58. All trash receptacles fire rated?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>59. Near-miss and incident reports filled out when hazards or events identified?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>60. Employees trained in proper lifting and handling techniques?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>61. Equipment checked for damage or wear and glassware inspected for chips and cracks before each use?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>62. Good housekeeping practices observed in all areas?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>63. Employees know and understand what to do in case of fire?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>64. Employees aware of fire extinguisher location nearest them?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>65. Employees know what to do in case of severe storm warning?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>66. Employees know what to do in case of bomb threat?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>67. Employees know what to do in case of building evacuation?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>68. Employees know what to do if injured?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>69. Employees know location of material safety data sheets (MSDSs)?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>70. Employees understand the OSHA Hazard Communication standard?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Topic</td>
<td>Yes</td>
<td>No</td>
<td>N/A</td>
<td>Comments</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>-----</td>
<td>----</td>
<td>-----</td>
<td>----------</td>
</tr>
<tr>
<td>71. Employees know when and how to use provided personal protective equipment?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>72. Employees know location of exposure control plan?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>73. Employees offered hepatitis B vaccines?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>74. Employees know Safety Officer and Safety Committee Representative?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>75. Employees know hospital emergency numbers?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>76. The no-smoking policy reviewed and posted?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### CHECKLIST 21 Safe Needle Device Preselection Checklist

<table>
<thead>
<tr>
<th>Type of Device ___________________________</th>
<th>Name ______________________________</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufacturer _____________________________</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Clinical Considerations</th>
<th>Does this consideration apply to this device?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>1. Device use requires a change in technique (compared to conventional product)?</td>
<td></td>
</tr>
<tr>
<td>2. Permits needle changes?</td>
<td></td>
</tr>
<tr>
<td>3. Permits reuse of needle on same patient during a procedure (e.g., local anesthesia)?</td>
<td></td>
</tr>
<tr>
<td>4. Allows easy visualization of flashback?</td>
<td></td>
</tr>
<tr>
<td>5. Allows easy visualization of medication?</td>
<td></td>
</tr>
<tr>
<td>6. Other clinical considerations:</td>
<td></td>
</tr>
<tr>
<td>7. Potential for causing harm?</td>
<td></td>
</tr>
<tr>
<td>8. Potential for causing increased pain or discomfort to patients?</td>
<td></td>
</tr>
<tr>
<td>9. Device latex free?</td>
<td></td>
</tr>
<tr>
<td>10. Use device with adult and pediatric populations?</td>
<td></td>
</tr>
<tr>
<td>11. Specialty areas (e.g., OR, anesthesiology, radiology) can use the device?</td>
<td></td>
</tr>
<tr>
<td>12. Can be used for same purposes as the comparable conventional device?</td>
<td></td>
</tr>
<tr>
<td>13. Available in all currently used sizes?</td>
<td></td>
</tr>
<tr>
<td>14. Safety feature does not require activation by user?</td>
<td></td>
</tr>
<tr>
<td>15. Worker’s hands can remain behind sharp during activation of safety feature?</td>
<td></td>
</tr>
<tr>
<td>16. Activation of safety feature can be performed with one hand?</td>
<td></td>
</tr>
<tr>
<td>17. Other safety considerations:</td>
<td></td>
</tr>
<tr>
<td>Comment:</td>
<td></td>
</tr>
<tr>
<td>18. Safety feature in effect during use in patient?</td>
<td></td>
</tr>
<tr>
<td>19. Safety feature permanently isolates sharp?</td>
<td></td>
</tr>
<tr>
<td>20. Safety feature integrated into device?</td>
<td></td>
</tr>
<tr>
<td>21. A visible or audible cue provides evidence of safety feature activation?</td>
<td></td>
</tr>
</tbody>
</table>
### CHECKLIST 21  Safe Needle Device Preselection Checklist (cont.)

<table>
<thead>
<tr>
<th>Clinical Considerations</th>
<th>Does this consideration apply to this device?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>22. Safety feature easy to recognize and intuitive to use?</td>
<td></td>
</tr>
<tr>
<td>23. Other safety issues:</td>
<td></td>
</tr>
<tr>
<td>24. Device available in all sizes currently used in the organization?</td>
<td></td>
</tr>
<tr>
<td>25. Manufacturer can provide device in needed quantities?</td>
<td></td>
</tr>
<tr>
<td>26. Vendor can assist with training?</td>
<td></td>
</tr>
<tr>
<td>27. Product materials available to assist with training?</td>
<td></td>
</tr>
<tr>
<td>28. Vendor will provide free samples for evaluation?</td>
<td></td>
</tr>
<tr>
<td>29. Vendor has a history of being responsive when problems arise?</td>
<td></td>
</tr>
<tr>
<td>30. Will device increase volume of sharps waste?</td>
<td></td>
</tr>
<tr>
<td>31. Will device require changes in size or shape of sharps containers?</td>
<td></td>
</tr>
<tr>
<td>32. Other considerations:</td>
<td></td>
</tr>
<tr>
<td>Topic</td>
<td>Yes</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>-----</td>
</tr>
<tr>
<td>1. Floor surfaces clean and free of cracks and holes?</td>
<td></td>
</tr>
<tr>
<td>2. Hallways and corridors cluttered?</td>
<td></td>
</tr>
<tr>
<td>3. Four-foot-wide clear path maintained?</td>
<td></td>
</tr>
<tr>
<td>4. All carts kept on same side of the hall?</td>
<td></td>
</tr>
<tr>
<td>5. Fire doors unobstructed?</td>
<td></td>
</tr>
<tr>
<td>6. Slipping or tripping hazards eliminated?</td>
<td></td>
</tr>
<tr>
<td>7. Handrails secure?</td>
<td></td>
</tr>
<tr>
<td>8. No-smoking policy posted and enforced?</td>
<td></td>
</tr>
<tr>
<td>9. Current fire plan maps posted?</td>
<td></td>
</tr>
<tr>
<td>10. Grab bars in place?</td>
<td></td>
</tr>
<tr>
<td>11. Safety strips or nonskid surfaces installed in baths?</td>
<td></td>
</tr>
<tr>
<td>12. Tub lifts operable?</td>
<td></td>
</tr>
<tr>
<td>13. Lighting adequate?</td>
<td></td>
</tr>
<tr>
<td>14. Room furnishings safely arranged?</td>
<td></td>
</tr>
<tr>
<td>15. Chemicals kept locked?</td>
<td></td>
</tr>
<tr>
<td>16. Hazardous areas are kept locked?</td>
<td></td>
</tr>
<tr>
<td>17. Warning signs used in hazardous areas?</td>
<td></td>
</tr>
<tr>
<td>18. Employees instructed in fire prevention?</td>
<td></td>
</tr>
<tr>
<td>19. Regulated medical waste storage areas labeled “Biohazard”?</td>
<td></td>
</tr>
<tr>
<td>20. Caution signs posted near microwaves?</td>
<td></td>
</tr>
<tr>
<td>21. Microwaves kept clean?</td>
<td></td>
</tr>
<tr>
<td>22. Eyewash stations inspected weekly?</td>
<td></td>
</tr>
<tr>
<td>23. Fire exits marked and kept clear?</td>
<td></td>
</tr>
<tr>
<td>24. Fire extinguishers accessible and have current inspection tags attached?</td>
<td></td>
</tr>
<tr>
<td>25. Lifting equipment available?</td>
<td></td>
</tr>
<tr>
<td>Topic</td>
<td>Yes</td>
</tr>
<tr>
<td>--------------------------------------------------------</td>
<td>-----</td>
</tr>
<tr>
<td>26. Explosion-proof fixtures installed in designated areas?</td>
<td></td>
</tr>
<tr>
<td>27. Elevators maintained in good repair?</td>
<td></td>
</tr>
<tr>
<td>Topic</td>
<td>Yes</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>-----</td>
</tr>
<tr>
<td>1. Pavement in good repair?</td>
<td></td>
</tr>
<tr>
<td>2. Lighting in parking area adequate?</td>
<td></td>
</tr>
<tr>
<td>3. Parking area free of trash and debris?</td>
<td></td>
</tr>
<tr>
<td>4. Fire and other zones marked “No Parking”?</td>
<td></td>
</tr>
<tr>
<td>5. Handicapped parking marked?</td>
<td></td>
</tr>
<tr>
<td>6. Parking lines clearly marked?</td>
<td></td>
</tr>
<tr>
<td>7. Sidewalks in good repair?</td>
<td></td>
</tr>
<tr>
<td>8. Outside lighting adequate?</td>
<td></td>
</tr>
<tr>
<td>9. Tripping hazards eliminated?</td>
<td></td>
</tr>
<tr>
<td>10. Obstructions eliminated?</td>
<td></td>
</tr>
<tr>
<td>11. Hazardous areas fenced?</td>
<td></td>
</tr>
<tr>
<td>12. Docks cleared of debris and excess storage?</td>
<td></td>
</tr>
<tr>
<td>13. Fire hydrants and fire department connections unobstructed?</td>
<td></td>
</tr>
<tr>
<td>14. Fences, railings, and gates in good repair?</td>
<td></td>
</tr>
<tr>
<td>15. Exterior furniture in good repair?</td>
<td></td>
</tr>
<tr>
<td>16. Grounds properly maintained?</td>
<td></td>
</tr>
<tr>
<td>17. Grounds drain properly?</td>
<td></td>
</tr>
<tr>
<td>18. Appropriate containers for cigarette butts available?</td>
<td></td>
</tr>
<tr>
<td>19. Regulated medical waste areas labeled “Biohazard” and kept locked?</td>
<td></td>
</tr>
<tr>
<td>20. Emergency exit doors and walkways kept clear of snow and other obstructions?</td>
<td></td>
</tr>
<tr>
<td>21. Safe operating procedures established and available for all outside equipment?</td>
<td></td>
</tr>
</tbody>
</table>
### CHECKLIST 24  Long-Term-Care Facility Resident Room Safety

<table>
<thead>
<tr>
<th>Topic</th>
<th>Yes</th>
<th>No</th>
<th>N/A</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. General cleanliness acceptable?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Equipment free of water leaks?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Windows and screens in good repair?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Curtain tracks in good order?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Drapery rods in working order?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Call buttons in working order?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Drawers have stops?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Electrical outlets free of paint and in good working condition?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. All resident-owned electrical equipment inspected?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Drawers and doors closed?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. No extension cords in use?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Pathways clear and unobstructed?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Bed in good repair?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bed wheels locked?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bed cranks returned under bed?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bed rails marked per care plan?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. Bathroom facilities meet requirements?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. Oxygen and infection control safety precautions posted?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>If oxygen is used in the room, signs posted outside the door?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16. Aerosols returned to storage?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17. Room furnishings safely arranged?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18. Electrical cords for radios, televisions, and lights safely placed!</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19. Lighting in all areas adequate?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20. Vases with water not set on televisions or on bed lights?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21. Televisions on secure stands (not on the bed table)?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22. Floors and carpets in good repair, with no broken tiles or loose seams?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### CHECKLIST 24  Long-Term-Care Facility Resident Room Safety (cont.)

<table>
<thead>
<tr>
<th>Topic</th>
<th>Yes</th>
<th>No</th>
<th>N/A</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>23. Walls in good repair?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24. Ceiling tiles in good repair?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25. Proper documentation of fireproofing on wall hangings (quilts, etc.) available?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Topic</td>
<td>Yes</td>
<td>No</td>
<td>N/A</td>
<td>Comments</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>-----</td>
<td>----</td>
<td>-----</td>
<td>----------</td>
</tr>
<tr>
<td>1. Fire extinguishers:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tagged and inspected annually?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Full and free of leaks?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inspected and initialed monthly by maintenance?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unobstructed?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Appropriate rating for the location?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proper number considering the amount of feet between each one?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Sprinkler heads are clean and free of paint, dust, lint, and corrosion?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Alarm pull boxes:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clean and in good repair?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Free from obstruction?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Fire doors:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unobstructed?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Smoke seals installed on them?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. All exit doors open from outside?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. “Exit” signs visible and lighted?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Smoke detectors clean?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Main sprinkler valves unobstructed?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Main sprinkler valve locked open?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. An 18-inch clearance provided between sprinkler heads and any objects?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Doors that can be confused as exits marked “Not an Exit”?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Flammable liquids kept in approved containers?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Escape plan posted?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. Local fire department acquainted with facility?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. Coffee pots turned off and unplugged at night?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### CHECKLIST 25  Long-Term-Care Facility Fire Prevention (cont.)

<table>
<thead>
<tr>
<th>Topic</th>
<th>Yes</th>
<th>No</th>
<th>N/A</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>16. Emergency lighting provided?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17. Proper documentation of fireproofing of all carpets, divider curtains, lounge furniture, etc. available?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Topic</td>
<td>Yes</td>
<td>No</td>
<td>N/A</td>
<td>Comments</td>
</tr>
<tr>
<td>---------------------------------------------------------------------</td>
<td>-----</td>
<td>----</td>
<td>-----</td>
<td>----------</td>
</tr>
<tr>
<td>1. Employees lifting properly?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Work areas clean and orderly?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Aisles and exits kept clear?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. All electrical machines in good repair?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. All electric plugs, switches, outlets, and cords in good repair?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Only three-wire cords or double insulated tools used?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Emergency power generators tested and ready to use?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. A 3-foot clearance maintained around the electrical control panel?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Breakers clean and labeled?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Blanks placed in electrical panels?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Panels labeled appropriately on the outside?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Panel doors kept closed and locked?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Combustible materials stored safely?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. Hazardous materials labeled and safely stored?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. MSDS files available and training completed?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16. Lockout/tagout program in place?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17. GFCI outlets installed within 6 feet of water sources?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18. Gas cylinders kept clear of heat sources (steam pipes, radiators, direct sunlight)?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19. Cleaning rags kept in covered metal receptacle?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20. Filters and ducts clean?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21. Extinguishers inspected, tagged, and charged?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22. Fire extinguishers of proper size and type?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23. Fire alarm systems frequently tested?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24. Fire escapes and exits plainly marked?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25. Employees trained in standard (universal) precautions?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Topic</td>
<td>Yes</td>
<td>No</td>
<td>N/A</td>
<td>Comments</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>-----</td>
<td>----</td>
<td>-----</td>
<td>----------</td>
</tr>
<tr>
<td>26. Response to safety repair requests prompt?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>27. Paint and flammable liquids are stored in storage lockers?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28. Ladders in good repair and properly stored?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>29. Light bulbs the correct size and type for the job?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30. Call-light system monitored and working?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>31. Regular maintenance checks done on all equipment?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>32. Heating system checked regularly?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>33. Doors to boiler and storage rooms locked?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>34. Confined space program in place?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>35. Sidewalks kept free of debris, including snow and ice?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>36. Dangerous branches cut from trees and debris cleared after storms</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>37. Ergonomic issues addressed (repetitive motion, prolonged position)?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>38. Personal protective equipment (e.g., goggles, gloves, aprons) available?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>39. Fall protection in place for roof and cooling tower work?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40. Boiler procedures in place?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Topic</td>
<td>Yes</td>
<td>No</td>
<td>N/A</td>
<td>Comments</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>-----</td>
<td>----</td>
<td>-----</td>
<td>----------</td>
</tr>
<tr>
<td>1. Work areas clean and orderly?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Aisles kept clear?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Equipment is stored properly?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Electric cords out of the way and in good repair?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Area is free of tripping hazards?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. File cabinet drawers closed?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Only one file drawer is opened at a time?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Illumination is adequate?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Chairs adjustable?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Computer areas ergonomically correct with adjustable keyboards and screens, adjustable chairs, glare-free monitors, phones with headsets?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Foot rests available?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Flooring poses no tripping hazard?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Stable stools available when employees need to reach files on high shelves?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. Heavy file boxes stored on low shelves?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. Employees have completed Hazard Communication program and MSDS training?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## CHECKLIST 28 Long-Term-Care Facility Nursing Services

<table>
<thead>
<tr>
<th>Topic</th>
<th>Yes</th>
<th>No</th>
<th>N/A</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Back safety:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employees lifting properly?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employees using gait belts?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employees using back supports?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mechanical lifts used when indicated?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Floor safety:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All floor surfaces free of cracks?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Floors clean and treated with nonslip finishes?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hallways kept clear and carts to one side?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wet-Floor signs used and removed in a timely manner?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spills cleaned up immediately?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Windows:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Windows in good repair?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Drawers and doors closed?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Pathways clear and unobstructed?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Bathrooms safe?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Sharps containers stored and used properly?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Carts well maintained and move easily?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Soiled linens examined for foreign objects before removal to laundry?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Resident food trays safely handled?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Hazardous materials safely stored?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. MSDS files available and training in them completed?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Proper oxygen procedures understood and followed?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. “Oxygen in Use” signs posted?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. Medicine carts kept locked?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16. Employees trained in standard (universal) precautions?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Topic</td>
<td>Yes</td>
<td>No</td>
<td>N/A</td>
<td>Comments</td>
</tr>
<tr>
<td>-------</td>
<td>-----</td>
<td>----</td>
<td>-----</td>
<td>----------</td>
</tr>
<tr>
<td>17. Ergonomic issues addressed (repetitive motion/prolonged position)?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18. Personal protective equipment available?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### CHECKLIST 29  Long-Term-Care Storage and Stairwells

<table>
<thead>
<tr>
<th>Topic</th>
<th>Yes</th>
<th>No</th>
<th>N/A</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Storage:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Storage orderly, items stacked neatly?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cylinders chained or secured in racks?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Storage area illuminated well?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Storage area ventilated (vented to the outside)?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cylinders capped when not in use or in transport?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Transportation cart:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Good working order?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Has round rubber wheels?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Straps in good condition?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Electric fixtures fireproof?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. No more than 2000 ft³ stored in any area not specifically designed for storage?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Rooms properly identified with appropriate signs (e.g., “No Smoking,” “No Oil/No Grease,” “No Combustibles Storage”)?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Outside door of storage area labeled “Oxygen Storage,” if appropriate?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Sprinklers, fire alarms, and extinguishers unobstructed?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. An 18-inch clearance from sprinkler heads maintained?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Area clear of prohibited items (combustibles)?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Heavy objects below eye level?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Storage areas uncluttered?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Overhead items secure?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. Aisles clear?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. Items not stored on floor?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16. Door closer operable?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17. Doors open properly?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18. Chemical storage areas locked?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19. All exits visible, marked, and unobstructed?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Topic</td>
<td>Yes</td>
<td>No</td>
<td>N/A</td>
<td>Comments</td>
</tr>
<tr>
<td>-------</td>
<td>-----</td>
<td>----</td>
<td>-----</td>
<td>----------</td>
</tr>
<tr>
<td>20. No combustible material is stored under stairs?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21. Nonslip treads installed?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22. Treads in good repair?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23. Handrails tight and in good repair?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24. Stairwell area is free of obstruction?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25. Stairwell area is clean?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>26. Sturdy rails installed on all open sides?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>27. Treads at least 22 inches wide?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28. Stair-tower has a proper sprinkling system?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**CHECKLIST 30  Long-Term-Care Facility Therapy Department**

<table>
<thead>
<tr>
<th>Topic</th>
<th>Yes</th>
<th>No</th>
<th>N/A</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Extension cords properly used?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Electrical outlets, switches, and cords in good repair, grounded, or double insulated?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Hydrocollators set at 159 to 174°F?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. All equipment is in proper working order?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Equipment is properly secured (e.g., parallel bars, grab bars, and wall rails; fold-down mat tables and wall pulleys)?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Power cords do not obstruct walkways?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Equipment is stored properly when not in use?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Hazardous chemicals stored properly and MSDS training completed?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Items not currently used stored properly?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Electrical equipment is safety tagged by maintenance?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Floor surfaces kept dry?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Aisles adequate for staff and equipment movement?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Sprinklers, fire alarms, and extinguishers unobstructed?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. Proper body mechanics utilized?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. Employees trained in fire safety?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16. Nonslip shoes worn?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17. All exits visible, marked, and unobstructed?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18. Automatic fire doors free of obstacles?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Topic</td>
<td>Yes</td>
<td>No</td>
<td>N/A</td>
<td>Comments</td>
</tr>
<tr>
<td>-------</td>
<td>-----</td>
<td>----</td>
<td>-----</td>
<td>----------</td>
</tr>
<tr>
<td>1. Floor surfaces clean and free of cracks and holes?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Floors kept dry and spills cleaned up immediately?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Equipment is free of water leaks?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Employees perform proper lifting?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Employees using safe working practices?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Electric cords safely placed?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Electrical outlets, switches, and cords in good condition?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Rooms free of electrical appliances?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Extension cords used?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Carts well maintained and move easily?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Rooms free of glass items?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Hazardous materials safely stored and MSDS training completed?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Lighting is adequate?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. Room furnishings safely arranged?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. Sharp tools handled and stored safely?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16. Helium tanks properly secured?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17. Residents do not have lighters and matches?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18. Employees instructed in fire prevention?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19. Routine testing of resident security systems is conducted?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20. Fire exits marked and kept clear?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21. Fire extinguishers readily accessible and have current inspection tags?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Topic</td>
<td>Yes</td>
<td>No</td>
<td>N/A</td>
<td>Comments</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>-----</td>
<td>----</td>
<td>-----</td>
<td>----------</td>
</tr>
<tr>
<td>1. General cleanliness is acceptable?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Equipment is free of water leaks?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Floors free of cracks and holes?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Clean linens kept in a closed, dustproof cabinet?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Soiled linens kept in closed receptacles?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Scissors and razors safely stored?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Current operator’s license is displayed?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Lighting in work area is sufficient?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Extension cords used?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Electrical outlets, switches, and cords in good repair?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Electrical appliances (hair dryers, curling irons, etc.) have current safety inspection stickers visible?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Ventilation is adequate?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Employees trained in fire safety?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. Supply of combs, brushes, and implements is sufficient to allow for adequate disinfecting practices?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. Appropriate wet sanitizer is used for disinfecting practices?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16. After cleaning and disinfecting, articles stored in clean, closed cabinets?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17. MSDSs available for required products and training completed?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18. Electrical outlets within 6 feet of water sources GFCI protected?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19. Ergonomic issues addressed (repetitive motion/prolonged position)?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Topic</td>
<td>Yes</td>
<td>No</td>
<td>N/A</td>
<td>Comments</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>-----</td>
<td>----</td>
<td>-----</td>
<td>----------</td>
</tr>
<tr>
<td>1. Floor surfaces clean and free of cracks and holes?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Floors kept dry?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Wet-floor signs posted in wet areas, or nonskid surfaces installed in wet areas (e.g., dish room)?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Equipment is free of water leaks?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Nonslip shoes worn?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Aisles clear for employees and material movement?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Bulk storage area clean and organized?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Electrical outlets, switches, and cords in good condition?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Electrical motors dirt free and well ventilated?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Extension cords used?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Lockout/tagouts used when cleaning energized equipment?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Electrical equipment is grounded?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Electrical outlets within 6 feet of water sources GFCI protected?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. All machines guarded and secure?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. Slicers, cutters, and processors guarded?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16. Sharp tools handled and stored safely?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17. Kitchen equipment is clean?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18. Lighting sufficient in all work and storage areas?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19. Steamtables, kettles, and pressure cookers in good repair?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20. Refrigerator equipment is on a regular maintenance schedule?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21. Emergency releases to open freezers from the inside functioning?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22. Worktables substantial and of sufficient size?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23. Hoods, filters, and vent ducts cleaned on a regular schedule?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Topic</td>
<td>Yes</td>
<td>No</td>
<td>N/A</td>
<td>Comments</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>-----</td>
<td>----</td>
<td>-----</td>
<td>----------</td>
</tr>
<tr>
<td>Exhaust fans, screens, and windows kept clean and lint free?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knives sharpened regularly and stored in drawers?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fire exits marked and kept clean?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employees properly trained in the use of fire blankets and fire extinguishers?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fire extinguishers accessible and have current inspection tags?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Range hood automatic fire extinguisher is inspected regularly?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MSDS files available and training completed?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Utensils easily accessible?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Protective covers in place over garbage disposals?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Personal protective equipment is available?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## CHECKLIST 34  Long-Term-Care Facility Housekeeping and Laundry

<table>
<thead>
<tr>
<th>Topic</th>
<th>Yes</th>
<th>No</th>
<th>N/A</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Employees:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Have been instructed in proper lifting procedures?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Have safe work habits?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perform daily stretching exercises?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Floors:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spills wiped up immediately?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wet-floor signs used and removed in a timely manner?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>An accessible dry passage is maintained when mopping?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All floor surfaces clean and free of cracks?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Fire safety:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Waste is kept in nonflammable containers?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cleaning rags kept in covered metal container?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Paper and other combustible materials disposed of promptly?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ashtrays emptied into containers with only nonflammable materials?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Equipment safety:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Buckets and tubs in good repair?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vacuum cleaners, buffers, and scrubbers in good repair?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ladders and stools solid and equipped with safety feet?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tools and carts placed to prevent interference?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carts locked when in resident areas?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cart keys controlled?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carts roll freely?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Appropriate tools for the job available?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Personal protective equipment:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Safety glasses or goggles provided?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Topic</td>
<td>Yes</td>
<td>No</td>
<td>N/A</td>
<td>Comments</td>
</tr>
<tr>
<td>-------</td>
<td>-----</td>
<td>----</td>
<td>-----</td>
<td>----------</td>
</tr>
<tr>
<td>Gloves provided?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bloodborne pathogens kit available?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Protective gear for corrosives is available?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hearing protection is available, where needed?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quick water flush facilities available for employees exposed to corrosive materials?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MSDSs available for all hazardous chemicals and training competed?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hazardous chemicals labeled and safely stored?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electrical safety:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electrical tools properly grounded?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electrical cords, extensions, and plugs in good repair?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employees lifting properly?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Windows in good repair?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equipment free of water leaks?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pathways clear and unobstructed?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drains and vents clean and lint free?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dryer tops and sprinkler heads lint free?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dryer filters clean?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carts maintained and move easily?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Laundry carts equipped with raising bottoms?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Soiled linens examined for foreign objects before removal to laundry?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sharps containers available and used properly?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Area is clean and free of clutter?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hazardous materials labeled and safely stored?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MSDS files available and employees have completed training?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ventilation is adequate?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No doors blocked?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Topic</td>
<td>Yes</td>
<td>No</td>
<td>N/A</td>
<td>Comments</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>-----</td>
<td>----</td>
<td>-----</td>
<td>-------------------</td>
</tr>
<tr>
<td>26. Doors operable, with positive latches?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>27. Gloves and gowns available and worn when sorting dirt linens?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28. Employees trained in standard (universal) precautions?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>29. Washers and dryers inoperable when doors are open?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30. Equipment guards in place?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>31. Dry chemical extinguishers present?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>32. Eye washes available?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>33. Cords and plugs free of damage and in good working condition?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>34. Power equipment is in good repair?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>35. Outlets installed within 6 feet of water sources GFCI protected?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>36. Three-prong grounded plugs on all equipment?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>37. Regular maintenance checks performed on all equipment?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>38. Adequate lighting is available?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>39. Benches for linen folding of an appropriate work height?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40. Ergonomic issues addressed (repetitive motion/prolonged position)?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>41. Linen carts kept covered while being transported?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>42. Personal protective equipment (e.g., goggles, gloves) is available?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Chapter 14

AGENCY LISTINGS

ALPHABETICAL LISTING

Agency for Health Care Policy and Research
2101 East Jefferson Street, Suite 600, Rockville, MD 20852

Agency for Healthcare Research and Quality and Center for Quality Improvement and Patient Safety
6011 Executive Blvd., Suite 200, Rockville, MD 20852
(301) 594-1783; www.ahrq.gov

Agency for Toxic Substances and Disease Registry and National Center for Environmental Health
(404) 498-0110, fax: 404-498-0093, toll-free: (888) 422-8737

American Board of Medical Specialties
1007 Church Street, Suite 404, Evanston, IL 60201-5913
(866) ASK-ABMS, (847) 491-909; www.abms.org

American Chemical Society (ACS)
1155 Sixteenth St. NW, Washington, D.C. 20036
(202) 872-4600; (800) 227-5558

American Conference of Governmental Industrial Hygienists (ACGIH)
1330 Kemper Meadow Drive, Cincinnati, OH 45240
(513) 742-2020

American Health Care Association
1201 L Street, NW, Washington, D.C. 20005
(202) 842-4444

American Health Information Management Association
919 North Michigan Avenue, Suite 1400, Chicago, IL 60611
(312) 787-2672, www.ahima.org

American Hospital Association
One North Franklin Street, Chicago, IL 60606
(312) 422-3000, fax: (312) 422-4796
325 Seventh Street, NW, Washington, D.C. 20004
(202) 638-1100, fax: (202) 626-2345, toll-free: (800) 424-4301

American Industrial Hygiene Association (AIHA)
2700 Prosperity Avenue, Suite 250, Fairfax, VA 22031
(703) 849-8888; fax: (703) 207-3561

American Medical Association
515 N. State Street, Chicago, IL 60610
(312) 464-5000, toll-free: (800) 621-8335; www.ama-assn.org

American National Standards Institute
11 W 42nd Street, New York, NY 10036
(212) 642-4900
American Nurses Association
600 Maryland Avenue SW, Suite 100 West, Washington, D.C. 20024
(202) 651-7000, (202) 651-7001, fax: (800) 274-4ANA (4262)

American Organization of Nurse Executives (AONE)
Liberty Place, 325 Seventh Street, NW Washington, D.C. 20004
(202) 626-2240, fax: (202) 638-5499

American Society for Healthcare Engineering (ASHE)
One North Franklin Street, Chicago, IL 60606
(312) 422-3800, fax: (312) 422-4571, e-mail: ashe@aha.org

American Society for Healthcare Environmental Services (ASHES)
One North Franklin Street, Chicago, IL 60606
(312) 422-3860, fax: (312) 422-4578

American Society for Healthcare Risk Management (ASHRM)
One North Franklin Street, Chicago, IL 60606
(312) 422-3980, fax: (312) 422-4580, e-mail: ashrm@aha.org

American Society for Testing and Materials (ASTM)
100 Barr Harbor Drive, West Conshohocken, PA 19428
(610) 832-9500

American Society of Heating, Refrigerating, and Air Conditioning Engineering (ASHRAE)
1791 Tullie Circle, N.E, Atlanta, GA 30329
(404) 636-8400, fax: (404) 321-5478, toll-free for customer service:
(800) 527-4723 (U.S. and Canada only)

American Society of Safety Engineers (ASSE)
1800 E. Oakton Street, Des Plaines, IL 60018
(847) 699-2929

Association for Professionals in Infection Control and Epidemiology (APIC)
1275 K Street, NW, Suite 1000, Washington, D.C. 20005-4006
(202) 789-1890, fax: (202) 789-1899, e-mail: APICinfo@apic.org

Association of American Medical Colleges
2450 N Street, NW, Washington, D.C. 20037-1126
(202) 828-0400, fax (202) 828-1125; www.aamc.org

Association of Healthcare Resour ces and Materials Management
One North Franklin Street, Chicago, IL 60606
(312) 422-3840, fax: (312) 422-4573, e-mail: ahrmm@aha.org

Centers for Disease Control (CDC)
1600 Clifton Road NE, Atlanta, GA 30333
(404) 639-3535

Centers for Medicare and Medicaid Services (CMS)
www.hcfa.gov

Chemical Manufacturers Association (CMA)
1300 Wilson Blvd, Arlington, VA 22209
(703) 741-5000

CHEM-TEL (24-Hour Emergency Information Services)
(800) 255-3924

CHEMTREC
(800) 262-8200 (nonemergency chemical information)

Compressed Gas Association (CGA)
1725 Jefferson Davis Hwy, Suite 1004, Arlington, VA 22202-4102
(703) 412-0900

Consumer Product Safety Commission Hotline
(800) 638-2772 or (800) 638-CPSC
Department of Defense (DOD)
Armed Forces Institute of Pathology, Patient Safety Center
1335 East West Highway, Suite 6-100, Silver Spring, MD 20910-9813

Department of Energy (DOE)
1000 Independence Avenue SW, Washington, D.C. 20585
(202) 586-5000

Department of Health and Human Services (HHS)
200 Independence Avenue, SW, Washington, D.C. 20201
(202) 619 0257; www.os.dhhs.gov/

Department of Transportation (DOT)
400 7th Street SW, Washington, D.C. 20590
(202) 366-4488

Emergency Care Research Institute (ECRI)
5200 Butler Pike, Plymouth Meeting, PA 19462-1298
(610) 825-6000; www.ecri.org, www.mdsr.ecri.org (medical device safety reports)

Environmental Protection Agency (EPA)
401 M Street SW, Washington, D.C. 20460
(202) 260-2090; EPA hotline: (800) 621-8431; RCRA, Superfund, Hazardous Waste hotline, Office of Solid Waste and Emergency Response: (800) 424-9346; Emergency Planning Community Right-to-Know hotline (CERCLA, SARA, Title III): (800) 535-0202; Toxic Substances Control Act hotline: (202) 554-1404

Factory Mutual (FM)
1151 Boston-Providence Turnpike, Norwood, MA 02062
(617) 762-4300

Food and Drug Administration
5600 Fishers Lane, Rockville, MD 20857-0001
(301) 443-1544; Center for Drug Evaluation and Research: 888-INFO-FDA (1-888-463-6332); www.fda.gov/cder/drug/MedErrors/default.htm (medication errors); www.accessdata.fda.gov/scripts/cdrh/cfdocs-psn/index.cfm (patient safety news)

Health Care Financing Administration
7500 Security Boulevard, Baltimore, MD 21244
(410) 786-300; www.hcfa.gov

Health Care Without Harm
1755 S Street, NW, Suite 6B, Washington, D.C. 20009
fax: (202) 234-9121

Health Physics Society
1315 Dolley Madison Boulevard, Suite 402, McLean, VA 22101
(703) 790-1745, fax: (703) 790-2672, e-mail: hps@BurkInc.com

Health Resources and Services Administration
5600 Fishers Lane, Parklawn Building, Room 14-45, Rockville, MD 20857
(301) 443-3376

Hospitals for a Healthy Environment
P.O. Box 53315, Washington, D.C. 20009
(800) 727-4179, fax: (866) 379-9705

Human Factors and Ergonomics Society
P.O. Box 1369, Santa Monica, CA 90406
(310) 394-1811, fax: (310) 394-2410; www.hfes.org

Institute for Healthcare Improvement
375 Longwood Ave., 4th Floor, Boston, MA 02215
(617) 754-4800; www.ihi.org

Institute for Safe Medication Practices (ISMP)
www.ismp.org

FEMA
500 C Street, SW, Washington, D.C. 20472
(202) 566-1600
Institute of Medicine
2101 Constitution Avenue NW, Washington, D.C. 20418
www.iom.edu; www.iom.edu/IOM/IOMHome.nsf/Pages/Quality+Initiative (patient safety)

International Association for Healthcare Security and Safety (IAHSS)
www.iahss.org

Joint Commission on Accreditation of Healthcare Organizations (JCAHO)
1 Renaissance Boulevard, Oakbrook Terrace, IL 60181
(708) 916-5600; www.jcaho.org

Leapfrog Group
1801 K Street NW, Suite 701-L, Washington, D.C. 20006
(202) 292-6713; www.leapfroggroup.org/safety.htm

National Association for Healthcare Quality (NAHQ)
4700 W. Lake Avenue, Glenview, IL 60025
(847) 375-4720, info@nahq.org

National Coalition on Healthcare
1200 G Street NW, Suite 750, Washington, D.C. 20005
(202) 638-7151; www.nchc.org

National Council on Radiation Protection and Measurements
7910 Woodmont Avenue, Suite 400, Bethesda, MD 20814-3095
(301) 657-2652, fax: (301) 907-8768; www.ncrp.com

National Fire Protection Association
1 Batterymarch Park, P.O. Box 9101, Quincy, MA 02269
(617) 770-3000

National Institute for Occupational Safety and Health (NIOSH)
4676 Columbia Parkway, Cincinnati, OH 45226
(513) 533-8236, toll-free: (800) 356-4674

National Institutes of Health
9000 Rockville Pike, Bethesda, MD 20892
(301) 496-4000; TTY: (301) 402-9612; www.nih.gov/health

National Library of Medicine
8600 Rockville Pike, Bethesda, MD 20894
(301) 496-6308; www.nlm.nih.gov/

National Oceanic and Atmospheric Administration (NOAA)
14th Street and Constitution Avenue NW, Room 6217, Washington, D.C. 20230
(202) 482-6090, fax: (202) 482-3154

National Patient Safety Foundation
8405 Greensboro Drive, Suite 800, McLean, VA 22102-5120
(703) 506-5280; www.npsf.org

National Quality Forum
601 Thirteenth Street NW, Suite 500 North, Washington, D.C. 20005
(202) 783-1300; www.qualityforum.org

Nuclear Regulatory Commission (NRC)
(301) 492-7000 (regulatory questions), (301) 492-7333 (publications)

National Response Center/Coast Guard Command
(800) 424-8802 (report spills, chemical releases, radiological incidents)

National Safety Council (NSC)
1121 Spring Lake Drive; Itasca, IL 60143-3201
(800) 621-7615; http://nsc.org

National Sanitation Foundation International
P.O. Box 130140, 789 N. Dixboro Road, Ann Arbor, MI 48113-0140
(734) 769-8010, fax: (734) 769-0109, toll-free: (800) NSF-MARK; www.nsf.org
Agency Listings

Occupational Safety and Health Administration (OSHA)
200 Constitution Ave. NW, Room 3647, Washington, D.C. 20210
(202) 219-8148, hotline: (800) 321-6742 (24-hour access line to report unsafe work practices)

Patient Safety Institute
555 Republic Drive, Suite 200, Plano, TX 75074
(972) 444-9800; www.ptsafety.org

Public Law Update Service
(202) 523-6641 (information on recent bills signed or vetoed by the President)

Safety Equipment Institute
1901 N. Moore Street, Suite 808, Arlington, VA 22209
(703) 525-3354

Superintendent of Documents
(202) 512-2457

Underwriters Laboratories
333 Pfingsten Road, Northbrook, IL 60062
(847) 272-8800

U.S. Fire Administration
16825 S. Seton Ave., Emmitsburg, MD 21727
(301) 447-1000, fax: (301) 447-1346, (301) 447-1441 (admissions)

Veteran’s Administration (V A)
National Center for Patient Safety, 24 Frank Lloyd Wright Drive, Lobby M, P.O. Box 486, Ann Arbor, MI 48106-0486
(734) 930-5890; www.patientsafety.gov

WEBSITE QUICK REFERENCE

Agency for Health Care Policy and Research
http://www.ahcpr.gov

American Board of Industrial Hygiene
http://www.abih.org

American Chemical Society
http://www.acs.org

American College of Health Care Administrators (ACHCA)
(long-term care)
http://www.achca.org

American College of Healthcare Executives (ACHE)
http://www.ache.org

American Conference of Governmental Industrial Hygienists
http://www.acgih.org

Air Force Safety Center
http://www.afsc.saia.af.mil

American Association of Homes and Services for the Aging (AAHSA)
http://www.aahsa.org

American Association of Integrated Healthcare Delivery Systems (AAIHDS)
http://www.aaihds.org

American Association of Poison Control Centers (AAPCC)
http://www.aapcc.org
American Health Care Association (AHCA)  
(nursing homes/long-term care)  
http://www.ahca.org

American Industrial Hygiene Association  
http://www.aiha.org

American Institute of Architects (AIA)  
Academy of Architecture for Health (AAH)  
(800) 242-3837; http://www.aia.org/pia/gateway/PIA_Home_Pages/aah_default

American Medical Association (AMA)  
http://www.ama-assn.org

American National Standards Institute  
http://www.ansi.org

American Nurses Association (ANA)  
http://www.ana.org

American Osteopathic Association (AOA)  
http://www.am-osteo-assn.org

American Osteopathic Healthcare Association (AOHA)  
http://www.aoha.org

American Public Health Association (APHA)  
http://www.apha.org

American Society for Healthcare Environmental Services  
http://www.ashes.org

American Society for Healthcare Risk Management  
http://www.ashrm.org

American Society of Health System Pharmacists (ASHP)  
http://www.ashp.com

American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE)  
http://www.ashrae.org

American Society of Safety Engineers (ASSE)  
http://www.asse.org

American Society of Safety Engineers/Healthcare Division (ASSE)  
http://www.gegoux.com/asse.html

American Subacute Care Association (ASCA)  
http://members.aol.com/ascamail/index.htm

Army MEDCOM Quality Management Office  

Army MEDCOM Safety  

Army Medical Department  

Army Safety Program  
http://safety.army.mil/

ASHP Compounding Resource Center  
(http://www.ashp.org/SterileCPD/)

Association for Health Services Research (AHSR)  
http://www.ahsr.org

Association for Professionals in Infection Control and Epidemiology (APIC)  
http://www.apic.org
Association of American Medical Colleges (AAMC)  
http://www.aamc.org

Bureau of Labor Statistics  
(includes price indexes)  
http://stats.bls.gov

Bureau of the Census  
http://www.census.gov

California Medical Services Authority, Disaster Medical Services Division  

Canadian Centre for Occupational Health and Safety (CCOHS), The  
http://www.ccohs.org

Canadian College of Health Service Executives (CCHSE)  
http://highlander.cbnet.ns.ca/cbnet/healthca/cchse/index.html

Case Management Society of America (CMSA)  
http://www.cmsaonline.com

Catholic Health Association of the United States  
http://www.chausa.org

Center for Health Design  
http://www.healthdesign.org

Centers for Disease Control and Prevention (CDC)  
1600 Clifton Road, N.E., Atlanta, GA 30333  
(404) 639-3534, (800) 311-3435; http://www.cdc.gov

Clinical Laboratory Management Association (CLMA)  
http://www.clma.org

Coalition for Healthier Cities and Communities  
http://www.healthycities.org

College of Healthcare Information Management Executives (CHIME)  
http://www.chime-net.org

Commission on Accreditation of Rehabilitation Facilities (CARF)  
http://www.carf.org

Compressed Gas Association (CGA)  
http://www.cganet.com/

Consumer Product Safety Commission  
http://www.cpsc.gov

Defense Environmental Network and Information Exchange  
http://www.denix.osd.mil/

Department of Health and Human Services  
http://www.os.dhhs.gov

http://www.fema.gov/nims

Department of Transportation Office of Hazardous Materials Safety  
http://hazmat.dot.gov/

Department of Veterans Affairs  
http://www.va.gov

Disaster Resource Guide  
http://www.disaster-resource.com

ECRI (formerly the Emergency Care Research Institute)  
http://www.ecri.org

Environmental Protection Agency (EPA)  
http://www.epa.gov/

FDA Patient Safety News  
http://www.accessdata.fda.gov/scripts/cdrh/cfdocs/psn/index.cfm
Federal Emergency Management Agency (FEMA)
http://www.fema.gov/

FedStats
http://www.fedstats.gov

Fire Prevention, Medical Equipment and Utilities, American College of Clinical Engineering
http://www.accenet.org

Food and Drug Administration (FDA)
http://www.fda.gov/

Government Printing Office
http://www.access.gpo.gov

H2E
http://www.h2e-online.org/index.asp

Hazard, Education, and Safety Per for mance Institute,
A Division of TLC Services, Inc.
http://certsafeforw.com

HAZMAT for Healthcare
http://www.hazmatforhealthcare.org/about_the_task_force.htm

HC Inform ation Resour ces Inc.
http://hcinfo.com

Healthcare and Resour ce Management Society (HCRMS)
http://www.hcrms.com

Health Resour ces and Services Administration
http://www.hrsa.dhhs.gov

Healthcare Engineering News
http://www.healthcareengineering.net/

Healthcare Financial Management Association (HFMA)
http://www.hfma.org

Healthcare Information and Management Systems Society (HIMSS)
http://www.himss.org

Healthcare Safety Institute
http://www.hcsinstitute.com

Howard Hughes Medical Institute
http://www.hhmi.org

Industrial Hygiene and Safety Resource
http://www.safetyonline.com/content/homepage/

Industrial Hygiene Resource Pages
http://freeweb.pdq.net/ennis/ih/

International Association for Healthcare Security and Safety (IAHHS)
http://www.iahss.org

International Executive Housekeepers Association (IEHA)
http://www.ieha.org

Joint Commission on Accreditation of Healthcare Organizations (JCAHO)
http://www.jcaho.org

Medical Group Management Association (MGMA)
http://www.mgma.com

National Association for Healthcare Quality (NAHQ)
http://www.nahq.org

National Association for Home Care (NAHC)
http://www.nahc.org

National Center for Health Statistics
http://www.cdc.gov/nchs/www/nchshome.htm

National Commission on Correctional Health Care (NCCHC)

National Center for Missing and Exploited Children
http://www.missingkids.org
Agency Listings

National Committee for Quality Assurance (NCQA)
http://www.ncqa.org

National Council for Community Behavioral Healthcare (NCCBH)
http://www.nccbh.org

National Fire Protection Association (NFPA)
http://www.nfpa.org

National Health Information Center
http://www.nhic-nt.health.org

National Hospice Organization (NHO)
http://www.nho.org

National Institute for Occupational Safety and Health (NIOSH)
http://www.cdc.gov/niosh/homepage.html

National Institutes of Health
http://www.nih.gov

National League for Nursing (NLN)
http://www.nln.org

National Library of Medicine

National Medical Association (NMA)
http://www.nma.org

National Rural Health Association (NRHA)
http://www.nrharural.org

National Safety Council
http://www.nsc.org

National Safety Management Society
http://www.safetyhealthmanager.org

National Society for Healthcare Food Service Management (NSHFSM)
http://www.nshfsm.org

Naval Safety Center
http://www.safetycenter.navy.mil

Occupational Hazards (resource for safety, health and industrial hygiene)
http://www.occupationalhazards.com/

Occupational Safety and Health Administration (OSHA)
http://www.osha.gov/

Public Health Foundation
http://www.phf.org

Safety Info.com
http://www.safetyinfo.com/

Substance Abuse and Mental Health Services Administration (SAMHSA)
http://www.samhsa.gov

University of Virginia Health Care Worker Safety Center
http://www.med.virginia.edu/medcntr/centers/epinet/home.html

U.S. Environmental Protection Agency
http://www.epa.gov

U.S. House of Representatives
http://www.house.gov

U.S. Senate
http://www.senate.gov

Vermont Safety Information Service
http://www.hazard.com/

White House
http://www.whitehouse.gov

World Health Organization
http://www.who.ch

WWW.IndustrialHygiene.Com
http://www.industrialhygiene.com
SELECTED DISASTER RESOURCE INFORMATION

• AHA Disaster Readiness (http://www.hospitalconnect.com/aha) — This website provides information on a variety of topics concerned with disaster readiness, including hospital readiness, response, and recovery; resources for healthcare professionals; education and training opportunities; contact information and links to readiness resources; and many other valuable resources.

• Noble Training Center (http://ndms.dhhs.gov/CT_Program/Noble_Training_Center/noble_training_center.html) — The U.S. Public Health Service Noble Training Center in Ft. McClellan, AL, is the only hospital facility in the United States devoted entirely to medical training for weapons of mass destruction. The hospital provider course provides instruction to healthcare personnel in protecting themselves from the effects of weapons of mass destruction; instruction in techniques and methods to protect the hospital physical plant; and instruction in the current, medically acceptable treatment for injuries and illnesses from nuclear, biological, chemical, radiation, or high-yield explosives.

• FEMA Emergency Response to Terrorism Self-Study (http://www.usfa.fema.gov/dhtml/fire-service/nfa-off3ss2.cfm) — This course is self-paced and is designed to provide the basic awareness training to prepare first responders to address incidents of terrorism safely and effectively.

• Johns Hopkins Center for Civilian Bio-Defense Studies (www.hopkins-biodefense.org) — The Center was established to foster the development of national and international medical and public health policies and structures to protect the civilian population from bioterrorism. The Center's principal focus is on those bioweapons that have the potential to cause catastrophic, potentially destabilizing epidemics. This website includes examinations of strategic policy and practical operational issues associated with medical and public health implications of bioterrorist threats, news and current debate sections, and links to many resources on bioterrorism.

• Association for State and Territorial Health Officials (www.astho.org) — This website provides links to every state's public health websites.

• Centers for Disease Control and Prevention (www.cdc.gov)

• Public Health Emergency Preparedness and Response (www.bt.cdc.gov)

• Morbidity and Mortality Weekly Report (www.cdc.gov/mmwr)

• Agency for Toxic Substances and Disease Registry (http://atsdr1.atsdr.cdc.gov)

• Federal Emergency Management Agency (www.fema.gov)

• Office of Emergency Preparedness (http://oep-ndms.dhhs.gov)

• Department of Homeland Security (http://www.whitehouse.gov/homeland)

• Department of Justice, Office of Domestic Preparedness (http://www.ojp.usdoj.gov/odp)

• U.S. Army Medical Research Institute of Infectious Diseases (http://www.usamriid.army.mil/general/index.html)
ACGIH, Guidelines for the Selection of Chemical Protective Clothing, American Conference of Governmental Industrial Hygienists, Cincinnati, OH, 1987.


CDC, Prevention Guidelines Database (online compendium of all CDC official guidelines and recommendations), Centers for Disease Control and Prevention, U.S. Department of Health and Human Services, Atlanta, GA, 2004.


OSHA, *Multi-Employer Citation Policy*, CPL 2-0.124, Occupational Safety and Health Administration, U.S. Department of Labor, Washington, D.C., 1999.


Romano, M., Back breaks, *Contemporary Long-Term Care*, February, 45–51, 1996.


INDEX

A
abrasive wheels, 219
absorbent materials, types of, 321
absorption, of hazardous materials, 280, 302, 304
accidents, 59–68
documentation of, 64
human behavior, and, 25
investigation of, 18, 62, 63
focus of, 63
formal, 63
reports, 65–66
sample process, 64
management, and, 16, 51
minimizing, 15
motivational causes of, 63
myths associated with, 60
operational causes of, 63
organizations factors, and, 63
preventing, 55
principles of, 62
signs for, 221–222
reports, 18, 20
site, 64
reporting, 61
risk management, and, 31
transportation, 148, 163–164
accountability, 368
accreditation
American Osteopathic Association, 6, 133
Canadian Council on Health Services, 7
CAP, 10
CARF, 8–9
CLIA, 133
JCAHO, 4, 6, 10, 52, 133, 371, 393
acetone, 300, 301
ACGIH, see American Conference of Governmental Industrial Hygienists
acryl amide, 300
acrylic substances, 299–300
activities of daily living, 430
additive formula, 277, 280
adhesives, 308
adjustable-height beds, 376
administrative controls, 60, 71, 314, 422, 427–428, 431
Administrative Procedure Act, 95
adult daycare accreditation, 9
adult education, 91–92
adverse events, 370, 371, 373, 496
adverse outcomes, anticipating, 8
Advisory Committee on Immunization Practices (ACIP), 331, 352
aerosol-delivered drugs, 402–403, 410, 492–493
affected employees, lockout/tagout, 231
Agency for Healthcare Research and Quality (AHRQ), 124–125
Agency for Toxic Substances and Disease Registry (ATSDR), 123, 126, 157
hazardous material incident guidelines, 158
agreement states, 462
AHA, see American Hospital Association
AHCA, see American Health Care Association
airborne exposure, 279
airborne precautions, 328
air changes per hour, 254
air compressors, 220
Air Conditioning and Refrigeration Institute, 251
air-conditioning maintenance, 250–252
Aspergillus, 353–354
assessment, 36–37
assigned protection factors (APFs), 81
assisted-living standards manual, CARF, 9
Association for Professionals in Infection
Control and Epidemiology (APIC), 327
Association of Occupational Health
Professionals (AOHP), 12–13
Association of periOperative Registered
Nurses (AORN), 419–420
asthma, 296, 353
ASTM, see American Society for Testing and
Materials
atropine, 173
ATSDR, see Agency for Toxic Substances
and Disease Registry
attendants, confined space, 235
attitude, defined, 25
audiogram, 241
audiometric test, 241
autoclave, 479
automatic sprinkler systems, 180, 181, 188,
196, 197
awkward positions, 203, 401, 427, 429, 431,
445, 485, 498, 499

B
Bacillus anthracis, 354
back injuries, 70, 408, 423, 424, 425, 427,
429, 430, 431, 484
back pain, 208–209
back pressure, plumbing, 247
back safety, 499
bacteria, 330–331, 347, 440, 441, 442, 452,
483
foodborne, 453–454
barricades, 270
batteries, 265, 319, 320
beards, respirators and, 78
bed alarm, 376, 379
bed safety, 375–380
bed height, 376
headboards, 376
mattresses, 177, 376
rail safety guidelines, 377
behavior
abusive, documenting, 392
combative, 390
correction of unsafe, 27
defined, 25
human, 25–27, 374
long-term-care residents, 390–392
modification, 387
promoting safe, 27
belief, defined, 25
benzene, 99, 156, 301, 419
in laser smoke, 421
best management practices
radioactive waste, 469
regulated medical waste, 361
beta particles, 459
biocides, 262, 263
biological agents, 166–167
biological hazard control, 325–366
biological products, regulation of, 118
biological safety cabinets, see biosafety
cabinets
biological waste management, 359–363
biosafety cabinets (BSCs), 68, 69, 310, 351,
473, 475, 489, 490, 491
classifications of, 352–353
biosafety levels, 351–353
bioterrorism, 165–166
birth announcements, 399, 400
bites, 248
bitrex solution aerosol qualitative test, 81
blame, 15, 60, 61, 62, 65
bleach, 262, 294, 356, 442–446
blister agents, 167
blizzard, see winter storms
blood, 360, 442, 444
blood agents, 167
bloodborne exposure control plan, 35
bloodborne pathogens, 34, 98, 99, 101, 106,
123, 401–402, 407, 410, 412, 444,
445, 467, 472–473, 474, 480,
481–482
as training topic, 89
specialized training in, 92
Bloodborne Pathogens standard, 2, 325,
337, 339–347, 357, 358, 363,
401–402, 410, 411, 421, 472, 475,
494
blow torches, 247
blue signage, 221
Board of Certified Hazard Control
Management (BCHCM), 137–138
body fluids, 68, 71, 100, 173, 310, 325, 328,
336, 357, 359, 342, 351, 355, 356,
360, 361, 364, 402, 472
body, human, 423
body protection, 74
boilers, 248–250
bomb threats, 165
bonding, 279
brazing, 247
breakthrough time, 322
broken glass, 68
buckets, filling and emptying, 438
building-related illness (BRI), 258
Bureau of Drugs, 118
Bureau of Radiological Health, 118
bureaucratic organizational theory, 22
burns, 224, 449, 472, 479, 480, 481
bursitis, 424
business occupancy, 150, 175, 179, 180, 184

C
CAA, see Clean Air Act
cabinet hoods, 255
cadmium, 304
call systems, 403
cameras, 64
Canadian Council on Health Services Accreditation, 7–8
CAP, see College of American Pathologists
capillary tubes, 361
carbon dioxide, 253, 254, 258, 289
carbon dioxide extinguishers, 189, 190, 195, 197
carbon monoxide, 116, 312
carbonless paper, 201
carcinogens, 277
cardiopulmonary resuscitation (CPR), 236
CARF, see Commission on Accreditation of Rehabilitation Facilities
carpal tunnel syndrome, 206
carts
equipment, 439
food, 446, 449, 498
linen, 446
trash, 499
case management, 37
human behavior, and, 25
of accidents, 15
summary of, 66–67
caution signs, 222
cave-ins, 270
ceiling, 276
Center for Devices and Radiological Health, FDA, 419, 420
Center for Healthcare Environmental Management (CHEM), 13, 18
Centers for Disease Control and Prevention (CDC), 34, 120, 123–124, 147, 150, 315, 325, 327–330, 334–335, 347, 357, 455
organization of, 124
Standard Precautions, 328–330
Centers for Medicare and Medicaid Services (CMS), 6, 10, 127–128, 132
flammability requirements, 177
NFPA 101-2000, and, 177
waiver authority, 177–178
central sterile supply, 479–483
CERCLA, see Comprehensive Environmental Response, Compensation and Liability Act
Certified Healthcare Safety Professional (CHSP), 138
CGA, see Compressed Gas Association
chain of custody, 43
character, defined, 25
charting, 403
checklists, 54, 372
chemical
agents, 167, 168
breakthrough times, 79
contaminants, 157, 257
dependency, 42–44
handling, 268–269
hazard symbols, 193
hazards, 70, 402, 412–413, 451, 475
hygiene officer, 476
protective clothing, 322; see also personal protective equipment (PPE)
sensitization, 281
chemotherapeutic drugs, 68, 69
chlorine, 335, 437, 451
compounds, 294
choking agents, 167
cholera, 166
ciprofloxin, 173
circadian rhythm, 38, 406
citations, OSHA, 100, 101
multi-employer, 104
Citizens Corps, 155
civil disturbances, 164
classes, of fire extinguishers, 189
Clean Air Act (CAA), 116, 156, 251, 303
Clean Water Act (CWA), 117, 304
cleaning
agents, 334, 437
effectiveness of, 439–440
Index

guidelines for, 439
levels of, 439
wet methods for, 438
clinical department safety, 400–411
Clinical Laboratory Improvement
Amendments (CLIA), 6, 10, 128, 132–133
Clinical Laboratory Improvement
Amendments Committee (CLIAC), 132
clinical safety, 367–434
closed systems, 27
CMS, see Centers for Medicare and Medicaid Services
cocaine, 43
Code of Federal Regulations (CFRs), 95, 96
cold environments, 271–272
College of American Pathologists (CAP), 6, 9–10, 133
color schemes, 221–222, 444
combustible liquids, 278, 284
combustible materials, 192–194, 223, 229, 247, 264
Commission on Accreditation of
Rehabilitation Facilities (CARF), 8–9
communication, 432
of medical errors, 372
systems, 246, 372
community groups, 155
compliance, promoting safety instead of, 17
Comprehensive Environmental Response,
Compensation and Liability Act (CERCLA), 114, 117
compressed air, 77, 220–221, 248
Compressed Gas Association (CGA), 135, 245, 289, 312
compressed gases, 68, 89, 97, 100, 135–136, 182, 223, 251, 288, 289–290, 401, 412, 449
storage of, 290
transport of, 290
computer recycling, 320
computer workstations, 207
computerized axial tomography (CAT), 458
conditions of participation (COP), 177
conductors, electrical, 224, 225
confidentiality, 35, 37
confined spaces, 55, 88, 98, 99, 101, 229, 246, 250
atmospheric requirements for, 239
defined, 234
emergency procedures for, 239
employee rights, 237
entry equipment, 239
entry preparation, 239
permit-required, 234–239, 269, 273
rescue requirements for, 236
retrieval requirements for, 236–237
welding in, 223
Construction Industry standard (29 CFR 1926), 269–273
construction safety, 269–273
Consultation Program, OSHA, 106
contact precautions, 329
containers
biological waste, 362
contaminated laundry, 444
hazardous materials, 292
needle, 445
sharps, 474, 489
contamination
chemical, 157
controlling, 173
dialysis units, 411
food, 453
radioactive, 168
continuing education, 92
continuous quality improvement program, 33, 385
teams, 7
contractor safety, 272–273
cost–benefit analysis, 22
continuing education, 92
cost-established by contract, 106
corrected employer, 105
cooking areas, fire safety and, 183
correcting employer, 105
corrosives, 276, 278, 284
cost–benefit analysis, 22
cost-containment programs, 39, 41
cross-contamination, 454
culture, 25
organizational, 25, 148
overt vs. covert, 22, 25
safety, 27–30, 34, 367–368, 374
assumptions, 30
development of, 28
improving, 29
cuts, prevention of, 447
CWA, see Clean Water Act
cyanide, 167
data
analysis, 370, 432
collection, 369, 385, 403
sources of, 370
death benefits, 41
deaths, of employees, 100
OSHA prosecution for, 101
decibel, 239, 240, 241
decontamination, 145, 146, 157, 167, 311, 444, 473, 497
areas, 171
procedure for, 172–173
radiation, 467–468
team, members of, 171
weapons of mass destruction, 170–173
dementia, 390, 391
dental workers, 364
Department of Transportation (DOT), 123, 163, 275, 278, 290
hazardous materials regulations, 290–293
hazardous materials training, 292–293
shipping requirements for infectious substances, 363–364
DeQuervain’s disease, 206
dermatitis, 281, 437, 445
desflurane, 313, 415
dialysis unit safety, 410–411
dietitians, 447
dining room safety, 452
disabilities, categories of, 41
disability, defined, 129–130
disabled person, defined, 154
Disaster Management Committee, 141
disaster planning, 8, 31
community, 143–144
disaster response team, 142
discharge, 117
discrimination, 31
discs, 423, 424
disinfectants, 308, 331, 333–336, 358, 442, 451, 483
how they work, 440
levels of, 441
selecting, 335

disinfection, 482–483
dissemination devices, 169
dosimeters, 240, 466
doxycycline, 173
drain cleaners, 308
drenching stations, 283, 298, 300, 482
drills, 144, 146, 152
earthquake, 163
emergency, 150–151, 159
emergency department, and, 170
emergency response, 146
evacuation, 148
fire, 141, 177, 180, 181, 184, 197
surgical, 195
tornado, 160
driver safety, 264
droplet precautions, 328–329
Drug-Free Workplace Act of 1988, 42–43
drug safety, see hazardous drug safety
drugs
investigational, 118
prescription, 118
quality of, 487
recalls of, 486
safe administration of, 492
storage of, 487
testing of, 131
dry-chemical extinguishers, 189, 190, 195
dust masks, 307
dusts, 77, 79, 82, 247, 255, 484
duty fitness evaluations, 36
\section{E}

ear protection, 241
earthquakes, 162–163
ECRI, 13, 195
EEBA, see emergency escape breathing apparatuses
effects
acute, 276
chronic, 277
egress, 186–188
EHS, see extremely hazardous substances
electrical
burns, 224
equipment, 191–192, 449
cleaning rooms containing, 438
safety, 226, 457
ladders, and, 214
safety, 224–228, 402, 449
office, 202–203
requirements, healthcare, 226–227
shock, 224, 418, 450
  preventing, 227–228
  standards, healthcare, 227
electricity, 224
electromagnetic radiation, 470
electronic waste, 320
electrosurgery safety, 417
emergency
  action plan, 98
  defined, 141
  department, 170–171, 172, 498
    hazards encountered in, 407
    security for, 456
    violence in, 407–409
drills, 150–151
  escape breathing apparatuses (EEBAs), 76
  lighting, 187
  management, 141–197
    plan, 142–143, 144, 150, 152
  management planning committee, 142
  medical services (EMS), 145
  pharmacy, 485
  planning, process of, 147–148
  power
    critical areas requiring, 243
    supply systems (EPSS), 244
    testing, 244
    probability of, 149
    procedures, 89
    response drills, 146
  response plan
    elements of, 144–145, 157
    evaluation, 152–153
  response team, 155, 156
  showers, 281–283
  technological, 163
Emergency Planning and Community
  Right-To-Know Act (EPCRA), 114, 303, 319
Emergency Preparedness and Response
  Directorate, 128
employee-assistance program (EAP), 42
employee handbook, 26
employee health, see health, employee
employee representatives, 111, 112
employee rights, confined space, 237
employers, types of, 104–105
employment, healthcare, 1–3, 4
EMS, see emergency medical services
enflurane, 313, 415
engineering controls, 60, 71, 75, 298, 299,
  300, 309, 314, 339, 343, 344, 349,
  351, 357, 417, 422, 477, 489, 490
  defined, 341
  employee input for, 340
  ventilation, 254
entrapment, 375
entry permits, confined space, 238
entry supervisor, confined space, 236
environment, impact of facility on, 8
Environment of Care®, standards, 4–5
environment, of a healthcare organization,
  16
  considerations regarding, 17
  safety challenges, 17
environmental
  hazards, 70, 381
  services, 435–443
  teams, 7–8
tours, 55–56
Environmental Protection Agency (EPA), 54,
  113–117, 144, 230, 241, 262, 275,
  278, 284, 285, 302, 303, 304, 306,
  308, 317, 334, 442, 459, 494
EPSS, see emergency: power: supply system
Equal Employment Opportunity Commission (EEOC), 129
equipment carts, 439
equipment maintenance, 68, 428, 436, 438,
  439, 448, 449, 466, 495–496, 498
equipment, mobile medical, 498
equivalencies, 176
ergonomics, 31, 36, 56, 58, 70, 89, 97,
  203–210, 422, 433, 466, 480, 482,
  485
  disorders related to, 206
  support departments, 498–500
  symptoms of problems, 207–208
ethyl alcohol, 294
ethylene, 156
ethylene oxide (EtO), 34, 36, 37, 55, 68, 71,
  93, 99, 156, 304–305, 479,
  480–481
evacuation, 158, 185, 186, 196
  partial vs. total, 186
  planning, 154
executive summary, of emergency plan, 147
exercise programs, 432
exhaust, 254
  ventilation systems, 68, 445
exit signs, 187–188
  illumination of, 187
experience ratings, 40
explosives, 169, 279, 288
transportation of, 123
exposing employer, 104-105
exposure, 339
acetone, 301
anesthetic gases, 415
anthrax, 356
asbestos, 305, 306, 307
benzene, 301
cadmium, 304
carbon monoxide, 312
ethylen oxide, 304, 480-481
formaldehyde, 297-298
glutaraldehyde, 296
hazardous drugs, 309, 310, 488-489, 492
lead, 304
mercury, 303, 481
methyl methacrylate, 299
nitric oxide, 312
nitrous oxide, 312
pesticides, 309
-post, evaluation, 342-343
solvents, 300
toluene, 301
tuberculosis, 347-348, 466
xylene, 301
exposure control plan, 340, 344
-glutaraldehyde, 296
tuberculosis, 349
exposure determination, 341
exposure limitations, 279-280
exposure records, 113
access to, 111
exposure routes, of hazardous materials, 276
exposure, toxicity of, 277
extension cords, 202, 203, 225, 226, 227, 228
extremely hazardous substances (EHSs), 116
eye injuries, laser, 420-421
eye protection, 35, 73, 212, 219, 223, 229, 246, 248, 310, 342, 357, 358
eyewash bottles, personal, 283
eyewash stations, 134, 269, 270, 281-283, 298, 300, 474, 482
common problems with, 282
specifications for, 283

F
face protection, 73
facet joint syndrome, 424

Factory Mutual Research Corporation (FM), 135, 188, 192
Failure mode and effect analysis (FMEA), 374
Fair Packaging and Labeling Act, 118
fall protection, 269
falls
investigating, 383
patient, 430
preventing, 201, 210-211, 380-383
fatalities, 100, 101
fault tree, 67
Federal Aviation Administration (FAA), 123, 267
Federal Emergency Management Agency (FEMA), 129, 142, 147, 155
Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), 117, 308, 334

Federal Register, 95-96
Federal Register Act, 95
fertilizer, 268-269
FIFRA, see Federal Insecticide, Fungicide, and Rodenticide Act
film badges, 464, 466
filters, particulate, 81
fire, 418, 445, 475
bed-related, 375, 379-380
blankets, 197
components of, 188, 196
confinement, 184-186
doors, 185
electrical, 226
hazard symbols, 193
hazards, 182
inspections, 181
laser, 422
office, 202
plan, written, 178
prevention, 180-183, 213, 450
painting, 229-230
welding, 223
safety, 35, 141-197
deficiencies, 175, 184
evaluation system, 178
management of, 178-180
pharmacy, 485
stages of development, 173-174
surgical, see surgical fires
vs. explosion, 279
fire alarms, 180, 181, 182, 183
inspection of, 181, 183
testing, 183
fire extinguishers, 97, 181, 183, 193, 197, 247, 269, 270, 294, 405, 418, 450 as training topic, 89 marking, 190–191 portable, 188–191, 193 ratings, 191 testing, 189 types of, 188–189
Fire Fighter Fatality Investigation and Prevention Program, 120
Fire Safety Evaluation System (FSES), 176
firefighters, 72, 120, 133, 337
first aid, 97, 109, 112, 236 guidelines, 39
first-in, first-out, 315
first responders, 288, 497 levels of, 145–146
fit check, respirator, 81
grounds equipment, maintaining, 268
grounds maintenance, 267–269
guarding, electrical, 225

H
HACCP, see hazard analysis and critical point
halogenated agents, 415
halothane, 313, 415
hammers, 217
hand protection, see gloves
hand rub dispensers, 174–175, 329
hand tools, 217, 499
hands-free instrument passing, 413
handwashing, 68, 336, 341, 344, 401
hazard; see also hazards
analysis, 18, 56–57
assessment, 72
biological, 325–366
classes, 291–292
closing, 52, 53
communication, 35, 99, 100, 101, 106
communication plan, 436, 454
communication program, 275, 285, 488, 494
control, 39, 46, 51–94
challenges to, 52
defined, 21
principles of, 52
respirators, and, 78
specialized training, and, 92
defined, 21
determination, 285
evaluation, 57
identification, 19, 53–54, 58
priorities, 58
process of, 58
surveillance, 32
passive vs. active, 56
programs, 21, 66
surveys, 18, 53, 54, 55–56, 72
personal protective equipment, and, 72
training, 69
vulnerability analysis, 142, 143, 144, 145, 147, 148–150
warnings, 53
hazard analysis and critical control point (HACCP), 454–455
employee training, 286–287
hazard determination, 285
hazard rating information, 286
hazardous material evaluation, 286
hazardous material labeling, 287, 288
hazardous materials listing, 286
MSDs, 287–288
written program, 286
hazardous chemicals, 445
hazardous drugs
defined, 309
preparation, 490
safety, 309–311, 488–489
spills, 494
storage of, 491, 493
waste, 493–494
hazardous material employees, 293
Hazardous Material Identification Guide (HMIG), 288, 289
Hazardous Material Information System (HMIS®), 288, 289
hazardous materials, 170; see also Hazard Communication standard
characteristics of, 276
confined space, 238
containers, 292
DOT regulations for, 290–293
effects of, 276
emergencies, 156–158
entry routes, 165
exposure examples, 281
exposure risks, 276–281
healthcare, 293–308
infectious wastes, 363
JCAHO categories of, 275
labeling of, 278, 287, 291, 292
managing, 275–322
marking for shipment, 292
ratings of, 193–194
regulation of, 123
secondary containment requirements for, 284–285
spill response plan, 156, 303
spills, 321–322
storage of, 283–285
table, 49 CFR 172.101, 290–292, 293
transporting, 149, 156, 157, 163
Hazardous Materials Transportation Act (HMTA), 123, 156
hazardous waste, 144
defined, 318
labels, 316–317
Index


hazards; see also hazard
  bed rail, 375
  burn, 449
  categories of, 55, 68–70
  chemical, 70, 436, 445, 451, 475
  confined space, 257, 238
  controlling, 59
  electrical, 258, 417
  emergency department, 407
  environmental, 70, 381, 383
  equipment, 402, 413
  ergonomic, 70
  fire, 475
  food service, 446, 448
  heat, 270–271
  laser, 418
  laundry, 445; see also laundry safety
  magnetic resonance imaging, 471
  metal, 302–305
  microorganism, 479
  office, 201; see also office safety
  pharmacy, 484
  physical, 70, 436
  psychosocial, 70
  respiratory, 76

head protection, 73–74

health and fitness programs, 86–87

Health and Human Services (HHS), Department of, 118, 120, 123, 124, 125, 126, 178

Health Hazard Evaluation (HHE), 120

Health Insurance Portability and Accountability Act (HIPAA), 155, 375

Health Resources and Services Administration (HRSA), 126–127

health, employee, 34–39

Healthcare Facilities standard, 191

healthcare occupancy, 175, 179, 180

healthcare workers, defined, 349

hearing protection, 35, 88, 212, 241, 436

heat exhaustion, 271

heat hazards, 270–271

heat stress, 270

heat stroke, 271

heating systems, 248–250

heating, ventilation, air-conditioning, and refrigeration (HVAC&R), 135

heating, ventilation, and air-conditioning system (HVAC), 252, 255, 256, 258, 259

recirculating vs. nonrecirculating, 313

hedge clippers, electric, 268

helicopter safety, 405

helicopter standards, OSHA, 267

helmets, 73, 76, 223

classes of, 74

hemopoietic stem-cell (HCST), 353

hepatitis A, 38, 70, 329, 331, 336, 452


immunoglobulin (HBIG), 337

surface antigen (HBsAg), 337

transmission, 337

vaccination, 45, 337–338

hepatitis C, 55, 69, 335, 338

herbicides, 268, 269, 308

high-efficiency particulate air (HEPA) filter, 81, 261, 307, 310, 348, 352, 353, 354, 356, 357, 490, 493

high-risk areas, 370

high-risk medications, 486

home healthcare safety, 407, 408, 431

Homeland Security, Department of, 128–129, 147, 152, 153

Hospital Emergency Incident Command System (HEICS), 152, 153

Hospitals for a Healthy Environment, 302

housekeeping, 342; see also environmental services

housekeeping equipment, maintaining, 439

HRSA, see Health Resources and Services Administration

human behavior, 52, 53, 56

unsafe, 26

human body, components of, 423

human immunodeficiency virus (HIV), 38, 55, 69, 109, 334, 335, 338–339, 343, 473, 474, 475

transmission of, 338–339

human resources, 18, 36, 42, 45

safety, and, 26

hurricanes, 158–159

hydrogen cyanide, 419

in laser smoke, 421

hydrogen peroxide, 295

hypobaric facilities, 191

hypothermia, 271
iceberg theory, 52
ICES, see information collection and evaluation system
IDLH, see immediate danger to life or health
ignitability, 276
ignitable solid waste, 318
ignition source, 278
ignition temperature, 279
illnesses
classifying, 110
managing, 36
immediate danger to life and health (IDLH), 76, 78
immunizations, 35, 37, 38, 69, 331–332
incendiary devices, 169
Incident Command System (ICS), 144, 152
incident commanders, responsibilities of, 152–155
incident reporting, 403
incineration, 362, 473
incorporation, of radioactive materials, 169
indoor air quality (IAQ), 256–260, 263
  factors affecting, 257
  illnesses associated with, 259
  investigating complaints about, 258–259
  symptoms of, 257
industrial hygiene, 21
infant abduction, 396–400
  nursing guidelines for, 397
  offender profile, 397
infection control, 18, 19, 31, 33, 35, 56, 69,
  87, 100, 325–327, 364–365, 371,
  411, 436, 448, 479
  construction/renovation, and, 365
  guidelines for, 330
  program design, 326–327
  tuberculosis, 349
infection transmission routes, 329
infections, hospital-acquired, 325, 326, 358,
  372
infections, opportunistic, 353–359
infectious diseases, 35
infectious waste, see waste: infectious
Information Analysis and Infrastructure Protection Directorate, 129
information collection and evaluation system (ICES), 5, 30, 90
information management, 30–31
informed consent, 37
  restraints and, 385
injuries, 15
  back, preventing, 425
  classifying, 110
  managing, 36
  types of, 424
injury logs, see Occupational Safety and Health Administration (OSHA):
injury logs
insecticides, 308
in-service education, 87
inspections, see Occupational Safety and Health Administration (OSHA):
inspections
Institute for Safe Medication Practices (ISMP), 396, 486
Institute of Electrical and Electronics Engineers (IEEE), 470
Institute of Medicine (IOM), 10–11
instruction techniques, 90
instruments, critical, 440, 442
insulation, electrical, 225
insulators, electrical, 224
insulin, 118
insurance companies, 54
intensive-care unit (ICU) safety, 410
International Agency on Research on Cancer (IARC), 277
International Electrotechnical Commission, 420
interviewing accident witnesses, 65
intoxications, foodborne, 452
inventory control, of hazardous wastes, 315
investigational drugs, 118, 487
iodine, 295
iodophors, 335, 442
ionizing radiation, 36, 69, 88, 98, 168,
  459–460, 464–465, 466
Ionizing Radiation standard, 464–465, 466
irradiation, 168
irritant smoke, 85
  qualitative test, 81
irritating agents, 167
isooxamyl acetate qualitative test, 81
isoflurane, 313
isolation, 329, 352
  rooms, 350, 448
isopropyl alcohol, 293
J
JCAHO, see Joint Commission on Accreditation of Healthcare Organizations
jewelry, 212, 219
job assignments, 36
job descriptions, 20, 42, 131
job hazard analysis (JHA), 58–59
Joint Information System (JIS), 153

K

KNACKS, see National Ambient Air Quality Standards

L

lab coats, 71, 297
lab safety, 35
labeling
biological waste, 361
hazardous drugs, 491
hazardous drug waste, 493
hazardous materials, 292
hazardous waste, 316–317
infectious substances, 345, 361
medication, 486
laboratories, types of, 472; see also Clinical Laboratory Improvement Amendments (CLIA)
Laboratory Accreditation Program, CAP, 10
laboratory safety, 87, 472–479
guidelines for, 478
Laboratory standard, 472, 475–476
laboratory vacuum systems, 245
ladders, 213–215, 217, 229, 258, 269, 270, 437, 479
landscaping, 267–269
lasers, 35, 55, 68, 69, 71, 412, 417–422, 469
categories of, 420
eye injuries due to, 420–421
incident reporting requirements, 420
maintenance of, 417, 418
plume, 421
regulations for, 419
safety guidelines for, 418–419
skin protection, and, 422
smoke, 421
lateral transfers, 430
latex allergy, 54, 97, 281, 346–347, 407, 412, 445
latex gloves, 74; see also latex allergy
laundry, 342
contaminated, 444, 445
loading/unloading, 445–446
safety, 445–446
guidelines for, 444
lawnmowers, 267
lead, 99, 111, 116, 304
-based paints, 230
lead–tin soldering, 247
leader, goals of, 23–24
leadership
improving, 24–25
qualities of, 24
safety values, and, 28
leaks, liquid, 252, 299
leg protection, 74
Legionella, 70, 257, 330, 359, 410
Legionnaires’ disease, 258
LEPC, see local emergency planning committee
lettering, for exit signs, 188
licenses, radionuclide, 461
Life Safety Code®, 150, 174–178, 182, 184, 187
construction considerations, 184
egress, 186
emergency lighting, 187
exit sign illumination, 187
fire response, 179
inspection, 6
life-support utility systems, 242, 243
lift teams, 430
lifting, 382, 401, 408, 410, 416, 422–433
devices, 429–430
guidelines for, 426
laundry, 445
safe, 424–425
tips, 204
lighting, 17, 48, 208, 381, 456, 457
office, 202
limited duty, 42
linen carts, 446
linens, contaminated, 446
liquefied petroleum gas (LPG), 246
liquids, 448–449
local emergency planning committee (LEPC), 114, 115, 116, 144, 145, 319
lockout employees, 230–231
definitions, 232
deVICES, 233
guidelines, 232–233
long-term care, 11
facilities, 331, 348, 379
falls, and, 381
ombudsman, 379
residents, 381, 390–392
assessment of, 391, 426–427
loss control, 19
loss, pre- and post- activities, 32
lumbar support belts, 209–210

M
machine guarding, 219–220
OSHA requirements for, 451–452
machinery safety, 219–220
magenta/yellow signage, 221
magnetic resonance imaging (MRI), 458, 469, 470–471, 472
maintenance absorbents, 321
management
accident investigation, and, 66
action plan, 19
attitude toward safety, 25
by exception, 22
by objective, 22
commitment to safety, 16
deficiencies in, 16, 51
functions of, 22
hazard control, 51–53
human resources, 45
information, 30–31
materials and purchasing, 45
problems with, 15
risk, 31–33
safety program, ineffective, 21
security, 46–49
violence prevention programs, and, 47
manhole covers, 247–248
manholes, 216, 248
manometer, 255
manual alarm stations, 182
materials and purchasing management, 45
mattress flammability requirements, 177
mechanical energy, stored, 234

mechanical lifts, 429
media relations, 155–156, 398
medical device management program, 495
medical devices, regulation of, 118, 119
medical equipment management, 495–497
medical errors, 31, 372–374
strategies for reducing, 374–375
medical evaluations, respirator and, 79–80
medical gas systems, 245
medical history, 37
medical isotopes committee, 463
medical management program, 206
medical records, 112, 346
access to, 111, 344
as defined by OSHA, 112
maintaining, 343
medical supplies, 146–147
medical surveillance, 36–37, 299, 304, 305, 306, 310, 312, 339, 348, 476, 484, 494
medical treatment, 108
medical waste, 320; see also waste management
incinerators, 302
packaging of, 363
regulated, 360
medical waste management and disposal, 35
Medicare, 6, 127, 128, 132, 139, 177, 375, 427, 485
medication errors, 393–396
Medication Errors Reporting (MER), 396
medication management program, 394–395
evaluation of, 487
medication safety, 392–396
mercury, 302–304, 319, 480, 481
metal hazards, 302–305
meters, sound-level, 240
methylmethacrylate, 299–300, 412, 416
microbial contamination, 257
microwave radiation, 470
Mine Safety and Health Administration (MSHA), 85
mists, 77, 79, 82, 228, 255
mixed waste, 319
modified duty, 41, 42
mold, 260–263

methicillin-resistant *Staphylococcus aureus* (MRSA), 332–333
methoxyflurane, 313
methyl ethyl ketone, 300
methyl methacrylate, 299–300, 412, 416
microbial contamination, 257
microwave radiation, 470
materials and purchasing management, 45
mattress flammability requirements, 177
mechanical energy, stored, 234
health effects of, 261
prevention, 260
remediation of, 261–263
monitoring devices, for radiation, 463–464
morale, 15, 26, 44
*Morbidity and Mortality Weekly Report*, 123
morgue, 475
mowing, 267–268
MRSA, see *methicillin-resistant Staphylococcus aureus*
MSD, see musculoskeletal disorders
multi-employer worksites, 104–105
multiple chemical sensitivity (MCS), 259
musculoskeletal disorders (MSDs), 203–204, 423
*Mycobacterium tuberculosis*, 347

N
NAAQS, see National Ambient Air Quality Standards
naps, sleep deprivation and, 38
National Ambient Air Quality Standards (NAAQS), 116
National Archives and Record Service, 95, 96
National Association of Fire Equipment Distributors, 191
National Board of Boiler and Pressure Vessel Inspectors, 249
National Coordinating Council for Medication Error Reporting and Prevention (NCC MERP), 396
National Council of Compensation Insurance (NCCI), 40
National Council on Radiation Protection and Measurements (NCRP), 137, 464
National Disaster Medical System, 170
National Electrical Code (NEC), 191, 224, 225, 226, 244–245
National Emission Standards for Hazardous Air Pollutants (NESHAP), 308
National Incident Command System (NICS), 152
National Incident Management System (NIMS), 153
National Institute for Occupational Safety and Health (NIOSH), 13, 34, 59, 79, 81, 120–121, 147, 201, 208, 209, 258, 263, 264, 270, 296, 301, 302, 309, 311, 313, 415, 419, 421, 470, 484, 488
respirator guidelines, 85
National Institutes of Health (NIH), 11, 125–126, 352
National Interagency Fire Center (NIFC), 162
National Nuclear Security Administration, 169
National Paint and Coatings Association (NPCA), 289
National Patient Safety Goals, 372
National Personal Protective Technology Laboratory (NPPTL), 120
National Pharmaceutical Stockpile, 147
National Pollutant Discharge Elimination System (NPDES), 117
National Restaurant Association (NRA), 136
National Safety Council (NSC), 139
National Sanitation Foundation (NSF), 136
poll, 38
National Welding Supply Association (NWSA), 312
natural disasters, 158–163
near-hit event, 32, 53, 57, 59, 60–61
investigating, 61
needleless systems, 341
needles, 31, 68, 440, 443, 445, 489
Needlestick Safety and Prevention Act, 339
needlesticks, 8, 37, 38, 60, 107, 108, 109, 339, 340, 401, 413, 474
injury log, 34
needs, human, 22
negative-pressure respirators, 77, 80, 81
negligence, 211
neoprene, 74, 76
nerve agents, 168
New Source Performance Standards (NSPS), 362
NFPA 101, see *Life Safety Code®*
NFPA 1600, 141–142
NFPA 99, see Healthcare Facilities standard
NIH, see National Institutes of Health
NIMS Integration Center (NIC), 153
NIOSH, see National Institute for Occupational Safety and Health
NIOSH Working Group on Hazardous Drugs, 309
nitric oxide, 312
nitrogen dioxide, 116
nitrous oxide, 312, 415
noise, 251, 371, 445
  administrative areas, 202
  control strategies, 240
  levels
    measuring, 240–241
    hospital, 239
  OSHA standard for, 239–242
  terms, defined, 240
nonionizing radiation, 418, 469–472
  standards for, 470
nonroutine tasks, 286
NPDES, see National Pollutant Discharge Elimination System
nuclear devices, 168–169
nuclear fuel facilities, licensing of, 122
Nuclear Incident Response Team, 169
nuclear medicine, 458–469
  NRC and, 122
Nuclear Regulatory Commission (NRC), 54, 92, 100, 121–123, 275, 278, 319, 459, 461–462, 463, 465
nurseries, security in, 457
nursing homes, 1, 4, 13; see also long-term care
nursing safety, 400–411
O
occupancies, 174, 175
Occupational Exposure to Hazardous Chemicals in Laboratories standard, 311
occupational health, 34–35, 37, 56
Occupational Safety and Health Act of 1970, 97, 100, 156
citations, 2, 100, 101
  confined spaces, 101
Consulting Service, 59
exit requirements, 187–188
flammable storage requirements, 192
  Form 300, 100, 108, 110, 111, 205
  Form 300A, 108, 110
  Form 301, 110, 205
HAZWOPER, 144
healthcare training requirements, 98–99
injury logs, 57, 102, 205, 422
inspections, 99–100
  closing conference, 103
  documenting, 103
  facility tour, 102–103
  fatality, 100
  opening conference, 102
  preparing for, 102
  priorities during, 104
medical records, 112
NIOSH, and, 121
  poster, 99
Program Management Guidelines, 106
recordkeeping, 107
Review Commission, 126
Strategic Partnership Program, 106
training, 106
violations, 103–104
website, 107
welding requirements, 223
Occupational Safety and Health Review Commission (OSHRC), 126
odor threshold, 280
odors, 256
office machinery, 201, 256
Office of Emergency and Remedial Response, 322
Office of Rural Health Policy, 127
office safety, 200–203
office storage, 200, 201
off-the-job safety programs, 17, 18, 23, 28, 29, 86, 90
Omnibus Budget Reconciliation Act (OBRA), 127
open systems, 28
opening conference for OSHA inspection, 102
operating room safety, 412–417
opportunistic infections, 353–359
orange signage, 221
organized labor, 45
orientation, employee, 21, 29, 45, 71, 89, 92, 447, 448
OSHRC, see Occupational Safety and Health Review Commission
osteoathritis, 424
other potentially infectious materials (OPIMs), 410
out-gassing, 256
oxidizers, 278, 284, 288, 318
oxygen deficiency, 75, 76, 77, 79
ozone, 116
-depleting refrigerants, 251

P
pacemakers, 471, 472
packaging, nonbulk/bulk, 291
painting, 228–230
paints, 308
lead-based, 230
PAPR, see powered air-purifying respirator
parking security, 457
particulate matter, 116
“PASS” guidelines, 188, 197
passing instruments, 413
Patient Safety Task Force, 125
patients
falls of, 8
identification of, 372, 373
monitoring of, 395
moving of, 422–433
guidelines for, 426
safety of, 367–434
standards, 371
committees, 374
officer (PSO), 138
security of, guidelines for, 457–458
violent, 48
PEL, see permissible exposure limit
pepper spray, 167
peracetic acid, 294–295, 412, 441
perception of care, 369–370
performance improvement activities, 32, 369
Performance Reports, JCAHO, 6
permeation rate, 322
permissible exposure limit (PEL), 75, 79, 239, 277, 280, 475
alcohol, 294
ethylene oxide, 304, 480
formaldehyde, 297, 298
iodine, 295
isopropyl alcohol, 293
mercury, 303
methyl methacrylate, 300
phenol, 295
sodium hypochlorite (bleach), 294
xylene, 302
permit, discharge, 117
permit-required confined spaces, 234–239, 269, 273
as training topic, 88
requirements for, 71
specialized training in, 92
welding, 223
pertussis, 331
pesticides, 308–309
petroleum absorbents, 321
pharmacy, 48
as closed system, 28
closed, procedures for, 486
housekeeping recommendations, 493
safety, 483–494
security in, 457
phenolic compounds, 335, 442
philosophy of care, 17
philosophy, of organization, 16, 19, 22
phosgene, 167
photographs, of accident site, 64
physical capacity determinations, 36
physical environment, suitable, 199–200
physical hazards, 70
physical properties, of a chemical, 278
physical resources, managing, 8
physical therapy department safety, 409–410
pipe marking standards, 289
piping systems
categories of, 289
identification of, 222
pipes, 248
placards, 292
Plan for Improvement, 174, 176
plant operations department, 200
pliers, 217, 218
plumber’s furnaces, 247
plumbing safety, 246–248
police liaison, 48
policy statements, 16, 19, 43, 90
polishing agents, 437
pollutants, air, 116
polychlorinated biphenyls (PCBs), 117
portable electric units, 224
portable gas units, 223
positive-pressure respirators, 77, 81
positron emission tomography (PET), 458
post-exposure assessment, 37
posture, 208, 209
postures, static, 413
potable water, 247, 483
power tools, 218–219
powered air-purifying respirator (PAPR), 75, 77, 80, 356
powered industrial trucks, see forklifts
preplacement assessment, 36–37
prescription drugs, 118
pressure equipment, 229
pressure-relief valve, 229
pressurized lines, 234
presumed asbestos-containing material (PACM), 306, 307
pretest, training, 90
privacy, 17, 37, 110
proficiency testing (PT), 132
Program Management Guidelines, 106
promoting safety, 85–87
proper shipping names (PSNs), 290
provider-performed microscopy (PPM), 132
Pseudomonas, 358–359
psychosocial hazards, 70
public demonstrations, 164
public relations, 15

Q
qualitative fit test (QLFT), 80, 81, 85
quality improvement, 19, 33
teams, 33
quantitative fit test (QNFT), 80, 82, 85
quaternary ammonium compounds (QACs), 294, 335, 441

R
“RACE” guidelines for evacuation, 196
radiation, 55, 87, 137, 401
control of, 459
effects of, 460
electromagnetic, 470
emergency procedures for, 467
exposure to, 122
ionizing, 88, 98, 168, 459–460
microwave, 470
monitoring devices for, 463–464
nonionizing, 418, 469–472
standards for, 470
protection against, 168
safety, 35
committee, 462–463
safety officer (RSO), 461, 462, 463, 464
ultraviolet, 470
units of measure, 460
Radiation Control for Health and Safety Act, 118
radioactive materials, 458–459
radioactive procedures, classes of, 465
radioactive waste management, 468, 469
radiology, 458–469
safety, 466
radionuclide licenses, 461
radon, 258
rage, 387
Raynaud’s syndrome, 206
reactive substances, 278
reactivity, 276
reasonable accommodation, 130
reasonable care standard, 105
recommended exposure limit (REL), 79
anesthetic gases, 313, 415
glutaraldehyde, 297
recordable events, 2
recordkeeping, 49, 107
asbestos, 305, 306
bloodborne pathogen training, and, 99
exposure monitoring, 477
exposures to bloodborne pathogens, 343
hazardous waste, 317
length of time, 112–113
medical, 346
monitoring devices, 464
radiology department, 463
respirator program, 85
sharps injuries, 340
training sessions, 346
ventilation maintenance, 475
records, review of, 57
recycling, 320
red bags, 444
red, use of to indicate danger, 221
refrigerant recycling, 251
refrigerants, storage of, 251–252
refrigeration, 250–252
REL, see recommended exposure limit repellents, animal, 308
repetition, defined, 203
repetitive motions, 422, 424, 427, 498, 499
reporting requirements
  adverse events, 496
  lasers, 420
  medical devices, 496, 497
reports, accident investigation, 65–66
repositioning, patients, 430
representatives, for OSHA inspections, 430
reproductive hazards, 35
Research and Special Programs
  Administration (RSPA), 123, 363
reserve staff, 146
residential occupancy, 175
resistance, electrical, 224
  Environmental Protection Agency (EPA), 320
respirator program elements, 78
  air-purifying, 263
  as training topic, 88
  classifications of, 76–77
  fit checks, 81
  fit testing, 29
  full face piece, 76, 78, 83, 262, 263, 301
  limitations of, 78
  maintaining records for, 85
  maintenance of, 82–83
  medical evaluations, and, 79–80
  procedures for, 75
  program evaluation, 84
  repairing, 83
  sanitizing, 82
  selection of, 78–79
  storage of, 83
  types of, 75–76
  when to wear, 75
  written recommendations for, 80
respiratory hazards, 76
restraints, 378, 383–386, 387
  bed rails as, 379
restricted work, 109
retraining, employee, 234
retrieval, from confined spaces, 236–237
return-to-work assessment, 36, 37
ricin, 166
Right-To-Know Act, see Emergency Planning and Community Right-To-Know Act
ring badges, 464
risk
  assessment, 326, 328, 330, 347, 349, 350, 371, 385, 390, 456, 495
  program, 20
  defined, 22
  environment, and, 17
  monitoring potential, 32–33
  criteria, for utility management plan, 242
  identifying, 5
  management, 12, 18, 19, 31–33
  managers, 22; see also risk: management
rodenticides, 308
roofs, 258
rooftops, working on, 216
root-cause analysis, 18, 21, 23, 28, 52, 57, 61, 62, 374, 400
  team, 67–68
rubber, 76
S
sabotage, 164
saccharin solution aerosol qualitative test, 81, 85
Safe Drinking Water Act (SDWA), 304
Safe Medical Device Act (SMDA) of 1990, 119, 495, 496–497
safety, 367–434
  bulletins, 86, 90, 91
  committee, 15, 19, 20
  reports, 21
  risk management, and, 31
  coordinating, 16
  coordinator, contractors, and, 272
  culture, see culture: safety
  defined, 22
  director, 20
  responsibilities of, 18
  inspections, 18, 54
  inspectors, qualifications of, 54
  leadership, 22–25
management program, 15–50
components of, 28
evaluation of, 20
fundamentals of, 16
leaders, and, 23
pharmacy, 484
requirements of, 4
risk of injuries, and, 20–21
safety director, and, 18
seven components of, 5
successful, 19
tasks for developing, 5
written, 19–20
meetings, 86
office, see office safety
officer, laser, 417, 419
orientation, 87–93
performance, measurement of, 52
policy statement, 22
development of, 17, 19
posters, 86, 90, 91, 309
promoting, 85–87
rules, enforcing, 26
signs, 221–222
slogans, 30
values, 28–29
valves, 249
Safety Equipment Institute (SEI), 134
Salmonella, 70
SARA, see Superfund Amendments and
Reauthorization Act of 1986
SARS, see severe acute respiratory syndrome
scaffolding, 215–216, 217, 229
scalds, 449
scalpels, 414
scavenging, 416
system, for anesthetic gases, 313, 314
SCBA, see self-contained breathing apparatuses
sciatica, 424
Science and Technology Directorate, 129
screwdrivers, 218
seat belts, 264
secondary containment of hazardous
materials, 284–285
security, 46–49
security management, 455–458
evaluation of, 458
security worksite analysis, 47–48
segregation, of hazardous materials, 284
self-assessment, 7, 10
self-contained breathing apparatuses
(SCBAs), 76, 77, 78, 83, 237, 248, 301
self-inspections, 53, 54, 57, 100
senior leadership, 14, 22, 203, 374, 425
challenges, 1
policy statements, and, 16, 17
responsibilities of, 18
safety director, and, 18
worker involvement, and, 19
sentinel events, 371, 372
SEPSS, see stored energy power plant supply system
SERC, see State Emergency Response
Commission
Service Employees International Union
(SEIU), 13
severe acute respiratory syndrome (SARS), 356–358
severe weather, 89, 158–163
planning considerations, 160
sevoflurane, 313, 415
sharps, 360, 361, 364, 412, 413–414, 443,
444, 445, 474, 479, 489
containers, 361
disposal of, 414, 416
injury log, 339, 340, 343, 412
shift work, 18, 23, 29, 38–39, 85, 87, 406
Shigella, 70
shipping, infectious substances, 363–364
shoes, 71, 74
shoring, 270
short-term exposure limit (STEL), 277, 298
ethylene oxide, 304
formaldehyde, 299
methyl methacrylate, 300
shoulder impingement, 424
shower specifications, 282
sick-building syndrome (SBS), 259
side rails, 375, 376–378, 385
silicone, 76
sinks, deep, 499
skin diseases, 110
sleep deprivation, 35, 38–39, 401, 406, 407
shift workers and, 24; see also shift work
sleeping environment assessment, 378
slipped vertebrae, 424
slips, trips, and falls, 89, 210, 380, 381, 402,
407, 412, 413, 424, 437–438, 439,
450–451, 457, 467, 482, 484
prevention of, 87, 210–211
Index

smallpox, 166, 332
smoke, 77, 174, 196
  control of, 185
  laser, 421
smoking, 21, 35, 86, 92, 181, 182, 184, 193, 229, 265, 273, 305, 308, 403, 405, 484, 490
sodium hypochlorite, 294, 442–443
soldering, 247
solid hazardous waste, defined, 318
Solid Waste Disposal Act, 113
solid waste, ignitable, 318
solvents, 300–302
spill response plan, see hazardous materials: spill response plan
spills
  containing, 360
  liquid, 311, 314, 381, 402, 416, 436, 448
  of hazardous materials, 321–322
spondylolisthesis, 424
sprain, 424
sprinkler systems, see automatic sprinkler systems
standard of care, 211
Standard Precautions, 328–330
stand–pivot transfers, 427
stannic chloride, 81
*Staphylococcus*, 332–333, 454
State Children’s Health Insurance Program (SCHIP), 128
State Emergency Response Commission (SERC), 114, 115, 116, 144, 319
state occupational health programs, 106
static coefficient of friction (SCOF), 211
steam sterilization, 362
steam valves, 250
sterilants, 333–336, 441, 480
sterilization, 459, 479; see also central sterile supply
Stoddard solvent, 300
storage, of materials, 213, 265
stored energy power plant supply system (SEPPS), 244
storm drains, 247–248
strains, 424, 449
  preventing, 448
Strategic Partnership Program, 106
stress, 405, 406, 407
  cold-related, 271
substance abuse, 35, 42–44
  losses attributed to, 44
  signs of, 44
  testing, 43
sulfur dioxide, 116
sumps, 248
Superfund Amendments and Reauthorization Act of 1986 (SARA), 113, 114, 144, 156, 319
supervisors
  safety responsibilities of, 18
  training effectiveness, and, 92–93
supplied-air respirators (SARs), 76, 77, 78, 277, 301, 299, 307
support department safety, 435–501
surface factors, 62
surgical fires, 194–197
  first response, 196
surgical room safety, 412–417
surgical vacuums, 245–246
survivor benefits, 41
syringes, 474, 489
T
tagout devices, 233
tags, 233
tanks, 216
teamwork, safety and, 24
tear gas, 167
technological emergencies, 163
tendinitis, 424
tendonitis, 206
tennis elbow, 206
tenosynovitis, 206, 424
terrorism, 147, 164–170, 330, 407, 409
  defined, 164
  hospital response to, 170
terrorist events, 142
therapeutic radiation, 465
thermal burns, 224
third-shift workers, see shift work
threat-assessment team, 47
threshold limit values (TLVs), 79, 277
  ammonia, 294
  enflurane, 313
  glutaraldehyde, 297
  halothane, 313
  methyl methacrylate, 300
threshold planning quantity (TPQ), 116
thunderstorms, 159
tier precautions, 329
Title I, ADA, 130–131
Title II, ADA, 131
Title III, ADA, 131, 186
Title III, Emergency Planning and Community Right-To-Know Act, 114–116
Title III, SARA, 146, 156, 319
Title IV, ADA, 132
Title V, ADA, 132
TLV, see threshold limit values
toluene, 301, 302
tool safety, 216–219
tornadoes, 159, 160
Toxic Substances Control Act (TSCA), 117, 156
toxicity, 276
TPQ, see threshold planning quantity
trainer qualifications, 345
training
budget, 93
determining need for, 91
documentation, 93
in personal protective equipment, 72
respirator, 83–84
unsafe behavior, and, 26
violence prevention, 48–49
methods, 91
objectives, 90
preparation, 91
program development, 89–90
specialized, 92
topics, 87–89
when to provide, 93
transfer, patient, 376, 377, 378, 379, 381, 385, 404, 408, 410, 422, 423, 425, 426, 427, 428, 429, 430, 431
transport systems, 246
transportation accidents, 148, 163–164
trenches, 270
triage, 143, 172, 173
trigger finger, 206
tropical storms, 158–159
TSCA, see Toxic Substances Control Act
tularemia, 166
tunnels, 248
two-person lift teams, 425
U
U.S. Code (USC), 96
U.S. Pharmacopeial Convention (USP), 396, 486
ultrasound, 458
ultraviolet radiation, 470
underground storage tanks (USTs), 114
Underwriters Laboratories (UL), 69, 134, 188, 192, 213, 380
undue hardship, 130
Uniform Fire Codes (UFCs), 194, 284
unit concept, of fire control, 185
universal absorbents, 321
universal precautions, 46, 402, 436, 439, 443, 444, 448, 467
Universal Protocol for Preventing Wrong Site, Wrong Procedure, and Wrong Person Surgery™, 374
Universal Waste Rules, 303
universal wastes, 319
upholstery flammability requirements, 177
utility systems, 242–246
V
vaccinia virus, 38, 332
vacuums, 438
values, defined, 25
valves, 301
vapor density, 278
vapors, 77, 79, 228, 247, 255, 278, 474
vaults, 216
vehicle safety, 263–266
ventilated cabinets, 490, 492
mechanical, 252–253
standards, 254
systems
components of, 252
evaluation of, 259
terms, 255
Index

verbal warnings, 26
video display terminal (VDT), 208
video recorders, 64
violations, OSHA, categories of, 103–104
violence, 97, 386–390, 401, 407–409, 485
  prevention tips, 388
  prevention plan, 46–49, 386
violent patients, 48
viruses, 330–331, 440, 441, 442, 452
Voluntary Protection Program (VPP), 106
volunteers, safety of, 407

W
walk-through drill, 151
warning signs, 69, 222, 298, 299, 309, 316, 317, 418, 477
warrant, OSHA inspection, 100, 102
waste
  anesthesia gas, 312–313, 415, 416
  biological, 359–363
  disposal, 316, 342
    medical, 362–363
  electronic, 320
generators, 113
handling, biological, 361
handling, by housekeeping personnel, 439
hazardous drug, 493–494
ignitable solid, 318
infectious; see also biological waste
  management
  incinerators, 362
  labeling of, 361
  offsite disposal of, 362
  packaging of, 359, 363
  shipping of, 363–364
  storage of, 360
management, 315–321, 359–363
medical, 320
pathological, 360
radioactive, 468, 469
regulated medical, 361
universal, 319
wastewater treatment, 117
weapons of mass destruction, 164–170
welding, 273, 286
welding safety, 222–224
wet-bulb globe temperature (WBGH), 270
wet vacuums, 261
wheelchair safety, 404
wildfires, 162
wind chill, 271
windows, cleaning, 437
winter storms, 161–162
witnesses
  interviews of, 65
to accidents, 63, 64
to near-hit events, 61
work practice controls, 60, 71, 75, 298, 299, 314, 341, 477, 489
work practices, 68
workplace protection standard for asbestos, 306
workplace protection standard for pesticides, 308–309
worker’s compensation, 31, 36, 39–42, 45, 52, 53, 54, 57, 108, 110, 210, 422
workers, successful, 29
workplace analysis, 16
workplace controls, 313
workstations, 206–207, 482, 485
World Health Organization (WHO), 13
wrenches, 217
written firearms policy, 456
written immunizations policy, 331
written plans
  as required by OSHA standards, 98
  chemical hygiene, 475, 476
  confined-space, 235
  emergency management, 142–143
  fire prevention, 445
  fire safety management, 178
  hazard communication, 286, 436, 454
  hazardous drug safety and health, 488, 489
  health, for dental workers, 364
  indoor air quality management, 258
  infant abduction, 396
  infection control, 325
  radiation control, 462
  respiratory protection, 348
  utilities management, 242
written warnings, 26

X
x-rays, 69, 74, 168, 173, 295, 296, 410, 458, 459, 460, 464, 466, 467
goggles, and, 71
xylene, 301, 302

Y
yellow, to indicate caution, 221