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Document 22.5
Fire

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New document or new requirements

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☐ **New document**
☒ **Major requirement change**

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22.5

Fire*

Contents

1.0 Introduction 1

2.0 Overview of Regulations and LLNL Programs 1

3.0 Applicability 2

4.0 Process for Compliance and Risk Reduction 2
- 4.1 Classes of Combustibles 2
- 4.2 Safe Handling of Ordinary Solid Combustibles 3
- 4.3 Safe Handling of Liquid Combustibles 3
  - 4.3.1 Storage Cabinets 5
  - 4.3.2 Safety Cans 5
  - 4.3.3 Drums and Drum-Storage Areas 6
  - 4.3.4 Transportation 6
- 4.4 Safe Handling of Other Combustibles 6
- 4.5 Refrigerator Storage 7
- 4.6 Permits for Welding, Burning, or Other Hazardous Operations 7
- 4.7 Portable Electric Appliances 8
- 4.8 Fire Protection Equipment 8
  - 4.8.1 Fire Detection and Alarms 9
  - 4.8.2 Fixed Fire-Suppression Systems 9
  - 4.8.3 Fire Extinguishers 10
  - 4.8.4 Fire Barriers 11
  - 4.8.5 Fire Hydrants 11
  - 4.8.6 Inspection, Testing, and Maintenance 12
- 4.9 Means of Egress 13
  - 4.9.1 Corridors 13
  - 4.9.2 Exit Doors 13
- 4.10 Capacities of Meeting Rooms 14
- 4.11 Construction Areas 14
- 4.12 Fire Department Access 15
- 4.13 Emergency Reporting 15
- 4.14 Seasonal Decorations 16
  - 4.14.1 Christmas Trees 16
  - 4.14.2 Candles 17
- 4.15 Fire Protection Assessment 17

5.0 Responsibilities 18

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* **Major revision**

5.1 Workers 18
5.2 Managers and Supervisors 18
6.0 Training 18
7.0 Work Standards 19
7.1 Work Smart Standards 19
8.0 Resources for More Information 19
8.1 Contacts 19
8.2 Other Sources 20

Tables

Table 1. Maximum sizes of containers for combustible and flammable liquids. 4
Table 2. Effective extinguishers for burning materials. 11

22.5

Fire

1.0 Introduction

The most common hazard that surrounds us, whether at work or at home, is the presence of combustible materials that can ignite and cause a fire. However, if proper control methods are applied, the risk of injury, illness, and property damage can be reduced to an acceptable level. To minimize the risk of fire, LLNL shall maintain an Improved Risk Program for fire protection by:

- Designing facilities using fire-resistant materials or those of limited combustibility.
- Using building materials and components that have been tested and approved by a nationally recognized testing laboratory (NRTL), when applicable.
- Providing and maintaining adequate corridors, exits, and fire barriers (including door assemblies, dampers, and windows).
- Installing automatic fire protection systems in all facilities larger than 5000 ft^2 or where a fire could result in a monetary loss of $1 million or more.
- Controlling the presence and use of ignition sources and combustibles within each facility.
- Conducting routine fire protection assessments to identify fire hazards and areas that are not sufficiently protected.
- Conducting periodic inspections, tests, and maintenance of fire and life safety equipment and systems to ensure that they operate properly.

2.0 Overview of Regulations and LLNL Programs

The requirements provided in this document are from the Work Smart Standards (WSSs) listed in Section 7.0. A listing of additional reference standards and guidance documents applicable to fire safety can be found in LLNL's *Fire Protection Program Manual* (UCRL-MA 116646) and LLNL Fire Protection Engineering Standard 1.2. The LLNL Improved Risk Program is described in LLNL Fire Protection Engineering Standard 1.3. All three of these documents are available from the fire protection engineering subject matter expert (SME). For guidance, construction criteria, and safety inspections, contact your area Environment, Safety, and Health (ES&H) Team.

Laboratory operations are designed to comply with Contract 48 requirements; LLNL internal policies, procedures, and standards; federal, state, and local regulations; and other WSSs. However, there may be occasions when a specific work activity or facility requires a deviation from these established requirements. In those cases, organizations shall request and obtain written authority to deviate from the requirements. This written approval can take two forms:

- **Exemption.** An exemption is written authority to deviate from a requirement or standard. Fire protection exemptions shall be processed in accordance with Document 2.3, "LLNL Exemption Process," in the *ES&H Manual.*
- **Equivalency.** An equivalency is an approved[†], alternate means of satisfying the technical provisions of the applicable fire protection code or standard. Fire protection equivalencies shall be processed in accordance with LLNL Fire Protection Engineering Standard 1.1, *Fire Protection Equivalency Request Processing*.

3.0 Applicability

The requirements and guidance in this document apply to all LLNL work processes, including those performed by subcontractors, guests, visitors, and construction or labor contractors.

4.0 Process for Compliance and Risk Reduction

4.1 Classes of Combustibles

In general, there are three classes of combustible material:

1. Ordinary solids (e.g., wood, paper, rags, and plastics).
2. Liquid fuels. Liquids are further divided into the following classifications.
   - Class IA liquids have a flash point of less than 73°F (22.8°C) and a boiling point of less than 100°F (37.8°C).
   - Class IB liquids have a flash point of less than 73°F (22.8°C) and a boiling point of 100°F (37.8°C) or greater.
   - Class IC liquids have a flash point of 73°F (22.8°C) or greater but less than 100°F (37.8°C).
   - Class II liquids have a flash point of 100°F (37.8°C) or greater but less than 140°F (60°C).
   - Class III liquids have a flash point of 140°F (60°C) or greater.

[†] **Approved: Acceptable to the fire protection Authority Having Jurisdiction.**

3. Other (e.g., oxidizing chemicals, fast-reacting or explosive materials, and combustible metals). Undesirable reactions from these materials can be surprisingly fast and can easily cause secondary fires.

This document does not contain guidance on flammable gases. For information and guidance on flammable gases, refer to Document 14.1, “LLNL Chemical Safety Management Plan,” in the *ES&H Manual,* and National Fire Protection Association (NFPA) Standard 55 (*Standard for the Storage, Use, and Handling of Compressed and Liquefied Gases in Portable Cylinders*), or contact your area ES&H Team.

4.2 Safe Handling of Ordinary Solid Combustibles

To minimize the risk of fires involving ordinary solids, the following precautions shall be observed:

- Avoid excessive accumulations of combustible materials.
- Keep work areas orderly to minimize fuel paths that facilitate the spread of fire.
- Keep combustibles away from ignition sources (e.g., hot plates, soldering irons, and other heat- or spark-producing devices).
- Use an ashtray when smoking cigarettes. Ensure that the contents of ashtrays have been extinguished and are cold to the touch before being emptied into a waste receptacle.
- Obtain a permit from the Emergency Management Division (commonly referred to as the Fire Department) of the Hazards Control Department for hot-work operations (see Section 4.6).
- Plan work to minimize the storage of excess combustibles in operating areas.
- Keep soiled rags in an approved container with a self-closing automatic lid. Consult the environmental analyst for your area ES&H Team regarding any additional environmental requirements for rags containing solvents or other hazardous materials.
- Frequently inspect and check work areas to ensure that the above precautions are followed.

4.3 Safe Handling of Liquid Combustibles

To minimize the risk of fire involving liquid combustibles, the following precautions shall be observed:

- Obtain a material safety data sheet (MSDS) for any combustible or flammable liquid from the supplier of the chemical or product or from ChemTrack. An MSDS can be obtained by accessing the ChemTrack website at:

  http://chemtrack.llnl.gov

  or by contacting the ChemTrack/MSDS hotline (ext. 4-4404) or emailing the MSDS Coordinator at msds@llnl.gov.

- Use safety cans to store flammable and combustible liquids that are to be dispensed. (See Table 1 for exemptions and maximum sizes of containers.)

- Use properly labeled containers.

- When using such liquids, ventilate the area to prevent the buildup of ignitable vapor or air mixtures, or the inhalation of toxic vapors or gases.

- Carefully avoid ignition sources (e.g., hot material, flames, and sparking equipment) in the general vicinity of such liquids.

Table 1. Maximum sizes of containers for combustible and flammable liquids.[a,b]

Container type[c]	Flammable liquids			Combustible liquids	
	Class IA[d]	Class IB[d]	Class IC	Class II	Class III
Glass	1 pt	1 qt	1 gal	1 gal	5 gal
Metals (other than DOT drums) or approved plastic	1 gal	5 gal	5 gal	5 gal	5 gal
Safety cans	2 gal	5 gal	5 gal	5 gal	5 gal
Metal drums (DOT specifications)	60 gal (Labs[e]-1 gal)	60 gal (Labs[e]–5 gal)	60 gal (Labs[e]-5 gal)	60 gal	60 gal
Approved portable tanks	660 gal	660 gal	660 gal	660 gal	660 gal

a Taken from NFPA 30 (*Flammable and Combustible Liquids Code*).

b See Section 4.1 for definitions of liquid classes.

c Container exemptions: medicines, beverages, foodstuffs, cosmetics, and other common consumer items, provided such items have been packaged according to commonly accepted practices for retail sales.

d Class IA and class IB liquids may be stored in glass containers (capacity ≤ 1 gal) if the required liquid purity (such as ACS analytical reagent grade or higher) would be affected by storage in metal containers or if the liquid can cause excessive corrosion of the metal container.

e Laboratories within the scope of NFPA 45, *Standard on Fire Protection for Laboratories Using Chemicals.*

- Use approved containers to store flammable and combustible liquid waste kept inside a building. Specially designed safety cans for flammable liquid wastes are available (see Table 1). Label the container FOR FLAMMABLE LIQUID WASTE ONLY. If necessary, contact the environmental analyst or Radioactive and Hazardous Waste Management

technician for additional labeling requirements. Never put corrosive or oxidizing materials in a flammable-liquid waste container; a fire or explosion could result. Waste may be transferred to drums or other larger shipping containers that meet the Department of Transportation (DOT) requirements for storing such materials outside buildings.

- Electrically interconnect (i.e., bond) equipment likely to produce a static spark.
- Limit the quantity of such materials in operating areas. Refer to Table 1 for maximum allowable container sizes. Applicable facility safety plans (FSPs) shall also be reviewed for any facility-specific limitations on allowable quantities.

Heating increases the volatility and hazards of liquids. Therefore, additional requirements may be necessary in cases where storage conditions, use conditions, or process operations cause a flammable or combustible liquid to be naturally or artificially heated to or above its flash point. Such additional requirements may include consideration for items such as ventilation, electrical area classifications, and exposure to ignition sources because of increased flammable vapor production. Consult your ES&H Team for further assistance.

4.3.1 Storage Cabinets

The following liquids shall be stored in approved flammable-liquid storage cabinets or inside storage rooms specifically designed for the safe storage of flammable and combustible liquids:

- Class IA flammable liquids (including wastes) in quantities greater than 25 gal in containers.
- Class IB, IC, II, or III liquids (including wastes) in quantities greater than 120 gal in containers.

Flammable and combustible liquids removed from flammable-liquid storage cabinets should be returned to the cabinet when not in use. Storage cabinets shall be:

- Placed where egress is not obstructed.
- Properly tied down to meet seismic requirements.
- Vented outdoors (if ventilation is required) in such a manner that the cabinets' fire resistance is not compromised. Consult your ES&H Team industrial hygienist for ventilation requirements.

For assistance in procuring an appropriate storage cabinet, consult your ES&H Team.

4.3.2 Safety Cans

Safety cans are constructed of stainless steel, Monel, or tin and are equipped with a flame arrestor and spring-loaded cap on both the filling and pouring spouts. The double-perforated

metal surface of the flame-arrestor screen prevents flames from entering the container. Safety cans are available for both dispensing products and collecting waste. Safety cans have been tested and listed by an NRTL and shall not be modified.

For assistance in procuring an appropriate safety can, consult your ES&H Team.

4.3.3 Drums and Drum-Storage Areas

The following precautions should be observed for drums and drum-storage areas:

- Store drums in the vertical position.
- Keep drum bungs closed when liquids are not being transferred into or out of drums.
- Shield drums from sunlight.
- When transferring flammable liquids into drums, use an approved funnel with an installed flash arrestor.
- Allow a minimum distance of 25 ft between a drum-storage area and a building. No minimum distance requirement applies to a drum-storage area that faces a blank masonry wall. For further guidance, contact your area ES&H Team.
- Post a NO SMOKING sign in a drum-storage area. (This sign is available from the health and safety technician for your area ES&H Team.)
- Keep an emergency spill kit near a drum-storage area. The kit consists of a garbage can, dustpan, whiskbroom, and absorbing compound. The absorbing compound is available from the Stores Catalog.
- Install a 20-lb, dry-chemical fire extinguisher no less than 10 ft and no more than 50 ft from a drum-storage area. Contact the ES&H Team fire protection engineer for assistance in acquiring fire extinguishers.

Contact your area ES&H Team regarding environmental requirements for drum storage.

4.3.4 Transportation

For requirements and guidance involving the transportation of hazardous materials, refer to Document 21.2, “ Onsite Hazardous Material Packaging and Transportation Safety Manual” (UCRL-MA-108269, Rev 2) in the *ES&H Manual.*

4.4 Safe Handling of Other Combustibles

Many other combustible materials (e.g., oxidizing chemicals, fast-reacting or explosive materials, and combustible metals) present special fire safety and extinguishing problems. The hazards and safe handling of many of these materials are covered in Document 14.1,

"Chemicals." For information about hazardous gases, refer to Document 14.3, "Toxic, Corrosive, or Reactive Gases," and NFPA 55 (*Standard for the Storage, Use, and Handling of Compressed and Liquefied Gases in Portable Cylinders*). Consult your area ES&H Team for specific safety procedures and guidance.

4.5 Refrigerator Storage

Commercially available, household refrigerators contain built-in ignition sources and shall not be used to store flammable liquids or explosive chemicals. Examples of such ignition sources include light bulbs, switches, temperature controls, standard plugs, motor-starting relays, thermal-overload devices, and heater strips (for frost control).

Anyone who needs a refrigerator to store flammable liquids or explosives should contact the area ES&H Team about refrigerators specifically designed and approved for such use. Refrigerators and freezers that have either been specifically designed or modified to store flammable or combustible liquids safely shall be labeled as such. Labels are available from your area ES&H Team.

4.6 Permits for Welding, Burning, or Other Hazardous Operations

As part of the LLNL program to control fire hazards, permits are required for welding, soldering, and other hot-work operations with a high fire potential. To obtain permits or additional information, call the Emergency Communications Center at the Livermore site or the Fire Department at Site 300.

Operations requiring permits include the following:

- Cutting and welding (i.e., arc, oxyacetylene, and heliarc welding) outside of an approved location.
- Soldering with a torch outside of an approved location.
- Using tar pots in roofing or roadwork.
- Using open fires for any purpose.
- Barbecuing.
- Using heat-producing, spark-producing, or impact tools (e.g., electric power tools and cartridge-actuated tools) to alter, maintain, or modify any system that contains or may contain explosives, flammable liquids, or gases. Permits shall be posted in the work area until the work is completed.

Approved locations for hot work are areas that have been either designed specifically for that purpose or modified to accommodate such operations safely. The Hazards Control Department shall review these areas to ensure that the necessary safeguards (e.g., adequate ventilation, noncombustible construction, and proper gas distribution systems) have been installed.

The above-listed hot-work operations involve other hazards and may require an Integration Work Sheet (IWS). Refer to Document 2.2, “Managing ES&H for LLNL Work,” for further information on the work planning process.

For further information regarding hot-work safety and requirements, refer to NFPA 51B (*Standard for Fire Prevention During Welding, Cutting, and Other Hot Work*), or contact your area ES&H Team.

4.7 Portable Electric Appliances

Portable appliances should be obtained from Central Supply because Laboratory specifications ensure that such items meet the requirements of Underwriters Laboratories (UL) or another NRTL and are safe to use under approved circumstances. Do not use electric appliances near combustible or explosive vapors or dust. When installing or operating a portable electric appliance, the following precautions should be observed:

- Place noncombustible material under the appliance.
- Maintain a clearance of at least 12 in. between the appliance and any combustible material.
- Ensure that the appliance is properly grounded or double insulated.
- Use only those appliances that have been listed or labeled by an NRTL (e.g., UL or Factory Mutual Research Corporation).
- Keep the area immediately around the appliance clean and free of combustibles.
- Ensure that electrical service is adequate for the appliance.

Appliances that remain energized during off-hours may become a fire hazard. When an appliance that contains a heating element (e.g., a coffee maker or portable heater) is to remain energized while unattended, a timer should be used to control the appliance’s operation. A timer should be set to automatically de-energize an appliance during off-hours and energize it no more than 30 minutes before personnel arrive in the area.

4.8 Fire Protection Equipment

Fire protection equipment in operating areas consists of both fixed and portable items to detect fires, alert personnel, and suppress and minimize the spread of fire. Fixed equipment includes

detectors, alarms, fire doors, fire dampers, automatic sprinkler systems, and other automatic fire-suppression systems. Portable equipment consists of fire extinguishers, which are required and available in buildings, and any specialized equipment that a fire-fighting team may bring to an area.

Before installing any fire protection equipment, consult your ES&H Team, which is responsible for ensuring that the equipment selected is appropriate, reliable, and compatible with other systems in use at LLNL.

4.8.1 Fire Detection and Alarms

Several types of fire-detection systems will detect fire and automatically transmit an alarm to the Emergency Communications Center to initiate emergency action. In high-hazard areas, fire detectors also alert the building occupants and, in some cases, activate an automatic extinguishing system.

Fire detection and alarm systems shall be designed and installed in accordance with the requirements of the applicable LLNL Specifications and Standards as well as the applicable NFPA code or standard.

4.8.2 Fixed Fire-Suppression Systems

Fires can be suppressed using automatic sprinklers or other automatic fire protection systems (such as carbon dioxide, Inergen, or dry chemical). The sprinkler head of an automatic sprinkler system contains a heat-sensitive element that usually activates at 165°F (70°C), causing the sprinkler head to open and spray water over the fire. The action of water flowing through the sprinkler line activates an alarm at the Emergency Communications Center.

Sprinkler heads can be damaged and their functions impaired by mechanical or thermal abuse or careless handling. To ensure that sprinkler systems operate properly, workers and supervisors shall observe the following:

- Contact the Plant Engineering Pipe Shop to have protective cages installed over sprinkler heads wherever mechanical damage is likely.
- Keep normal and maintenance-type heat sources (e.g., torches and soldering irons) away from sprinkler heads.
- Keep furniture, equipment, and other materials away from sprinkler heads so as not to interfere with the water-spray pattern.
- Allow 18 in. of clearance below sprinkler heads. Materials located closer than 18 in. interfere with the sprinkler’s water-spray pattern.
- Provide at least 3 ft of clearance around sprinkler control valves to allow fire-safety personnel access to them.

- Do not paint sprinkler heads.
- Do not use sprinkler piping to support other objects, such as plants and wiring.
- Ask the ES&H Team fire protection engineer to review the sprinkler system before modifying a work space (permanent or temporary) or installing large equipment items.

Gaseous fire-suppression systems, such as those containing carbon dioxide, Inergen, or Halogenated Agent, are used to control or extinguish fires in normally unoccupied spaces. Such systems shall be designed and installed in accordance with the applicable LLNL Specification and Standards as well as the applicable NFPA code or standard.

For further information regarding these systems, consult the ES&H Team fire protection engineer.

4.8.3 Fire Extinguishers

Fire extinguishers are manually operated, portable devices that discharge an extinguishing agent when properly activated. They are designed as a method of controlling a fire during the time between discovery and arrival of the Fire Department. It is essential that personnel be familiar with the location and type of extinguishers in their work areas. However, it is unsafe for personnel to use a fire extinguisher to control a fire if they have not taken the one-hour fire extinguisher training course (HS1670-W, “Qualification for Fire Extinguishers Users - Web,” or approved alternate; see the *LLNL Course Catalog*) conducted by the Hazards Control Department. Personnel who have not been trained in the use of fire extinguishers shall not attempt to use them.

Successfully extinguishing a fire depends on the following (in the order of importance):

- Notifying the Fire Department immediately upon learning of a fire.
- Having the proper knowledge and training in the use of fire extinguishers.
- Choosing the proper extinguishing agent (see Table 2).
- Using an extinguisher of the proper size for the size of the fire.
- Properly operating the extinguisher before attempting to extinguish the fire.

Contact the ES&H Team fire protection engineer for assistance in acquiring fire extinguishers.

Table 2. Effective extinguishers for burning materials.

Class of fire	Characteristics of burning materials	Extinguisher
Class A	Ordinary combustible materials, such as cellulose products, wood, paper, cloth, plastics, or rubber	Water, multipurpose dry chemical (ABC), or Halogenated Agent
Class B	Flammable or combustible liquids, such as oils, gasoline, alcohol, and solvents[a]	Carbon dioxide, Halogenated Agent, or dry chemical (BC or ABC)[a]
Class C	Energized electrical equipment or wiring [b]	Carbon dioxide, Halogenated Agent, or dry chemical (BC or ABC)[b]
Class D	Burning magnesium, thorium, uranium, potassium, or sodium metals	G-1 powder (special graphite) or Met-L-X (sodium chloride)
Class K	Fires in cooking appliances involving combustible media (oils and fats)	Wet Chemical

[a] Do not use water on a flammable or combustible liquid fire because it will spread and accelerate the fire. An explosion may result if water is used.

[b] Do not use water on energized electrical equipment. Many electrical fires involving personal computers, photocopiers, or similar equipment can be controlled by safely turning off the equipment's power.

4.8.4 Fire Barriers

Fire barriers, such as fire doors and windows, fire dampers, and firewalls, are placed in strategic locations to block the spread of smoke and fire. The following requirements concerning fire barriers shall be observed:

- Fire doors shall never be blocked or wedged open.
- Fire doors shall be allowed to operate freely and without obstructions.
- Fire doors contain labels from testing laboratories that shall never be removed or painted over.
- All penetrations made in walls and floors to accommodate piping, electrical conduit, wiring, or ducts shall be properly sealed with approved fire-stopping materials.
- Ceiling tiles removed to accommodate maintenance or construction activities shall be replaced at the completion of the job or whenever work on the project is significantly delayed (i.e., two weeks or longer).

4.8.5 Fire Hydrants

Fire hydrants are intended primarily for use by the Emergency Management Division in emergency situations. However, the Fire Chief may permit the use of fire hydrants for temporary activities (e.g., connections by gardeners and construction subcontractors). If you need to use a fire hydrant, call the Fire Department for concurrence.

The following precautions shall be observed when using fire hydrants:

- Use only valved outlets provided by the Plant Engineering Pipe Shop.
- Use only a hydrant spanner provided by the Pipe Shop; other types of wrenches can damage the flats on the valve stem.
- Do not leave connections unattended; connections to fire hydrants may remain in place only while attended. (This requirement does not apply to connections at construction sites.)
- When opening a hydrant valve, slowly open the valve to the fully open position, then close one-eighth of a turn to minimize the likelihood of the valve being inadvertently forced in the wrong position and damaged.
- When turning off the flow of water, close the valve slowly.
- After using a hydrant, manually screw on the caps (i.e., hand-tighten only).

The testing and use of fire hydrants can wash sand, rocks, dirt and other debris onto roadways and paths, resulting in potential hazards to their users. Users of fire hydrants shall ensure that paths and roadways are cleared of any debris such as rocks and dirt that may have washed onto them during the use of a fire hydrant.

4.8.6 Inspection, Testing, and Maintenance

Fire protection equipment (i.e., fire detection and alarm systems, fire suppression systems, fire extinguishers, fire dampers, standpipes, and horizontal or vertical sliding and rolling type fire doors) shall be inspected, tested, and maintained (IT&M) in accordance with the applicable NFPA code or standard. Laboratory Services (Plant Engineering or UTEL departments) normally performs the required IT&M of fire protection equipment.

A qualified Fire Extinguisher Service Technician assigned to the Maintenance Mechanics Group of the Plant Engineering Department performs the required annual maintenance of fire extinguishers. This annual maintenance is a thorough examination, which includes any necessary repair or replacement and is intended to give maximum assurance that extinguishers will operate effectively and safely.

In addition to the annual maintenance of fire extinguishers performed by the Fire Extinguisher Service Technician, the Emergency Management Division performs a monthly inspection of fire extinguishers using a checklist verifying that:

- Seals and tamper indicators are not broken or missing.
- The extinguisher is full (fullness is determined by weighing or “hefting”).
- There is no obvious physical damage, corrosion, leakage, or clogged nozzles.

- The pressure-gauge reading or indicator is in the operable range or position.

Facility management should consider verifying the required IT&M of fire protection equipment as part of their self-assessment program (see Document 4.1, “Directorate ES&H Self-Assessment Program,” in the *ES&H Manual*). Forms that may be useful in documenting the IT&M of fire protection equipment can be found on the web at:

http://www.nfpa.org/premiums/

4.9 Means of Egress

All Laboratory buildings are provided with egress systems (e.g., corridors, stairs, and doors) to meet the requirements of NFPA Life Safety Code. Egress systems provide building occupants with a safe way out of the building and the Fire Department with a way into buildings when responding to emergencies. To maintain the integrity of egress systems, the requirements below shall be observed.

4.9.1 Corridors

- When used as part of an egress system, corridors shall have a minimum clear width of 44 in. in office buildings and 36 in. in laboratory buildings. In certain cases, corridors in existing laboratory or shop buildings may be permitted to have a clear width of 28 in. (check with the ES&H Team fire protection engineer).
- Corridors shall always remain free of obstructions and impediments.

4.9.2 Exit Doors

- An exit door and the routes to it shall be illuminated and properly identified with appropriate signs. Emergency lighting may also be required. Refer to Document 11.2, “Hazards – General and Miscellaneous,” for guidance on emergency lighting.
- Do not use locks or fastening devices that would prevent free escape from the building.
- An exit door shall be able to be opened with a single operation. Do not use locks requiring multiple operations or special knowledge or effort to open.
- Minimum door width shall not be less than 28 in. For new doors, contact your area ES&H Team for requirements.
- An exit door and the floor area on both sides of it shall be kept clear and accessible at all times.

When conflicts arise regarding security requirements and safe exiting requirements, contact your area’s ES&H Team leader, who can arrange for the proper parties to resolve the issue.

4.10 Capacities of Meeting Rooms

The number of people allowed to occupy a facility at any one time shall not exceed the facility's ability to safely accommodate them. This personnel limit is referred to as a room or building's occupant load or capacity.

The sponsor of a talk or meeting shall be responsible for ensuring that the number of people attending the function does not exceed the room or building's occupant load. This requirement applies to all meetings and presentations conducted in Laboratory facilities. The Laboratory's phone book contains a listing of available meeting rooms along with the occupant load of each.

The occupant load of a meeting room should be posted in the room for convenience. Your ES&H Team can assist you in determining the occupant load of a meeting room or other area in which you may be considering sponsoring a meeting or other event.

4.11 Construction Areas

Construction areas shall be maintained in a fire-safe condition. Such efforts include maintaining egress paths and ensuring that a construction site is accessible to the Fire Department. The Fire Department should be consulted regarding specific access requirements for construction sites. Accumulations of combustible waste material, dust, and debris shall be removed from structures and their immediate vicinity at the end of each work shift or more frequently if necessary for safe operations.

Subcontractors shall be made aware of the following:

- The need for permits and portable fire extinguishers.
- Provisions for the safe use of combustible materials.
- Requirements for storing flammable and combustible liquids in approved safety containers.
- Requirements for disposing of excess construction materials.
- LLNL's emergency telephone numbers.

Each LLNL representative who supervises a subcontractor is responsible for ensuring that the above information is communicated to the subcontractor.

In facilities under construction, automatic sprinkler systems shall be placed in service as soon as possible, even if no working detection or flow alarm system is in place yet.

4.12 Fire Department Access

Proper access to all LLNL facilities is important to ensure a timely response to emergencies. Fire lanes have been established throughout the Laboratory so that the Fire Department can access buildings when responding to emergencies. Fire lanes are posted and shall be kept clear at all times. Vehicles are not allowed to park in a fire lane under any circumstances. The Safeguards and Security Department will issue a traffic citation to any vehicle that is improperly parked in a designated fire lane. The Fire Department reviews all plans for building construction, trailer relocation, and fencing changes to ensure proper access. If you need assistance or have any questions about the Fire Department's vehicle access requirements or the adequacy of fire lanes, call the Fire Department.

4.13 Emergency Reporting

For emergency reporting purposes, at least one readily accessible analog telephone shall be located in each normally occupied LLNL facility. This telephone shall be in an area that is not subject to being locked (e.g., a lobby or hallway). For a larger facility, multiple telephones shall be placed so that the travel distance from any location in the facility to the nearest telephone is no more than 200 ft.

Note: When you report an emergency, the emergency dispatcher may request only brief information at first, then put you on hold to dispatch the Fire Department. Do not hang up at this time, as the dispatcher will ask you for more detailed information.

In an emergency:

- Call 911 (or from a cellular telephone, call 925-447-6880).
- Briefly state what happened and where it happened.
- Indicate if anyone was hurt and, if so, how badly.
- Give your name and the extension from which you are calling; do not hang up until the dispatcher instructs you to do so.
- Wait in the area, if it is safe to do so, until the Fire Department arrives to provide information to the Incident Commander.
- In a large facility, have someone meet Fire Department personnel at the entrance to guide them to the scene.

The emergency dispatcher may need the following additional information for specific types of emergencies:

- Fires
  - What is burning?
  - Is the fire small or large?
- Emergency medical assistance
  - Is the person conscious or unconscious?
  - How many people are injured?
- Hazardous spills
  - What is the name of the material spilled? (Include the correct spelling, if known.)
  - Is the material a liquid, solid, or gas?
  - Has anyone been exposed to the material?
  - Has the flow of the material been stopped?

In addition, report any actions that may have been or are being taken (e.g., attempts to extinguish the fire, evacuation of the area, and administration of CPR). This information will help emergency response personnel anticipate actions that may be required upon arrival.

4.14 Seasonal Decorations

In observance of certain holidays, some Laboratory facilities are temporarily decorated with Christmas trees and candles. The following precautions shall be taken to ensure safety.

4.14.1 Christmas Trees

- Do not place a natural, cut Christmas tree in an assembly, healthcare, or dormitory facility that does not have an approved, automatic fire sprinkler system.
- Place a Christmas tree where it will not obstruct corridors, exit ways, or other means of egress.
- Use only electrical lights that have been listed by an NRTL, such as UL.
- Do not use electrical lights on metal artificial trees.
- Do not use open flames, such as candles, on or near a Christmas tree.
- Do not locate a natural, cut Christmas tree near a heating vent or portable heating device that could dry out prematurely or ignite the tree.

- Cut off the bottom end of a natural tree trunk at an angle, at least 1 in. to 2 in. above the end, to help the tree absorb water. Place the tree in a suitable stand with adequate water. Check the water level daily.
- Immediately remove a Christmas tree from a building upon evidence of dryness.
- Disassemble and remove a Christmas tree and decorations before workers leave for the holidays.

4.14.2 Candles

- Never leave a burning candle unattended. Extinguish all candles before leaving a room.
- Keep candles away from items that can catch fire (e.g., papers, books, and combustible holiday decorations).
- Place candles in sturdy candleholders that will not tip over. Make sure the candleholders are made of noncombustible materials and are designed to protect the candle flame.
- Always place a burning candle on a heat-resistant surface. A candleholder can become hot and ignite or damage the surface on which it is placed.

4.15 Fire Protection Assessment

To ensure that DOE fire safety objectives for worker protection, property conservation, and programmatic continuity are met, all Laboratory facilities shall be subject to a fire protection assessment at least every 3 years. A fire protection engineer with knowledge and experience in applying fire safety codes and standards to diverse facilities should perform this assessment. The formality of the assessment depends on the facility's classification (i.e., nuclear or non-nuclear) and monetary or programmatic loss potentials.

The fire protection assessment of nuclear facilities, facilities with unique fire safety risks, significant new facilities and all facilities with a maximum possible fire loss (MPFL) potential of $25 million or more is carried out in the form of a fire hazard analysis (FHA.) This analysis includes details about the facility's fire protection features and estimates of the monetary and programmatic loss potentials associated with that facility. The analysis shall be fully documented.

For all non-nuclear facilities and facilities that do not represent unique fire safety risks, and facilities with a MPFL of less than $25 million, assessment is in the form of a facility fire protection assessment. This assessment is less rigorous and examines fewer aspects of the overall fire protection features of a building. The documentation for this assessment typically includes a listing of deficiencies uncovered.

More information on fire protection assessments can be found in DOE order 420.1A, “Facility Safety,” and its implementation guide (G-420.1/B-0). The Laboratory’s *Fire Protection Program Manual* (UCRL-MA 116646) contains a brief description of the fire protection assessment program. You may also contact the ES&H Team for additional information and for assistance with performing these assessments.

5.0 Responsibilities

General responsibilities for all workers are described in Document 2.1, “Laboratory and ES&H Policies, General Worker Responsibilities, and Integrated Safety Management.” Specific responsibilities for fire emergencies are listed under each title below.

5.1 Workers

Workers are responsible for being aware of and following the work controls identified in this document. When those work controls cannot be followed, the worker shall contact his or her supervisor for guidance.

5.2 Managers and Supervisors

- Ensure that your work areas comply with the work controls identified in this document.
- Notify your ES&H Team of any operational changes that alter the fire risk in your work areas so that protection can be adjusted accordingly.
- Ensure that fire protection assessments are performed for your facilities.

6.0 Training

OSHA regulations require that anyone who uses a fire extinguisher be trained annually in its use. The Hazards Control Department’s Course HS1670-W, or an approved alternate fulfills this requirement. In addition, LLNL requires that facility points of contact (both primary and alternate) complete HS1670-W at least once to become familiar with portable fire extinguishers. The *LLNL Course Catalog* may be viewed online at the following Internet address:

https://www-ais.llnl.gov/llnl_only/docs/hr/catalog/

7.0 Work Standards

7.1 Work Smart Standards

29 CFR 1910, Subpart E, “Means of Egress” (1910.35 to 1910.38), January 1999.

29 CFR 1910, Subpart L, “Fire Protection” (1910.155 to 1910.165), January 1999.

29 CFR 1926, Subpart F, “Fire Protection and Prevention” (1926.150 to 1926.159), January 1999.

DOE O 420.1A , Facility Safety, § 4.2.2, Fire Protection Design Requirements.

DOE O 440.1A, “Worker Protection Management for DOE Federal and Contractor Employees,” Attachment 2, “Contractor Requirement Document,” Sections 1-11, 13-18 (delete item 18.a), 19 (delete item 19.d.3) and 22.

DOE-HDBK-1081-94, *Primer on Spontaneous Heating and Pyrophoricity.*

http://tis.eh.doe.gov/techstds/standard/hdbk1081/hbk1081.html

DOE M 440.1-1, *DOE* Explosives Safety Manual, (including DOE Explosives Safety Committee approved changes through May 2002).

Factory Mutual Data Sheet 7-98, “Hydraulic Fluids.”

National Fire Codes (NFC). Volumes 1-13, May 2003 Edition, with the exception of NFPA 5000 http://ltmofs.llnl.gov/nfpabin/lpext.dll?f=templates&fn=main-h.htm&toc=yes

Uniform Building Code (UBC), 1997 with exception of Chapters 1, 3, 4, 8, 9, and 10.

8.0 Resources for More Information

8.1 Contacts

Contact the Emergency Management Division (i.e., the Fire Department) for further information on or assistance with the following:

- Emergency reporting.
- Fire department access.
- Hot-work permits.

For information or assistance regarding fire extinguisher maintenance or service, contact the fire extinguisher service technician.

For fire safety information or assistance in subjects not covered above, contact your area ES&H Team or the fire protection engineering subject matter expert.

8.2 Other Sources

Fire Protection Program Manual, UCRL-MA 116646, Lawrence Livermore National Laboratory, Livermore, CA (latest edition).

LLNL Fire Protection Engineering Standards, Hazards Control Department, Lawrence Livermore National Laboratory, Livermore, CA (latest edition).

DOE-HDBK-1092-98, *Electrical Safety*.

http://tis.eh.doe.gov/techstds/standard/hdbk1092/hbk1092.pdf