

**Forest Service Handbook  
National Headquarters - Washington Office  
Washington, DC**

**Forest Service Handbook 6709.11 – Health and Safety Code Handbook  
Chapter 60 - Hazardous Materials**

**Amendment:** 6709.11-2018-1

**Effective date:** December 03, 2018

**Duration:** This amendment is effective until superseded or removed.

**Approved by:** Robert Velasco II, Acting Deputy Chief, Business Operations

**Date approved:** November 28, 2018

**Responsible Staff:**

**Last Change:** 6709.11-2016-1 to 6709.11\_20

**Superseded Document(s):** Entire Handbook; 6709.11, Contents, Amendment 6709.11-99-1, December 01, 1999; 6709.11\_zero\_code, Amendment 6709.11-99-1, December 01, 1999; 6709.11\_10, Amendment 6709.11-2015-1, December 07, 2015; 6709.11\_20-24, Amendment 6709.11-2016-1, July 19, 2016; 6709.11\_25-27, Amendment 6709.11-99-1, December 01, 1999; 6709.11\_30, Amendment 6709.11-99-1, December 01, 1999; 6709.11\_40, Amendment 6709.11-99-1, December 01, 1999; 6709.11\_50, Amendment 6709.11-99-1, December 01, 1999; 6709.11\_60, Amendment 6709.11-99-1, December 01, 1999; 6709.11\_70, Amendment 6709.11-99-1, December 01, 1999; 6709.11, Glossary, Amendment 6709.11-99-1, December 01, 1999; 6709.11, Index, Amendment 6709.11-99-1, December 01, 1999

**Digest:** Following is an explanation of the changes throughout the directive by section.

**6709.11:** Revised Handbook in its entirety.

**12 - 13:** Removes codes, captions, and direction for Motorized Vehicles and Specialized Equipment and recodes direction with revisions to FSM 7130.

**14:** Removes codes, captions, and direction for Aviation and recodes direction with revisions to the 2016 National Aviation Safety Management System Guide.

**15:** Removes codes, captions, and direction for Watercraft Safety and recodes direction with revisions to FSM 7130.

**22:** Removes codes, captions, and direction for Resource Management.

**Forest Service Handbook 6709.11 – Health and Safety Code Handbook**  
**Chapter 60 - Hazardous Materials**  
**Amendment: 6709.11-2018-1**  
**Effective date: December 03, 2018**

**22.3:** Removes codes, captions, and direction for Recreation and recodes direction with revisions to FSM 2300.

**22.4:** Removes codes, captions, and direction for Forest Management and recodes directions with revisions to FSM 2000.

**22.5:** Removes codes, captions, and direction for Watershed and Air Management and recodes direction with revisions to FSM 2500.

**22.6:** Removes codes, captions, and direction for Wildlife, Fish, and Sensitive Plant Management and recodes directions with revisions to FSM 2630.

**22.62:** Removes codes, captions, and direction for Diving and recodes directions with revisions to FSH 4209.11.

**22.7:** Removes codes, captions, and direction for Special Uses and recodes directions with revisions to FSM 2700.

**22.8:** Removes codes, captions, and direction for Minerals and Geology and recodes directions with revisions to FSM 2800.

**23:** Removes codes, captions, and direction for State and Private Forestry.

**24:** Removes codes, captions, and direction for Research.

**25.1:** Removes codes, captions, and direction and recodes directions with revisions to Interagency Standards for Fire and Fire Aviation Operations.

**25.2:** Removes codes, captions, and direction on Smokejumping and recodes directions with revisions to Interagency Standards for Fire and Fire Aviation Operations.

**25.3:** Removes codes, captions, and direction on Law Enforcement and recodes directions with revisions to FSH 5309.11.

**26:** Removes codes, captions, and direction on Management Services.

**27:** Removes codes, captions, and direction on Engineering and recodes directions with revisions to FSM 7000 Series Publications.

**36:** Removes codes, captions, and direction for Electrical Standards and recodes direction with revisions to FSM 7600.

**Forest Service Handbook 6709.11 – Health and Safety Code Handbook**

**Chapter 60 - Hazardous Materials**

**Amendment:** 6709.11-2018-1

**Effective date:** December 03, 2018

**37:** Removes codes, captions, and direction for Occupational Health and Environmental Controls and recodes directions with revisions to FSM 7400.

**38:** Removes codes, captions, and direction for General Environmental Controls and recodes direction with revisions to FSM 7400.

**44:** Removes codes, captions, and direction for Heavy Equipment and recodes direction with revisions to EM 7130-2.

**45:** Removes codes, captions, and direction for Equipment Development and recodes direction with revisions to FSM 7120.

**70:** Changes chapter caption from “Job Hazard Analysis (Form FS-6700-7) and Personal Protective Equipment” to “Personal Protective Equipment, Glossary, and Index” and revises chapter in its entirety.

## Table of Contents

<b>61 - Hazardous Materials .....</b>	<b>6</b>
<b>61.01 - Authority .....</b>	<b>6</b>
<b>61.05 - Definitions .....</b>	<b>7</b>
<b>61.06 - References .....</b>	<b>8</b>
<b>61.1 - General Safety Requirements .....</b>	<b>9</b>
<b>61.11 - Personnel Qualifications .....</b>	<b>9</b>
<b>61.12 - Personal Protective Equipment .....</b>	<b>10</b>
<b>61.14 - Safety Practices .....</b>	<b>10</b>
<b>61.15 - Use .....</b>	<b>11</b>
<b>61.15a - Marking and Labeling .....</b>	<b>11</b>
<b>61.16 - Storage .....</b>	<b>14</b>
<b>61.17 - Transportation .....</b>	<b>14</b>
<b>61.18 - Disposal .....</b>	<b>14</b>
<b>61.2 - Laboratory and General Chemical Safety .....</b>	<b>15</b>
<b>61.21 - Qualifications .....</b>	<b>15</b>
<b>61.22 - Personal Protective Equipment .....</b>	<b>15</b>
<b>61.23 - Procedures .....</b>	<b>16</b>
<b>61.24 - Chemical Hygiene Plan .....</b>	<b>17</b>
<b>61.25 - Emergency Planning .....</b>	<b>18</b>
<b>61.25a - Emergency Evacuation Procedures and Communications Plan .....</b>	<b>20</b>
<b>61.25b - Emergency Guidelines .....</b>	<b>20</b>
<b>61.26 - Safety Practices .....</b>	<b>20</b>
<b>61.3 - Greenhouse Safety .....</b>	<b>24</b>
<b>61.31 - Procedures .....</b>	<b>24</b>
<b>61.32 - Safety Practices .....</b>	<b>24</b>
<b>61.32a - Operations .....</b>	<b>24</b>
<b>61.32b - Pesticides .....</b>	<b>24</b>
<b>61.32c - Equipment .....</b>	<b>25</b>
<b>61.32d - Electrical .....</b>	<b>25</b>
<b>61.4 - Incompatible Chemicals .....</b>	<b>25</b>
<b>61.41 - Area 1 - Solvents .....</b>	<b>29</b>
<b>61.42 - Area 2 - Corrosive Materials .....</b>	<b>29</b>
<b>61.43 - Area 3 - Strong Oxidizing Agents .....</b>	<b>30</b>
<b>61.44 - Area 4 - Remaining Chemicals .....</b>	<b>30</b>
<b>61.5 - Flammable/Combustible Liquids .....</b>	<b>31</b>
<b>61.51 - Special Concerns .....</b>	<b>34</b>
<b>61.51a - Density .....</b>	<b>34</b>
<b>61.51b - Vapor Density .....</b>	<b>34</b>
<b>61.51c - Toxicity .....</b>	<b>34</b>
<b>61.51d - Storage .....</b>	<b>34</b>

Forest Service Handbook 6709.11 – Health and Safety Code Handbook

Chapter 60 - Hazardous Materials

Amendment: 6709.11-2018-1

Effective date: December 03, 2018

61.51e - Dispensing .....	36
61.6 - Compressed and Flammable Gases .....	39
61.61 - General Safety .....	39
61.62 - Liquefied Petroleum Gas .....	41
61.7 - Pesticides .....	43
61.71 - Safety Practices .....	43
61.71a - Storage .....	43
61.71b - Pesticide Transportation .....	44
61.71c - Disposal .....	45

## **61 - Hazardous Materials**

Hazardous materials consist of a wide variety of substances that may be gas, liquid, or solid. Characteristically, this material may be corrosive, explosive, flammable, radioactive, reactive, toxic, or a combination, and requires specific cautionary procedures to permit safe use, transport, and storage. The unique properties of hazardous materials require that all employees who work with these materials have a general awareness of the dangers these materials present to life, safety, and health.

### **61.01 - Authority**

Authorities include the following:

1. The authority for flammable/combustible liquids, hazardous waste operations, respiratory protection, specifications for accident prevention signs and tags, and toxic and hazardous substances is in Title 29, Code of Federal Regulations (29 CFR), sections 1910.106, 1910.120, 1910.134, 1910.145, and 1910.1000 - 1910.1450.
2. The authority for ventilation, lead, and Occupational Safety and Health Administration (OSHA) safety standards is in 29 CFR 1926.57 and 1926.62 and Part 1960, Subpart C.
3. The authority for hazardous waste management is in 40 CFR Subchapter C.
4. The authority for pesticides programs is in 40 CFR Subchapter E. Additional agency direction is in FSM 2150 and FSH 2109.14.
5. The authority for underground storage tank standards is in 40 CFR Subchapter I, Part 280.
6. The authority for general and specific information on hazardous materials, commercial driver's license standards, and hazardous materials transportation is in 49 CFR Parts 171, 173, 175-177, 383, and 397.
7. Agency direction on hazardous materials, in addition to this chapter, is in FSM 2160 and 6740. For management of asbestos-containing materials refer to FSM 2167.13; for radon, FSM 2167.14a; for polychlorinated biphenyls (PCBs) and restricted wood preservatives commonly used in buildings and structures, FSM 2167.16; and for lead, FSM 2167.17.
8. The Interagency Aviation Transport of Hazardous Materials document (January 1999) establishes the USDA Forest Service and the Department of the Interior interagency aviation transport of hazardous materials program as authorized in FSM 5700, Aviation Management. This document can be ordered from the National Interagency Fire Center, Great Basin Cache Supply Office, 3833 South Development Avenue, Boise, Idaho

83705. Order NFES no. 1068. Also reference the Interagency Transportation Guide for Gasoline, Mixed Gas, and Diesel, PMS 442, April 2011.

## 61.05 - Definitions

Chemical. Any element, chemical compound, or mixture of elements and/or compounds.

Combustible Liquids. Any liquids having a flash point at or above 100 oF (38 °C). Kerosene is an example.

Compressed Gas. A gas stored under pressure, which has the potential for explosive action if suddenly released and may irritate eyes, skin, and lungs.

Corrosive Material. Material that burns on contact, causing visible damage and/or irreversible changes to body tissues and also burns through inert materials. Hydrochloric acid is an example.

Cryogenic Material. Material that has the potential for explosion and also freezes body tissues on contact.

Etiologic Agent. A microorganism that causes a disease or disorder as determined by medical diagnosis.

Explosive. Chemical material that can undergo a sudden and violent release of pressure and heat causing injuries, death, and damage.

Explosive Material. Material with the potential for explosion.

Exposure Routes. Ways that chemicals enter a person's body. There are four main routes of exposure: ingestion, inhalation, skin absorption, and skin/eye contact.

Flammable Compressed Gas. A very highly flammable or explosive material when mixed in air at ambient temperature and pressure. Ignition of even a small leak may cause the material to ignite.

Flammable Liquids. Any liquid having a flash point below 100 °F (38 °C). Alcohol is one example.

Flammable Solid. Solid material that ignites easily and burns vigorously.

Flash Point. Lowest temperature at which a liquid gives off enough vapor to ignite in the presence of an ignition source.

Hazardous Chemical. Any chemical having a physical or health hazard associated with its use.

**Forest Service Handbook 6709.11 – Health and Safety Code Handbook**  
**Chapter 60 - Hazardous Materials**  
**Amendment: 6709.11-2018-1**  
**Effective date: December 03, 2018**

Hazardous Waste. Any solid, liquid, or contained gaseous material that because of its quantity, concentration, or physical, chemical, or infectious characteristics may bring about the following:

1. Cause or significantly contribute to an increase in mortality or an increase in serious irreversible or incapacitating reversible illness; or
2. Pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, disposed of, or otherwise managed.

Incompatible Materials. Materials that could cause dangerous reactions when in direct contact with each other.

Irritating Materials. Materials that release dangerous fumes on contact with water, fire, or air and that react with body tissues at the point of contact causing reddening, itching, tearing, irritation, and/or minor inflammation.

Oxidizing Material. Any material that yields oxygen to stimulate combustion.

Poison. A material that adversely affects systems of the body.

Pyrophoric Liquid. Liquid that ignites spontaneously in air at 130 °F (54 °C) or lower temperatures.

Radioactive Material. A substance containing an element that emits ionizing radiation upon decay.

Toxic Material. Material that may cause systemic damage when taken into the body.

## **61.06 - References**

1. National Fire Protection Association. NFPA issues standards for use and management of various hazardous materials and related topics as follows: NFPA 30, Flammable and Combustible Liquids Code; NFPA 43A, Storage of Liquid and Solid Oxidizers; NFPA 43B, Storage of Organic Peroxide Formulations; NFPA 43C, Storage of Gaseous Oxidizing Materials; NFPA 43D, Storage of Pesticides; NFPA 58, Storage and Handling of Liquefied Petroleum Gases; NFPA 70, National Electrical Code; NFPA 80, Fire Doors and Windows; NFPA 251, Building Construction and Materials; NFPA 325M, Fire Hazard Properties of Flammable Liquids, Gases, and Volatile Solids; NFPA 395, Storage of Flammable and Combustible Liquids at Farms and Isolated Sites; NFPA 491M, Hazardous Chemical Reactions; and NFPA 704, Identification of the Fire Hazards of Materials for Emergency Response. Quincy, MA.

See the Unit Engineer or Safety Manager for NFPA references.



2. U.S. Department of Transportation, Research and Special Programs Administration (most current version). 1993. Emergency Response Guidebook. U.S. Government Printing Office, Washington, DC.
3. Interagency Transportation Guide for Gasoline, Mixed Gas, and Diesel, PMS 442, April 2011 (or most current version).

## **61.1 - General Safety Requirements**

### **61.11 - Personnel Qualifications**

Line Officers shall ensure that all employees involved in the use, storage, transportation, and disposal of hazardous materials receive training specified in 29 CFR 1910.120, 29 CFR 1910.1200, and 49 CFR Part 172. At a minimum, this must include general awareness training for handling hazardous materials and must extend to function-specific, safety, and driver training, when warranted.

OSHA requires specific training for workers who may come in contact with hazardous materials in their work. This includes the following:

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. They would take no further action beyond notifying the authorities of the release 29 CFR 1910.120(q)(6)(i).

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. Refer to FSM 2165 concerning Forest Service employee emergency response direction, including Human Resource Management involvement. First responders at the operational level shall have received at least eight hours of training and any subsequent required training, 29 CFR 1910.120(q)(6)(ii).

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 and any subsequent required training, 29 CFR 1910.120(q)(6)(iii).

In accordance with FSM 2161.41a, Line Officers shall ensure that all employees, including seasonal workers and volunteers who are likely to discover a hazardous material release, receive Emergency Response Awareness Training.

Operators of Government vehicles transporting hazardous materials for noncommercial purposes in quantities that require placarding shall obtain a commercial driver's license with a hazardous materials endorsement. Refer to 49 CFR Part 383 for requirements. Drivers shall receive general awareness, safety, driving, and function-specific training.

### **61.12 - Personal Protective Equipment**

The Occupational Safety and Health Administration (OSHA) hazard communication standard (29 CFR 1910.1200) requires manufacturers to provide on their chemical product labels specific guidelines on its hazards, uses, personal protective equipment (PPE), and disposal techniques. Provide this information to employees by means of a written hazard communication program, risk assessment (RA), standard operating procedure(s) (SOP), other forms of warning, safety data sheet (SDS), and training. Maintain employee exposure and medical records in accordance with 29 CFR 1910.20. The RA or SOP must address site-specific hazards associated with drug dumps, methamphetamine labs, and so forth that employees may discover on Forest Service Lands.

### **61.14 - Safety Practices**

A hazard communication (HazCom) training program provides information related to general awareness, hazard chemical inventory, and SDSs. All employees are required to at least have initial HazCom training and need additional training when there are changes in the workplace. Many employers offer an annual refresher as a best management practice. FSM 211.42, 2162.5.

1. A hazardous chemical inventory must be maintained for all chemicals in the workplace and must be readily accessible to all employees.
2. Employees shall not handle hazardous chemicals that do not have an SDS. A SDS is required from the manufacturer/supplier of each chemical used on site. SDSs can be found online on manufacturer's Web sites as well. SDSs must be readily accessible to employees at all times.
3. Emergency response awareness training must address the following:
  - a. Hazardous material releases by third parties on National Forest System lands and Forest Service-leased lands;
  - b. Releases from Forest Service facilities or operations that are beyond the ability of the employees in the immediate work area to clean up. Response to these situations should be limited to collecting as much information as possible from a safe distance and notifying the appropriate Forest Service person who can help determine if a

Reportable Quantity was released, the appropriate investigation and cleanup necessary, and required appropriate notifications.

Appropriate internal notifications may go to your unit's Hazmat Coordinator, Dispatch Office, Forest Engineers, or Regional Environmental Engineers. Large spills will likely require a professional cleanup contractor's assistance. Notifications may be required to the National Response Center (1-800-424-8802), U.S. Environmental Protection Agency (EPA), State, and/or local emergency response authorities and Hazmat Coordinator.

### **61.15 - Use**

Research and identify the hazards and properties of chemicals before purchase. Order only enough of each chemical to meet current needs. Chemical-specific information must be available through labels and the SDS.

#### **61.15a - Marking and Labeling**

All containers in the workplace should have the original manufacturer's label. Secondary containers must be labeled with specific contents and hazard types.

The Forest Service uses two primary labeling systems for hazardous materials in buildings and for transportation:

1. National Fire Protection Association (NFPA) Hazard Rating System (61.15a, ex. 01). This system identifies the hazards of a material in terms of four categories: Health Hazard, Flammability, Reactivity, and Special Hazard, using the following hazard signal marking arrangement.
2. Department of Transportation (DOT) labeling/placarding system. International regulations require that packages (all quantities) to be transported must carry content labels unless otherwise provided by 49 CFR. Air, marine, highway, and rail transportation labeling may differ. Labels are four inches (102 mm) square, with lettering across the face. DOT requires these labels for interstate shipment via rail or highway carrier, and a label must appear on at least two opposing sides or two opposing ends of a package (excluding the bottom).

Except as otherwise provided by 49 CFR, each bulk package, freight container, unit load device, and transport vehicle must be placarded on each side and each end. Placards are at least 10-3/4 inch (273 mm) square, with lettering across the face. Refer to 49 CFR 172.400 through 172.560 for additional requirements on labeling/placarding. Except for size, required labels and placards have similar physical characteristics.

The Forest Service also ensures that no employee uses, stores, or allows any other person to use or store any hazardous substance if the container (including bags, barrels, bottles, boxes, cans,

**Forest Service Handbook 6709.11 – Health and Safety Code Handbook**

**Chapter 60 - Hazardous Materials**

**Amendment:** 6709.11-2018-1

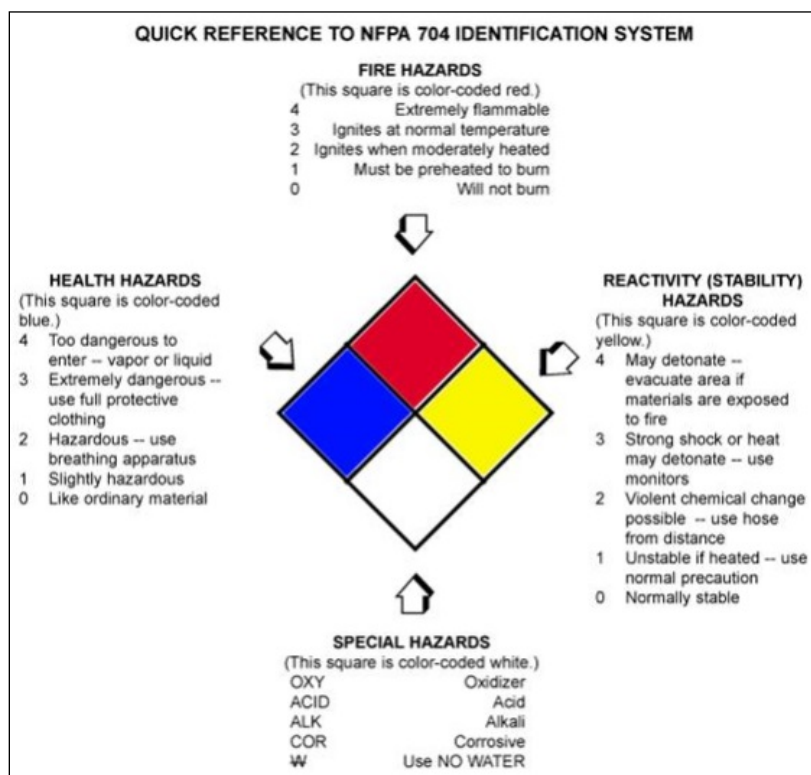
**Effective date:** December 03, 2018

cylinders, drums, and reaction vessels) does not meet labeling requirements in OSHA standard 29 CFR 1910.1200(f)(1).

For more marking and label guidance, see the Forest Service Hazmat User's Training Guide and the Interagency Transportation Guide for Gasoline, Mixed Gas, and Diesel.

Forest Service Handbook 6709.11 – Health and Safety Code Handbook  
 Chapter 60 - Hazardous Materials  
 Amendment: 6709.11-2018-1  
 Effective date: December 03, 2018

**61.15a - Exhibit 01 - NFPA Hazard Rating System**



Example:



### **61.16 - Storage**

Plan the storage area with personnel safety and health in mind, which includes the following:

1. Ensure all personnel are familiar with the types of hazardous materials in their workplace; are familiar with the SDS for any material in which they come in contact; and know how to safely evacuate the storage area in case of an accident or fire.
2. Clear all obstructions that prevent ready access to exits or to emergency equipment, such as eyewash stations, fire extinguishers, and safety showers.
3. Provide a spill kit for dealing with spills and ensure the kit is readily available.
4. Ensure the work area storage for excess chemicals is adequate.
5. Educate employees on the hazardous chemical inventory, including its location, staff member responsible for its maintenance, and inventory addition instructions.

### **61.17 - Transportation**

All containers (safety cans, drums, tanks, or tank trucks) used for transporting hazardous materials must be correctly labeled or placarded to ensure quick identification of the materials in an emergency. Refer to FSM 5714.2 for agency direction; 49 CFR Parts 71-173, 175, and 177-178 for further requirements; 49 CFR Part 383 for vehicle operation requirements; and 49 CFR Part 397 for hazardous materials driving and parking rules.

At an accident scene involving hazardous materials, exercise caution to prevent being injured and initiate measures without delay to protect life. Consult the Emergency Response Guidebook (sec. 61.06) if necessary.

### **61.18 - Disposal**

The Environmental Protection Agency (EPA) and/or a State agency controls disposal of many hazardous waste products. To assure proper disposal procedures, a competent person knowledgeable in EPA and State guidelines shall be appointed as the unit hazardous materials coordinator to oversee the Hazardous Waste Disposal Program. The Forest Service designates these personnel as Hazmat Coordinators. Hazmat Coordinators are required to be assigned for all units.

1. All disposal methods must comply with Federal, State, and local laws and regulations. Never flush hazardous waste products into drains and sewers, dump on the ground, or throw in the regular trash bin or dumpster.

2. Hazardous wastes are clearly labeled and tracked in a log and managed according to EPA's Very Small Generator requirements

(<https://www.epa.gov/hwgenerators/hazardous-waste-generator-regulatory-summary>).

Larger quantity generators must follow more extensive requirements.

3. Universal and excluded wastes can be recycled instead of being disposed of as a hazardous waste. These include the following: antifreeze, batteries, electronics, mercury-containing equipment, mercury lamps, oil and filters, and pesticides. Hazmat Coordinators should provide guidance. The Property Management Office recycles electronics. Also check with the State environmental programs for additional regulatory requirements for universal waste management and disposal.

Reference <https://www.epa.gov/hw/universal-waste> for Federal regulations.

4. Mercury spills or waste must be collected in a special receptacle and recycled. Follow EPA guidelines at: <https://www.epa.gov/mercury/what-do-if-mercury-thermometer-breaks>. Mercury spills that are beyond local expertise or have been spread through a building may require professional assistance to evaluate and cleanup the building. Contact your Hazmat Coordinator, Forest Engineering office, or Environmental Engineering office for guidance.

5. Containers previously used for toxic chemicals must not be used for feed troughs, trash barrels, or water storage tanks.

## **61.2 - Laboratory and General Chemical Safety**

This section applies to any room, building, or area used for scientific or technical research, testing and analysis, or small-scale preparation or storage of toxic or hazardous materials. Most of these requirements also apply to any employee who handles or uses hazardous materials.

### **61.21 - Qualifications**

Employees shall receive OSHA Hazardous Communications (Right-to-Know) Standard initial training and refresher courses, as required. They shall be familiar with the chemicals, equipment, and procedures for an assigned task; demonstrate the ability to recognize potential hazards; know how to prevent accidents; and know steps to follow in the event of an accident, exposure, spill, or other emergency.

### **61.22 - Personal Protective Equipment**

To reduce contaminant spread to offices, lunchrooms, meeting rooms, and homes, never wear PPE outside the laboratory or workplace.

1. The RA or SOP must identify appropriate PPE to be provided and used in the laboratory. Examples include body protection (aprons, coveralls, or air-supplied suits), footwear, gloves, and safety eyewear.

2. When the RA or SOP identifies a respiratory hazard (sec. 21.13), approved and appropriate respiratory protective equipment must be provided. Maintain a written respiratory protection program in accordance with OSHA Respiratory Standard (29 CFR 1934). For certain hazardous chemicals, such as perchloric acid or hydrogen fluoride, specially designed fume hoods must be used. Do not store or use organic materials in the perchloric hood. (Exception: store or use organic materials in the perchloric hood only when needed for prescribed reactions. Label perchloric fume hoods as follows: “Perchloric Acid Fume Hood—Use Only Prescribed Organic Materials.”) Provide an auxiliary power supply for fume hoods for toxic gases or volatile chemicals to maintain ventilation in case of utility failure.

Employees cannot use respirators unless they are in a documented and approved Respiratory Protection Program, which requires training, custom equipment, fit testing, medical evaluation, and monitoring. (Exception: employees may use employer-provided N-95/100 disposable dust masks on a voluntary basis if they are working in an atmosphere below the Permissible Exposure Limit (PEL). Employees shall read and sign Appendix D of 29 CFR 1910.134 to do so).

3. The laboratory or local Safety and Health Manager shall identify and post excessive noise areas (85 dB or above). When possible, use engineering controls to reduce noise or relocate the process. Reference the Hearing Conservation Program, if needed.

4. Safety eyewear that meets or exceeds the ANSI Standard Z87.1-1989 is the minimum eye protection required for laboratory work.

- a. Always use goggles and a face shield when there is increased risk of eye damage, such as when handling corrosives.
- b. Clean lenses often. Always flush abrasive dirt from lenses with running water; do not clean with abrasive soap.
- c. Inspect lenses for chips or scratches that weaken hardened lenses. Replace damaged lenses immediately.
- d. Use special lenses for work with nonionizing radiation sources, such as lasers, ultraviolet/infrared light, and burning and welding equipment.
- e. Laboratories and workplaces that handle corrosive or other chemicals that could damage the eyes must have an emergency eyewash station.

### **61.23 - Procedures**

RAs or SOPs developed for laboratory activities must include potential hazardous procedures from time of purchase to disposal. Discuss each procedure thoroughly with all involved personnel and plan how to prevent accidents. In addition, the RA or SOP must identify specific PPE for each functional area or task. A Team Leader, Project Lead, or Program Manager with



oversight of laboratory work shall review activities involving hazardous materials, high-risk procedures, or toxic substances. All potential hazards must be addressed and preventive measures taken before work begins. Basic procedures alone do not ensure a safe and healthful workplace. Application of the rules must be accompanied by careful consideration of every action. Maintain current references on laboratory safety, such as Prudent Practices in the Laboratory, a Forest Service Research standard that provides safety guidance and answers lab-specific questions.

1. Prohibit unnecessary ignition sources within 50 feet (15-1/4 m) of flammable storage or work areas.
2. When transferring flammable liquids from metal containers, ground and bond the containers to prevent static charges.
3. Ensure that refrigerators for flammable chemical storage are explosion proof (NFPA 70 – article 500). Tight-fitting covers for containers must be used for storing flammable liquids in refrigerators.
4. Mark compressed cylinders with DOT labels (see 61.6 – Compressed and Flammable Gases for more information).
  - a. Use hand trucks to move cylinders. Secure cylinders in an upright position with a safety chain.
  - b. Ensure cylinders are equipped with an approved pressure regulator for the specific gas being used.

#### **61.24 - Chemical Hygiene Plan**

Research laboratories, particularly those with wet labs, must have a written Chemical Hygiene Plan (CHP) as required by 29 CFR 1910.1450 (OSHA Standard on Occupational Exposure to Hazardous Chemicals in Laboratories). Employee education and training should be a regular, continuing activity, not simply an annual presentation. If chemicals are involved in the project work, then the RA or SOP must contain the following information concerning each chemical to be used:

1. Chemical name (common and International Union of Chemists name).
2. SDS.
3. Quantity on hand, stored, and to be handled at any one time.
4. Shelf-life (useful storage timeframe).
5. Frequency of use (exposure in terms of calendar days or months).

6. People designated to handle and dispose of materials. Include personal qualifications for disposal.
7. Emergency procedures and equipment, such as for spills.
8. Storage facilities (main building, in transit, in the field).
9. Handling procedures (main building, in transit, and in the field). Employees shall inspect their equipment and work areas for hazards and defects every work day and correct or repair hazards and defects as they occur. In any area where personnel may be exposed to hazardous levels of chemicals, supervisors shall monitor the environment at regular intervals consistent with 29 CFR 1910.1001.

#### **61.25 - Emergency Planning**

1. Conspicuously post telephone numbers for emergency assistance near each phone in laboratory work areas. Include names and telephone numbers of employees trained in first aid.
2. Make an appropriate first-aid kit readily available for each laboratory. Maintain emergency equipment and locate it along normal paths of travel where it is readily accessible.
3. Locate emergency showers in or near all laboratory rooms with unobstructed access. Shower valves must be easily activated, and the shower head must be the deluge type that delivers 30 to 60 gallons per minute at pressures of 20 to 50 pounds per square inch (psi) at the head. Every laboratory room or area must have ready access to low pressure, aerated water for removing contaminants from the eyes, and where possible, and with the eyewash fountain co-located with the emergency shower.
4. Maintain all eyewash stations (61.25, ex. 01) in accordance with ANSI Z358.1 and inspect them per the manufacturer's instructions. Squeeze bottles also require frequent inspection and maintenance since they lose water to evaporation, become contaminated, and are easily misplaced (sec. 21.22).
5. Maintain emergency equipment in good working order.

**61.25 – Exhibit 01 – Emergency Eyewash Station**



### **61.25a - Emergency Evacuation Procedures and Communications Plan**

Employees shall be familiar with the Emergency Evacuation Procedures and Communications Plan and of their duties in the following:

1. Sounding the alarm.
2. Operating emergency equipment.
3. Evacuating to shelters or assembly points.
4. Notifying emergency response crews.
5. Having rescue and first-aid skills. Include provisions for advising emergency response crews of potential dangers when such crews are summoned.

### **61.25b - Emergency Guidelines**

1. Provide guidelines for all conceivable emergencies during which laboratory activities might be interrupted and for utility failures. Include provisions for the following:
  - a. Emergency ventilation and lighting.
  - b. Cooling of chemical reactions.
  - c. Personnel evacuation.
  - d. Advising emergency response crews of potential dangers when such crews are summoned.
2. Conduct emergency drills at least twice a year. Ensure that the drills do not create hazards themselves.

### **61.26 - Safety Practices**

Management shall ensure the safety and health of employees and the visiting public. Some chemical combinations are very reactive and can produce heat, generate gas, or detonate. Such reactivity generally can be predicted. Sometimes chemicals must be combined in specific sequences. Before working with chemicals, laboratory employees shall review the applicable SDS to know and recognize the potential reactions of the chemicals being used and to know how to control these reactions.

The toxicity of many chemicals has not been completely investigated. Lethal doses of some chemicals can be absorbed through the skin, inhaled into the lungs, and ingested through the mouth. The inhalation of toxic vapors and gases, skin contact, and poor housekeeping pose some

of the greatest hazards when working with chemicals. Safety devices and PPE do not provide complete protection. Care in handling chemicals is essential.

Follow these safety practices.

1. Chemical Spills. Clean up chemical spills immediately, using approved procedures for disposal referenced in the unit's emergency spill response plan and FSM 2165.2. Reference the SDS and consult with the unit Hazmat Coordinator. Do not clean up any spill larger than an "incidental release;" those with proper training shall handle spills larger than that.
2. Removal of Stored Toxic Liquid Chemicals. Remove toxic liquid chemicals from large storage containers by a pump, siphon, or a pipette equipped with a rubber suction bulb. Do not start siphons by mouth to remove liquid chemicals. Do not allow mouth pipetting.
3. Food Safety. Do not eat or drink in any room or area where there is danger of contamination by toxic or radioactive substances. Do not store food and beverages in laboratory refrigerators. Do not use laboratory glassware for food or beverages. All refrigerators should be labeled properly, designating either for chemical/sample storage or for food and drinks only.
4. Laboratory Glassware. Inspect glassware before and after use. If damaged, repair or discard. Do not pick up large glass containers by their necks or rims. Hands must be dry when handling chemical containers. Do not stress any glass part when setting up an apparatus. Rinse or purge flammable or toxic residue from glassware after use.
5. Mechanical Hazards. Operate equipment according to the manufacturer's recommendations. Secure appropriate guards and shields. Do not operate instruments or leave equipment unattended unless adequate safety measures are taken. All warning signs must be clearly visible. Employees shall be familiar with all safety features.
6. Nonionizing Radiation. Mount appropriate eye protection or shields on instruments emitting nonionizing radiation. Post warnings. Equipment or materials emitting high-energy radiation must be handled according to established radiation and radioisotope policy (FSM 6741).
7. Pressure and Vacuum Systems. Store compressed gases and handle them in a safe manner. Use safety shields to protect personnel from equipment that may explode or implode. Regulatory and safety valves or controls must be maintained and regularly inspected as prescribed by the manufacturer.
8. Thermal Hazards. Wherever there are high or low temperature areas in the laboratory, install suitable insulation and warning signs. Employees working with high or low temperatures shall use adequate safety clothing. Never leave high-temperature ovens or

**Forest Service Handbook 6709.11 – Health and Safety Code Handbook**  
**Chapter 60 - Hazardous Materials**  
**Amendment: 6709.11-2018-1**  
**Effective date: December 03, 2018**

furnaces unattended unless they are equipped with temperature control and warning signs.

9. Electrical Hazards. Ensure that wiring meets National Electrical Code standards as required in classified areas where hazardous materials are stored and used. All electrical work must be done by licensed electricians or specially trained personnel designated by the Director of Engineering.

All electrical equipment, wiring, switches, controls, and posted signs must comply with NFPA 70 (ex. 01).

10. Infectious Hazards. Ensure that personnel using potentially hazardous microorganisms are trained in safety and health measures and that they conduct their laboratory activities in accordance with the level of risk.

- a. Keep laboratories clean. Disinfectants identified as effective against organisms being handled must be available in each laboratory and used routinely on work.
- b. Do not eat or drink in laboratories where biohazardous materials are used or stored. Always wash hands after working with microorganisms.
- c. Label all pathogens properly for ready identification (29 CFR 1910.1030).
- d. Pipetting of hazardous microorganisms or toxic fluids must be done only by bulb or other non-mouth devices. Do not blow infectious fluids out of pipettes.
- e. Perform all work with hazardous microorganisms or toxic fluids on plastic-backed absorbent material.

11. Animal Hazards. Practice good personal hygiene and housekeeping techniques when caring for and working with animals. Use PPE to reduce the possibility of infection through a skin break, the respiratory tract, or contact with excreta.

61.26 – Exhibit 01 – Various Electrical Hazard Signs



### **61.3 - Greenhouse Safety**

#### **61.31 - Procedures**

Develop a safety and health plan that includes the following:

1. Supervision responsibility.
2. Periodic inspection.
3. Use of hazardous materials.
4. Emergency evacuation procedures and communication plan.
5. Equipment use.

#### **61.32 - Safety Practices**

An RA or SOP is required for all greenhouse work projects and activities.

##### **61.32a - Operations**

1. Do not use soil amendments containing pathogenic microorganisms (such as *Sporotrichum schenckii*, the cause of sporotrichosis) as a potting medium or for packing nursery stock. This prohibition applies especially to fresh, nondecomposed sphagnum moss that is often infested with *S. schenckii*. The prohibition does not apply to decomposed sphagnum peat moss sold commercially.
2. Wear a respirator when working with dry soil amendments like peat moss, vermiculite, and perlite (sec. 21.13). Any worker who uses a respirator (other than a disposable N-95/100 dust mask), must be in a Respiratory Protection Program meeting all Federal OSHA requirements outlined in 29 CFR 1910.134.
3. Keep aisles and passageways clear. Do not obstruct exits with stored materials.
4. Consider fire characteristics when storing materials.

##### **61.32b - Pesticides**

Only licensed or certified persons are permitted to apply restricted-use pesticides. Refer to sections 22.11 and 61.7 for additional information. Only personnel who are adequately trained and qualified in the proper use of pesticides shall implement pesticide-use projects (FSM 2154).

1. Use only registered pest control chemicals. Apply all pesticides according to label instructions and SDS. Use required PPE.



2. When using smoke fumigators, post warning signs on all greenhouse doors to indicate the following:

- a. Fumigants to be used.
- b. Fumigation timeframe.
- c. Access allowances.

#### **61.32c - Equipment**

Fire extinguishers, first-aid kits, safety equipment, and safety showers must be readily available for emergencies. Employees shall be trained in the use of such equipment.

#### **61.32d - Electrical**

All electrical work must be done in compliance with the NFPA 70 and State or local safety codes.

1. Because greenhouses are often damp, use double insulation and ground-fault circuit breakers to prevent shocks.
2. Schedule routine inspection of all electrical cords. Do not use worn or frayed cords, 29 CFR 1910.334.
3. Watch for overloading of surge protectors and improper use of extension cords.

#### **61.4 - Incompatible Chemicals**

Organize storage to include separate areas for solvents, corrosive liquids, strongly oxidizing agents, and the remaining chemicals. The following list of common incompatibles is only a partial listing (61.4, ex. 01).

**Forest Service Handbook 6709.11 – Health and Safety Code Handbook**  
**Chapter 60 - Hazardous Materials**  
**Amendment: 6709.11-2018-1**  
**Effective date: December 03, 2018**

**61.4 – Exhibit 01 – Incompatible Chemicals**

<b>CHEMICAL</b>	<b>INCOMPATIBLES</b>
Acetic Acid	<i>Chromic acid, ethylene glycol, hydroxyl-containing compounds, nitric acid, perchloric acid, permanganates, and peroxides</i>
Acetone	<i>Bromine, chlorine, nitric acid, and sulfuric acid</i>
Acetylene	<i>Bromine, chlorine, copper tubing, mercury, silver, fluorine, and iodine</i>
Alkaline and alkaline earth metals, such as calcium, cesium, lithium, magnesium, potassium, and sodium	<i>Carbon dioxide, chlorinated hydrocarbons, and water</i>
Aluminum and its alloys (particularly powders)	<i>Acid or alkaline solutions, ammonium persulphate and water, chlorates, chlorinated compounds. Nitrates, and organic compounds in nitrate / nitrate salt baths</i>
Ammonia (anhydrous)	<i>Bromine, calcium hypochlorite, chlorine, hydrofluoric acid, iodine, mercury, and silver</i>
Ammonium Nitrate	<i>Acids, chlorates, chlorides, lead, metallic nitrates, metal powders, finely divided organics, or combustibles, sulfur, and zinc</i>
Ammonium perchlorate permanganate, or persulfate	<i>Combustible materials, oxidizing materials, such as acids, chlorates and nitrates</i>
Aniline	<i>Hydrogen peroxide or nitric acid</i>
Barium peroxide	<i>Combustible organics, oxidizable materials, and water</i>
Barium rhodanide	<i>Sodium nitrate</i>
Bismuth and its alloys	<i>Perchloric acid</i>
Bromine	<i>Acetone, acetylene, ammonia, benzene, butadiene, butane, and other petroleum gases, hydrogen, finely divided metals, sodium carbide, and turpentine</i>
Calcium or sodium carbide	<i>Moisture (in air) or water</i>
Calcium hypochlorite	<i>(Activated) ammonia or carbon</i>
Chlorates or perchlorates	<i>Acids, aluminum, ammonium salts, cyanides, phosphorus, metal powders, oxidizable organics or other combustibles, sugar, sulfides, and sulfur</i>
Chlorine	<i>Acetone, acetylene, ammonia, benzene, butadiene, butane, and other petroleum gases, hydrogen, metal powders, sodium carbide, and turpentine</i>
Chlorine dioxide	<i>Ammonia, hydrogen sulfide, methane, and phosphine</i>
Chromic Acid	<i>Acetic Acid (glacial), acetic anhydride, alcohols, combustible materials, flammable liquids, glycerin, naphthalene, nitric acid, sulfur, and turpentine</i>
Cumene hydroperoxide	<i>Acids (mineral or organic)</i>
Cyanides	<i>Acids or alkalis</i>
Fluorine	<i>Most materials</i>
Hydrocarbons, such as benzene, butane, gasoline, propane, turpentine	<i>Bromine, chlorine, chromic acid, fluorine, hydrogen peroxide, and sodium peroxide</i>

**Forest Service Handbook 6709.11 – Health and Safety Code Handbook**  
**Chapter 60 - Hazardous Materials**  
**Amendment: 6709.11-2018-1**  
**Effective date: December 03, 2018**

<b>CHEMICAL</b>	<b>INCOMPATIBLES</b>
Hydrofluoric acid or anhydrous	<i>Ammonia (anhydrous or aqueous)</i>
Hydrogen peroxide 3%	<i>Chromium, copper, iron, most metals or their salts</i>
Hydrogen peroxide 30% or 90%	<i>Same as 3% hydrogen peroxide plus aniline, any flammable liquids, combustible materials, nitromethane, and all other organic matter</i>
Hydrogen sulfide	<i>Fuming nitric acid or oxidizing gases</i>
Iodine	<i>Acetylene, ammonia (anhydrous or aqueous), and hydrogen</i>
Lithium	<i>Acids, moisture in air, and water</i>
Lithium, aluminum hydride	<i>Air, chlorinated hydrocarbons, carbon dioxide, ethyl acetate, and water</i>
Magnesium (particularly powder)	<i>Carbonates, chlorates, heavy metal oxalates or oxides, nitrates, perchlorates, peroxides, phosphates, and sulfates</i>
Mercuric oxide	<i>Sulfur</i>
Mercury	<i>Acetylene, alkali metals, ammonia, hydrogen, nitric acid with ethanol, and oxalic acid</i>
Nitrates	<i>Combustible materials, esters, phosphorus, sodium acetate, stannous chloride, water, and zinc powder</i>
Nitric acid (concentrated)	<i>Acetic acid, aniline, carbon, chromic acid, flammable gases and liquids, hydrocyanic acid, hydrogen sulfide, and nitratable substances</i>
Nitric acid	<i>Alcohols and other oxidizable organic material, hydriodic acid (hydrogen iodide), magnesium or other metals, phosphorous, and thiophene</i>
Nitrates	<i>Potassium or sodium cyanide</i>
Nitro paraffins	<i>Inorganic alkalies</i>
Oxalic acid	<i>Mercury or silver</i>
Oxygen (liquid or enriched air)	<i>Flammable gases, liquids, or solids such as acetone, acetylene, grease, hydrogen, oils, and phosphorous</i>
Perchloric acid	<i>Acetic anhydride, alcohols, bismuth and its alloys, grease, oils or any organic materials, and reducing agents</i>
Potassium	<i>Air (moisture and/or oxygen) or water</i>
Potassium chlorate or perchlorate	<i>Acids of their vapors, combustible materials, especially organic solvents, phosphorous, and sulfur</i>
Potassium permanganate	<i>Benzaldehyde, ethylene glycol, glycerin, and sulfuric acid</i>
Silver	<i>Acetylene, ammonium compounds, nitric acid with ethanol, oxalic acid, and tartaric acid</i>
Sodium amide	<i>Air (moisture and oxygen) or water</i>
Sodium chlorate	<i>Acids, ammonium salts, oxidizable materials, and sulfur</i>
Sodium hydrosulfite	<i>Air (moisture) or combustible materials</i>
Sodium nitrite	<i>Ammonia compounds, ammonium nitrate, or other ammonium salts</i>

**Forest Service Handbook 6709.11 – Health and Safety Code Handbook**

**Chapter 60 - Hazardous Materials**

**Amendment:** 6709.11-2018-1

**Effective date:** December 03, 2018

<b>CHEMICAL</b>	<b>INCOMPATIBLES</b>
Sodium peroxide	<i>Acetic acid (glacial), acetic anhydride, alcohols, benzaldehyde, carbon disulfide, ethyl acetate, ethylene glycol, furfural, glycerin, methyl acetate, and other oxidizable substances</i>
Sulfur	<i>Any oxidizing materials</i>
Sulfuric acid	<i>Chlorates, perchlorates, permanganates, and water</i>
Water	<i>Acetyl chlorides, alkaline and alkaline earth metals, their hydrides and oxides, barium peroxide, carbides, chromic acid, phosphorous oxychloride, phosphorous pentachloride, phosphorous pentoxide, sulfuric acid, and sulfur trioxide</i>
Zinc (particularly powder)	<i>Acids or water</i>
Zinc chlorate	<i>Acids or organic materials</i>
Zirconium (particularly in powder form)	<i>Carbon tetrachloride, other halo generated hydrocarbons, peroxides, sodium bicarbonate, and water</i>

#### **61.41 - Area 1 - Solvents**

Solvents should be stored close to the floor with adequate ventilation to carry off any vapors. Store flammables only in the cabinets designed for flammable storage.

#### **61.42 - Area 2 - Corrosive Materials**

Corrosive materials react with other substances, causing erosion and destruction of structural efficacy. Besides acids, such materials include acid anhydrides and alkalis. These materials often destroy their containers; therefore, container labels and structural integrity must be checked often. Acids are corrosive and produce hydrogen gas when they contact metals in the storage area. Alkalis in contact with aluminum release hydrogen, a highly explosive gas. Keep these materials close to, but not on, the floor. Do not store them in cabinets that contain gas pipes. Separate acids and strong bases by placing them in separate cabinets or at least on separate shelves with spill containment.

Also, organic acids react violently with strongly oxidizing mineral acids. Use spill trays under containers; use separate spill trays for incompatible chemicals. After using a chemical, return the container to its proper storage location.

Segregate acids away from substances that react with them or their mists. These reactions may cause heat, the release of hydrogen, or other explosive gases. Reactive materials in this category include those listed (61.42, ex. 01).

#### **61.42 - Exhibit 01 - Reactive Corrosive Materials**

Lithium	Nitrides	Cyanides
Sodium	Sulfides	Concentrated alkalis
Potassium	Carbides	Arsenic metal
Calcium	Borides	Selenium metal
Rubidium	Silicides	Tellurium metal
Cesium	Tellurides	Common metals
Selenides	Arsenides	Phosphides
Alloys, amalgams, and hydrides of the materials above		

### **61.43 - Area 3 - Strong Oxidizing Agents**

Oxidizing agents are gases, liquids, or solids that yield oxygen or other oxidizing gas during the course of a chemical reaction or that readily react to oxidize combustible materials. When containers of oxidizing materials are damaged and then allowed to mix with other chemicals, such as flammables, a fire or explosion may occur.

1. Common strong oxidizing agents include the following: bromates, chlorates, halogens (bromine, chlorine, fluorine, and iodine), nitrates and nitrites, nitric acid, perchlorates, permanganates, and peroxides (acetaldehyde, dichloride, ethylene, ethyl ether, and many other chemicals).

2. Separate the agents listed in paragraph one from: combustible materials, metal hydrides, metal powders, organic solvents (even high flashpoint), and phosphorus.

Take special precautions if highly hazardous compounds are to be stored, such as bromine, chlorine, and fluorine. For example, secure small cylinders of halogen gases in a fume hood.

3. Store the following materials in a manner that prevents reaction with moisture, which creates alloys, amalgams, calcium, cesium, hydrogen gas, lithium, potassium, rubidium, sodium, and hydrides of these.

4. Similarly, the following materials can react with moisture to produce flammable and sometimes spontaneously explosive hydrides: arsenides, borides, carbides, nitrides, phosphides, selenides, silicides, sulfides, and tellurides.

5. Certain materials react with moisture to evolve heat, including acid anhydrides, concentrated acids, and concentrated alkalis.

6. Be careful in the storage of materials that ignite easily under normal conditions, such as finely divided metals, flammable gases, hydrides of boron, phosphorus, sodium, and solvents with flash points below 20 °F (6-1/2 °C).

Take special precautions in the storage of peroxidizable compounds. The degree of danger varies considerably with the structure of the peroxide. In some cases they may undergo an accelerating self-reaction that can be violent. Organic peroxides have combined oxidizing and combustible properties. Incompatible materials can initiate, catalyze, or accelerate the decomposition of organic peroxides. Refer to NFPA 43B for further information.

### **61.44 - Area 4 - Remaining Chemicals**

Store chemicals on lipped shelves or in cabinets based on their compatibility (sec. 61.4, ex. 01). Store them within easy reach of the people using them.

## **61.5 - Flammable/Combustible Liquids**

Flammable liquids are dangerous when they are in open containers, when they leak or spill, or when they are heated. The degree of danger is determined by the flashpoint, whether the vapor-air mixture is in an explosive range, and whether an ignition source potentially exists.

Identifying the hazard class of flammable liquids is often difficult. Smell is not a reliable indication, but a strong odor is a signal that investigation is needed.

The distinction between a flammable liquid and a combustible liquid lies in the ease with which the liquid gives off flammable vapors (61.5, ex. 01). For example, acetone, alcohol, and gasoline are flammable. Fish, lubricating, or vegetable oils and glycerin are combustible. Any combustible liquid heated sufficiently or dispersed in a fine spray where small particles are mixed with air becomes flammable (61.5, ex. 02).

The flammability hazard depends to a certain extent on the liquid exposed and the volume of the room or building. In a large, open room, a small quantity of flammable liquid may not produce sufficient vapors to make the atmosphere flammable except in the immediate vicinity. If the quantity is sufficient to make the entire atmosphere flammable, a further increase in quantity may not increase the hazard but does provide more fuel for continuing fire. Minimum flash points for fuel oils of various grades are as follows: No. 1 and 2, 100 °F (38 °C); No. 4, 110 °F (43 °C); No. 5, 130 °F (54 °C); and No. 6, 150 °F (65-1/2 °C) or higher (ex. 02). Actual flash points are commonly higher and are required to be higher by some State laws. No. 1 fuel oil is often sold as coal oil, kerosene, or range oil.

Note that the NFPA hazard class numbers and the OSHA GHS hazard class numbers are not the same. Employees should not confuse or use the OSHA hazard numbers when discussing flammability hazards under

NFPA. [http://www.nfpa.org/assets/files/aboutthecodes/704/704\\_faqs.pdf](http://www.nfpa.org/assets/files/aboutthecodes/704/704_faqs.pdf).

### 61.5 - Exhibit 01

#### Flashpoint and Boiling Point of Flammable and Combustible Liquids

<i>Liquid Class</i>	<i>Flash Point °F (°C)</i>	<i>Boiling Point °F (°C)</i>	<i>Example</i>
<i>Flammable Liquids</i>			
1 A	Below 73°F (23°C)	Below 100°F (38°C)	Ethyl Ether
1 B	Below 73°F (23°C)	100°F and above	Gasoline
1 C	73°F and below 100°F (38°C)	Turpentine	
<i>Combustible Liquids</i>			
II	100°F and below 140°F (60°C)		Fuel Oil #1
III A	140°F and below 200°F (93°C)		Pine Oil
III B	200°F (93.3°C) and above		Transformer Oil



**Forest Service Handbook 6709.11 – Health and Safety Code Handbook**  
**Chapter 60 - Hazardous Materials**  
**Amendment: 6709.11-2018-1**  
**Effective date: December 03, 2018**

**61.5 - Exhibit 02**

**Fire Hazard Properties of Flammable / Combustible Liquids,  
Gases, and Volatile Solids (Condensed from NFPA 325M)**

Flammable/ Combustible Liquid	Flash Point °F (°C)	Ignition Temperature °F (°C)	Flammable Limits Percent by Volume		Hazard Class (H = Health, F = Flammability R = Reactivity)		
			Lower	Upper	H	F	R
Acetic acid (Glacial)	103 (39)	867 (463)	4.0	19.9	2	2	1
Acetone	-4 (-20)	869 (465)	2.5	12.8	1	3	0
Amyl acetate	60 (16)	680 (360)	1.1	7.5	1	3	0
Amyl alcohol	91 (33)	572 (300)	1.2	10.0	1	3	0
Aniline	158 (70)	1139 (615)	1.3	3	2	0	
Benzene (Benzol)	12 (-11)	928 (498)	1.2	7.8	2	3	0
Butyl alcohol (Butanol)	98 (37)	650 (343)	1.4	11.2	1	3	0
Carbon disulfide	-22 (-30)	194 (90)	1.3	50.0	2	3	0
Corn oil	490 (254)	740 (393)	0	1	0		
Creosote oil	165 (74)	637 (336)	2	2	0		
Ethyl acetate	24 (-4)	800 (426)	2.0	11.5	1	3	0
Ethyl alcohol	55 (13)	685 (363)	3.3	19.0	0	3	0
Ethyl chloride	-58 (-50)	966 (519)	3.8	15.4	2	4	0
<i>(continued)</i>							

Flammable/ Combustible Liquid	Flash Point °F (°C)	Ignition Temperature °F (°C)	Flammable Limits Percent by Volume		Hazard Class (H = Health, F = Flammability R = Reactivity)		
			Lower	Upper	H	F	R
Ethylene dichloride	56 (13)	775 (413)	6.2	16.0	2	3	0
Ethyl ether	-49 (-45)	356 (180)	1.9	36.0	2	4	1
Ethylene oxide	-20 (-29)	1058 (570)	3.0	100.0	2	4	3
Gasoline (low octane)	-45 (-43)	536 (280)	1.4	7.6	1	3	0
Hexane	-7 (-22)	437 (225)	1.1	7.5	1	3	0
Hydrocyanic acid	0 (-18)	1000 (538)	5.6	40.0	4	4	2
Kerosene	100 (43)	410 (210)	0.7	5.0	0	2	0
Lard oil	395 (202)	833 (445)	0	1	0		
Methyl acetate	14 (-10)	850 (454)	3.1	16.0	1	3	0
Methyl alcohol	52 (11)	867 (464)	6.0	36.0	1	3	0
Methyl ethyl ketone	16 (-9)	759 (404)	1.4	11.4	1	3	0
Naphtha, coal tar	107 (42)	531 (277)	2	2	0		
<i>(continued)</i>							

Flammable/ Combustible Liquid	Flash Point °F (°C)	Ignition Temperature °F (°C)	Flammable Limits Percent by Volume		Hazard Class (H = Health, F = Flammability R = Reactivity)		
			Lower	Upper	H	F	R
Naphtha, varnish markers' and painters'	28 (-2)	450 (232)	0.9	6.0	1	3	0
Petroleum ether (Benzin)	0 (-18)	550 (288)	1.1	5.9	1	4	0
Phenol (Carbolic acid)	175 (79)	1319 (715)	1.8	8.6	3	2	0
Pine oil	172 (78)	0	2	0			
Propyl alcohol (Propanol)	74 (23)	775 (412)	2.2	13.7	1	3	0
Quenching oil	365 (185)	0	1	0			
Toluene	40 (4)	896 (480)	1.1	7.1	2	3	0
Transformer oil	295 (146)	0	1	0			
Turpentine	95 (35)	488 (253)	0.8	1	3	0	

## **61.51 - Special Concerns**

### **61.51a - Density**

With few exceptions, such as carbon disulfide, flammable liquids are lighter than water and can float on the water's surface. However, some flammable liquids, such as acetone and alcohol, can dissolve in and completely mix with water.

### **61.51b - Vapor Density**

Vapor density is the volume weight of pure gas compared to an equal volume weight of dry air. A figure greater than one indicates that a gas is heavier than air. This means that any escaped vapors settle downward onto floors and flow with air currents around corners and down stairs or shafts to pool in low spots. If the source liquid is open and a continuous supply of vapor is flowing, a spark anywhere along the vapor trail (perhaps hundreds of feet or several floors away) can set off an explosion and a fire that may envelop an entire building almost instantly.

### **61.51c - Toxicity**

Trichloroethylene, perchloroethylene, and similar nonflammable solvents are more toxic than gasoline or naphtha. Nontoxic, noncorrosive, nonflammable, nonacidic, noncaustic solvents that are biodegradable are recommended for substitution when possible (FSM 2160, 2162.2, and 2163.5).

### **61.51d - Storage**

Specific standards for storing flammable/combustible liquids are in NFPA 30 and 395, 29 CFR 1910.106 and 1910.144, and ANSI Z535.1-91. Refer to section 38.12 for further direction. Also reference the Everyday Hazmat User's Training Guide from the National Technology and Development Program (formerly the Missoula Technology and Development Center) <https://www.fs.fed.us/t-d/pubs/htmlpubs/htm04712810/page02.htm>.

Do not allow sources of ignition where flammable liquids are stored or used or where there is a possibility of leaks from piping or storage containers. One common precautionary measure is to ensure that there is no open-flame heating. Provide explosion-proof electrical wiring and equipment for hazardous (classified) locations (NFPA 70). Treat unmarked containers of liquid as flammable.

1. Outside Above-ground Tanks. Such tanks are used for large quantity storage. Approved tanks must be vented, protected from physical damage, and proper signage applied. Tank design, construction, and location must be in compliance with Federal and State regulations, 29 CFR 1910.106.
2. Containers and Portable Tanks. Generally, the quantity of flammable or combustible liquids to be stored in individual drums or other containers must not exceed 60 gallons (227 L); individual portable tanks must not exceed 660 gallons (2,498 L).

Plastic fuel containers may not be used (Dolmars are an exception for short-term storage of flammable or combustible liquids). Store fuels in approved metal safety cans with spring-loaded lids. All fuel containers must be clearly labeled. For additional requirements, see the Forest Service Hazmat User's Training Guide and the Interagency Transportation Guide for Gasoline, Mixed Gas, and Diesel, and 29 CFR 1910.106(d).

3. Inside Storage. All doors must open outward from flammable/combustible liquid storage areas. Post appropriate signs inside and outside buildings and locations storing flammables. Prohibit open flames or sparks within 50 feet (15-1/2 m) of flammables. Prevent vapor accumulation. Protect electric light bulbs to avoid accidental breakage. Fixtures and switches must be vapor- and spark-proof or explosion-proof where explosion hazards exist.

4. Incidental Storage or Use of Flammable/Combustible Liquids. Adequate precautions must be taken to prevent flammable-vapor ignition. Sources of ignition include but are not limited to cutting and welding; electrical and mechanical sparks; lightning; open flames; smoking; and spontaneous ignition, including heat producing chemical reactions and radiant heat.

- a. Store such liquids in an NFPA-approved storage cabinet and label it "Flammable – Keep Fire Away."
- b. Do not store more than 60 gallons (227 L) of Class I or Class II liquids in a storage cabinet.
- c. Use a NFPA-approved safety container for storing and dispensing small quantities of flammable liquids. The approved container for this purpose must have not more than a five-gallon capacity; have a spring-closing lid and a spout cover; and be designed so it safely relieves internal pressure when subjected to fire exposure (sec. 61.5, ex. 01).
- d. Do not use a safety container that leaks when upright or leaks more than four drops per minute when inverted. Do not weld or solder these containers. Destroy defective safety containers.
- e. Always place a portable fuel container on the ground prior to filling to dissipate static electricity. Bed liners create excellent insulation, preventing static electricity from bleeding off the gas can to the truck body, through the tires, and to the ground. Static is generated from the flow of gasoline through the hose, and when the nozzle is removed from the gas can, a spark can cause the vapors to ignite.
- f. Do not store more than one day's supply of gasoline or other flammable liquid on equipment unless the vehicle is a fuel supply truck that is properly placarded, labeled, and designed for that purpose.

- g. Keep gasoline in warehouses with assembled fire-suppression units only if not more than one five-gallon (19 L) can is assigned to each unit. Such storage must also conform with local laws and not exceed 25 gallons (94-1/2 L). When the fire season is over, remove gasoline cans from the units and store them in approved flammable storage buildings or cabinets.
- h. Never store flammable/combustible liquids in office areas, except those required for maintenance and operation of building and equipment. Such storage must be in closed metal containers in a storage cabinet or in safety containers.
- i. Store kerosene in dwellings in two-gallon (7-1/2 L) closed safety containers. Storage must be away from flames and sparks and in locations where the temperature is below 100 °F (38 °C).
- j. Do not store or transport flammables and radio equipment in the same truck compartment or storage building. It is illegal to dispose of flammable/combustible liquids in floor drains, sewer drains, storm drains, or to the ground.
- k. Provide portable fire extinguisher(s) and control equipment in such quantities and types as are needed for the special hazards of operation and storage.
- l. Ensure that all fire protection equipment and supplies are adequately maintained and periodically inspected and tested by a competent person to ensure they are in satisfactory operating condition and will serve their purpose in time of emergency.
- m. Always maintain unobstructed aisles, exits, passageways, and stairways for movement of personnel.
- n. Ensure that maintenance and operating practices are in accordance with established procedures that tend to control leakage and prevent accidental escape of flammable or combustible liquids.

#### **61.51e - Dispensing**

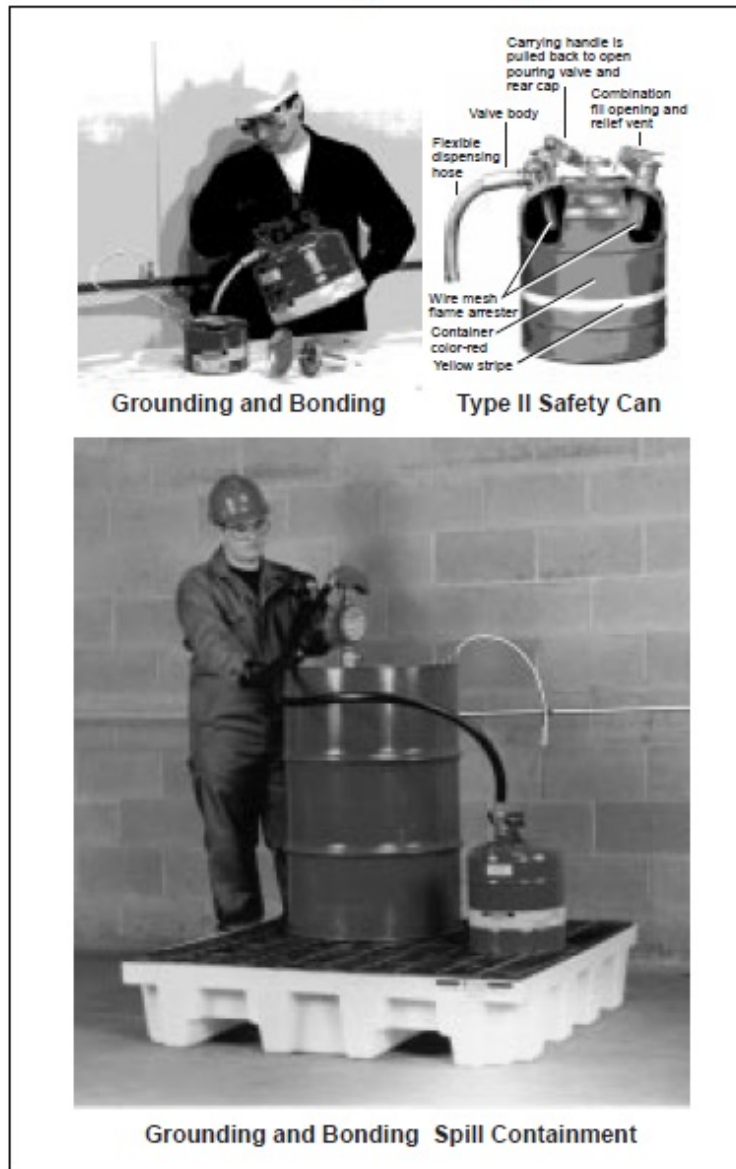
- 1. General Safety. Ensure that all handling and dispensing of flammable liquids is done in a well-ventilated area free of sources of ignition and provide bonding between the dispensing equipment and the container being filled.
  - a. Use dispensing pumps approved by the Underwriters' Laboratories (UL) or Factory Mutual Liability Insurance Company of America. Pumps generally are the best means of withdrawing flammable liquids from tanks or drums because the flow can be controlled.
  - b. Where faucets are used on tanks or drums, provide the spring-closing type that flow only while manually held open. Blocking such faucets open is not permitted.

- c. Ground and bond gravity flow dispensing units to prevent static-electricity build-up (61.51e, ex. 01).
2. Cleanliness. Cleanliness is essential where combustible or flammable liquids are handled.
- a. Wipe up spilled gasoline, kerosene, or oil at once.
  - b. Use dry earth, sand, or special oil-absorbent compound, not sawdust, to soak up spills. Wash off any part of the body that has been exposed to petroleum products immediately.
  - c. Keep combustible waste material and residues to a minimum. Store them in covered metal receptacles and dispose of them daily.
  - d. Use nontoxic cleaners to remove oil from metal parts.
  - e. Replace gas- and oil-soaked wood floors with a nonabsorbent surface or remove old flooring from inside the building or platform.
3. Gasoline Dispensing Units and Associated Buildings.
- a. Do not dispense gasoline in enclosed buildings.
  - b. Post flammable material signs on the outside of gasoline storage buildings. Prohibit all flammable material within 50 feet (15-1/2 m) of the dispensing station and buildings.
  - c. When filling tanks, leave vapor above the liquid level to permit expansion with rising temperatures.
  - d. Shut engines off and set the parking brake before filling fuel tanks on vehicles or equipment.
  - e. Ground the delivery hose or gasoline container before contacting the hose nozzle or can spout against the container being filled.
  - f. Do not fill portable containers while they are located inside the trunk, in the passenger compartment of a vehicle, or in a pickup truck with a bed liner.
  - g. Do not use static-generating materials to wipe up spilled gasoline or flammables.
  - h. Provide gasoline dispensing units and buildings with explosion-proof wiring, switched, outlets, and lights. Ensure that electrical maintenance does not compromise explosion-proof wiring or fixtures.

**Forest Service Handbook 6709.11 – Health and Safety Code Handbook**  
**Chapter 60 - Hazardous Materials**  
**Amendment: 6709.11-2018-1**  
**Effective date: December 03, 2018**

- i. Use UL-approved dispensing hoses of the retractable type and protect them from physical damage. Inspect at least annually and replace as needed.

**61.51e - Exhibit 01 - Grounding and Bonding**



## **61.6 - Compressed and Flammable Gases**

### **61.61 - General Safety**

Compressed gases and flammable gases have potential explosion hazards due to high pressures and flammability. Flammable gases that mix with air burn rapidly and explode if there is an ignition source. (61.61, ex. 01). Employees should read the SDS for ALL compressed gases in the workplace.

1. Store cylinders properly.
2. Always keep cylinders secured from falling. Use a safety chain approximately 1/3 from the top of the standing cylinder. Always use cylinder caps when moving. Cylinder caps are not a replacement for a safety chain.
3. Never store acetylene cylinders on their side.
4. All cylinders must be labeled with contents and hazard type.
5. Keep cylinders out of the sun, away from sources of flame or sparks, and out of areas in which temperatures may exceed 125 °F. Separate cylinders by the types of hazards their contents pose. Don't store any type of oxidizers within 20 feet of flammable gases unless the cylinders are separated by a firewall.

Specific information on storage and handling of compressed gases are found in multiple regulations in 29 CFR 1910 and 29 CFR 1926, in the Compressed Gas Association Pamphlet S-1.1, Forest Service Everyday Hazmat User's Training Guide <https://www.fs.fed.us/t-d/pubs/htmlpubs/htm04712810/page02.htm> and NFPA 58.

**Forest Service Handbook 6709.11 – Health and Safety Code Handbook**  
**Chapter 60 - Hazardous Materials**  
**Amendment: 6709.11-2018-1**  
**Effective date: December 03, 2018**

**61.61 - Exhibit 01 - Characteristics of Gases in Common Use**

Gas	Color Compared to Air	Odor When Breathed	Weight When Shipped	Flammable State	Effect	Physical	Remarks
Acetylene	None	Garlic-like	Lighter	Yes	Anesthetizing	Dissolved	Wide explosive range when mixed with air or oxygen
Compressed Air	None	None	Same	No	None	Gas	Supports Combustion
Ammonia	None	Pungent	Lighter	Yes	Irritant	Liquid	Does not support combustion
Argon	None	None	Heavier	No	None	Gas	Does not support combustion
Carbon Dioxide	None	Faint	Much Heavier	No	None	Liquid	Does not support combustion
Carbon Monoxide	None	Faint	Lighter	Yes	Asphyxiant	Gas	Supports combustion
Chlorine	Greenish-Yellow	Disagreeable	Much Heavier	No	Irritant	Liquid	Not explosive or flammable, will support combustion
Freon-12	None	None	Heavier	No	None	Liquid	Does not support combustion
Helium	None	None	Much lighter	No	None	Gas	Does not support combustion
Hydrogen	None	None	Much lighter	Yes	None	Gas	Wide explosive range when mixed with air or oxygen
Methyl Bromide	None	Pungent	Heavier	No	Irritation, Intoxication, Nausea	Liquid	Does not support combustion
Methyl Chloride	None	Ether-like	Heavier	Yes	Anesthetic	Liquid	Explosive when mixed with air or oxygen
Nitrogen	None	None	Slightly lighter	No	None	Gas	Does not support combustion
Oxygen	None	None	Slightly heavier	No	None	Gas	Supports combustion
Propane	None	None or artificially odorized	Heavier	Yes	Intoxicant	Liquid	Flammable
Sulphur Dioxide	None	Disagreeable	Much heavier	No	Irritant	Liquid	Does not support combustion

**61.61 - Exhibit 02 - Vapor Densities of Certain Nonflammable Gases**

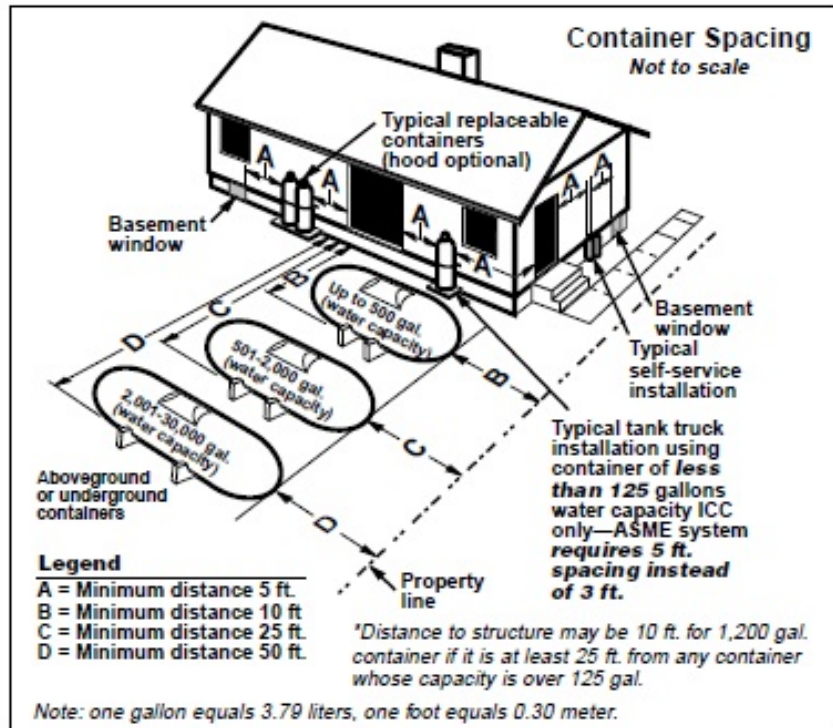
<i>Air=1</i>			
Carbon dioxide	1.52	Nitrogen	0.97
Chlorine	2.40	Nitrous oxide	1.53
Helium	0.13	Propane	1.52
Hydrogen	0.07	Oxygen	1.10
Neon	0.67	Sulphur dioxide	2.20



## 61.62 - Liquefied Petroleum Gas

1. Store liquefied petroleum (LP) gas containers, including portable tanks, outside in a well-ventilated area that is protected from physical damage. Store all portable LP gas bottles upright and restrained. Never drop tanks. Install tanks in accordance with the placement shown in 61.62, exhibit 01.
2. Mount tanks on level, durable pads. Design pads with sufficient support for the tank's weight. A competent person shall inspect and approve each LP gas installation.
3. Inspect tanks for corrosion and damage at the beginning of each work season. Containers showing serious dents, bulging, gouging, or excessive corrosion must be removed from service and destroyed.
4. Use only DOT-approved tanks. Clearly label tanks and containers to identify contents and capacity. Approved tanks have specifications stamped into tank body. Use only a container furnished by a distributor for bottled gas.
5. Paint tanks only with the owner's permission. Use heat reflective paint.
6. Protect tanks and lines from human and environmental conditions, such as mowers, snow plows, and vehicles, to prevent damage and leaks. Install tanks on firm foundations, with nonmetallic straps for holding tanks upright and pipes in position. Where below-freezing temperatures occur, use only bottled gas that does not freeze. Protect distribution lines from freezing up.
7. Pipe must comply with applicable ASTM and ANSI standards. Protect supply lines from damage. Keep brush, weeds, and other foliage away from tanks.
8. Propane tanks must be labeled: Propane, Flammable, and No Smoking within 25 feet.
9. Ensure that all gas containers are transported, stored, and secured with the safety valve protected by a ventilated cap or collar. Secure all stored tanks with a safety chain, strap, or material that will hold the containers.
10. Inspect gas regulators periodically using recognized dealers and/or their maintenance personnel.
11. Tightly close the cylinder valve when the tank is not in use or when it is empty.
12. Never allow LP gas to contact skin or clothing.

### 61.62 – Exhibit 01 – LP Gas Storage Tank Installation



## **61.7 - Pesticides**

The field of pesticide use and management is extremely complex, constantly changing, and subject to many laws and regulations. Before using or disposing of any pesticide, check with the responsible Forest Service Pesticide Coordinator. The project planner, handler, user, and applicator are responsible for safety in pesticide use. For pesticide application use, safety requirements listed on the product Label takes precedence over the SDS. See storage and signage requirements in the Forest Service Everyday Hazmat User's Training Guide (<https://www.fs.fed.us/t-d/pubs/htmlpubs/htm04712810/page02.htm>).

Direction on the specific hazards encountered by exposure through handling, mixing, and application and preventive measures is in FSM 2167.12. Follow the direction in FSM 2150; FSH 2109.14, chapter 40); and sections 22.1 and 61.32b of this Handbook to ensure proper storage, transportation, disposal, and handling of pesticides. Ensure all secondary containers and spray tanks are labeled with product name, dilution, and hazard type.

### **61.71 - Safety Practices**

Do not use a pesticide without following the information on the label or SDS. Apply pesticides so that they do not endanger humans, livestock, crops, beneficial insects, fish, or wildlife. Avoid inhaling pesticide sprays or dusts. Do not apply pesticides when there is danger of drift that may contaminate water or leave illegal residues. Wear PPE as identified by the Label, RA, SOP, or manufacturer.

#### **61.71a - Storage**

Store pesticides that are flammable/combustible liquids in accordance with the Forest Service Everyday Hazmat User's Training Guide (<https://www.fs.fed.us/t-d/pubs/htmlpubs/htm04712810/page02.htm>) and FSH 2109.14, and NFPA 30 and 395. Store pesticides that are oxidizing agents in accordance with NFPA 43A.

1. Do not store pesticide quantities exceeding 200 gallons (757 L) with other flammable materials.
2. Store all pesticides in the original labeled container. Never store unused pesticides in a beverage, feed, food, or medicine container.
3. Frequently check containers for leaks, loose lids or tears. If containers are in poor condition, put contents in a suitable container and label properly. Protect pesticide-container labels so that they remain legible.
4. Always store pesticides in rooms away from feed, food, or water. Segregate and store each pesticide formulation under a sign containing the formulation's name.

5. Never store combustible materials in direct sunlight. Excessive heat or extreme cold adversely affect some chemicals, so check the SDS and the label for special storage requirements.

6. Store herbicides away from other pesticides or fertilizers.

### **61.71b - Pesticide Transportation**

Pesticides labeled with the signal words “Danger Poison” (skull and cross bones) or “Warning” are considered highly or moderately toxic, respectively. Transport these pesticides to and from the worksite with any related equipment outside the passenger-carrying portion of vehicles, such as in trailers and pickup beds. Pesticides labeled “Caution” are considered slightly toxic, and when necessary, may be transported inside the passenger-carrying portion of vehicles. In all transportation situations, the following apply:

1. All pesticide bottles, cans, drums, and jugs must be securely capped and protected from breakage or spillage. Ripped or punctured bags or cardboard containers should be put into plastic bags or otherwise contained to prevent leakage.

2. Pesticide containers and application equipment, such as a hypo-hatchet or tree injectors, must be stored in the vehicle in a locked, leak-proof case or enclosure. Label the case or enclosure to identify the contents and potential hazard. Separate the case or enclosure from people and securely anchor it to the vehicle to minimize damage or spillage in the event of an accident. Pesticides must not be transported in application equipment.

3. Original pesticide containers must display the EPA-approved label.

4. Service containers (any container used to hold, store, or transport a pesticide concentrate or diluted preparation, other than the original labeled container) must be labeled as follows:

a. Pesticide concentrate:

(1) Product name.

(2) EPA registration number.

(3) Name and percentage of active ingredient.

(4) Signal word(s) from registered label.

b. Diluted preparation:

(1) Product name preceded by the word “Diluted.”

- (2) EPA registration number preceded by the words “Derived from.”
- (3) Name and percent of active ingredient as diluted.
- (4) Signal word(s) from registered label.

#### **61.71c - Disposal**

When transporting or shipping pesticides or pesticide containers for the purpose of disposal (FSM 2167.12), the following apply:

1. The containers must be clearly marked “This product is for disposal only” in addition to the registered product label.
2. When the registered label is unreadable, an ingredient statement is required. When the ingredients are not known, a statement to that effect must appear on the containers.
3. Each container must bear the name, address, and telephone number of the person to be contacted in case of an accident or emergency.
4. If the container contains a highly toxic substance, a warning of the potential hazard (such as a skull and crossbones label) must be prominently displayed in red.

Some States may have unique requirements regarding the transportation of pesticides for disposal. Contact lead State agencies before transporting the material.