NOTMEASUREMENT SENSITIVE

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DOE HANDBOOK

CHEMICAL MANAGEMENT
(Volume 3 of 3)

Consolidated Chemical User Safety and Health Requirements

U.S. Department of Energy
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Foreword

Numerous requirements have been promulgated to protect workers, equipment, facilities, and the environment. When work is performed, the specific requirements affecting the work must first be identified and incorporated into the work plan. Because such requirements can number in the thousands, simply identifying all of the applicable chemical safety-related safety and health requirements that govern any work activity can be a monumental task. Concern over this was addressed in the 1994 DOE Chemical Vulnerability Study Management Response Plan, which identified the need for a complex-wide "Roadmap for Requirements." Similarly, discussions within the Energy Facility Contractors Group (EFCOG)/DOE chemical safety community have indicated that one of the main causes of continuing chemical safety issues at DOE facilities is the large number of requirements that govern chemical-related work throughout the Complex. Many of these requirements approach chemical safety from different perspectives and contain provisions that overlap and are sometimes contradictory and confusing. An EFCOG/DOE Chemical Safety Topical Committee (CSTC) Team, the Chemical User Safety and Health Requirements Roadmap (CUSHR) Team, undertook the task of looking into this issue.

Background

The EFCOG/DOE CSTC CUSHR Team conducted a limited review of how DOE sites address compressed gases. Results showed that at these sites, between 50 and 70 percent of requirements were addressed in site documentation of chemical-related safety and health requirements. These results confirmed the view that, while all DOE contractors who engage in the same work activities must follow the same requirements, many either do not know which requirements apply to their work or are confused by them. The Team concluded that this was likely due to the fact that multiple requirements from many varied sources frequently overlap, covering the same points in slightly different and sometimes conflicting ways.

To assist the sites in understanding and addressing the myriad requirements with which they must comply, the CUSHR Team committed to developing a series of activity-based chapters that consolidate the safety and health requirements that govern DOE chemical-related work activities, removing overlaps and duplications where found.

Before beginning its work, the Team conducted a Chemical Storage Requirements Pilot in the summer of 2000 to see if this planned effort would be perceived as "value-added" for the DOE community. The pilot document provided consolidated chemical-related safety and health requirements for chemical storage, a universal activity conducted by all that use chemicals throughout the Complex. A listing of consolidated requirements for safe chemical storage, along with a survey, was distributed to chemical users across the Complex. The survey results demonstrated that the effort to consolidate requirements would be useful to chemical users throughout the Complex and should continue.

In support of the above mandate to assist the sites with a requirements roadmap, the CSTC CUSHR Team developed a series of activity-based chapters that consolidate the safety and health requirements that govern DOE chemical-related work activities. The ten chapters of this document coordinate with the subjects covered in other volumes of the *DOE Chemical Management Handbook*.

Instructions for Use

This volume consolidates existing core safety and health requirements that all sites engaged in chemical-related activities must follow when applicable and when no exemptions have been granted. It eliminates the confusion of overlapping and/or duplicative chemical-related safety and health requirements. It serves only to **consolidate existing DOE and Federal chemical-related safety and health requirements. It does not create any new or additional requirements.**

The listing of consolidated requirements contained here includes "pointers" to the sources of those requirements, showing the user what the requirements are and where each comes from.

In addition to DOE Orders, it includes Occupational Safety and Health Administration (OSHA), National Fire Protection Association (NFPA), American National Standards Institute (ANSI), and Compressed Gas Association (CGA) requirements that are cited in either 10 CFR Part 851, *Worker Safety and Health Program*, or in OSHA standard 29 Code of Federal Regulations (CFR) Section 1910.6, *Incorporation by Reference*. It also includes technical standards that are made mandatory by their specific reference within a DOE Regulation or Order.

State and local codes including locally adopted building and fire codes are not addressed in this document. U.S. Department of Agriculture (USDA) regulations are not addressed because the impact from these is considered to be negligible at DOE facilities. Similarly, U.S. Environmental Protection Agency (EPA) pesticide regulations are not addressed in this document. This handbook does not address design requirements and construction aspects of facilities, which can be found elsewhere (for example, DOE O 420.1C*, Facility Safety,* DOE-STD-1066-2016*, Fire Protection,* NFPA 5000*, Building Construction and Safety Code*).

Appendix B is added in this revision to demonstrate how local fire code regulations can have an impact on chemical safety and lifecycle management, for instance, through imposition of facility inventory limits on the storage and use of various hazard classes of chemicals.

Because ANSI, CGA, and NFPA documents are available only to subscribers to those organizations, subscribers can access the specific requirements of interest. Non-subscribers may be able to find these documents in their site libraries or can purchase them through the organizations' web pages.

This Requirements Roadmap contains a Glossary of terms and explanatory notes of the various consolidated chemical-related safety and health requirements.

The numerous requirements included in this document have been collected from many sources with differing safety purposes. As a result, some of these requirements may not always apply to the work being performed at a DOE site or facility. *It is the user's responsibility to determine which of these requirements apply to his or her work and how the requirements are to be implemented.* The reference sources for the requirements included in this document can be used to determine the applicability of those requirements to the work being performed. The source requirements are listed to the left of the corresponding section of the document that consolidates the referenced requirements. If there is any question as to the applicability of a requirement or if it is thought that any requirement is taken out of context, the user can use the reference sources to research the original requirement.

To ensure that the most current document is used, the user should contact the subject matter expert (e.g., fire protection engineer, industrial safety engineer, industrial hygienist, and environmental engineer) as applicable, depending on site contractual requirements.

This document is guidance only. Users of this document refer to the Local, State, or Federal requirements and regulations, including applicable Parts of the Code of Federal Regulations (CFRs), Department of Energy (DOE) Orders and Standards for specific requirements.

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Glossary

Abandon: Leave in place.

Acid-Contaminated Property: Property that may cause burns or toxicosis when improperly handled due to acid residues adhering to or trapped within the material.

Approval: Authorization from subject matter experts or the appropriate level of management as defined in local site or facility procedures.

***Approved*:** Deemed acceptable by the appropriate Authorities Having Jurisdiction (AHJ).

Biologicals: Hazardous materials associated with the products and operations of applied biology and/or biochemistry, especially serums, vaccines, etc., produced from microorganisms.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Hazardous Substance: A substance on the list defined in section 101(14) of the CERCLA (42 USC Parts 9601-9675); refer to list in Appendix A of 40 CFR Section 302.4.

Certain Categories of Property (that require special handling)*:* Specific types of hazardous property, the disposition of which is described in 41 CFR Subpart 109-42.11 and 41 CFR Subpart 101-42.1102, such as radioactively or chemically contaminated property, asbestos, polychlorinated biphenyls (PCBs), controlled substances, Nuclear Regulatory Commission (NRC)-controlled materials, drugs and reagents other than controlled substances, lead-containing paint, U.S. ***Munitions List*** (see definition) of items requiring ***demilitarization*** (see definition), etc.

Chemical: Any element, compound, or mixture of elements or compounds. A substance that: a) possesses potentially hazardous properties (including, but not limited to, flammability, toxicity, corrosivity, reactivity); or b) is included on any federal, state, or local agency regulatory list; or c) is associated with a ***Safety Data Sheet (SDS)*** (see definition) and is not an "Article," as defined in 29 CFR Section 1910.1200. For the purposes of this document, this definition also applies to ***chemical product*** (see definition).

Chemical Product: A mixture of any combination of two or more chemicals that may or may not be the result, in whole or in part, of a chemical reaction, and that itself has hazardous properties. Chemical products will have SDS (or Material Safety Data Sheet (MSDS)) associated with them and include materials such as paints, lubricants, cleaning agents, and fuels.

Chemical Storage Area: A location that is segregated by either physical barriers or a distance approved by a fire protection engineer and is used to store any chemical except those that are classified as being ***low hazard chemicals*** (see definition). Example 1: If a flammable liquid storage cabinet is in a work area, only the inside of the cabinet is the storage area, not the entire work area. Example 2: Areas used to store low-hazard chemicals are not considered to be chemical storage areas. Types of chemical storage areas include flammable liquid storage areas, oxidizer storage areas, and organic peroxide storage areas.

Chemical Tracking: The task of monitoring changes to the chemical inventory data over time from acquisition to disposition in order to keep the inventory up-to-date.

Class I Flammable Liquids: Class 1A, Class 1B, and Class 1C flammable liquids.

Class IA Flammable Liquids: Liquids having a flash point less than 73°F and boiling points below 100°F.

Class IB Flammable Liquids: Liquids having a flash point less than 73°F and boiling points at or above 100°F.

Class IC Flammable Liquids: Liquids having a flash point at or above 73°F and below 100°F.

Class II Combustible Liquids: Liquids having a flash point greater than 100°F but less than or equal to 140°F.

Class IIIA Combustible Liquids: Liquids having a flash point greater than 140°F but less than or equal to 200°F.

Class 1 Oxidizer: An oxidizer that does not spontaneously combust when it comes into contact with combustible materials, but slightly increases the burning rate of combustibles that have already been ignited.

Class 2 Oxidizer: An oxidizer that may cause spontaneous ignition when it comes into contact with combustible materials or that causes a moderate increase in the rate at which combustible burns.

Class 3 Oxidizer: An oxidizer that undergoes a vigorous self-sustained decomposition when exposed to contamination or heat or that causes a significant increase in the rate at which combustibles burn.

Class 4 Oxidizer: An oxidizer that explosively decomposes upon exposure to heat, shock, or contaminants and that causes a significant increase in the rate at which combustible burn.

Clean-Up Operations: An operation in which hazardous substances are removed, contained, incinerated, neutralized, stabilized, cleared up, or in any other manner processed or handled with the ultimate goal of making the site safer for people and the environment.

Code of Record: The collection of codes and standards used in the approved design of a facility, based upon which the facility is constructed.

Commerce Control List Items[1](CCLIs)*:* Dual-use (i.e., commercial/military) items that are subject to export control by the Bureau of Industry and Security, Department of Commerce. These items have been identified in the U.S. Export Administration Regulations (15 CFR Part 774) as export-controlled for reasons of national security, crime control, technology transfer, and scarcity of materials.

Commission: The emergency response commission for the State in which the facility is located or the Indian tribe under whose jurisdiction the facility is located. In the absence of an Emergency Response Commission, the Governor and the chief executive officer, respectively, shall form the commission. Where there is a cooperative agreement between a State and a tribe, the commission shall be the entity identified in the agreement.

Committee or Local Emergency Planning Committee (LEPC): The local emergency planning committee appointed by the Emergency Response Commission.

[1] The Commerce Control List includes deuterium, heavy water, other compounds of deuterium; nuclear- grade graphite; chemical agents (e.g., tear gas formulation, smoke bombs, and other pyrotechnic articles) having dual military and commercial use; propellants and constituent chemicals (e.g., fine powders of high-purity aluminum, beryllium, iron, magnesium, zirconium, boron, or boron carbide); guanidine nitrate; liquid oxidizers (e.g., dinitrogen trioxide, nitrogen dioxide/dinitrogen tetroxide, dinitrogen pentoxide); certain alloys and polymer composites; high-purity (99.99% or greater) bismuth; hafnium metal and alloys (> 60% Hf); helium-3; chlorine trifluoride; and precursors for toxic chemical agents.

Confined Space: Any enclosed space not intended for continuous human occupancy and having a limited or restricted means for entry or exit and that is subject to the accumulation of toxic or flammable contaminants or an oxygen-deficient atmosphere. Confined or enclosed spaces include, but are not limited to, storage tanks, process vessels silos, storage bins, hoppers, vaults, pits, manholes, tunnels, equipment housings, ductwork, pipelines etc.

Control area: A designated area, located indoors or outdoors, within which hazardous materials are stored, used, handled, or dispensed in amounts that do not exceed the ***Maximum Allowable Quantity (MAQ***) (see definition).

Controlled Substance: (a) Any narcotic, depressant, stimulant, or hallucinogenic drug, or any other drug, other substance, or immediate precursor included in Schedules I, II, III, IV, or V of section 202 of the Controlled Substance Act (Title 21 U.S. Code (USC) Section 812) except exempt chemical preparations and mixtures, and excluded substances listed in 21 CFR Part 1308; (b) Any other drug or substance that the U.S. Attorney General determines to be subject to control pursuant to Subchapter I of the Controlled Substances Act (21 USC 801 et seq.); or (c) Any other drug or substance that by international treaty, convention, or protocol is to be controlled by the United States.

Cryogenic Liquids: Gases that are handled in liquid form at relatively low pressures and extremely low temperatures, usually below -130°F (-90ºC).

Dangerous Property: Material that exists in a condition that poses a hazard to public health or safety, thus requiring special care and handling.

Decontamination: The removal of hazardous substances from employees and their equipment to the extent necessary to preclude the occurrence of foreseeable adverse health effects.

Demilitarization: The act of destroying the military capabilities inherent in certain types of equipment or material. Such destruction may include deep-sea dumping, mutilation, cutting, crushing, scrapping, melting, burning, or alteration so as to prevent the further use of the item for its originally intended purpose.

Disposal: The discharge, deposit, injection, dumping, spilling, leaking, or placing of any solid waste or hazardous waste into or on any land or water so that such solid waste or hazardous waste or any constituent thereof may enter the environment or be emitted into the air or discharged into any waters, including ground waters. [42 USC 6903(3)]

Disposition: The process of reutilizing, transferring, donating, selling, abandoning, destroying, or other disposition of Federally-owned personal property (i.e., chemicals and chemical products).

DOE Screening Period: The period of time that reportable ***excess chemicals*** (see definition) are screened throughout the DOE Complex for reutilization purposes.

Donee: Any of the eligible entities that receive Federal surplus personal property (i.e., chemicals) through a ***State Agency for Surplus Property*** (see definition), for example, a service educational activity, a ***public agency*** (see definition), a nonprofit tax-exempt educational or public health institution, or a State or local government agency.

Departmental Property Management Officer (DPMO): Also, designated as the DOE National Utilization Officer, who provides approval for user access to the ***Federal Disposal System (FEDS)*** (see definition).

Dual-Use List*[2]*: A list of nuclear-related material, equipment, software, and related technology that has valid uses in both commercial and military applications, developed by the ***Nuclear Suppliers Group*** (see definition) and described in the International Atomic Energy Agency (IAEA) Information Circular (INFCIRC) 254, Part 2 (as amended).

Emergency Planning Hazards Assessment (EPHA): A quantitative analysis identifying hazards and the potential consequences from unplanned releases of (or loss of control over) hazardous materials, using accepted assessment techniques.

Energy Asset Disposal System (EADS): a module within the ***FEDS*** (see definition) database, available to DOE and DOE contractor personnel to conduct internal screening of excess chemicals for use within the agency; it became effective Sept. 1, 1998. [NOTE: EADS has replaced the *Reportable Excess Automated Property System (REAPS)* provided in 41 CFR Subparts 109-43.304-1.50].

Engineered Nanoparticle*:* Intentionally created (in contrast with natural or incidentally formed) particle with one or more dimensions greater than 1 nanometer and less than 100 nanometers.

Environmental Management System: "Environmental Management System" means a set of processes and practices that enable an organization to increase its operating efficiency, continually improve overall environmental performance and better manage and reduce its environmental impacts, including those environmental aspects related to energy and transportation functions. EMS implementation reflects accepted quality management principles based on the "Plan, Do, Check, Act," model found in the ISO 14001 International Standard and using a standard process to identify and prioritize current activities, establish goals, implement plans to meet the goals, evaluate progress, and make improvements to ensure continual improvement.

Environment: Includes water, air, and land, and the interrelationship that exists among and between water, air, and land and all living things.

Especially Designed or Prepared Property: Equipment and material designed or prepared especially for use in the nuclear fuel cycle and described in the ***Nuclear Suppliers Group*** (see definition) ***Trigger List*** (see definition) (INFCIRC 254, Part 1, [as amended]). ***Especially Designed or Prepared Property*** is a category under ***High-Risk (Personal) Property*** (see definition).

Excess Chemicals: Chemicals (see definition) or ***Chemical Products*** (see definition) that are still in good condition and for which the current owner has no further use. This does not include spent/used material. *[NOTE: This term is used in DOE Property Management Regulations (PMR) and FPMR to mean chemicals that are excess to a* ***holding agency*** *(*see definition*), such as DOE, that can only be reutilized within the same agency or by another federal agency]*. It includes chemicals identified as ***high-risk personal property***, ***hazardous (personal) property***, ***hazardous materials***, ***extremely hazardous materials***, hazardous items, and ***certain categories of property that require special handling*** (see definitions).

[2] The Dual-Use List includes several metals (e.g., beryllium, hafnium, and zirconium) and their compounds and alloys; tritium and its compounds; helium-3, radium-226; chlorine trifluoride; and certain high explosives and their mixtures.

Excess (Personal) Property: Any personal property under the control of any federal agency (i.e., DOE, for purposes of this document) that is no longer required for that agency's needs, as determined by the agency head or designee.

Excluded PCB products: Materials containing 0 (zero) through 49 parts per million (***ppm)*** (see definition) of Polychlorinated Biphenyls (***PCB)*** (see definition).

Explosive-Contaminated Property: Property that may ignite or explode when exposed to shock, flame, sparks, or other high temperature sources due to residual explosive material in joints, angles, cracks, or around bolts.

Export-Controlled Property: Property, the export of which is subject to licensing by the U.S. Department of Commerce, the U.S. Department of State, the U.S. Nuclear Regulatory Commission (NRC), or which is authorized by DOE.***Export-Controlled Property*** is a category under ***High-Risk (Personal) Property*** (see definition). Refer to the ***Commerce Control List*** (see definition) for items that are export-controlled.

Extremely Hazardous Materials: (a)Those materials that are hazardous to the extent that they generally require special handling such as licensing and training of handlers, protective clothing, and special containers and storage;(b) those materials that, because of their extreme flammability, toxicity, corrosivity, or other perilous qualities, could constitute an immediate danger or threat to life and property and that usually have specialized uses under controlled conditions; and(c) those materials that have been determined by the ***holding agency*** (see definition) to endanger public health or safety or the environment, if not rendered harmless before release to other agencies or to the general public.

Extremely Hazardous Substance: A substance listed in Appendices A and B of 40 CFRPart355.

Federal Disposal System(FEDS): A real-time, online computer data base managed by the General Services Administration (GSA) since 1992 for recording, tracking, and controlling the nationwide inventory of excess and surplus personal property inventory (e.g., equipment and commodities, including chemicals) of the Federal Government. Also, see GSAXcess.

Fire Area: An area in a building that is separated from the rest of the building by a one-hour fire barrier. All penetrations through this fire barrier must be constructed to maintain the one-hour fire resistance.

First Responder-Awareness Level: 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 are temporarily in command of the incident until the Incident Commander(IC) arrives. They take no further action beyond notifying the authorities of the release.

First Responder- Operations Level: 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.

Flammable Liquids Storage Rooms: Roomsthataredesignedaccordingto29 CFRSubpart1910.106 (d)(4) for the storage of flammable and combustible liquids.

Flammability Rating of "0" or "1": Liquids, solids, or semi-solids having a flashpoint above 200°F (93.4°C) or those materials that will not burn when exposed to a temperature of 1500°F(815.5ºC) for 5 minutes.

Friable Asbestos Materials: Materials that contain more than 1 percent asbestos by weight and that can, by hand pressure, be crumbled, pulverized, or reduced to powder, thus allowing for the potential release of asbestos fibers into the air.

Foreseeable Emergency: Any potential occurrence such as, but not limited to, equipment failure, container rupture, or control equipment failure, that could result in an uncontrolled release of a hazardous chemical into the workplace.

General-Purpose Warehouse: A detached building or a separate portion of a building used specifically for warehousing-type operations.

Greenhouse Gases (GHGs): Carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, nitrogen trifluoride, and sulfur hexafluoride. [EO 13693, Sec. 19 (m)]

GSAXcess: GSA's online (http://gsaxcess.gov) platform that serves as the customer interface to the ***FEDS*** (see definition). It can be used to access all customer functions of FEDS such as reporting, searching, and selecting inventories of federal excess, surplus, and exchange or sale property.

Hazard: Potential for radiation, chemical, energy source or other material to cause human illness or injury or possibly environmental harm.

Hazard Analysis: The determination of material, system, process, and plant characteristics that can produce undesirable consequences, followed by the assessment of hazardous situations associated with a process or activity. Largely qualitative techniques are used to pinpoint weaknesses in design or operation of the facility that could lead to accidents.

Hazardous Chemical: Any ***chemical*** (see definition) that presents a physical hazard or health hazard, a simple asphyxiant, combustible dust, pyrophoric gas, or hazard not otherwise classified; a substance that possesses potentially hazardous properties (including, but not limited to, flammability, toxicity, corrosivity, reactivity/instability).

Hazard Control: The management actions or physical measures taken to eliminate, limit, or mitigate hazards to workers, the public, or the environment, including (1) physical, design, structural, and engineering features; (2) safety programs and procedures; (3) personal protective equipment; and (4) administrative limits or operational restrictions.

Hazardous Material: Property that is deemed a hazardous material, chemical substance or mixture, or hazardous waste under the Hazardous Materials Transportation Act (HMTA), the Resource Conservation and Recovery Act (RCRA), or the Toxic Substances Control Act (TSCA).[3] Generally, a hazardous material has one or more of the following characteristics:

(1) Are carcinogens (according to Occupational Safety and Health Administration (OSHA) regulations at 29 CFR part 1910), toxic or highly toxic agents, reproductive toxins, irritants, corrosives, hepatotoxins, nephrotoxins, neurotoxins, agents that act on the hematopoietic system, and agents that damage the lungs, skin, eyes, or mucous membranes;

[3] Also, see the List of Hazardous Substances and Reportable Quantities, which is contained in in 40 CFR S ec t i o n 302.4, Designation of Hazardous Substances.

(2) Are combustible liquids, compressed gases, explosives, flammable liquids, flammable solids, organic peroxides, oxidizers, pyrophorics, unstable (reactive) or water-reactive;

(3) Are radioactive to the extent it requires special handling;

(4) Identify hazards on associated SDS, MSDS, or HMIS documentation;

(5) Possess special characteristics which, in the opinion of the ***holding agency*** (see definition), could be hazardous to health, safety, or the environment if improperly handled, stored, transported, disposed of, or otherwise improperly used;

(6) Materials that, in the course of normal handling, use or storage, may produce or release dusts, gases, fumes, vapors, mists or smoke having any of the above characteristics.

Hazardous Materials Branch Officer: The person responsible for directing and coordinating all hazardous materials operations assigned by the Incident Commander (IC).

Hazardous Materials Regulations (HMR): Department of Transportation (DOT) 49 CFR Parts 171 through 180.

Hazardous Materials Specialists: Individuals who respond with, and provide support to, hazardous materials technicians. Their duties parallel those of the hazardous materials technician; however, specialist's duties require a more directed or specific knowledge of the various substances they may be called upon to contain. The hazardous materials specialist also serves as the site liaison with federal, state, local, and other government authorities regarding site activities.

Hazardous Materials Technicians: 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 or patch leaks or otherwise stop the release of a hazardous substance.

Hazardous Operations: Includes process operations that are subject to regulatory actions because of the presence of one or more specific hazardous materials or types of materials that meet or exceed established thresholds or guidelines. These include operations with chemicals governed by:

- 29 CFR Section 1910.119, *Process safety management of highly hazardous chemicals* or 40 CFR Part 68 *Chemical accident prevention provisions – Sec. 68.67, Process hazards analysis*;
- Hazard category 1, 2, or 3 nuclear operations, as defined in 10 CFR Part 830, *Nuclear Safety Management*;
- Operations involving beryllium, as defined by 10 CFR 850, *Chronic beryllium disease prevention program*;
- Facilities with "significant" fire hazards as defined by DOE O 420.1C, *Facility Safety*;
- Hazardous waste operations as defined in 29 CFR Section 1910.120, *Hazardous waste operations and emergency response*; and
- Activities subject to National Environmental Policy Act (NEPA) environmental assessment or environmental impact statement as defined in 10 CFR Section 1021.400.

Hazardous (Personal) Property: Any personal property, including ***scrap*** (see definition) or waste, but excluding property involving a radiological hazard, that is ignitable, corrosive, reactive, or toxic because of its quantity, concentration, or physical, chemical, or infectious characteristics, or that is deemed a hazardous material, chemical substance or mixture, or hazardous waste under the HMTA (49 USC 5101-5128), RCRA (42 USC 6901-6981), or TSCA (15 USC 2601-2692). Such property may be in solid, liquid, semi-liquid, or contained gas form and may cause or significantly contribute to an increase in mortality or illness, or pose present or potential hazards to human health or the environment when improperly used, treated, stored, transported, disposed of, or managed. ***Hazardous (Personal) Property*** is a category under ***High-Risk (Personal) Property*** (see definition).

Hazardous Substance: For the purposes of this document, as defined in 29 CFR Section 1910.120:

a. Any substance defined under section 101(14) of the CERCLA;

Any biologic agent and other disease-causing agent which after release into the environment and upon exposure by ingestion, inhalation, or assimilation by any person, either directly from the environment or indirectly by ingestion through food chains, will or may reasonably be anticipated to cause death, disease, behavioral abnormalities, cancer, genetic mutation, physiological malfunctions (including malfunctions in reproduction) or physical deformations in such persons or their offspring;

c. Any substance listed by the U.S. Department of Transportation as hazardous materials under 49 CFR Section 172.101 and appendices; and

d. Hazardous waste as herein defined.

Hazardous waste means —

- A waste or combination of wastes as defined in 40 CFR Section 261.3, or
- Those substances defined as hazardous wastes in 49 CFR Section 171.8.

Hazardous Waste[4]: Those materials or substances, the handling and disposal of which are governed by 40 CFR Part 261, 29 CFR Section 1910.120, and 29 CFR Section 1926.65.

Highly Hazardous Chemical: A substance possessing toxic, reactive, flammable, or explosive properties and as specified by 29 CFR Section 1910.119(a)(1).

[4] The outdated/incorrect definition for hazardous waste, as given in 41 CFR Subparts 101-42.001 and 41 CFR Section 102-40-30, is modified here (as shown in italics under (b) 1 and 2) to account for the 1990 replacement of the term "Extraction procedure (EP) toxicity" with "toxicity". The modified definition, includes the following caveats:

a) In general, ***hazardous materials*** (see definition) are hazardous wastes when one or both of the following is true:
   1. they have passed through the disposition cycle without having been successfully reutilized, transferred, donated, or sold, and the holding agency declares an intent to discard them.
   2. they are no longer usable for their intended purpose, a valid alternate purpose, or resource recovery.

b) In general, solid (non-hazardous) wastes, as defined at 40 CFR Section 261.2, become hazardous wastes when:
   1. they exhibit one or more of the characteristics of *hazardous waste* (*ignitability, corrosivity, reactivity, or toxicity*) [*40 CFR Part 261, Subpart C*], or
   2. they are *included on the regulatory lists* of predetermined hazardous wastes [*40 CFR Part 261, Subpart D*].

Highly Protected Risk: Consistent with DOE O 420.1C, the design and construction of a DOE facility to Highly Protected Risk level incorporates a level of fire protection design, systems, and management controls to fulfill requirements for the best-protected class of industrial risks, similar to the best protected class of an industrial building in private industry that qualifies for preferred insurance premium status.

High-Risk (Personal) Property[5]: Property that, because of its potential impact on public health and safety, the environment, national security interests, or proliferation concerns, must be controlled and dispositioned in other than the routine manner. The categories of high-risk property are (1) especially designed or prepared property, (2) export-controlled property, (3) proliferation-sensitive property, (4) nuclear weapon components or weapon-like components, (5) hazardous property, (6) automatic data processing equipment, (7) export-controlled information, (8) radioactive property, (9) special nuclear material, and (10) unclassified controlled nuclear information.

Holding Agency: The federal agency having accountability for, and general possession of, the chemicals involved.

Incident Commander: The individual responsible for all incident activities, including the development of strategies and tactics and the ordering and the release of resources. The IC has overall authority and responsibility for conducting incident operations and the management of all incident operations at the incident scene.

Internal Screening Period: See ***DOE Screening Period*** (see definition).

Inside Liquid Storage: A location inside a building that is segregated by either physical barriers or a distance approved by a fire protection engineer and that is used to store any liquid chemical except those that are classified as being ***low hazard chemicals*** (see definition); a room or building used for the storage of liquids in containers or portable tanks, separated from other types of occupancies.

Inside room: A room totally enclosed within a building and having no exterior walls.

Labeling: A descriptive name, identification number, graphic element, instruction, or caution to be placed directly on the primary hazardous material container.

Laboratory units: For a complete overview of laboratory units and their definitions, see NFPA 45, *Fire Protection for Laboratories Using Chemicals*.

LC_{50}: The concentration of a vapor or gas that will kill 50 percent of a test population. Exposure periods are typically for 1 hour unless otherwise stated.

Lead-containing Paint: Paint or other similar surface coating material containing lead or lead compounds in excess of 0.06 percent of the weight of the total nonvolatile content of the paint or the weight of the dried paint film.

[5] Excess chemicals identified as high-risk personal property are most likely to belong to category (5), (2), or (3).

Low-Hazard Chemicals*[6]*: Chemicals that have an NFPA flammability hazard rating of "0" or "1;" a health hazard rating of "0" or "1;" an instability (or reactivity) hazard rating of "0;" and no special hazard rating such as "oxidizer," "water reactive," or "simple asphyxiant," per NFPA 704, *Standard System for the Identification of Hazards of Materials for Emergency Response*.

Maximum Allowable Quantity (MAQ): A threshold quantity of hazardous material of a specific hazard category allowed in a control area. Storage in excess of the MAQ will require building-related protective features and/or controls.

Marking: A descriptive name, identification number, instructions, cautions, weight, specification, or UN marks, or combinations thereof, that is required on the outer packaging of hazardous materials.

MSDS: Material Safety Data Sheet. Replaced by the term, ***Safety Data Sheet (SDS)*** (see definition).

Munitions List*[7]*: Property and related technical data designated as defense articles and defense services by the Arms Export Control Act of 1968, as amended (22 U.S.C. Sec. 2778 and 2794(7)). Items are listed in 22 CFR Part 121, in Subchapter M, International Traffic in Arms Regulation (ITAR), published by the U.S. Department of State.

nCi/g: Nanocuries per gram.

No Commercial Value: An item has "no commercial value" when it has neither utility nor monetary value as an item or as ***scrap*** (see definition).

Non-Appropriated Fund Property: Property (i.e., chemicals) procured without the use of Federal government funds.

Nonfriable Asbestos Materials: Materials containing asbestos that is bonded or otherwise rendered unavailable for release into the atmosphere through normal usage and that cannot, when dry, be crumbled, pulverized, or reduced to powder by hand pressure. However, cutting, sanding, crushing, or performing some other disruptive action on items containing nonfriable asbestos can release asbestos fibers into the air.

Nuclear Suppliers Group: A select group of nuclear supplier countries dedicated to nuclear nonproliferation that establishes the ***Trigger List*** (see definition) and ***Dual-Use List*** (see definition) in formulating guidelines for the export of nuclear materials, equipment, and technology and for the transfer of nuclear-related dual-use nuclear equipment, materials, software, and related technology, respectively.

Ozone-Depleting Substance (ODS): "Ozone-depleting substances" means any substance designated as a Class I or Class II substance by the EPA in 40 CFR Part 82.

[6] **Low-Hazard Chemical**: This definition makes reference to the hazard identification numbers in NFPA 704, which includes information on how to use them to determine if a chemical is a "low hazard" chemical. A well-developed set of criteria is needed in order to determine the appropriate ratings for chemicals that have not been rated. Criteria for these ratings are well defined in NFPA 704. The criteria can be used to determine hazard ratings for chemicals that have yet to be evaluated. While other rating systems exist, none is as well-accepted; nor do any have criteria that are as well defined for the evaluation of chemicals as does the NFPA 704 system. It should be noted, however, that NFPA 704 criteria are developed for acute exposures only. Chronic effects such as carcinogenicity should be factored into any evaluation when determining health ratings. Information concerning chronic health hazards can be found in numerous resources such as Tomes®, the ACGIH *Guide to Occupational Exposure Threshold Limit Values*, and the NIOSH *Pocket Guide to Chemical Hazards*

[7] The U.S. Munitions List includes military explosives, propellants, and toxicological agents.

ODS, Class I Substance: Any substance designated as Class I by EPA pursuant to 42 USC 7671a(a), including, but not limited to, chlorofluorocarbons, halons, carbon tetrachloride, and methyl chloroform.

ODS, Class II Substance: Any substance designated as Class II by EPA pursuant to 42 USC 7671a(b), including, but not limited to, hydrochlorofluorocarbons.

Onsite: Any area within the boundaries of a DOE site or facility to which access is controlled.

Operational Emergencies: For all activities, except Office of Secure Transportation (OST) activities, the following definition applies:

- A major unplanned or abnormal incident or condition that involves or affects DOE facilities and activities by causing or having the potential to cause serious health and safety or environmental impacts and requires additional resources to supplement the planned initial response offsite; and

For non-OST DOE, offsite shipments:

- Any accident/incident involving an offsite DOE shipment containing hazardous materials that causes the initial responders to initiate protective actions at locations beyond the immediate/affected area.

Oxidizer (solid or liquid): A chemical while in itself, is not necessarily combustible, causes or contributes to combustion in other materials, generally through the release of oxygen or other oxidizing gas.

Oxidizing gas: A gas that can support and accelerate combustion of materials more than air (containing 23.5% or less by volume of oxygen at standard atmospheric conditions) does.

Outdoor Storage Locker: A moveable, prefabricated structure, manufactured at a site other than the final location of the structure and transported completely assembled or in a ready-to-assemble package to the final location. It is intended to meet local, state, and federal requirements for the outside storage of hazardous materials.

PCB or Polychlorinated biphenyls: A class of chlorinated aromatic compounds that is hazardous to human health and the environment. [NOTE: In 41 CFR Subparts 101-42.1102-2, the same acronym *"PCBs" is used to mean substances containing polychlorinated biphenyls at a concentration of 500 ppm or greater*].

PCB Items: Materials containing 50 through 499 ppm PCB.

Personal Property: Property of any kind, except for real estate and interests therein (such as easements and rights-of-way) and permanent fixtures, which are Federal Government-owned, chartered, rented, or leased from commercial sources by, and in the custody of, DOE or its designated contractors; source, byproduct, special nuclear materials, and atomic weapons as defined in Section 11 of the Atomic Energy Act of 1954, as amended(42 USC 2014), as amended; and petroleum in the Strategic Petroleum Reserve and the Naval Petroleum Reserves. For purposes of this document, personal property means chemicals or chemical products.

Pollution Prevention(P2): "Pollution prevention" means "source reduction" as defined in Sec.6603 of the Pollution Prevention Act of 1990 (42 U.S.C. 13102), and other practices that reduce or eliminate the creation of pollutants through (a) increased efficiency in the use of raw materials, energy, water, or other resources, or (b) the protection of natural resources by conservation.

Precious Metal: A term that refers to gold, silver, and platinum group metals – platinum, palladium, rhodium, iridium, ruthenium, and osmium.

Process Hazard Analysis: Hazard evaluation, as defined in 29 CFR Section 1910.119, *Process Safety Management of Highly Hazardous Chemicals*, subsection (e).

Proliferation-Sensitive Property: Nuclear-related or dual-use equipment, material, or technology as described in the ***Nuclear Suppliers Group*** (see definition) ***Trigger List*** (see definition) and ***Dual-Use List*** (see definition), or equipment, material, or technology used in the research, design, development, testing, or production of nuclear or other weapons. ***Proliferation-Sensitive Property*** is a category under ***High-Risk (Personal) Property*** (see definition).

Property Act: The Federal Property and Administrative Services Act of 1949 (63 Stat. 3778), as amended (codified, as amended, in various sections of Titles 40 and 41 of the United States Code), the law that centralized Federal property management and disposition functions under the GSA.

Public Agency: Any State or political subdivision thereof, including any unit of local government or economic development district; any department, agency, or instrumentality thereof, including instrumentalities created by compact or other agreement between States or political subdivisions; multi-jurisdictional sub-state districts established by or pursuant to State law; or any Indian tribe, band, group, pueblo, or community located on a State reservation.

Public Body: Any department, agency, special-purpose district, or other instrumentality of a State or local government; any Indian tribe; or any agency of the Federal Government.

Pyrophoric: A chemical that will ignite spontaneously in air at a temperature of 130ºF (54.4ºC) or below.

Reagent: Any hazardous material used to detect or measure another substance or to convert one substance into another by means of the reactions it causes.

Regulated Area: An area where entry and exit is restricted and controlled.

Release: Any spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping, or disposing into the environment (including the abandonment or discarding of barrels, containers, and other closed receptacles) of any chemical, ***extremely hazardous substance*** (see definition), or CERCLA hazardous substance.

Reportable Excess Property: Excess property that is reportable to the GSA by the ***Holding Agency*** (see definition) on Standard Form (SF) 120, excluding ***Hazardous Waste*** (see definition), ***Extremely Hazardous Property***, ***Scrap*** (see definition), ***Controlled Substances*** (see definition), chemicals determined to be appropriate for abandonment or destruction, nuclear-related and ***Proliferation Sensitive Property*** (see definition), national security-sensitive property, and NRC controlled materials. Reportable excess property includes non-hazardous chemicals, drugs and reagents other than controlled substances; nonfriable asbestos materials, and excluded PCB products (i.e., those containing less than 49 ppm PCB).

Reportable Property: Excess or surplus property that is reportable to the GSA by the ***holding agency*** (see definition) or receiving organization on an appropriate Standard Form to affect a disposition transaction or to initiate the next phase of screening.

Resource Conservation and Recovery Act (RCRA): The Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act of 1976, as amended, 42 USC, Section 6901 et seq.

Safety Can: Approved container of not more than 20 liters (~5.3 gallons) capacity having a spring-closing lid and a spout cover and so designed that it will safely relieve internal pressure when subjected to fire exposure.

Safety Data Sheet (SDS): Safety document, prepared in accordance with 29 CFR Subpart 1910.1200(g). Although a manufacturer may provide an SDS for a chemical, the issuance of that SDS does not necessarily indicate that the material is hazardous. Some manufacturers develop SDSs for all their chemicals whether or not the material is hazardous. Replaces the formerly used term, ***Material Safety Data Sheet (MSDS)***.

Safety Officer (designated as Hazardous Materials Branch Safety Officer in NFPA regulations): The person who ensures that recognized safe practices are followed and provides other technical safety advice as needed.

Scrap: Property that has no value except for its basic material content.

Screening Period: Prescribed period of time during which excess chemicals are offered for transfer or surplus chemicals are offered for donation to eligible recipients.

Segregated Warehouse: A separate or detached building used specifically for warehousing-type operations.

Senior Program Official or Designee: The person who controls the acquisition and production of heavy water for a given program.

Shelf Life: The length of time an age-sensitive material can be stored under prescribed conditions and can still retain its properties such that it will function as intended when placed into service.

Shelf-Life Item: Any item that deteriorates over time or has unstable characteristics such that a storage period must be assigned to ensure that the item is issued within that period to provide satisfactory performance. Management of such items is governed by 41 CFR Section 101-27.2, and by Department of Defense (DoD) instructions, for executive agencies and DoD respectively.

Sprinklered Area: An area that has an overhead system designed and installed according to NFPA 13, "*Standard for the Installation of Sprinkler Systems*" to spray water down from sprinkler heads during a fire.

Standard Form (SF): One of the U.S. Government forms; herein used to document and report disposition actions.

State Agency for Surplus Property (SASP): The agency designated under state law to receive federal surplus personal property for distribution to eligible ***Donees*** (see definition) within the state, as provided for in Subsection 203(j) of the Property Act (40 USC 549 (a)(3)).

Storage: The act of setting aside chemicals for future use or safekeeping or an inventory of compressed or liquefied gases in containers that are not in the process of being used, examined, serviced, refilled, loaded, or unloaded.

Superfund or Superfund Act: The common name for the ***Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)*** (see definition) of 1980, as amended.

Surplus Chemicals: Any excess chemicals that remain with a facility after having undergone internal screening for reuse within the DOE complex as well as excess screening for transfer to another federal agency.

Surplus Property (Surplus): Excess personal property that is no longer needed by federal agencies, as determined by GSA.

Surplus Release Date: The date on which screening of excess chemicals for federal use is completed and the chemicals are not needed for any federal use. On that date, excess chemicals become surplus and are eligible for donation to non-federal recipients.

Suspect (Property): Any material or property that cannot be guaranteed, without further evaluation, of being free from chemical or radioactive contamination.

Sustainability**:** Those actions taken to maximize energy and water efficiency; minimize chemical toxicity and harmful environmental releases, particularly Greenhouse Gases (GHGs); promote renewable and other clean energy development; and conserve natural resources while sustaining assigned mission activities. (DOE O 436.1, section 6.d).

System: Piping, pumps, or containers that collectively perform a specific function.

Threshold Planning Quantity (TPQ): The minimum amount of a substance at which notification is required under 40 CFR Part 355. TPQs are listed in Appendices A and B of that regulation.

Toxic Gas: Any gas with an NFPA ***health hazard rating of 3 or 4*** (see definition) per NFPA 704, *Standard System for the Identification of Hazards of Materials*; specific definitions for *Toxic gas* and *Highly Toxic gas* are given in NFPA 55.

Transuranic Waste: Transuranic (TRU) waste contains alpha-emitting radionuclides with the following characteristics: atomic number greater than 92, half-life greater than 20 years, and concentrations greater than 100 ***nCi/g*** (see definition).

Trigger List[8]: A compilation of nuclear materials, equipment, and related technology developed by the ***Nuclear Suppliers Group*** (see definition) and maintained by the International Atomic Energy Agency (IAEA), as Information Circular INFCIRC 254, Part 1. Items on this list trigger the imposition of IAEA safeguards.

Type I Items: Non-extendable shelf-life items with a definite storage life after which the item or material is considered to be no longer usable for its primary function and should be discarded. Examples of Type I items include drugs and medicines with certain characteristics, and select ***unstable reactive chemicals*** (see definition).

Type II Items: Extendable shelf-life items for which successive re-inspection dates can be established when the items or materials have a continued usability as determined by examination based upon criteria that have been agreed upon. Examples of Type II items include paints, coatings, and inks, as well as time-sensitive hazardous chemicals that are inspected for continued use, in accordance with NFPA 45 Section 8.2.4.4.

[8] The Trigger List includes nuclear-grade graphite, deuterium, and heavy water.

Unbound Engineered Nanoparticles (UNP): Those nanoscale particles that are not contained within a matrix under normal temperature and pressure conditions that would reasonably be expected to prevent the particles from being separately mobile and a potential source of exposure. An engineered primary nanoscale particle dispersed and fixed within a polymer matrix, incapable as a practical matter of becoming airborne, would be "bound," while such a particle suspended as an aerosol would be "unbound". [DOE O 456.1A]

UL-Listed: A product that has been tested and certified by the Underwriters Laboratories (UL) to indicate that it conforms with UL safety standards.

Universal Waste: Any of the following hazardous wastes that are managed under the universal waste requirements of 40 CFR Part273: (1) Batteries as described in 40 CFR Section 273.2; (2) Pesticides as described in 40 CFR Section 273.3; (3) Mercury containing equipment (including thermostats) as described in 40 CFR Section 273.4 and as defined at 40 CFR Section 273.9; and (4) Light bulbs containing mercury (such as fluorescent bulbs) as described in 40 CFR Section 273.5.

Unstable Reactive Chemical (or Unstable Material): A chemical that in the pure state, or as produced or transported, will vigorously polymerize, decompose, condense, become self-reactive, or otherwise undergo a violent chemical change under conditions of shock, pressure, or temperature. An unstable reactive chemical may be identified as either a ***Type I item*** or a ***Type II item*** (see definition). Examples include explosives, reactive monomers, organic peroxides that undergo self-accelerating thermal decomposition, and peroxide formers that produce unstable, highly friction-sensitive or shock-sensitive peroxides.

Upright Position: The position a cylinder is in when the valve is located at a position higher than any other on the tank.

Waste Minimization: The reduction, to the extent feasible, in the amount of hazardous waste generated prior to any treatment, storage, or disposal of the waste. Because waste minimization efforts eliminate waste before it is generated, disposal costs may be reduced, and the impact on the environment ***may be lessened. (RCRA Orientation Manual, 2014).***

Water-Reactive Material: A substance that will spontaneously react with water to release toxic gases, flammable gases, or amounts of heat that could become significant (e.g., resulting in spattering, pressure-volume explosions). It includes those materials that can form explosive mixtures with water.

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Acronyms and Abbreviations

ACGIH:	American Conference of Governmental Industrial Hygienists
AHJ:	Authority Having Jurisdiction
AL:	Acquisition Letter
ANSI:	American National Standards Institute
ATF:	Bureau of Alcohol, Tobacco, Firearms and Explosives
CCLI:	Commerce Control List Item
C&D:	Construction and Demolition
CEQ:	(Whitehouse) Council on Environmental Quality
CERCLA:	Comprehensive Environmental Response, Compensation and Liability Act of 1980 (also known as "Superfund"), as amended
CGA:	Compressed Gas Association
CFR:	Code of Federal Regulations
CRD:	Contractor Requirements Document
CSA:	Controlled Substances Act
CRD:	Contractor Requirements Document
DEAR:	Department of Energy Acquisition Regulation (48 CFR Chapter 9)
DoD:	U.S. Department of Defense
DOE:	U.S. Department of Energy
DOE-PMR:	Department of Energy Property Management Regulations, 41 Part CFR 109
DOT:	U.S. Department of Transportation
DPMO:	Departmental Property Management Officer
EADS:	Energy Asset Disposal System
EMS:	Environmental Management System
EO:	Executive Order
EPA:	U.S. Environmental Protection Agency
EPCRA:	Emergency Planning and Community Right-To-Know Act of 1986, Title III of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)/Superfund Act of 1980
EPHA:	Emergency Planning Hazards Assessment
FAR:	Federal Acquisition Regulation System (48 CFR)
FEDS:	Federal Disposal System
FM:	Factory Mutual
FMR:	Federal Management Regulation, (Title 41, Subtitle C), 41 CFR Part 102

FPMR:	Federal Property Management Regulations, (Title 41, Subtitle C), 41 CFR Parts 101 to 200
FSC:	Federal Supply Classification (as described in the Federal Standard 313)
GHG:	Greenhouse Gas
GSA:	General Service Administration
GSAXess:	GSA's web-based platform to access the FEDS
HAZMAT:	Hazardous Materials Response Team
HMIS:	Hazardous Material Information System, sponsored and maintained by the Department of Defense
HMR:	Hazardous Materials Regulations, 49 CFR Parts 171 to 180
HMTA	Hazardous Material Transportation Act
HSWA:	The Hazardous and Solid Waste Amendments of 1984 to RCRA
IC:	Incident Commander
ICS:	Incident Command System
IDLH:	Immediately Dangerous to Life or Health
ISMS:	Integrated Safety Management System
ISO:	International Organization for Standardization
LEPC:	Local Emergency Planning Committee
MLI:	Munitions List Item
MSDS:	Material Safety Data Sheet, replaced by *SDS* in 2012
NAICS:	North American Industrial Classification System
NFPA:	National Fire Protection Association
NIOSH:	National Institute for Occupational Safety and Health
NNSA:	National Nuclear Security Administration
NRC:	Nuclear Regulatory Commission
O:	Order
ODS:	Ozone Depleting Substance
OPMO:	Organizational Property Management Officer
OSHA:	Occupational Safety and Health Administration
P2:	Pollution Prevention
PCB:	Polychlorinated Biphenyl
PHA:	Process Hazard Analysis
PPA:	Pollution Prevention Act of 1990
PPE:	Personal Protective Equipment

PPL:	Personal Property Letter
RCRA	Resource Conservation and Recovery Act of 1976
REAPS:	Reportable Excess Automated Property System, replaced by EADS
RQ:	Reportable Quantity
SARA:	**Superfund Amendments and Reauthorization Act of 1986** (see definition)
SASP:	**State Agency for Surplus Property** (see definition)
SCBA:	Self-contained Breathing Apparatus
scf:	Standard cubic feet
SDS:	Safety Data Sheet; replaces *MSDS*
SF:	Standard Form
SIC:	Standard Industrial Classification
SNAP:	Significant New Alternative Policy; EPA Program
SSP:	Site Sustainability Plan
SSPP:	Strategic Sustainability Performance Plan
TBD:	To Be Determined at a later date
TPQ:	Threshold Planning Quantity
TRU:	Transuranic Waste
TSCA:	Toxic Substances Control Act (15 USC 2601 – 2692)
USC:	United States Code
UNP:	Unbound Engineered Nanoparticles

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Chapter 1 – Hazard Analysis

1.1 Introduction

This chapter identifies and consolidates existing user safety and health requirements found in DOE and Federal chemical-related safety and health regulations and National Standards that address hazard analysis of DOE operations or activities involving ***chemicals*** (see definition) and ***chemical products*** (see definition). State and local codes and requirements are not included. This chapter specifically consolidates requirements found in the National Fire Protection Association (NFPA), the American National Standards Institute (ANSI), and the Compressed Gas Association (CGA) publications, the Occupational Safety and Health Administration (OSHA) standards, and certain Environmental Protection Agency (EPA) regulations and Department of Energy (DOE) Rules and Orders, including technical standards that are made mandatory by their specific reference within a DOE Regulation, or Order.

This chapter is intended to list chemical-related safety and health requirements and to consolidate those that are overlapping or duplicative. The list of requirements includes "pointers" to the sources of those requirements.

This document does not create any new or additional requirements.

1.2 Applicability

The information presented here applies to all locations that use chemicals or chemical products. *[NOTE: Throughout this document, the term "chemicals" is used to indicate chemicals and/or chemical products as described in Glossary Section.]* This chapter is intended only to address safety and health-related hazard and risk analysis requirements applicable to chemical user operations or activities. It consolidates existing, core safety and health requirements that all sites must follow when engaged in chemical-related operations or activities.

The requirements included in this chapter come from sources that have multiple, differing safety purposes. As a result, some of these requirements may not always be applicable to the work being performed at an individual site or facility. Users are responsible for determining how specific requirements apply to their operational or activity work and how they are implemented. The reference sources for the requirements included in this chapter can be used to determine the applicability of those requirements to the work being performed to accomplish an operation or activity.

1.3 Definitions and Acronyms

See **Glossary.**

1.4 Requirements for Chemical Hazard Analysis

Sources[9]	Consolidated Requirements[10], [11], [12]
	4.1 General (Applicable to all operations/activities involving chemicals)
ANSI Z49.1, 3.2.2.2; CGA P-1, 6.1; NFPA 30-2003, 7.2; NFPA 30, 6.3.6.4; NFPA 45-2003, 7.2, NFPA 45, 8.1.1, 8.1.2, 8.2.2.1; NFPA 45,12.1; NFPA 430, 4.1.1; NFPA 432, 4.7.1; NFPA 400, 1.11.1, 10.4, 7.3.1.1, 14.2.10.4; 10 *Code of Federal Regulations* (CFR) 835.204(d)(2); 10CFR 851.21; 29 CFR 1910.106(e)(8); 29 CFR 1910.146(c)(1)-(d)(2); 29 CFR 1910.1450(e)(3); 48 CFR 970.5204-2(c)[13]	**4.1.1** Hazards associated with all activities involving chemicals that could put the employee at risk of injury or illness shall be evaluated. Those activities include, but are not limited to; a) Design of new facilities or modification of existing facilities and equipment, b) Operations and procedures and c) Equipment, products and services that are selected or purchased. *[NOTE: Numerous other substance-specific hazard analysis requirements can be found in 29 CFR Part 1910, Subpart Z.]*
10 CFR 851.26; NFPA 430, 4.1.1; NFPA 430, 4.10.1; NFPA 432, 4.7.1; NFPA400, 1.11,1.12, 14.2.10.4; 29 CFR 1910.132 (d)(2)	**4.1.1.1** The results of the hazard analysis shall be documented and approved by the appropriate safety official or manager.

[9] ANSI, CGA, and NFPA requirements require user subscription to a prescribed service in order to access these organizations' source requirements.

[10] 29 USC 654(a)(1), the *Duties of employers and employees*, requires employers to protect their employees from all recognized hazards in the workplace and is a general requirement applicable to all operations/activities involving chemicals.

[11] DOE has a "General Duty Clause" in 10 CFR Section 851.10(a)(1) that applies to DOE contractors who may be exempt from OSHA regulation.

[12] DOE standards and industry codes and standards become requirements either by incorporation by reference in DOE regulations (e.g., 10 CFR) or when included in the Contractor Requirements Document (CRD).

[13] This requirement of the DOE Acquisition Regulations (DEAR, ES&H Clause) requires an identification and evaluation of hazards associated with work, as part of an overall documented safety management system.

Sources[9]	Consolidated Requirements[10]
ANSI Z49.1, 3.2.1.2; ANSI Z49.1, 3.2.1.3; ANSI Z49.1, 3.2.1.5; CGA P-1, 6.1; NFPA 45, 8. 1.1; NFPA 430, 4.7.2.1; NFPA 432, 4.2; NFPA 400, 6.1.4.1–6.1.4.2; NFPA 400, 15.2.11.7; 10 CFR 851.23; 29 CFR 1910.1200(h)(1); 29 CFR 1910.1450(f)(1) and (f)(4)(i)(B) and (f)(4)(i)(C); 29 CFR 1926.21(b)(2)	**4.1.2** Before beginning work, employees shall be informed of the hazards present in their work area.
	4.2 Hazardous Operations[14] (see definition)
DOE O 151.1D, Attachment 4, sec. 2a; Attachment 3, sec. 2d(1); DOE O 420.1B, II.3.b(5); DOE O 420.1C, II 3 f(1); 10 CFR 830, Subpart B; 10 CFR 850.21(a); 10 CFR 851.21(a); 10 CFR 1021.400; 29 CFR 1910.119(e); 29 CFR1910.120(c)(1); 40 CFR 68.50; 40 CFR 68.67(a); 40 CFR 1502.14	**4.2.1** Hazardous processes shall be analyzed for possible natural and man-made events that could lead to or result in a loss of control of hazardous materials.

[14] The requirements for hazardous operations are in addition to requirements associated with those activities specified in Section 4.1.

Sources[9]	Consolidated Requirements[10]
DOE O 151.1D, Attachment 3, sec. 2e; DOE-STD-1120-2016; DOE-STD-3009-2016; DOE-STD-3011-2016; DOE-STD-3016-2016; DOE O 460.1C; 10 CFR 830.7; 10 CFR 830 Subpart B, 204(a) and (b); 10 CFR 851.21(a)(5); 10 CFR 851.23(a); 29 CFR 1910.119(e)(2); 40 CFR 68.67(b); 40 CFR 1502.24	**4.2.1.1** Hazard analysis techniques shall be selected and used that are appropriate for the hazards and complexities of work processes being analyzed.
DOE-STD-1027-92; 10 CFR 830 Subpart B, Part 202(b)(3); 10 CFR 851.21(a); 10 CFR 851.23(a); 29 CFR 1910.119(d); 29 CFR 1910.120(c)(3); 40 CFR 68.65; 40 CFR 1502.15	**4.2.1.2** Process information relevant to the hazard analysis, such as energy sources and hazardous materials, shall be identified.
DOE O 151.1D, Attachment 3, sec. 2d(2)(a); DOE O 420.1C; DOE-STD-3009-2014; 10 CFR 830.204(b)(3); 10 CFR 851.21(a); 29 CFR 1910.119(e)(3); 29 CFR 1910.120(c)(7); 40 CFR 68.22; 40 CFR 68.25; 40 CFR 68.28; 40 CFR 68.67(c); 40 CFR 1502.16; 40 CFR 1508.8	**4.2.1.3** Consequences of postulated accidents associated with hazardous processes and their likelihood of occurrence shall be evaluated.
10 CFR 850.21(b); 10 CFR 851.20(a)(2); 29 CFR 1910.119(e)(4); 40 CFR 68.67(d)	**4.2.1.4** Hazard analyses shall be performed by qualified personnel.

Sources[9]	Consolidated Requirements[10]
10 CFR 1021.310; 10 CFR 830 Subpart B, 830.204(a) and (b); 10 CFR 851.26(a)(1); 29 CFR 1910.119(e)(5); 29 CFR 1910.120(b)(4); 40 CFR 68.39; 40 CFR 68.67(e); 40 CFR 1508.10	**4.2.1.5** Results of hazard analyses shall be documented and approved by appropriate management.
DOE O 151.1D, Attachment 3, sec. 2c; 10 CFR 830 Subpart B, 830.202(c); 10 CFR 851.10(c); 10 CFR 851.21(c); 29 CFR 1910.119(e)(6); 40 CFR 68.67(f)	**4.2.1.6** At least every 3 years after the completion of the initial process, the hazard analyses shall be updated and revalidated periodically.
10 CFR 830.6; 10 CFR 851.26(a)(1); 29 CFR 1910.119(e)(7); 40 CFR 68.67(g)	**4.2.1.7** Hazard analysis results and documentation, including updates, shall be retained for the life of the process operation.

1.5 Source Documents

ANSI Z49.1 (2012), *Safety in Welding, Cutting, and Allied Processes*

CGA P-1 (2015), *Safe Handling of Compressed Gases in Containers*

DOE O 151.1D, *Comprehensive Emergency Management System, 08-11-2016*

DOE O 420.1B, *Facility Safety*, *12-22-2005*; Canceled on 12-04-2012

DOE O 420.1C, *Facility Safety, 2-27-2015*

DOE O 460.1D, *Hazardous Materials Packaging and Transportation Safety, 12-20-2016*

DOE-STD-1027-92, *Hazard Categorization and Accident Analysis Techniques for Compliance with DOE Order 5480.23, Nuclear Safety Analysis Reports*, *12-12-1997*

DOE-STD-1120-2016, *Preparation of Documented Safety Analysis for Decommissioning and Environmental Restoration Activities*, *3-15-2016*

DOE-STD-3009-2014, *Preparation of Nonreactor Nuclear Facility Documented Safety Analysis*, *11-12-2014*

DOE-STD-3011-2002*, Guidance for Preparation of Basis of Interim Operation (BIO) Documents, 01-03-2003*

DOE-STD-3011-2016, *Preparation of Documented Safety Analysis for Interim Operations at DOE nuclear Facilities*, *1-22-2016*

DOE-NA-STD-3016-2006, *Hazard Analysis Reports for Nuclear Explosive Operations*, 5-19-2006

NFPA 30 (2014), *Flammable and Combustible Liquids Code, 2015 ed.*

NFPA 45 (2014), *Standard on Fire Protection for Laboratories Using Chemicals, 2015 ed.*

NFPA 400 (2015), *Hazardous Materials Code, 2016 ed.*

NFPA 430 (2004), *Storage of Liquid and Solid Oxidizers;* Replaced by NFPA 400, Chapter 15

NFPA 432 (2002), *Storage of Organic Peroxide Formulation;* Replaced by NFPA 400, Chapter 14

10 CFR 830, *Nuclear Safety Management,* Subpart B*, Safety Basis Requirements*

10 CFR 835, *Occupational Radiation Protection*

10 CFR 850, *Chronic Beryllium Disease Prevention Program*

10 CFR 851, *Worker Safety and Health Program*

10 CFR 1021, *National Environmental Policy Act Implementing Procedures*

29 CFR 1910.106, *Flammable Liquids*

29 CFR 1910.119, *Process Safety Management of Highly Hazardous Chemicals*

29 CFR 1910.120, *Hazardous Waste Operations and Emergency Response*

29 CFR 1910.132, Subpart I, *Personal Protective Equipment*

29 CFR 1910.146, *Permit-Required Confined Spaces*

29 CFR 1910.1200, *Hazard Communication*

29 CFR 1910.1450, *Occupational Exposure to Hazardous Chemicals in Laboratories*

29 CFR 1926.21, *Safety Training and Education*

29 USC 654, *Duties of Employers and Employees*

40 CFR 68, *Chemical Accident Prevention Provisions*

40 CFR 1500-1508, Chapter V–*Council on Environmental Quality*

48 CFR 970, *DOE Management and Operating Contracts*

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Chapter 2 – Acquisition

2.1 Introduction

This chapter identifies and consolidates existing user safety and health requirements found in DOE and Federal chemical-related safety and health regulations and National Standards that address the acquisition of ***chemicals*** (see definition) and ***chemical products*** (see definition). State and local codes and requirements are not included. This chapter specifically consolidates requirements found in NFPA and OSHA standards, Codes of Federal Regulations of the Bureau of Mines, the Bureau of Alcohol, Tobacco, Firearms and Explosives, and certain EPA regulations and DOE Orders, including technical standards that are mandatory because of their specific reference within a DOE Regulation, or Order.

Direct requirements for acquisition are found in *Federal Acquisition Regulations* (FAR) and *Department of Energy Acquisition Regulations* (DEAR). In addition, there are many regulations and standards that include implied requirements for the acquisition of chemicals and chemical products. Therefore, implied requirements are summarized here but are not included as mandatory requirements in this chapter.

Requirements for on-site transportation of chemicals and chemical products can be found in Chapter 4 of this document.

This chapter is intended only to consolidate overlapping or duplicative chemical-related safety and health requirements. The listing of consolidated chemical-related safety and health requirements contained here includes "pointers" to the sources of those requirements, showing the user what the requirements are and where each comes from.

This document does not create any new or additional requirements.

2.2 Applicability

The information presented here applies to all locations that purchase or use chemicals, chemical products or services that involve the use of chemicals or chemical products. *[NOTE: Throughout this chapter, the term "chemicals" is used to indicate chemicals and/or chemical products as described in Glossary Section.]* This chapter consolidates existing core safety and health requirements that all sites must follow when engaged in chemical-related activities.

The requirements included in this chapter come from sources that have different safety purposes. As a result, some of these requirements may not always be applicable to the work being performed at an individual site or facility. Users are responsible for determining how specific requirements apply to their work and how they are implemented. The reference sources for the requirements included in this chapter can be used to determine the applicability of those requirements to the work being performed.

2.3 Definitions and Acronyms

See **Glossary.**

2.4 Requirements for the Acquisition of Chemicals

Sources[12]	Consolidated Requirements[10, 11]
	4.1 General (Applicable to all acquisitions involving chemicals)
10 CFR 851.22(c); 10 CFR 851.23; 48 CFR 970.5223-1	**4.1.1** Hazards associated with all activities involving chemicals that could put the employee at risk of injury or illness shall be identified and evaluated using the appropriate Safety Data Sheet (SDS) before purchase.
10 CFR 1021; 10 CFR 851.22(b); DOE O 436.1; DOE O 460.1C; DOE O 460.1D; DOE-STD-1189-2008; DOE-STD-1189-2016	**4.1.2** Prevention practices, such as substitution of less hazardous materials in a project or design of a process to reduce generation of hazardous waste.
DOE O 460.1C; DOE O 460.1D	**4.1.3** Packaging and Transportation Safety requirements shall be addressed as a part of the acquisition process.
NFPA 45, 8.1,1, 8.1.2; 10 CFR 851.23; 10 CFR 851.25(a); 29 CFR 1910.1200(g)(8)	**4.1.4** When a chemical is ordered, its hazards shall be determined and that information shall be provided to those who receive, store, use, or dispose of the chemical. Restrictions imposed by local governmental regulations and in-house rules shall be followed.
29 CFR 1910.1200(g)(6)(iii); 29 CFR 1910.1200(g)(8); 29 CFR 1910.1450(f)(3)(v)	**4.1.5** The manufacturer's Safety Data Sheet shall be obtained for all new chemical purchases and shall be made readily available to those who receive, store, use or dispose of the chemicals. In laboratories subject to 29 CFR Section 1910.1450, other reference materials may be used.
	Additional Procurement Requirements *(Non-Health and Safety Requirements are provided for Informational purposes)*
	4.2 Alcohol
27 CFR 22.41; 48 CFR 908.7107	**4.2.1** Applications to purchase tax-free alcohol shall be submitted to the Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF).
	4.3 Helium
48 CFR 52.208-8	**4.3.1** DOE and its contractors shall purchase "major" helium requirements (that is, in excess of 200,000 standard cubic feet (scf) of gaseous helium or 7510 liters of liquid helium delivered to a helium use location per year) from Federal helium suppliers and shall provide to the DOE Contracting Officer the following data within 10 days after receiving a delivery: Name of the supplier, Amount purchased, Delivery date(s), and the Location of use.

Sources[12]	Consolidated Requirements[10, 11]
Helium Stewardship Act of 2013; 43 CFR 3195	**4.3.2** DOE contractors shall report (by mail, fax, or e-mail) the total itemized quarterly deliveries of any major helium requirement, within 45 calendar days after the end of the previous quarter, to the Bureau of Land Management, Helium Operations, United States Department of the Interior, Amarillo, TX 79101.
	4.4 Fuel and Petroleum
41 CFR 101-26.602; 48 CFR 908.7109	**4.4.1** Acquisitions of fuel and packaged petroleum products by DOE offices and contractors shall be from defense sources.
48 CFR 908.7110	**4.4.2** DOE offices and authorized contractors may participate in the Defense Fuel Supply Center (DFSC) coal-contracting program for carloads or larger lots.
	4.5 Arms and Ammunition
48 CFR 908.7111	**4.5.1** Acquisition of arms and ammunition readily procurable in the civilian market shall be made in accordance with local site acquisition procedures.
	4.6 DOE-Specific materials acquisitions[15]
	Contracting activities shall require authorized contractors to obtain the special materials identified in the following subsections in accordance with the procedures stated therein.
48 CFR 908.7121(a)	**4.6.1 Heavy water.** The Senior Program Official or designee controls the acquisition and production of heavy water for a given program. Requests for the acquisition or production of heavy water orders shall be placed directly with the cognizant ***Senior Program Official or designee*** (see definition).
48 CFR 908.7121(b)	**4.6.2 Precious metals.** NNSA, Y-12 National Security Complex in Oakridge, TN is responsible for maintaining the DOE supply of precious metals. These metals are platinum, palladium, iridium, osmium, rhodium, ruthenium, gold and silver.
77 FR 74387 (12-14-2012); 48 CFR 908.7121(c)	**4.6.3** Lithium is available from Y-12 at no cost other than normal packing, handling and shipping charges from Oak Ridge.
	4.7 Controlled Substances
21 CFR 1301	Use of controlled substances in research requires compliance with the Drug Enforcement Administration's regulations.

[15] This section covers the purchase of materials peculiar to the DOE program. While purchases of these materials are unclassified, the specific quantities, destination or use may be classified. See appropriate sections of the Classification Guide.

Sources[12]	Consolidated Requirements[10, 11]
	4.8 DOE Sustainable acquisition program
EO 13693 section 3(i); 48 CFR 970.2301; 48 CFR 970.5223-7; 2015 DOE SSPP Goal 6	Federal policy via EO 13693 requires DOE and its contractors to purchase environmentally friendly products identified by the EPA or DOE. To promote sustainable acquisition by DOE sites, DOE has developed a Priority Product List, which includes chemical products such as paints, hydraulic fluids, cleaning agents, oils and greases, adhesives, herbicides, etc. This list can be accessed at: https://www.fedcenter.gov/members/workgroups/sustainable_acquisition/priority products/

2.5 Source Documents

Executive Order (EO) 13693, *Planning for Federal Sustainability in the Next Decade*, *03-19-2015*

2015 DOE Strategic Sustainability Performance Plan (SSPP), Report to The White House Council on Environmental Quality and Office of Management and Budget, June 2015

DOE O 436.1, *Departmental Sustainability, 05-02-2011*

DOE O 460.1D, *Hazardous Materials Packaging and Transportation Safety, 12-20-2016*

DOE-STD-1189-2008, *Integration of Safety into the Design Process, 03-31-2008*

DOE-STD-1189-2016, *Integration of Safety into the Design Process, December 2016*

NFPA 45 (2014) *Standard on Fire Protection for Laboratories Using Chemicals, 2015 ed.*

Public Law 113-40 (10-02-2013), *Helium Stewardship Act of 2013*

10 CFR 851, *Worker Safety and Health Program*

10 CFR 1021, *National Environmental Policy Act Implementing Procedures*

21 CFR 1301, *Drug Enforcement Administration; Registration of Manufacturers, Distributors, and Dispensers of Controlled Substances*

27 CFR 22.41, *Distribution and Use of Tax-free Alcohol, Qualification*

29 CFR 1910.1200, *Occupational Safety and Health Standards – Hazard Communication*

29 CFR 1910.1450, *Occupational Safety and Health Standards – Occupational Exposure to Hazardous Chemicals in Laboratories*

41 CFR 101-26.602, *Federal Property Management Regulations - Procurement Sources Other Than GSA - Fuels and Packaged Petroleum Products Obtained from or Through the Defense Logistics Agency*

43 CFR Part 3195, *Helium Contracts*

48 CFR, *Federal Acquisition Regulations (FAR) System*

48 CFR (chapter 9), *Department of Energy Acquisition Regulations (DEAR)*

48 CFR Section 52.208-8*, Federal Acquisition Regulations, Required Sources for Helium and Helium Usage Data*

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Chapter 3 – Chemical Inventory and Tracking

3.1 Introduction

This chapter identifies and consolidates existing user safety and health requirements found in DOE and Federal chemical-related safety and health regulations and National Standards that address the inventory and tracking of ***chemicals*** (see definition) and ***chemical products*** (see definition). State and local codes and requirements are not included. This chapter specifically consolidates requirements found in the OSHA standard and certain EPA regulations and DOE Orders, including technical standards that are mandatory because of their specific reference within a DOE Regulation, or Order.

Direct requirements for a chemical inventory and tracking system are found in OSHA standard 29 CFR Section 1910.1200, and EPA regulation 40 CFR Subpart C, Section 370.20 and Sections 370.40 through 370.45. In addition, there are many regulations and standards for which an inventory and tracking system is an implied requirement because inventory information facilitates compliance. Therefore, necessary actions which facilitate compliance are summarized here, but are not as mandatory requirements in this chapter.

This chapter is intended to list chemical-related safety and health requirements and to consolidate those that are overlapping or duplicative. The list of requirements includes pointers to the sources of those requirements.

This document does not create any new or additional requirements.

3.2 Applicability

The information presented here applies to all locations that use or store chemicals or chemical products. It applies to chemicals prior to their becoming waste (see Disposition, Chapter 9, for requirements for the disposition of chemicals and chemical products). *[NOTE: Throughout this document, the term "chemicals" is used to indicate chemicals and/or chemical products as described in Glossary Section.]* This chapter consolidates existing core safety and health requirements that all sites must follow when engaged in chemical-related activities.

The requirements included in this chapter come from sources that have different safety purposes. As a result, some of these requirements may not always apply to the work being performed at an individual site or facility. Users are responsible for determining how specific requirements apply to their work and how they are implemented. The reference sources for the requirements included in this chapter can be used to determine the applicability of those requirements to the work being performed.

3.3 Definitions and Acronyms

See **Glossary.**

3.4 Requirements for Chemical Inventory and Tracking

[NOTE: The information that follows is a consolidation of existing federal safety and health requirements and national standards that relate to the inventorying and tracking of chemicals. It therefore contains "shall" statements that are taken from, or based on "shall" statements in those existing requirements. While requirements from national standards that are referenced here are not, in and of themselves, mandatory, they may be made mandatory by DOE and federal requirements, including OSHA standard 29 CFR Section 1910.6, which incorporates them by reference. 10 *CFR Part 851.23 mandates compliance with OSHA regulations found in 29 CFR Part 1910. National standards requirements referenced here are thereby made mandatory for DOE contractors by operation of law through 10 CFR Part 851.* P*lease see the Introduction to this section of the Chemical Management Handbook for more information.]*

Sources[12]	Consolidated Requirements[10, 11]
	4.1 Chemical Inventory Requirements
29 CFR 1910.1200(e)(1)(i)	**4.1.1** Maintain a list of the hazardous chemicals known to be present using a product identifier that is referenced on the appropriate Safety Data Sheet (SDS) (the list may be compiled for the workplace as a whole or for individual work areas). *[NOTE: Some chemical specific regulations, such as those for asbestos and beryllium, may also contain their own inventory tracking requirements.]*
40 CFR 370.40 to 370.45	**4.1.2** The owner or operator of a facility shall annually submit an inventory form (Tier 1 or equivalent State or local form) containing information on specified hazardous chemicals present at the facility during the preceding calendar year above specified threshold levels to the state emergency response commission, the local emergency planning committee, or the fire department with jurisdiction over the facility. For any specific hazardous chemical at the facility, the owner or operator may submit a Tier II form (40 CFR 370.42) in lieu of the Tier I information. (Uniform Fire Code, Article 80, 8001.15; NFPA 45 7-2.3.3)
NFPA 45, 8.2.4.1, 8.2.2.1	**4.1.3** For laboratories, chemical inventories shall be maintained within facility limits.
	4.2 Necessary Actions Which Facilitate Compliance.
	There are many mandatory standards that do not directly require an inventory of hazardous chemicals, but for which a chemical inventory and tracking system would be necessary for, or would facilitate, compliance. A list of major standards for keeping a chemical inventory and for tracking chemicals is necessary for compliance. The applicability of specific DOE Orders will depend on each site's individual contract.
29 CFR 1910.39; 29 CFR 1910.38	**4.2.1 Employee Emergency Plans and Fire Prevention Plans.** Maintain a list of the major workplace fire hazards and their proper handling and storage procedures; potential ignition sources and their control procedures; and the type of fire protection equipment or systems that can control a fire involving the identified hazards.

Sources[12]	Consolidated Requirements[10, 11]
29 CFR 1910.1450	**4.2.2 Occupational Exposure to Hazardous Chemicals in Laboratories.** Requires employee protection for work in laboratory environments with particularly hazardous substances, including carcinogens, reproductive toxins, and substances with a high acute toxicity. Requires an approved Chemical Hygiene Plan covering the tasks, hazards, and controls before beginning the work. Upon assignment, employees must be provided with information and training to ensure that they are apprised of the hazards of chemicals in their work areas. This information and training must be provided to employees prior to the start of any work in the area, including the startup of any new operation or task.
29 CFR 1910.1020	**4.2.3 Access to Employee Exposure and Medical Records.** Authorizes employee access to SDSs or to a chemical inventory or any other record that may reveal the identity of toxic substances or harmful physical agents and where and when they were used in order to give employees some idea of their potential chemical exposures.
DOE O 151.1D	**4.2.4 Comprehensive Emergency Management System.** Uses a hazard assessment to develop an emergency management program that protects workers, the public, and the environment. Additions or deletions of chemical hazards or changes in the magnitude of a chemical hazard from an up-to-date chemical inventory can be used in development and maintenance of the emergency management hazards assessment. During an emergency response, a real-time chemical inventory can provide the basis for consequence assessments used for protective action determinations.
10 CFR 851, Appendix A, Sec.6	**4.2.5 Worker Protection Management for DOE Federal and Contractor Employees.** Mandates an Industrial Hygiene Program with surveys of all work areas and operations to identify and evaluate potential health hazards through appropriate workplace monitoring. A chemical inventory can help to identify locations where chemical health hazards may be present. Managers must ensure that applicable explosives operations comply with DOE M 440.1-1. Requires compliance with OSHA standards (29 CFR Part 1910 and 29 CFR Part 1926).

Sources[12]	Consolidated Requirements[10, 11]
29 CFR 1910.119	**4.2.6 Process Safety Management [PSM] of Highly Hazardous Chemicals.** Establishes requirements to protect workers by preventing or minimizing the consequences of: 1) catastrophic releases of toxic, reactive, or flammable chemicals used in quantities at or above specified thresholds; or 2) ignition of explosives in manufacturing processes. Chemical tracking is needed to determine where threshold quantities are exceeded. PSM also requires an employer to keep process safety information on the chemicals used and specify the maximum intended inventory of any listed chemical.
DOE O 420.1C, Attachment 1, para 1.C	**4.2.7 Facility Safety.** All new construction shall, at a minimum, conform to the International Building Code or applicable state or regional codes approved by the Field Element Manager, supplemented with additional safety requirements associated with the facility hazards. Chemical inventories must be tracked in order to ensure that chemical limits specified in applicable regulations are not exceeded.
Local building and fire codes	**4.2.8 Local Codes.** Establish requirements for the prevention, control, and mitigation of dangerous conditions created by hazardous materials and for providing information needed by emergency response personnel. Permits are required to store, dispense, use, or handle quantities of hazardous materials exceeding listed permit amounts. The authority having jurisdiction may require that a Hazardous Materials Management Plan or Hazardous Materials Inventory Statement accompany the permit. In addition, inventories of chemicals must be tracked in order to determine whether or not listed permit quantities of chemicals have been exceeded. Each facility is responsible for determining the applicability of local building and fire codes.

Sources[12]	Consolidated Requirements[10, 11]
The DEAR Clause	**4.2.9 DEAR 970.5223-1, Integration of Environment, Safety and Health into Work Planning and Execution.** The contractor shall comply with and assist DOE in complying with ES&H requirements of all applicable laws and regulations, and applicable directives identified in the clause of this contract on laws, regulations, and DOE directives. The contractor shall cooperate with federal and non-federal agencies having jurisdiction over ES&H matters under the terms of the contract. Before work is performed, the associated hazards are evaluated and an agreed-upon set of ES&H standards and requirements are established which, if properly implemented, provide adequate assurance that employees, the public, and the environment are protected from adverse consequences. Administrative and engineering controls to prevent and mitigate hazards are tailored to the work being performed and its associated hazards. Emphasis should be on designing the work and controls to reduce or eliminate the hazards and to prevent accidents and unplanned releases and exposures. [See also *Safety Management System Policy* (DOE P 450.4) and *Integrated Safety Management System Guide* (DOE G 450.4-1B)]
10 CFR 830	**4.2.10 Nuclear Safety Management.** The documented safety analysis requires a systematic identification of all natural and manmade hazards associated with the facility.
40 CFR 68	**4.2.11 Chemical Accident Prevention Provisions.** Requires offsite consequence analysis, development, and implementation of a Risk Management Plan to protect the public and the environment by preventing or minimizing the consequences of catastrophic releases of toxic, reactive, or flammable chemicals used in quantities at or above specified thresholds. Inventories of chemicals must be tracked in order to ensure that specified chemical limits are not exceeded.
40 CFR 355	**4.2.12 Emergency Planning and Notification.** Establishes the list of extremely hazardous substances, threshold planning quantities, and facility notification responsibilities necessary for development of state and local emergency response plans.
40 CFR 61; 40 CFR 63	**4.2.13 National Emission Standards for Hazardous Air Pollutants (NESHAPs) Standards** are provided for specific types of sources and processes involving hazardous air pollutants (including radionuclides). Requires registration of emission sources and quantity of air contaminant emissions. Contains standards for specific processes involving hazardous chemicals. A chemical inventory is needed to identify and track locations and quantities of chemicals that may be released as hazardous air pollutants.

Sources[12]	Consolidated Requirements[10, 11]
40 CFR 82	**4.2.14 Protection of Stratospheric Ozone.** A system to track the acquisition and inventory of ozone-depleting substances can be used to accomplish the required annual certification that each ozone-depleting substance is being used only for laboratory applications and is not being resold or used in manufacturing.

3.5 Source Documents

48 CFR DEAR 970.5204-2, *Laws, Regulations and DOE Directives*

48 CFR 970.5223-1, *Integration of Environment, Safety and Health into Work Planning and Execution*

DOE O 151.1D, *Comprehensive Emergency Management System, 08-11-2016*

DOE O 420.1C, *Facility Safety,* Chg. 1; *02-27-2015*

NFPA 45 (2014), *Standard on Fire Protection for Laboratories Using Chemicals, 2015 ed.*

10 CFR 830, *Nuclear Safety Management*

10 CFR 851, *Worker Safety and Health Program*

29 CFR 1910.38, *Emergency Action Plans*

29 CFR 1910.39*, Fire Prevention Plans*

29 CFR 1910.119, *Process Safety Management of Highly Hazardous Chemicals*

29 CFR 1910.1020, *Access to Employee Exposure and Medical Records*

29 CFR 1910.1200, *Hazard Communication*

29 CFR 1910.1450, *Occupational Exposure to Hazardous Chemicals in Laboratories*

40 CFR 61, *National Emission Standards for Hazardous Air Pollutants (NESHAPs)*

40 CFR 63, *National Emission Standards for Hazardous Air Pollutants for Source Categories*

40 CFR 68, *Chemical Accident Prevention Provisions*

40 CFR 82, *Protection of Stratospheric Ozone*

40 CFR 355, *Emergency Planning and Notification*

40 CFR 370, *Hazardous Chemical Reporting Community Right-To-Know*

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Chapter 4 – On-Site Chemical Transportation

4.1 Introduction

This chapter identifies and consolidates existing user safety and health requirements found in DOE and Federal chemical-related safety and health regulations and National Standards that address the on-site transport of non-radioactive ***chemicals*** (see definition) and ***chemical products*** (see definition). State and local codes and requirements are not included. This chapter specifically consolidates requirements found in DOE O 460.1C and DOE O 460.1D, *[NOTE: This order, issued on 12/20/2016, cancels DOE O 460.1C]*, OSHA standards 29 CFR Section 1910.101, 29 CFR Section 1910.253, and 29 CFR Section 1926.350, ANSI standard ANSI Z49.1, and CGA Pamphlets G-1 and P-1, including technical standards that are made mandatory by their specific reference within a DOE Regulation or Order. OSHA standards and certain consensus standards are included in Department of Energy 10 CFR Part 851, *Worker Safety and Health Program*.

This chapter is intended to list chemical-related safety and health requirements and to consolidate those that are overlapping or duplicative. The list of requirements includes pointers to the sources of those requirements.

This document does not create any new or additional requirements.

4.2 Applicability

The information presented here applies to all transport of chemicals or chemical products on-site. It includes hazardous materials offered for transportation on-site, and the packaging, labeling, or marking of hazardous materials for transportation on-site. Packaging and transportation safety requirements apply to the purchasers of hazardous chemicals if they subsequently transfer those chemicals to another location for on-site transfers, site rules apply; for off-site transfers, Department of Transportation (DOT) rules apply. *[NOTE: Throughout this document, the term "chemicals" is used to indicate chemicals or chemical products as described in Glossary Section.]* This chapter consolidates existing core safety and health requirements that all sites must follow when engaged in chemical-related activities.

The requirements included in this chapter come from sources that have different safety purposes. As a result, some of these requirements may not always be applicable to the work being performed at an individual site or facility. Users are responsible for determining how specific requirements apply to their work and how they are implemented. The reference sources for the requirements included in this chapter can be used to determine the applicability of those requirements to the work being performed.

4.3 Definitions and Acronyms

See **Glossary.**

4.4 Requirements for On-Site Chemical Transportation

Sources[12]	Consolidated Requirements[10, 11]
DOE O 460.1C, 4.b; DOE O 460.1D	**4.1 Onsite Hazardous Materials Transfers -** shall comply with:
49 CFR 171-180; 10 CFR 851; 29 CFR 1910	**4.1.1** The ***Hazardous Materials Regulations (HMR)*** (see definition) that cover, but are not limited to, such subjects as shipper's responsibilities, shipping papers, packaging, handling, labeling of material containers, marking packages place carding and emergency response information, and 10 CFR Part 851 (*Worker Safety and Health Program*) that incorporates OSHA 29 CFR Part 1910 standards.
DOE O 460.1C, 4.b; DOE O 460.1D	**4.1.2** The site or facility-specific document, from the cognizant Operations or Field Office, that describes the methodology and compliance process to meet equivalent safety for any deviation from the Hazardous Materials Regulations.
DOE O 460.1C, 4.b; DOE O 460.1D	**4.1.2.1** For multiple-tenant DOE/NNSA sites, safety documents for several contractor organizations may be combined into a single document.
DOE O 460.1C, 4.b; DOE O 460.1D	**4.1.2.2** DOE-operated sites (specifically, Morgantown and Pittsburgh Energy Technology Centers) may approve their own Transportation Safety Documents (TSDs).
DOE O 460.1C, 4.b; DOE O 460.1D	**4.1.2.3** For onsite transfers not subject to 10 CFR Part 830, the TSDs must be approved and in effect no later than one year from incorporation of the CRD of this Order into contracts.
	4.2 Specific materials
29 CFR 1910.101(b)	**4.2.1 Compressed Gas Cylinders**
CGA P-1	**4.2.1.1** The in-plant handling of all compressed gases in cylinders, portable tanks, rail cars, or motor vehicle cargo tanks shall be in accordance with the ***CGA*** (see definition) P-1.
29 CFR 1910.253(b)(1)(i); 49 CFR 171-179	**4.2.1.2** All portable cylinders used for the shipment of compressed gases shall be constructed and maintained in accordance with DOT regulations, 49 CFR Parts 171-179.
ANSI Z49.1, 10.8.1.4, 10.8.1.5; CGA P-1, 5.2; CGA C-7; 29 CFR 1910.253(b)(1)(ii)	**4.2.1.3** To identify the gas content, compressed-gas cylinders shall be legibly marked with either the chemical or the trade name of the gas in conformance with CGA C-7, *Guide to Classification and Labeling of Compressed Gases*. Such marking shall be by means of stenciling, stamping, or labeling, and shall not be readily removable. Whenever practical, the marking shall be located on the shoulder of the cylinder.

Sources[12]	Consolidated Requirements[10,11]
CGA P-1, 5.5; 29 CFR 1926.350(a)(1); 29 CFR 1910.253(b)(2)(iv)	**4.2.1.4** Valve protection caps shall be in place and secured when not in use or being transported.
ANSI Z49.1, 10.8.3.7	**4.2.1.5** Valve protection caps shall not be used for lifting cylinders.
ANSI Z49.1, 10.8.3.8; CGA P-1, 5.6	**4.2.1.6** When transporting cylinders by a crane or derrick, a cradle or suitable platform shall be used. Slings or electromagnets shall not be used for this purpose.
29 CFR 1926.350(a)(3)	**4.2.1.7** Cylinders shall be moved by tilting and rolling them on their bottom edges. They shall not be rolled in the horizontal position or dragged. Thy shall not be intentionally dropped, struck, or permitted to strike each other violently.
CGA P-1, 5.6; 29 CFR 1926.350(a)(4)	**4.2.1.8** A suitable hand truck, forklift, cylinder pallet system, or similar material-handling device shall be used with the container properly secured to the device. When powered vehicles transport cylinders they shall be secured in a vertical position.
29 CFR 1926.350(a)(5)	**4.2.1.9** Bars shall not be used under valves or valve protection caps to pry frozen cylinders loose. Warm, not boiling water shall be used to thaw frozen cylinders loose.
ANSI Z49.1, 10.8.3.10; 29 CFR 1926.350(a)(6)	**4.2.1.10** Unless cylinders are firmly secured on a special carrier intended for this purpose, regulators shall be removed from the cylinders and valve protection caps put in place before cylinders are moved.
ANSI Z49.1, 10.8.3.10; 29 CFR 1926.350(a)(8)	**4.2.1.11** When cylinders are moved at any time, the cylinder valve shall be closed.
CGA P-1, 5.5	**4.2.1.12** Gas-tight valve outlet caps and plugs in accordance with 49 CFR Section 173.40 are mandatory for poison gas containers but may also be used for other products. The gas-tight valve outlet cap or plug shall be checked and tightened securely before return shipment to the gas supplier.
CGA P-1, 6.7.2	**4.2.2 Cryogenic liquid containers**. In addition to the requirements listed above for other compressed gases, cryogenic liquids must be moved by use of a four-wheeled hand truck designed to move cryogenic liquefied gas containers with a capacity greater than 20 gal (76 ℓ). Hand trucks must be kept in good operating condition.
CGA G-1	**4.2.3 Acetylene.** The in-plant transfer of acetylene in cylinders shall be in accordance with CGA G-1.

Sources[12]	Consolidated Requirements[10, 11]
CGA-G-1, 6	**4.2.3.1** Acetylene shall be called by its proper name, "acetylene". Acetylene shall not be referred to merely by the word "gas".
CGA G-1, 6.1	**4.2.3.2** When acetylene cylinders are moved, they should* not be subjected to abnormal mechanical shocks that might damage the cylinders, the valves, or the fusible pressure relief devices. Care shall be exercised to ensure that acetylene cylinders are not dropped or permitted to strike each other violently.
CGA G-1, 6.1	**4.2.3.3** Acetylene cylinders should* not be dropped while being unloaded or loaded from a truck or dock. *[NOTE: Trucks with elevator tailgates provide a very good means or unloading or loading acetylene cylinders safely.]*
CGA-G-1, 6.1	**4.2.3.4** When transporting acetylene cylinders by crane or derrick, lifting magnets, slings, ropes or chains, or any other device in which the cylinders themselves form a part of the carrier should* never be used for hoisting acetylene cylinders. When transporting acetylene cylinders by crane, a platform, cage, or ladle should* be used to protect the cylinders from damage and keep them from falling out.
CGA G-1, 6.1	**4.2.3.5** A positive method such as chaining should* be used in securing acetylene cylinders that are standing upright. During movement, acetylene cylinders shall not be transported when lying horizontally with the valves unprotected in a position that would allow the valves to collide with stationary objects.
CGA G-1, 6.1	**4.2.3.6** Acetylene cylinders should* never be dragged from place to place**.**
CGA G-1, 6.1	**4.2.3.7** Valves shall always be closed before acetylene cylinders are moved.
CGA G-1, 6.1	**4.2.3.8** Unless acetylene cylinders are to be moved while secured in an upright position to a suitable hand truck, pressure regulators should* be removed and valve protection caps, if provided for in the cylinder design, should* be attached.
	4.3 Release of Hazardous Materials
49 CFR 171.15; 40 CFR 302.6	As required under 40 CFR Section 302.6, personnel in charge of facilities (including transport vehicles and vessels) shall immediately report any release of a hazardous substance (refer to 40 CFR Section 302.4) in an amount equal to or greater than its Reportable Quantity (RQ) to DOT's National Response Center at 800-424-8802 or 202-267-2675.

*The CGA Pamphlet uses the work "should". Because DOE incorporates the CGA documents by reference, the requirements may be interpreted as mandatory.

4.5 Source Documents

ANSI, Z49.1 (2012), *Safety in Welding, Cutting, and Allied Processes*

CGA C-7 (2014), *Guide to Classification and Labeling of Compressed Gases*

CGA G-1 (2015), *Acetylene*

CGA P-1 (2015), *Standard for Safe Handling of Compressed Gases in Containers*

DOE O 460.1C, *Packaging and Transportation Safety, 5-4-2010*

DOE O 460.1D, *Hazardous Materials Packaging and Transportation Safety, 12-20-2016*

10 CFR 851, *Worker Safety and Health program*

29 CFR 1910.101, *Compressed Gases*

29 CFR 1910.102, *Acetylene*

29 CFR 1910.253, *Oxygen-Fuel Gas Welding and Cutting*

29 CFR 1926.350, *Gas Welding and Cutting*

40 CFR 302.4, *Designation of Hazardous Substances*

40 CFR 302.6, *Notification Requirements*

40 CFR 302, *Designation, Reportable Quantities, and Notification*

49 CFR 171-180, *Hazardous Materials Regulations (HMR)*

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Chapter 5 – Chemical Storage

5.1 Introduction

This chapter identifies and consolidates existing user safety and health requirements found in DOE and Federal chemical-related safety and health regulations and National Standards that address the storage of ***chemicals*** (see definition) and ***chemical products*** (see definition). It specifically consolidates requirements found in ANSI Z49.1, CGA G-1 and CGA P-1, NFPA 30, NFPA 45, NFPA 51, NFPA 55, NFPA 400, NFPA 430, NFPA 432, as applicable, OSHA standards found at 29 CFR Section 1910.6, 29 CFR Section 1910.106, 29 CFR Section 1910.134, 29 CFR Section 1910.253, 29 CFR Section 1926.350, and 29 CFR Section 1910.1200. It includes requirements that are cited in either 10 CFR Part 851 or 29 CFR Section 1910.6 ("Incorporation by Reference") and technical standards that may be made mandatory by their specific reference within a DOE Regulation, or Order. State and local codes and requirements are not included. USDA regulations are not addressed because the impact from these is considered to be negligible at DOE facilities. Similarly, EPA pesticide regulations are not addressed in this document because most DOE sites do not routinely store pesticides.

*[NOTE: Current editions of NFPA codes and standards cited in this chapter use the concepts of "**Control Area**" (*see definition*) and "**Maximum Allowable Quantity (MAQ)**" (*see definition*) per control area to manage chemical inventories for storage and use. This strategy suits recently built laboratories and facilities where multiple laboratory units or control areas are feasible either by design or via minor structural modifications. Because it is impractical for many of the older facilities (such as warehouses) to be managed in terms of control areas and MAQs, the last editions of the NFPA codes in effect, prior to adoption of the control area concept, are identified in Section 5.4 by the year of publication when referencing an applicable requirement for specific storage practices or quantity limits. Thus, canceled editions of NFPA 430 (2004) and NFPA 432 (2002) are still referenced here. The year of issue is also used when citing earlier editions of NFPA 45. To be consistent with other chapters in this volume, current NFPA codes being cited in this chapter appear without the year of issue. In spite of the **Code of Record** (*see definition*), from a chemical safety standpoint, it is prudent to apply the more stringent requirements from current codes to the older facilities, to the maximum extent practical, on issues such as hazard identification signage, segregation distances between incompatible chemicals, or separation distances for protection from exposure hazards.]*

This chapter is intended to list chemical-related safety and health requirements and to consolidate those that are overlapping or duplicative. The list of requirements includes pointers to the sources of those requirements.

This document does not create any new or additional requirements.

5.2 Applicability

This chapter applies to all locations that store chemicals or chemical products. [*NOTE: Throughout this document, the term "chemicals" is used to indicate chemicals or chemical products as described in Glossary Section.]*

This document does not apply to:

- Chemicals stored in tanks with a greater than 735-pound water capacity;
- Drums that have a greater than 55-gallon capacity;
- Chemical distribution ***systems*** (see definition);
- Storage containers attached to a system;
- Waste chemical storage; or
- The building or design of chemical storage areas [a design engineer who is acquainted with those requirements should be consulted before a chemical storage facility is built or before an existing facility is converted to chemical storage].

Special laboratory requirements presented in this document apply to laboratories that are constructed and operated in accordance with NFPA 45, *Standard on Fire Protection for Laboratories Using Chemicals*.

This chapter consolidates existing core safety and health requirements that all sites must follow when engaged in chemical-related activities. The requirements included in this chapter come from sources that have different safety purposes. As a result, some of these requirements may not always be applicable to the work being performed at an individual site or facility. Users are responsible for determining how specific requirements apply to their work and how they are implemented. The reference sources for the requirements included in this chapter can be used to determine the applicability of those requirements to the work being performed.

5.3 Definitions and Acronyms

See **Glossary.**

5.4 Requirements for Chemical Storage

Sources[12]	Consolidated Requirements[10, 11]
10 CFR 851; 29 CFR 1910.6; DOE O 420.1C	*[NOTE: The information that follows is a consolidation of existing Federal safety and health requirements and National Standards that relate to the storage of chemicals. It therefore contains "shall" statements that are taken from, or based on "shall" statements in those existing requirements. While NFPA and CGA requirements that are referenced here are not, in and of themselves mandatory, some are made mandatory by OSHA regulation 29 CFR Section 1910.6, which incorporates them by reference. 10 CFR Part 851 mandates compliance with OSHA standards found in 29 CFR Part1910 with certain exceptions, and 1926. NFPA and CGA requirements referenced here may be made mandatory for DOE contractors by operation of law, pursuant to 10 CFR Part 851. Please see the Introduction to this section of the DOE Chemical Management Handbook for more information.]*
	4.1 General
NFPA 45-2000, 7.2.3.3; NFPA 45-2004, 9.2.3.2; NFPA 45, 8.2.1.1; NFPA 1, 20.15.4	**4.1.1** Facilities shall be evaluated to determine chemical storage limits, allowable chemical container storage sizes, and stacking limits. Quantities of chemicals stored shall remain within those limits.[16] (Fire Code NFPA 1, 20.15.4; NFPA 400, NFPA 45 editions)
NFPA 430-2004, 4.1.1; NFPA 430-2004, 4.10.1; NFPA 432-2002, 4.7.1; NFPA 400, 14.2.10.4	**4.1.2** The identification or design of ***chemical storage areas*** (see definition), or maintenance work on chemical storage areas shall be reviewed.[17]
NFPA 430-2004, 4.6.2	**4.1.2.1** ***Approval*** (see definition) of chemical storage areas shall take into consideration the potential for large quantities of smoke and toxic fumes, especially as storage affects manual firefighting operations, building egress, and evacuation of adjacent facilities.
NFPA 432-2002, 4.7.2; NFPA 400, 14.2.10.5	**4.1.2.2** Cutting and welding operations in areas where organic peroxides are stored shall not be performed until all organic peroxide formulations have been removed.

[16] Facility chemical quantity limits stem primarily from the local fire and building codes. NFPA 45 may modify these for laboratories, by local ordinances, or by other codes that are specific to one particular class of chemicals such as NFPA 30, *Flammable and Combustible Liquids*, or NFPA 400, *Hazardous Materials Code* that applies to various chemical classes including corrosives, pyrophorics, water-reactives, unstable reactives, etc.

[17] There are restrictions and requirements for welding and cutting activities at locations where chemicals are used and stored. Consult your local welding and cutting program to determine what these requirements are.

Sources[12]	Consolidated Requirements[10, 11]
ANSI Z 49.1, 10.8.2.1; CGA G-1, 5.2; CGA P-1, 8.1; NFPA 30-2003, 6.7.4; NFPA 51-2002, 4.2; NFPA 51, 4.2.1; NFPA 55, 7.1.8.1, 7.1.8.2; NFPA 400, 9.1; 29 CFR 1910.253(b)(2) (ii); 29 CFR 1926.350(a)(11)	**4.1.3** Chemical storage areas shall be secured using physical or administrative controls to prevent unauthorized entry. [18]
CGA P-1, 6.2.3; NFPA 55-1998, 4.1.1; NFPA 55, 4.9.1(2), 4.10.3, 7.6.3.2; NFPA 400, 6.1.5.1(2), 6.1.8.3(1); NFPA 430-2004, 4.9.2; NFPA 432-2002, 4.6; 29 CFR 1910.103(b)	**4.1.4** "No smoking" signs shall be posted at all entrances to areas where hazardous materials such as toxic and highly toxic chemicals, pyrophorics, ammonium nitrate, oxidizers, organic peroxides, compressed gases, or cryogenic fluids are stored.
CGA P-1, 5.8.1; NFPA 55, 4.8.1(1), 6.12.2.2; NFPA 400, 6.1.5.1(1), 6.1.8.3(2)	**4.1.4.1** "No smoking within 25 feet" signs shall be posted at perimeters of outdoor areas where hazardous materials such as corrosives, water-reactives, unstable reactives, flammable solids, oxidizers, organic peroxides, or compressed gases are stored.
NFPA 30-2003, 6.10; NFPA 30, 6.5; NFPA 430, 4.9.1; NFPA 400, 6.1.5; 29 CFR 1910.106(d)(7)(iii)	**4.1.5** Ignition sources such as open flames, smoking, spark producing equipment, static electricity, and other hot sources shall not be permitted in areas where chemicals are stored unless reviewed and approved.[19]
NFPA 55, 7.1.7.1, 8.4.1.1; NFPA 430, 4.2.4; NFPA 400, 6.1.8.2.2; DOE O 456.1A, Attachment 1; 29 CFR 1910.1200(f)	**4.1.6** All chemical containers shall be properly labeled or marked. *[NOTE: DOE O 456.1A Attachment 1 requires that storage and transfer containers containing* ***Unbound Engineered Nanoparticles (UNP)*** (see definition) *be clearly identified as to the contents by using terms such as "nanoscale particles" or "nanoparticles" on thelabel.]*

[18] It is recommended that a graded approach be used in meeting this requirement.

[19] Restrictions and requirements for welding and cutting activities at locations where chemicals are used and stored are based on specific conditions. Consult your local facility welding and cutting program to determine what requirements are applicable to specific activities and conditions at your site.

Sources[12]	Consolidated Requirements[10, 11]
CGA P-1, 5.8; NFPA 45-2000, 7.2.3.4; NFPA 45, 8.2.4.2; NFPA 55, 7.1.10.2; NFPA 55, 8.7; NFPA 400, 6.1.12, 14.3.2.9, 15.2.11.13.1; NFPA 430, 4.4.3.4; NFPA 430, 4.4.3; NFPA 430, 4.4.4; NFPA 432, 4.11.3.1	**4.1.7** Chemicals shall be stored compatibly and in a way to prevent contact with incompatible materials. This includes preventing liquids from flowing out of a chemical storage area into another area where they may be exposed to incompatible materials. *[EXCEPTION: NFPA 430-2004, 4.4.3.1 and NFPA 400, 15.2.11.9 exempt packaging materials, pallets, and other dunnage from this requirement. However, hydrogen peroxide (Classes II to IV) cannot be stored on wooden pallets per NFPA 430-2004, 4.4.3.2 and NFPA 400, 15.2.11.2.]* [20]
NFPA 432-2002, 4.3; NFPA 400, 6.1.13.2.1.1, 6.2.1.9.2.3, 6.2.1.10	**4.1.7.1** All construction materials in a chemical storage area shall be compatible with those chemicals being stored. Floors shall be of liquid-tight, noncombustible construction in areas where ammonium nitrate, oxidizers, organic peroxides, pyrophoric substances, unstable reactive chemicals, water-reactive solids and liquids, corrosive materials, and toxic and highly toxic materials are stored.
NFPA 430, 4.4.3.3; NFPA 400, 15.2.11.13.1	**4.1.7.2** When flammable and combustible liquids are stored in ***segregated warehouses*** (see definition) with oxidizers, they shall be separated from those oxidizers by a minimum distance of 25 feet, with dikes, drains, or sloping floors present to prevent the flammable liquids from encroaching on the separation.
NFPA 45-2000, 7.2.3.5; NFPA 45-2000, 10.3.2; NFPA 45, 8.2.4.4, 8.2.4.4.1, 8.2.4.4.2	**4.1.8** Time-sensitive chemicals that might become hazardous upon prolonged storage shall be dated when first opened and properly managed. This includes periodic inspections at defined intervals (typically 3 to 6 months for opened containers) to evaluate for safety, and for retention until the next inspection date or disposal.
NFPA 45-2000, 7.2.3.5; NFPA 45, 8.2.4.4.3	**4.1.8.1** Chemicals that are found to be unsafe and cannot be made safe shall be disposed of safely and in compliance with applicable requirements.

[20] This requirement is intended to keep chemicals safe during routine storage and during an upset condition such as a fire. Therefore, chemicals that are only incompatible at elevated temperatures are still considered incompatible during routine storage conditions due to the possibility of fire or other upset condition. This document does not intend to direct which compatibility scheme should be used. Each site or facility must determine for itself which compatibility scheme they will use to implement this requirement.

Sources[12]	Consolidated Requirements[10, 11]
CGA G-1, 5.2; CGA P-1, 6.2.1, 5.8.2; NFPA 45-2000, 7.2.3.6; NFPA 45, 8.2.4.5; NFPA 51-2002, 4.2.2; NFPA 55-1998, 2.2.3; NFPA 55, 6.16, 6.16.3.2, 6.16.6, 6.16.7, 8.13.1.4; NFPA 400, 6.2.1.5, 6.2.1.5.3; 29 CFR 1910.106(d)(4)(iv)	**4.1.9** Indoor chemical storage areas shall have either natural or mechanical ventilation designed to provide a minimum rate of either six air exchanges per hour or 1 ***scf*** (see definition) per minute per square foot of floor area and shall discharge the air at least 50 feet. from any air intakes for air handling systems, air compressors, etc. *[EXCEPTION 1: Under NFPA 30-2003, 6.3.4; NFPA 30, 9.5.4; NFPA 45-2000, 7-2.3.6; and NFPA 45, 8.2.4.5, this requirement does not apply to flammable liquid storage cabinets.]* *[EXCEPTION 2: Per NFPA 400, 6.2.1.5.1, the ventilation requirement for hazardous materials does not apply to control areas of solids and liquids stored in closed containers, where no dispensing is done.]*
NFPA 55-1998, 3.-1.3(b); NFPA 55, 6.16.3.3, 6.16.3.3.1; 29 CFR 1910.106(d)(4)(iv)	**4.1.9.1** A manual shutoff shall be provided outside the compressed gas and cryogenic fluid storage areas and flammable/combustible liquids storage areas adjacent to the entry door and shall be labeled "Warning: Ventilation System Emergency Shutoff."
NFPA 55-1998, 3-1.3(c); NFPA 55, 6.16.5; NFPA 400, 6.2.1.5.12.4	**4.1.9.2** Exhaust ventilation shall not be recirculated within any room or building, where there is a potential for release of hazardous gases or vapors.
NFPA 430, 4.13; NFPA 432, 4.9; NFPA 400, 14.2.10.7, 14.2.10.8, 14.3.2.8.1, 15.2.11.4, 15.2.1.2	**4.1.10** Good housekeeping shall be maintained in areas where chemicals are stored.
NFPA 30-2003, 6.4.3.1, 6.5.1.2; NFPA 30, 6.9.5, 9.3.3.1; 29 CFR 1910.106(d)(5)(i)	**4.1.10.1** Aisles established for the movement or egress of personnel shall be maintained clear of obstructions, including stored chemicals.
NFPA 30-2003, 6.7.4; NFPA 30, 15.3.7; NFPA 430, 4.13.1; NFPA 432, 4. 9.1; NFPA 400, 14.2.10.7, 15.2.11.4	**4.1.10.2** Accumulation of wastes, debris, weeds, and other combustible materials shall be prohibited.
NFPA 430, 4.13.2; NFPA 432, 4.9.2; NFPA 400, 14.2.10.8, 15.2.1.2	**4.1.10.3** Spilled chemicals and broken containers shall be immediately managed using appropriate procedures.
NFPA 430, 4.13.3; NFPA 400, 6.1.7, 15.2.11.5	**4.1.10.4** Each used and empty container shall be stored in a manner appropriate for the chemical that existed in that container until it is disposed of or cleaned; or stored in a detached or ***sprinklered area*** (see definition) until disposed of or cleaned.

Sources[12]	Consolidated Requirements[10, 11]
NFPA 430, 4.13.4; NFPA 400, 15.2.11.6	**4.1.10.5** Storage operations shall be arranged to prevent the accumulation of fugitive dust from the stored chemical.
NFPA 432, 4.9.3; NFPA 400, 14.2.10.9, 14.5.14.3	**4.1.10.6** Specific disposal procedures shall be developed for all areas where organic peroxides are stored.
NFPA 45-2000, 7.2.3.1; NFPA 45-2004, 9.3.1, 9.4.1, 9.5.1; NFPA 45, 8.2.3.6	**4.1.11** Hazardous chemicals stored in the open in laboratory work areas shall be kept to the minimum necessary for the work being done.
NFPA 45-2004, 9.2.3.1; NFPA 45, 8.2.2.3	**4.1.12** Hazardous liquid chemicals in a laboratory work area shall be stored and handled such that a potential spill is less than 5 gallons.
NFPA 45-2000, 8.1.6.3; NFPA 45, 10.1.6.3	**4.2 Compressed Gases and Cryogenic Fluids** *[NOTE: In a laboratory, a compressed gas cylinder shall be considered "in use" if it is: (a) connected through a regulator to deliver gas to a laboratory operation; or (b)connected to a manifold being used to deliver gas to a laboratory operation; or (c) a single cylinder secured alongside the cylinder in (a) above as the reserve cylinder]*
CGA P-1, 5.8.1; NFPA 55-1998, 4-1.1; NFPA 55, 6.12.1, 8.4.1.3	**4.2.1** Hazard identification signs shall be placed at all entrances to areas where compressed gases or cryogenic fluids are stored.
NFPA 55, 6.12.1.1, 8.4.1.3; NFPA 704	**4.2.1.1** Hazard ratings shall be assigned in accordance with NFPA 704.
NFPA 55-1998, 4-1.2(a); NFPA 55, 4.10.1.3, 6.12.2.1	**4.2.1.2** Signs shall not be obscured or removed, except for replacement.
CGA G-1, 5.2; CGA P-1, 6.2.1, 5.8.1; NFPA 55, 6.12.2.26; NFPA 55, 4.9.1; NFPA 55, 7.6.3.2;	**4.2.1.3** Signs shall prohibit smoking or an open flame within 25 feet of area perimeters where toxic, highly toxic, corrosive, unstable reactive, pyrophoric, oxidizing, or flammable gases are stored.
ANSI Z49.1, 10.8.2.1; CGA G-1, 5.2; CGA P-1, 5.8.2; CGA P-1, 5.8.3; NFPA 51, 4.2.1; NFPA 55, 7.1.10.4; NFPA 55, 7.1.10.6; NFPA 55, 7.1.10.9; NFPA 55, 4.11.1.1; 29 CFR 1910.253(b)(2)(ii); 29 CFR 1926.350(a)(11)	**4.2.2** Compressed-gas cylinders shall be stored away from stairways, elevators, exit routes, or gangways, in assigned places where they will not be exposed to physical damage (e.g., damage from vehicles, or damage from falling objects).

Sources[12]	Consolidated Requirements[10, 11]
ANSI Z49.1, 10.8.2.1, 8.6.6; CGA G-1, 5.2; CGA P-1, 5.8.4; NFPA 55-1998, 2-2.1.6, 6-6; NFPA 55, 7.1.8.4; NFPA 55, 7.2.1.2; 29 CFR 1910.253(b)(2)(iv); 29 CFR 1910.253(b)(3)(ii); 29 CFR 1910.253(b)(5)(iii)(A)	**4.2.3** Compressed gas cylinders shall be stored in an ***upright position*** (see definition) with their valve protection caps in place and secured to prevent cylinders from falling over or being knocked over. *[EXCEPTION: All requirements cited here indicate that upright storage is not required for lecture bottles, cylinders used in self-contained breathing apparatus (SCBA), liquefied gas cylinders with a water capacity of 1.3 gallon or less, and those designed for use in a horizontal position.]*
NFPA 55-1998, 2-1.6.1; NFPA 55, 6.6.1, 6.6.2, 6.6.3	**4.2.4** Overhead cover for outdoor storage areas of compressed gases shall be of non-combustible construction, open on three sides, and shall not be considered indoor storage.
NFPA 55-1998, 2-1.6.1(a); NFPA 55, 7.1.10.3	**4.2.4.1** Storage areas of compressed gases shall be kept clear of dry vegetation and combustible materials for a minimum distance of 15 feet (or 10 feet for control areas) in all directions.
CGA P-1, 5.8.3; CGA G-1, 5.2; NFPA 55-1998, 2-1.6.1(b); NFPA 55, 7.1.15.1	**4.2.4.2** Cylinders stored outdoors shall not be placed in direct contact with the earth or on surfaces where water can accumulate.
NFPA 55, 8.7.3	**4.2.4.3** Outdoor storage areas of portable cryogenic fluid containers shall be kept free of dry grass, leaves, debris, and common combustible materials for a minimum distance of 15 feet in all directions.
NFPA 55, 8.7.3, Table 8.7.3	**4.2.4.4** Portable cryogenic fluid containers in storage areas shall be segregated from incompatible hazardous materials by at least 20 feet.
ANSI Z49.1, 10.8.1.8; CGA G-1, 5.2; CGA P-1, 5.8; NFPA 51, 4.2; NFPA 55-1998, 2-1.6.2, 6-10; NFPA 55, 7.1.10.5.1, 7.1.10.7	**4.2.5** Compressed-gas cylinders in storage shall not be heated above 125°F.[21]

[21] This requirement includes the storage of compressed gas cylinders in direct sunlight where the sunlight may cause the cylinder to overheat.

Sources[12]	Consolidated Requirements[10, 11]
ANSI Z49.1, 10.8.2.2; ANSI Z49.1, 10.8.2.3; CGA G-1, 5.2; CGA P-1, 6.4.3; NFPA 51-2002, 4.2.1, 4.3.1, 4.4.3; NFPA 51, 1.1.5(1), 4.2.1, 4.3.1, 4.3.3, 4.4.3; NFPA 55-1998, 2-1.6.3; NFPA 55, 7.1.10.2, 7.1.10.2.2; 29 CFR 1926.350(a)(10); 29 CFR 1926.350(a)(11); 29 CFR 1910.253(b)(2)(ii); 29 CFR 1910.253(b)(4)(iii)	**4.2.6** Compressed gases in storage shall be segregated from incompatible materials or combustibles in storage by either a distance of 20 feet or by a noncombustible partition with a fire-resistance rating of one-half hour and extending not less than 18 inches above and to the sides of the stored material. The noncombustible barrier shall be 5 feet high for those cylinders that are less than 3½ feet tall. *[EXCEPTION 1: Under ANSI Z49.1 and NFPA 55, welding gases located on a weld cart are considered to be "in use" and not in storage. This is also consistent with the NFPA 45 definition of "in use." Under these cited standards, then, this requirement does not apply to oxygen and fuel gases on a weld cart. Similarly, since oxygen and fuel gases on a weld cart are considered to be "in use" under these standards, they also are not required to be segregated from each other. However, NFPA 51 (2012) provides an alternative interpretation, as noted in the exception below.]* *[EXCEPTION 2: According to NFPA 51 (2012), Sec. 1.1.5(1), above segregation requirement does not apply to a welding cart with a single oxygen cylinder and a single fuel gas cylinder, each containing 120 scf or less. For a pair of larger sized cylinders on a welding cart, segregation is not required if the conditions of NFPA 51 (2012), Sec. 4.3.3 are met.]* *[NOTE: The intent of these requirements is to discourage the manufacture of unsafe weld carts and to prevent the practice of removing welding gases from carts at the end of every work shift or day, since this additional handling of the gases is considered to be inherently more hazardous than is their temporary storage on weld carts. However, keeping oxygen and fuel gases on a weld cart for excessively long periods without any actual use would counter the intent of these requirements. If there is any conflict between a national standard and a regulatory requirement, the regulation is controlling. [prevails]]*
NFPA 55-1998, 2-2.1.5; NFPA 51-2002, 4.2.1; NFPA 51, 4.2.1; 29 CFR 1910.253(b)(2)(ii); 29 CFR 1926.350(a)(11)	**4.2.6.1** Flammable gas cylinders shall be stored a minimum distance of 20 feet from storage of flammable and combustible liquids and solids.

Sources[12]	Consolidated Requirements[10, 11]
29 CFR 1910.253(b)(3)(i)	**4.2.7** The inside storage of more than 2,000 standard cubic feet (scf) of flammable gas, or more than 300 pounds of liquefied petroleum gas requires a separate room, compartment, or special storage building, or the cylinders shall be kept outside.
NFPA 51, 4.3.4	**4.2.7.1** Subject to approval by the AHJ, designated storage areas separated by at least 100 feet may be used instead of control areas for the storage of fuel (flammable) gases.
NFPA 55-1998, Chapter 2	**4.2.8** Indoor storage in one fire area of multiple groups of cylinders containing flammable gas shall be performed according to specifications in NFPA 55-1998, Chapter 2.
NFPA 55-1998, 2-2.1.7; NFPA 51-2002, 4.3.1	**4.2.8.1** Groups each with a collective volume of 2500 scf or less, in one fire area may be separated from each other by masonry walls with a fire resistance rating of 2 hours instead of by a minimum distance of 100 feet.
NFPA 55-1998, 2.2.1.8	**4.2.8.2** Different flammable gases shall be allowed to be stored together in a group.
NFPA 51-2002, 4.3.2, 4.3.5; NFPA 55-1998, 2-2.2, 2-2.2.2	**4.2.9** Flammable gases with a collective volume between 2,501 and 5,000 scf, when stored indoors, shall be stored in rooms or enclosures with a minimum 1-hour fire resistance rating.
NFPA 55-1998, 2-2.2.2	**4.2.9.1** Multiple groups of flammable gas cylinders in one sprinklered fire area shall be stored a minimum of 100 feet apart.
NFPA 55-1998, 2-2.3, 2-2.3.1	**4.2.10** Flammable gases with a collective volume greater than 5,000 scf, when stored indoors, shall be stored in a room or enclosure with a minimum fire resistance of 2 hours.
NFPA 51-2002, 4.3.4; NFPA 55-1998, 2-2.3.2; NFPA 55, 6.10	**4.2.10.1** Rooms used to store compressed gases shall be sprinklered according to NFPA 13. *[EXCEPTION: According to NFPA 55 (2015), Sec. 6.10.1, an automatic fire sprinkler system is not required for rooms or areas built with noncombustible materials and having noncombustible contents.]*
NFPA 55-1998, 3-1.1; NFPA 55, 7.9.3.2.1; NFPA 55, 7.9.6.5; NFPA 55, 7.9.6.6	**4.2.11** Indoor compressed-gas storage areas that are used to store toxic or highly toxic gases indoors shall be equipped with a continuous monitoring system that would provide warning of toxic gas concentrations that could present a hazard to life.
NFPA 55, 7.9.2.2; NFPA 55-1998, 3-1.4	**4.2.12** Outdoor storage areas for toxic and highly toxic gases shall be located at least 75 feet from a line of property, public ways, or places of assembly.
NFPA 55, 7.9; NFPA 55-1998, Chapter 3	**4.2.13** Other requirements for the storage of toxic and highly toxic gases can be found in NFPA 55, Sec. 7.9.

Sources[12]	Consolidated Requirements[10, 11]
29 CFR 1910.134; 29 CFR 1910.134(d)(2); 29 CFR 1910.134(h); CGAP-1, 5.11.14	**4.2.14** Where toxic gases are stored, a minimum of two National Institute for Occupational Safety and Health (NIOSH)-approved SCBAs shall be kept available at all times for use in upset conditions that may create an IDLH atmosphere. They shall be cleaned and disinfected after each use, properly maintained and stored, inspected at least monthly, and checked for proper function before and after each use.
CGA P-1, 6.3; CGA P-1, 6.5.1	**4.2.14.1** NIOSH-approved SCBAs shall also be provided where protection is deemed necessary for entry into atmospheres containing asphyxiant or corrosive gases.[22]
CGA P-1, 6.5.1	**4.2.14.2** One of the two SCBAs present shall be in the possession of a qualified backup person present at the scene when the SCBAs are being used.
	4.3 Flammable and Combustible Liquids
NFPA 30-2003, 6.4.3.3; NFPA 30-2003, 6.4.3.4; NFPA 30-2003, 6.8, 6.8.1.5; NFPA 30, 12.3.4, 12.3.5, 12.3.6, 12.3.7; 29 CFR 1910.106(d)(4)(v)	**4.3.1** Aisles in areas that qualify as "unprotected" indoor liquid storage areas as per NFPA 30, *Flammable and Combustible Liquids Code*, shall be at least 4 feet wide. Aisles in protected liquid storage areas shall be 6 feet wide, as a minimum. Main aisles shall be at least 8 feet wide. *[NOTE: Per NFPA 30 (2014), Sec. 12.3.4, storage in liquid storage rooms and in (liquid or general purpose type) warehouses installed after January 1, 1997 and protected in accordance with NFPA 30-2014, Chapter 16 (Automatic Fire Protection for Inside Liquid Storage Areas) is regarded as "protected"; all other storage is unprotected. Requirements in this chapter for protected storage using automatic fire protection systems do not apply to Class IA flammable liquids or to unstable flammable or combustible liquids.]*
29 CFR 1910.106(d)(5)(vi)(f)	**4.3.1.1** Aisles at least 3 feet wide shall be provided where necessary to allow for access to doors, windows, or standpipe connections.
NFPA 30-2003, 6.4.3.5; NFPA 30-2003, 6.5.2.6; NFPA 30, 9.3.6, 9.3.7, 9.7.3	**4.3.2** ***Class I flammable liquids*** (see definition) shall not be stored in basement areas or in below grade control areas. ***Class II and Class IIIA combustible liquids*** (see definition) shall not be stored in basement areas unless those areas are protected with automatic sprinkler systems.
NFPA 30-2003, 6.4.3.1; NFPA 30, 9.3.3.1	**4.3.3** Class I flammable liquids and combustible liquids shall not be stored such that a fire in the liquid storage area would prevent egress from the area.

[22] Any other respirator used must go through a NIOSH approval process for equivalency. This process must be described in the facility's written respiratory protection program.

Sources[12]	Consolidated Requirements[10, 11]
NFPA 30-2003, 6.5.2.9(1); NFPA 30, 12.8.5(1)	**4.3.4** In ***general-purpose warehouses*** (see definition), flammable and combustible liquids shall not be stored in the same pile or on the same rack as ordinary combustibles.
NFPA 30-2003, 6.5.2.9(2); NFPA 30, 12.8.5(2)	**4.3.4.1** Ordinary combustibles, other than those used for packaging flammable liquids, shall be stored a minimum of 8 feet from flammable or combustible liquids.
NFPA 30-2003, 6.4.3.7; NFPA 30, 12.3.10, 12.3.11	**4.3.5** Storage of empty or idle combustible pallets inside an unprotected flammable liquid storage area shall not exceed 2,500 ft.^{2} pile size and 6 ft. in height. Also, pallet storage shall be separated from liquid storage by at least 8 ft. side aisles.
NFPA 30-2003, 6.4.3.8; NFPA 30, 9.3.9; 29 CFR 1910.106(d)(5)(vi)(c)	**4.3.6** Containers in piles shall be stacked in such a manner as to provide stability and to prevent excess stress on container walls.
NFPA 30-2003, 6.4.3.8; NFPA 30, 9.3.9.1; 29 CFR 1910.106(d)(5)(vi)(d)	**4.3.6.1** Portable tanks stored over one tier high shall be stacked securely without dunnage.
NFPA 30-2003, 6.4.3.8; NFPA 30, 9.3.9.2	**4.3.6.2** Material handling equipment shall be suitable to handle containers and tanks safely at all tier levels.
NFPA 30-2003, 6.4.4.2; NFPA 30, 12.6.1.2; 29 CFR 1910.106(d)(4)(v)	**4.3.7** Containers having more than 30 gallons of Class I or Class II liquids shall not be stacked over one level high in ***inside rooms*** (see definition) or liquid storage rooms.
NFPA 30-2003, 6.4.3.9; NFPA 30, 9.3.10; 29 CFR 1910.106(d)(5)(vi)(e)	**4.3.8** No stack of flammable or combustible liquid containers shall be closer than 3 feet to the nearest beam, chord, or other construction, and shall be 3 feet below sprinkler deflectors, discharge orifices of water spray, or other overhead fire protection systems.
NFPA 30-2003, 6.9; NFPA 30, 9.10.2; 29 CFR 1910.106(d)(7)(i)	**4.3.9** Suitable fire control devices shall be available at locations where flammable and combustible liquids are stored.
29 CFR 1910.106(d)(7)(i)(a); 29 CFR1910.106(d)(7)(i)(b); NFPA 30-2003, 6.9.1; NFPA 30, 9.10.2.2	**4.3.10** At least one portable fire extinguisher having a rating of not less than 12-B units shall be located outside but not more than 10 feet, from any door to a flammable and combustible liquids storage room or within 25 feet from any area where Class I or Class II liquids are stored.

Sources[12]	Consolidated Requirements[10, 11]
NFPA 30-2003, 6.10.1; NFPA 30, 9.17.4; 29 CFR 1910.106(d)(7)(iv)	**4.3.11** ***Water-reactive materials*** (see definition) shall not be stored in the same area with flammable or combustible liquids.[23]
NFPA 30-2003, 6.5.2.4; NFPA 30, 12.8.4	**4.3.12** Class I and Class II liquids in plastic containers shall only be stored in ***flammable liquids storage rooms*** (see definition) or flammable liquid storage warehouses or flammable liquid storage cabinets.
NFPA 30-2003, 6.5.1.3; NFPA 30, 9.3.11	**4.3.13** Liquids used for building maintenance, painting, or other similar infrequent maintenance purposes shall be permitted to be stored temporarily in closed containers outside of flammable liquids storage cabinets or flammable liquids storage areas, if the amount stored does not exceed a 10-day supply at anticipated use rates.
NFPA 45-2000, 2.2.1 Table 2.2.1 (a); NFPA 45, 9.1.1, Table 9.1.1(b); 29 CFR 1910.106(e)(2)(ii)(b)(1)(2)	**4.3.14** The quantity of flammable and combustible liquids that can be stored outside a flammable liquids storage room or flammable liquids storage cabinet is as follows[24]: • 25 gallons of Class IA liquids in containers per ***fire area*** (see definition), and • 120 gallons of Class IB, IC, II, or IIIA liquids in containers per fire area. OR • 150 gallons of Class I liquids in sprinklered ***laboratory units*** (see definition), and • 200 gallons of Class I, II, and IIIA liquids in sprinklered laboratory units. *[NOTE 1: The second set of bullets above refers to Class C sprinklered laboratory units only. See NFPA 45 for proper quantities for Class A, B, and D laboratory units.]* *[NOTE 2: Non-sprinklered laboratory units in laboratories approved for construction prior to July 2004 shall comply with the Maximum Quantities listed in NFPA 45-2004, Table 10.1.5]*
NFPA 45-2000, 2.2.1.4; NFPA 45, 8.2.4.3	**4.3.15** With the exception of Section 4.3.13 and 4.3.14, all Class I, II, and IIIA flammable and combustible liquids not in a flammable liquids storage room shall be stored in flammable liquid storage cabinets when not in use.

[23] This requirement is intended to protect water reactive chemicals from exposure to water in water based fire suppression systems that may be used where flammable liquids are stored. Spraying water on a water reactive material during an upset condition could increase the severity and danger of the upset condition. While not required, consideration should be given to applying a similar restriction in oxidizer storage areas. See section 4.4.2.

[24] Numerous types of storage areas (e.g., cutoff storage rooms, mercantile storage areas, inside storage rooms, etc.) can exist. Storage limits for laboratories have been defined in 4.3.14. There are many other types of storage areas and limits for each of these are not included in this document. A fire protection engineer should be consulted to determine storage limits for these other storage areas.

Sources[12]	Consolidated Requirements[10, 11]
NFPA 30-2003, 6.3.1; NFPA 30, 9.5.1	**4.3.15.1** The total quantity of liquids shall not exceed 120 gallons per cabinet.
NFPA 30-2003, 6.3.3; NFPA 30, 9.5.3	**4.3.15.2** Flammable liquid storage cabinets shall be FM-approved, UL-listed or built in accordance with NFPA 30.
NFPA 30-2003, 6.3.2	**4.3.15.3** Not more than three flammable liquid storage cabinets are allowed in any one fire area, except as follows: *[EXCEPTION 1: In an industrial occupancy, additional groups of storage cabinets can be located in any fire area if a minimum100-foot separation is maintained between each group.* *EXCEPTION 2: In an industrial occupancy that is protected by an automatic fire sprinkler system, the number of cabinets can be increased to six in a group.* *EXCEPTION 3: In a laboratory fire area, the number of flammable liquid storage cabinets is not limited; however, the total quantity of flammable and combustible liquids is limited to the quantities defined in 4.3.15.4.]*
NFPA 45-2000, 2.2.1.3, Table 2.2.1(a); NFPA 45-2004, Table 10.1.5; NFPA 45, Table 90.1.1(b)	**4.3.15.4** The maximum amount of Class I, II, and IIIA flammable and combustible liquids that can be stored in a sprinklered Class C (Low Fire hazard) laboratory fire area is 400 gallons of which the maximum amount of Class I flammable liquids is 300 gallons. For a non-sprinklered Class C fire area, the corresponding amounts are 200 and 150 gallons.
NFPA 30-2003, 6.6.4; NFPA 30, 14.5, 14.5.1, 14.5.2, 14.5.3	**4.3.16** Sites for ***outdoor storage lockers*** (see definition) shall be reviewed to ensure proper placement, separation, etc.
NFPA 30-2003, 6.6.4; NFPA 30, 14.5.2, 14.5.4	**4.3.16.1** Multiple outdoor storage lockers at a given site shall be separated according to requirements in NFPA 30.
NFPA 30-2003, 6.6.4.4.1; NFPA 30, 14.6.1, 14.6.2	**4.3.16.2** In outdoor storage lockers, containers in their original shipping packages shall be permitted to be stored either on pallets or in piles, while unpacked containers shall be stored on shelves or on the floor.
NFPA 30-2003, 6.6.4.4.2; NFPA 30, 14.6.5	**4.3.16.3** No other flammable or combustible materials including idle pallets, dry vegetation, packing materials, etc. shall be allowed within 5 feet of designated outdoor storage locker sites.

Sources[12]	Consolidated Requirements[10, 11]
NFPA 30-2003, 6.6.4.4.3; NFPA 30, 14.6.6; NFPA 704	**4.3.16.4** Outdoor storage lockers shall be placarded or have warning signs according to applicable regulations or NFPA 704.
NFPA 430-2004; NFPA 400, Chapter 15	**4.4 Oxidizers** *[NOTE: Additional warehousing requirements can be found in NFPA 430-2004,* Code for Storage of Solid and Liquid Oxidizers*, when quantities in a facility exceed 4,000 pounds of* ***Class 1 oxidizer*** *(*see definition*), 1,000 pounds of* ***Class 2 Oxidizer*** *(*see definition*), 200 pounds of* ***Class 3 Oxidizer*** *(*see definition*), or 10 pounds of* ***Class 4 Oxidizer*** *(*see definition*). For storage requirements in control areas, refer to Chapters 5 and 15 in NFPA 400. Oxidizer classes are defined in Chapter 3 of NFPA 430-2004 and NFPA 400.]*
NFPA 430-2004, 4.2.1	**4.4.1** Oxidizer storage areas shall be conspicuously identified with the words "Class (appropriate classification number) Oxidizers."
NFPA 430-2004, 4.2.3; NFPA 400, 15.2.11.12	**4.4.1.1** Areas used to store oxidizers of different classes shall be marked as containing the most severe hazard class present. *[NOTE: The NFPA 400 requirement applies to storage for mercantile occupancies only.]*
NFPA 430-2004, 4.11.6	**4.4.2** Water-based, manual firefighting equipment shall be used in oxidizer storage areas.[25]
NFPA 430-2004, 4.11.6.1; NFPA 400, 15.5.5.1.1	**4.4.2.1** The placement and use of carbon dioxide and dry chemical fire extinguishers containing ammonium compounds (Class ABC) shall be prohibited in oxidizer storage areas where oxidizers that can release chlorine or bromine are stored. *[NOTE: This restriction may be extended to oxidizers that can release fluorine or iodine.]*
NFPA 430-2004, 4.11.6.2; NFPA 400, 15.5.5.1.2	**4.4.2.2** Halon extinguishers shall not be used in oxidizer storage areas.
NFPA 430-2004, 4.11.6.3; NFPA 400, 15.5.5.1.3	**4.4.2.3** Halocarbon clean agent extinguishers shall not be used in oxidizer storage areas unless tested and approved.
NFPA 430-2004, 4.12.1; NFPA 400, 15.3.2.1.1	**4.4.3** Combustible construction materials that could come into contact with oxidizers shall be coated with a compatible material to prevent their impregnation with the oxidizers.

[25] Oxidizer storage areas and flammable liquids storage areas require water- based fire suppression systems. While there are no requirements to keep water reactive materials away from oxidizers, when storing oxidizers, consideration should be given to the additional hazard posed by the presence of water reactive materials when water suppression systems are activated.

Sources[12]	Consolidated Requirements[10, 11]
NFPA 430-2004, 4.13.5; NFPA 400, 15.2.11.11	**4.4.4** Absorptive packing materials, wooden pallets, etc., that are exposed to water containing oxidizers or that contain water soluble oxidizers, and are exposed to water shall be immediately relocated to a safe outside area and properly disposed of.
NFPA 430-2004, 4.4.6; NFPA 400, 15.2.8.2	**4.4.5** Oxidizers shall not be stored where they can be heated to within 25°F of their decomposition temperature or above 120°F, whichever is lower.[26]
NFPA 430-2004, 4.8.1; NFPA 400, 15.2.8.1	**4.4.5.1** Oxidizers will not be stored where they can come into contact with heating units, pipes, and ducts.
NFPA 430-2004, 4.4.3.5; NFPA 400, 15.2.11.1	**4.4.6** Solid oxidizers shall not be stored directly beneath liquids.
	4.5 Organic Peroxides
NFPA 432-2002, 4.1; NFPA 400, 14.2.10.1	**4.5.1** Chemical storage areas used for the storage of organic peroxides shall be conspicuously identified with the words "Organic Peroxides" and by the class.
NFPA 432-2002, 4.1.1; NFPA 400, 14.2.10.1.1	**4.5.1.1** Areas used to store organic peroxides of different classes per NFPA 432-2002 or NFPA 400 shall be marked to indicate the highest hazard class of the peroxides stored.
NFPA 432-2002, 4.1.2; NFPA 400, 14.2.10.2	**4.5.1.2** Containers of organic peroxide formulations shall be individually marked with chemical name and other pertinent information to allow proper classification.
NFPA 432-2002, 4.1.3; NFPA 400, 14.2.10.3	**4.5.1.3** Packages of organic peroxides that require temperature control shall be marked with the recommended storage range.
NFPA 432-2002, 4.11.2; NFPA 400, 14.3.2.8.2	**4.5**.2 A clear space of at least 2 feet shall be maintained between organic peroxide storage and uninsulated metal walls.
NFPA 432-2002, 4.11.3.1; NFPA 400, 14.3.2.9	**4.5.3** Incompatible materials and flammable liquids shall not be stored within 25 feet of organic peroxide formulations in chemical storage areas. *[NOTE: Organic peroxide formulations that are also classified as flammable liquids may be stored with other organic peroxide formulations.]*
NFPA 432-2002, 4.11.3.2; NFPA 400, 14.3.2.9.1	**4.5.3.1** If a 25-foot separation cannot be maintained, a 1-hour, liquid-tight fire barrier shall be permitted.
NFPA 432-2002, 4.11.4; NFPA 400, 14.3.2.9.2	**4.5.4** Only closed containers shall be permitted in an organic peroxide storage area.
NFPA 432-2002, 4.11.6; NFPA 400, 14.3.2.9.4	**4.5.5** Fifty-five-gallon drums of Class I, Class II and Class III organic peroxide formulations shall not be stacked.

[26] Attention should be used to ensure that oxidizers stored in direct sunlight are not heated above allowed temperatures by radiant heating.

Sources[12]	Consolidated Requirements[10, 11]
NFPA 432-2002, 4.4.1; NFPA 400, 14.2.10.10.1	**4.5.6** Storage temperatures in chemical storage areas (including refrigerators) shall be maintained within the recommended storage temperature range for the materials being stored.[27]
NFPA 432-2002, 4.4.2; NFPA 400, 14.2.10.10.2	**4.5.6.1** High and low-temperature switches, as applicable, shall be provided in addition to normal temperature controls. These switches shall actuate an alarm to ensure prompt response.
NFPA 432-2002, 4.4.3; NFPA 400, 14.2.10.10.3, 14.2.10.10.4	**4.5.6.2** Heating systems shall use low-pressure steam, hot water, or indirectly heated air; cooling systems shall not use direct expansion of a flammable gas.
NFPA 432-2002, 4.4.4; NFPA 400, 14.2.10.10.5	**4.5.6.3** Heating or cooling pipes and other heat-transfer devices shall not come into contact with organic peroxide containers to cause their overheating or overcooling.
NFPA 432-2002, 4.5.2; NFPA 400, 14.2.10.6	**4.5.7** Refrigerators used for storing Class I, II or III organic peroxide formulations shall be Class I, Group D, and Division I (i.e.), "explosion-proof", as defined in Article 500 of NFPA 70.
NFPA 432-2002, 4.5.3	**4.5.8** Unventilated, unrefrigerated storage cabinets used for the storage of organic peroxides shall be considered Class I, Division I as defined in Article 500 of NFPA 70.
NFPA 432-2002, 4.5.4; NFPA 400, 14.2.10.6.1	**4.5.9** Ventilated storage cabinets shall be considered Class I, Division II as defined in Article 500 of NFPA 70. Ventilation must be a minimum of 1 cubic foot/minute/square foot of floor area.

[27] Attention should be used to ensure that organic peroxides stored in direct sunlight are not heated above allowed temperatures by radiant heating.

Sources[12]	Consolidated Requirements[10, 11]
	4.6 Other Hazardous Chemical Categories
NFPA 400	For indoor/outdoor storage requirements of ammonium nitrate and specific chemical hazard categories not covered in Sections 4.2 through 4.5, consult the following chapters in NFPA 400.
NFPA 400, Chapter 11	**4.6.1** Ammonium nitrate - Chapter 11.
NFPA 400, Chapter 12	**4.6.2** Corrosive solids and liquids - Chapter 12.
NFPA 400, Chapter 13	**4.6.3** Flammable solids - Chapter 13.
NFPA 400, Chapter 17	**4.6.4** Pyrophoric solids and liquids - Chapter 17.
NFPA 400, Chapter 18	**4.6.5** Toxic and highly toxic solids and liquids - Chapter 18.
NFPA 400, Chapter 19	**4.6.6** Unstable reactive solids and liquids - Chapter 19.
NFPA 400, Chapter 20	**4.6.7** Water reactive solids and liquids - Chapter 20.
NFPA 400, 6.1.12.2	**4.6.8** Chemicals in an indoor/outdoor storage area shall be separated from any incompatible hazardous substances by at least 20 feet or by an appropriate noncombustible partition.
NFPA 400, 6.1.15	**4.6.9** When hazardous materials are stored outdoors, the surrounding area shall be kept clear of vegetation (such as dry grass, leaves and weeds), debris, and common combustible materials (e.g., paper, oily rags, etc.) for a minimum distance of 15 feet.

5.5 Source Documents

DOE O 456.1A (7-15-2016), *The Safe Handling of Unbound Engineered Nanoparticles*

ANSI Z49.1 (2012), *Safety in Welding, Cutting and Allied Processes*

CGA G-1 (2015), *Acetylene*

CGA P-1 (2015), *Safe Handling of Compressed Gases in Containers*

NFPA 1 (2014), *Fire Code, 2015 ed.*

NFPA 30 (2003), *Flammable and Combustible Liquids Code*

NFPA 30 (2014), *Flammable and Combustible Liquids Code, 2015 ed.*

NFPA 45 (2000), *Standard on Fire Protection for Laboratories Using Chemicals*

NFPA 45 (2004), *Standard on Fire Protection for Laboratories Using Chemicals*

NFPA 45 (2014), *Standard on Fire Protection for Laboratories Using Chemicals, 2015 ed.*

NFPA 51 (2002), *Standard for the Design and Installation of Oxygen-Fuel Gas Systems for Welding, Cutting, and Allied Processes*

NFPA 51 (2012), *Standard for the Design and Installation of Oxygen-Fuel Gas Systems for Welding, Cutting, and Allied Processes, 2013 ed.*

NFPA 55 (1998), *Standard for the Storage, Use, and Handling of Compressed and Liquefied Gases in Portable Cylinders and Tanks*

NFPA 55 (2015), *Compressed Gases and Cryogenic Fluids Code, 2016 ed.*

NFPA 400 (2015), *Hazardous Materials Code, 2016 ed.*

NFPA 430 (2004), *Code for the Storage of Liquid and Solid Oxidizers, 2004 ed.; Replaced by NFPA 400, Chapter 15*

NFPA 432 (2002), *Code for the Storage of Organic Peroxide Formulations, 2002 ed.; Replaced by NFPA 400, Chapter 14*

NFPA 704 (2016), *Standard System for the Identification of the Hazards of Materials for Emergency Response, 2017 ed.*

10 CFR 851, *Worker Safety and Health Program*

29 CFR 1910.6, *Incorporation by Reference*

29 CFR 1910.106, *Flammable Liquids*

29 CFR 1910.134, *Respiratory Protection*

29 CFR 1910.253, *Oxygen-Fuel Gas Welding and Cutting*

29 CFR 1910.1200, *Hazard Communication*

29 CFR 1926.350, *Gas Welding and Cutting*

29 CFR 1926, *Safety and Health Regulations for Construction*

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Chapter 6 - Hazard Control

6.1 Introduction

This chapter identifies and consolidates existing user safety and health requirements found in DOE and Federal chemical-related safety and health regulations and National Standards that address the control of hazards associated with activities involving ***chemicals*** (see definition) and ***chemical products*** (see definition). State and local codes and requirements are not included. This chapter specifically consolidates requirements found in NFPA codes and standards, ANSI Z49.1, CGA P-1, OSHA standards, and certain EPA regulations and DOE Orders, including technical standards that are made mandatory by their specific reference within a DOE Regulation, or Order.

This chapter is intended to list chemical-related safety and health requirements and to consolidate those that are overlapping and/or duplicative. The list of requirements includes pointers to the sources of those requirements.

This document does not create any new or additional requirements.

6.2 Applicability

The information presented here applies to all locations that use chemicals or chemical products. *[NOTE: Throughout this document, the term "chemicals" is used to indicate chemicals and/or chemical products as described in Glossary Section.]* This chapter is intended only to address chemical hazard control requirements applicable to chemical user activities. It consolidates existing core safety and health requirements that all sites must follow when engaged in chemical-related activities.

The requirements included in this chapter come from sources that have different safety purposes. As a result, some of these requirements may not always be applicable to the work being performed at an individual site or facility. Users are responsible for determining how specific requirements apply to their work and how they are implemented. The reference sources for the requirements included in this chapter can be used to determine the applicability of those requirements to the work being performed.

6.3 Definitions and Acronyms

See **Glossary.**

6.4 Requirements for Hazard Control

Sources[12]	Consolidated Requirements[10, 11]
10 CFR 851	**4.1 General** (Applicable to all operations/activities involving chemicals)
10 CFR 851.22; 48 CFR 970.5223-1(c)[28]	**4.1.1** A hazard prevention/abatement process shall be implemented to ensure that all identified hazards are managed through final abatement or control.
10 CFR 851.22(a)(1)	**4.1.1.1** Controls shall be incorporated into facility design and procedures.
10 CFR 851.22(a)(2)	**4.1.1.2** Abatement actions shall be prioritized based on risks to workers and promptly implemented for existing hazards identified in the workplace. Workers shall be protected immediately from imminent danger conditions.
10 CFR 851.22(b); 29 CFR 1910.120(g)(1); 29 CFR 1910.134(a); 29 CFR 1910.1450(e)(3)(i)	**4.1.1.3** Hazard controls shall be selected using the following hierarchy: (1) Elimination of the hazard through practices such as chemical substitution or process modification; (2) Engineering controls; (3) Work practices and administrative controls; and (4) Personal protective equipment.
10 CFR 851.20(b); 29 CFR 1910.1200(h)(1-3); 29 CFR 1910.132(d)	**4.1.1.4** Workers shall be informed of and involved in identifying and controlling workplace hazards, including decisions on selection of Personal Protective Equipment (PPE).
10 CFR 851.20(a)(2); 10 CFR 851.21(a); 10 CFR 851.24(a); 10 CFR 851, Appendix A.6.; 29 CFR 1910.1450(c) and (e)	**4.1.2** An industrial hygiene program shall be implemented by professionally- and technically-qualified industrial hygienists to reduce the risk of work-related disease or illness in all chemical operations including laboratories. The program shall specify appropriate process modification (including chemical substitution), engineering, administrative, work practice, and/or personal protective control methods to limit exposures to hazardous materials to acceptable levels.

[28] This requirement of the DOE Acquisition Regulations (DEAR, ES&H Clause) requires development and implementation of controls as part of an overall documented safety management system.

Sources[12]	Consolidated Requirements[10, 11]
	4.2 Hazardous Operations[29] (see definition)
DOE O 420.1C; DOE-STD-1120-2016; DOE-STD-1189-2016; DOE-STD-3009-2002; DOE-STD-3009-14; DOE-STD-3011-2002; DOE-STD-3016-2016; 10 CFR 830.204(b)(4); 10 CFR 850.25(c); 29 CFR 1910.119(e)(3)(iii); 29 CFR 1910.120(c)(1); 29 CFR 1910.120(d) and (g)(1); 29 CFR 1910.252(a); 40 CFR 68.67(c)(3); 40 CFR 1502.14; 40 CFR 1502.16	**4.2.1** An appropriate combination of chemical substitution, engineering and administrative controls (including the appropriate application of detection methodologies), safe work practices, and PPE shall be implemented to prevent or mitigate adverse impacts from hazardous chemicals on workers, the public, or environment.
10 CFR 851.10(b), 11(a)(3); 29 CFR 1910.119(f); 40 CFR 68.69(b)	**4.2.1.1** Written operating procedures shall be developed that include (1) Precautions necessary to prevent worker exposure to chemical hazards, (e.g., chemical substitution/process change), engineering controls, administrative controls and PPE; (2) Control measures to be taken if physical contact or airborne exposure to chemical hazards can occur; (3) Fire safety procedures that govern the use and storage of combustible, flammable and other hazardous materials; (4) Measures for controlling hazardous chemical inventory; and (5) Any required safety systems and their functions.
29 CFR 1910.119(j); 40 CFR 68.73	**4.2.1.2** Process safety equipment and engineering controls shall have (1) Written procedures on maintaining their integrity; (2) Training of personnel involved in process maintenance activities; (3) Documented inspection and testing that meets manufacturer's recommendations and good engineering practices;(4) Prompt correction of deficiencies that are outside of acceptable operating limits.
29 CFR 1910.119(f)(4); 29 CFR 1910.120(d) and (g)(1); 40 CFR 68.69(d)	**4.2.1.3** Safe work practices shall be implemented such as lockout/tagout; permitted confined space entry; removal of non-essential personnel from hazardous material areas; and site and building access control.

[29] The requirements for hazardous operations are in addition to requirements associated with those activities specified in Section 4.1.

Sources[12]	Consolidated Requirements[10, 11]
29 CFR 1910.119(k); 40 CFR 68.85	**4.2.1.4** Hot work operations (e.g., cutting, welding, brazing) conducted on or near hazardous operations shall be in accordance with fire prevention and protection requirements in 29 CFR Subsection 1910.252(a) and shall have a permit that authorizes the work to be performed.
ANSI Z49.1, 5.1- 5.5.7	**4.2.2** Ventilation and exposure monitoring requirements for welding and burning.
ANSI Z49.1, Chapter 9	**4.2.3** Precautionary and warning requirements for welding with toxic materials including cadmium, fluorides, and lead.
	4.3 Requirements for Laboratory Use of Chemicals
29 CFR 1910.1450(e)(3)	**4.3.1** A chemical hygiene plan shall be prepared for laboratory operations that includes safe operating procedures, hazard control measures, operability requirements for protective equipment, provisions for employee training and medical consultations, designation of individuals responsible for implementing the plan, and provisions for employee protection against extremely hazardous substances.
29 CFR 1910.1450(e)(3)(viii)	**4.3.1.1 Particularly Hazardous Substances** include "select carcinogens," reproductive toxins, and substances with a degree of acute toxicity. Provisions, where appropriate, shall include: • Establishment of a designated area • Use of containment devices • Procedures for safe removal of contaminated waste • Decontamination procedures
NFPA 400, Chapter 18	**4.3.2** Highly toxic chemicals have requirements for design, storage, fire extinguishing, treatment systems and ventilation.
NFPA 45, 4.2.1.1	**4.3.3 Fire Hazard Classification** – Laboratory units shall be classified Class A (High Fire Hazard), Class B (Moderate fire Hazard), Class C (Low fire Hazard), or Class D (Minimal Fire Hazard), according to the quantities of flammable and combustible liquids present in the lab (outside of the storage area) as specified in Table 9.1.1(a) and Table 9.1.1(b) in NFPA 45.
NFPA 45, 1.1.4, 1.1.5; NFPA 45, Annex C	**4.3.3.1** A laboratory shall be considered to contain an explosion hazard if an explosion could result in serious injuries of occupants. Quantities are limited to include but not limited to Annex C of NFPA 45.
NFPA 45, 6.1-6.6	**4.3.4** All laboratory units shall be provided with fire protection appropriate to the fire hazard, including: automatic fire extinguishing systems, standpipe and hose systems, portable fire extinguishers, fire alarm systems, fire prevention programs, and emergency plans.

Sources[12]	Consolidated Requirements[10, 11]
NFPA 45, Annex C, C2.1, C2.2; NFPA 45, Chapters 7, 9, 11	**4.3.5** If a laboratory contains explosion hazards, as defined in sections 1.1.4 and 1.1.5 of NFPA 45, protection shall be provided by one or more of the following: • Limiting the amounts of flammable or reactive chemicals or chemicals with unknown characteristics used in or exposed by experiments; • Special preventive or protective measures for the reactions, equipment, or materials themselves (e.g., high-speed fire detection with deluge sprinklers, explosion-resistant equipment or enclosures, explosion suppression, and explosion venting directed to a safe location); • Explosion-resistant walls or barricades around the laboratory area containing the explosion hazard; • Remote control equipment; • Sufficient deflagration venting in outside walls and/or roofs; and • Conducting experiments in a detached or isolated building, or outdoors.
NFPA 45, Annex C, C2.3 to C2.6	**4.3.5.1** Other explosion hazard protection may be considered, including: • Explosion-resistant construction; • Explosion venting; • Controlled access to laboratory; and • Regularly scheduled inspection and maintenance
NFPA 45, Chapter 7	**4.3.6** Laboratory Ventilation and Hoods • The release of chemical vapors shall be controlled by enclosures • Design shall ensure that chemical vapors are not recirculated • Duct construction shall be of noncombustible materials • Hood design and operation must meet NFPA 45 • Perchloric acid hoods require special construction per NFPA 45
NFPA 45, 8.2.2.1	**4.3.6.1** Chemicals shall not be brought into a laboratory work area unless design, construction, and fire protection of the facilities are commensurate with the quantities and hazards of the chemicals involved.
NFPA 45, 8.2.3.1	**4.3.6.2** Receiving, transporting, unpacking, and dispensing of chemicals and other hazardous materials shall be carried out by trained personnel in such locations and in such a manner as to minimize hazards from flammable, reactive, or toxic materials.
NFPA 45, 8.2.3.4	**4.3.6.3** Class I liquids shall not be stored or transferred from one vessel to another in any access corridor, open plan buildings, or ancillary spaces unprotected from the exit access corridor.

Sources[12]	Consolidated Requirements[10, 11]
NFPA 45, 9.3.1	**4.3.6.4** Transfer of Class I liquids to smaller containers from bulk stock containers not exceeding 20 liters (5 gal.) in capacity shall be performed as follows: • In a laboratory hood; • In an area provided with ventilation adequate to prevent accumulations of flammable vapor/air mixtures from exceeding 25 percent of the lower flammable limit; • In a liquid storage area specifically designed and protected for dispensing Class I flammable liquids that meet the requirements of NFPA 30
NFPA 45, 9.3.2	**4.3.6.5** Transfer of Class I liquids from containers of 20 liters (5 gal.) or more capacity shall be carried out as follows: • In a separate area outside the building; OR • In a liquid storage area specifically designed for dispensing Class I flammable liquids that meet the requirements of NFPA 30
NFPA 45, 9.3.3 and 9.3.4	**4.3.6.6** Class I liquids shall not be transferred between conductive containers of greater than 4 liters (1 gal.) capacity unless the containers are electrically interconnected by direct bonding or indirect bonding through a common grounding system. When dispensing Class I liquids involves nonconductive containers larger than 4 liters (1 gal.), which can be difficult to bond or ground, special dispensing procedures commensurate with the electrical characteristics of the liquid shall be developed and implemented.
NFPA 45, 9.1.2	**4.3.6.7** Individual containers of flammable or combustible liquids shall not exceed the capacities listed in NFPA 45, Table 9.1.2.
NFPA 45, 10.1.4-10.1.6	**4.3.7** Laboratory compressed gases shall be used according to NFPA 45 requirements.
NFPA 45, 10-1.4.2	**4.3.7.1** Lecture bottle-sized cylinders of the following gases located in laboratory units shall be kept in a continuously mechanically ventilated hood or other continuously mechanically ventilated enclosure: (1) All gases that have an NFPA 45 Health Hazard Ratings of 3 or 4;(2) All gases that have a NFPA 45 Health Hazard Rating of 2 without physiological warning properties; and (3) Pyrophoric gases.

Sources[12]	Consolidated Requirements[10, 11]
NFPA 45, 10.1.4.3	**4.3.7.2** Cylinders of gases that are greater than lecture bottle size and have NFPA 45 Health Hazard Ratings of 3 or 4, and cylinders of gases that have a Health Hazard Rating of 2 without physiological warning properties that are located in laboratory units shall meet both the following conditions: (1) Storage in approved continuously mechanically ventilated gas cabinets; and (2) Compliance with the requirements of NFPA 55.
NFPA 45, 10.1.4.4	**4.3.7.3** Cylinders of pyrophoric gases that are greater than lecture bottle size that are located in laboratory units shall be kept in approved continuously mechanically ventilated, sprinklered gas cabinets.
NFPA 45, 10.1.5.2.1-2	**4.3.7.4** Regulator systems in laboratory operations shall be equipped with two gauges, either on the regulator or remote fromthe regulator, installed as to show both the cylinder pressure and the outlet pressure. When the source cylinder is outside of the laboratory, a station regulator and gauge shall be installed at the point of use to show the outlet pressure.
NFPA 45, 10.1.6.3	**4.3.7.5** Only *in use* cylinders shall be allowed in the immediate work area. A compressed gas cylinder shall be considered in use when it is: (1) Connected through a regulator to deliver gas; or (2) Connected to a manifold being used to deliver gas; or (3) A single cylinder secured as a reserve cylinder alongside the cylinder described in (1).
NFPA 45, 10.1.6.5; NFPA 55, Table 6.3.1.1	**4.3.7.6** The quantity of compressed and liquefied gases in Class A, B and C laboratories shall be in accordance with the amounts in Table 6.3.1.1 of NFPA 55.
NFPA 55; NFPA 400, Chapter 21	**4.3.7.7** Requirements are given for the storage, use and handling of compressed gases and cryogenic fluids in portable and stationary containers, cylinders and tanks.
NFPA 45, 11.2.2 to 11.3.6	**4.3.8** Laboratory Operations and Apparatus – NFPA 45 contains additional laboratory safety controls covering: • Operations: heating, distillation, other separation procedures, drying, mixing and grinding, and operations involving reactions attemperatures and pressures above and below ambient conditions • Apparatus: refrigeration and cooling equipment, heating equipment, pressure equipment, and analytical instruments

Sources[12]	Consolidated Requirements[10, 11]
	4.4 Flammable and Combustible Liquids
NFPA 30, 6.4.1	**4.4.1** Operations involving flammable or combustible liquids shall be reviewed to ensure that fire and explosion hazards resulting from loss of containment of liquids are provided with corresponding fire prevention, fire control and emergency action plans.
NFPA 30, 6.5.1; 29 CFR 1910.106(b)(6); 29 CFR 1910.106(e)(6)(i)	**4.4.2** Precautions shall be taken to prevent the unintentional ignition of flammable vapors.
NFPA 30, 6.5.2	**4.4.2.1** Smoking shall be permitted only in designated and properly identified areas.
NFPA 30, 6.5.3.1; 29 CFR 1910.106(e)(8)	**4.4.2.2** Welding, cutting, and similar spark-producing operations shall not be permitted in areas containing flammable or combustible liquids until a written permit authorizing such work has been issued.
NFPA 30, 6.5.4.1; 29 CFR 1910.106(e)(6)(ii)	**4.4.2.3** All equipment (such as tanks, machinery, and piping) where an ignitable mixture could be present shall be bonded or connected to a ground. The bond or ground or both shall be physically applied or shall be inherently present by the nature of the installation. Electrically isolated sections of metallic piping or equipment shall be bonded to the other portions of the system or shall be individually grounded.
29 CFR 1910.106(d)(2)(iii)	**4.4.3**[30] Individual containers of flammable or combustible liquids shall not exceed the capacities listed in 29 CFR Section 1910.106, Table H-12.
29 CFR 1910.106(a)(19)(iii)	**4.4.4** Whenever a combustible liquid is heated for use to within 30°F (16.7°C) of its flash point, it shall be handled in accordance with the requirements for the next lower class of liquids.
NFPA 30, 6.9.1	**4.4.5** All fire protection equipment, and associated alarms, interlocks, and controls, shall be properly maintained, and periodic inspections and tests shall be done in accordance with both standard practice and the equipment manufacturer's recommendations.
NFPA 30, 6.9.2; 29 CFR 1910.106(e)(9)(i)	**4.4.6** Maintenance and operating practices shall control leakage and prevent spillage of flammable liquids.
29 CFR 1910.106(e)(9)(i)	**4.4.7** Spills shall be cleaned up promptly.

[30] Glass or plastic containers up to one gallon in size may be used for Class IA or IB liquids if either (1) the liquid would be rendered unfit for its intended use by contact with metal, (2) the liquid would corrode a metal container so as to create a leakage hazard, (3) the process would require more than the allowed quantities of liquid of a single assay lot to be used at one time, or (4) the process would require the maintenance of an analytical standard liquid of a quality which is not met by the specified standards of liquids available, and the quantity of the analytical standard liquid required for any one control process exceeds one-sixteenth the capacity of the container allowed under Table 1.

Sources[12]	Consolidated Requirements[10, 11]
NFPA 30, 6.9.3; 29 CFR 1910.106(e)(9)(iii)	**4.4.8** Combustible waste material and residues in operating areas shall be kept to a minimum, shall be stored in covered metal containers, and shall be disposed of daily.
NFPA 30, 6.9.4; 29 CFR 1910.106(e)(9)(iv)	**4.4.9** Ground areas around facilities where liquids are used shall be kept free of weeds, trash, or other unnecessary combustible materials.
NFPA 30, 6.9.5; 29 CFR 1910.106(e)(9)(ii)	**4.4.10** Aisles established for movement of personnel shall be maintained clear of obstructions.
NFPA 30, 9.18.1	**4.4.11** Dispensing, handling, transfer, and use of flammable liquids or combustible liquids shall meet all applicable requirements of Chapter 18 of NFPA 30.
NFPA 30, 18.5.2; 29 CFR 1910.106(e)(2)(iv)(d)	**4.4.12** Flammable liquids or combustible liquids shall be drawn from or transferred into vessels, containers, or portable tanks using one of the following methods: • From safety cans; • Through a closed piping system; • From portable tanks or containers by means of a device that draws through an opening in the top of the tank or container; • By gravity through a listed self-closing valve or self-closing faucet *[NOTE: **Class I-A liquids** (see definition) shall not be dispensed by gravity from tanks.]*
29 CFR 1910.106(e)(2)(iv)(d)	**4.4.13** Transferring flammable or combustible liquids by means of air pressure on the container or tank shall be prohibited.
29 CFR 1910.106(d)(4)(v)	**4.4.14** Dispensing in inside storage rooms shall be by approved pump or self-closing faucet only.
NFPA 30, 6.5.4	**4.4.15** Means shall be proved to minimize generation of static electricity. Such means shall meet the requirements of NFPA 30.
29 CFR 1910.106(e)(6)(ii)	**4.4.16** ***Class I liquids*** (see definition) shall not be dispensed into containers unless the nozzle and container are electrically interconnected.
29 CFR 1910.106(e)(2)(iii)	**4.4.17** Areas in which flammable or combustible liquids are transferred from one tank or container to another container shall be separated from other operations in the building by adequate distance or by construction having adequate fire resistance. Adequate natural or mechanical ventilation shall be provided.

Sources[12]	Consolidated Requirements[10, 11]
NFPA 30, 9.18.2	**4.4.18** Dispensing of flammable liquids or dispensing of combustible liquids at temperatures at or above their flash points shall not be permitted in cutoff rooms or attached buildings that exceed 1,000 ft^2 (93 m^2) in floor area or in liquid warehouses unless the dispensing area is suitably cut off from the storage areas in accordance with NFPA 30.
NFPA 30-2003, 6.5.2.10; NFPA 30, 18.5, (*Incidental Operations*)	**4.4.19** Dispensing of flammable liquids or of Class II combustible liquids shall not be permitted in general purpose warehouses unless the dispensing area is suitably cut off from other ordinary combustible or liquid storage areas in accordance with NFPA 30-2003, and otherwise complies with NFPA 30-2003 edition. Chapter 18 of NFPA 30 (2014) applies to facilities containing control areas.
29 CFR 1910.106(e)(2)(iv)(a)	**4.4.20** Flammable liquids shall be kept in covered containers when not actually in use.
29 CFR 1910.106(e)(2)(iv)(b)	**4.4.21** Where flammable or combustible liquids are used or handled, except in closed containers, means shall be provided to dispose promptly and safely of leakage and spills.
29 CFR 1910.106(e)(2)(iv)(c)	**4.4.22** Class I liquids shall be used only where there are no open flames or other sources of ignition within the possible path of vapor travel.
	4.5 Compressed Gases
29 CFR 1910.101	**4.5.1** Compressed-gas cylinders shall be used in accordance with the CGA.
NFPA 55, 4.10.2.2; 29 CFR 1910.253(b)(1)(ii)	**4.5.2** Compressed gas cylinders shall be appropriately labeled. Whenever possible, labels shall be located near the shoulder of the cylinder.
CGA P-1, 5.2.2	**4.5.2.1** The color of the cylinder shall not be the only means used to identify the gas it contains.
ANSI Z49.1, 10.8.1.4 and 10.8.1.5; CGA G-1, 4.5; CGA P-1, 5.2.1; NFPA 55,7.1.7.1; 29 CFR 1910.253(b)(5)(ii)(L)	**4.5.2.2** Labels or markings placed on compressed gas cylinders by the manufacturer or distributor shall not be defaced or removed. Cylinders shall be legibly marked with the chemical or trade name.
ANSI Z49.1, 10.8.1.4	**4.5.2.3** Cylinders not bearing a legible label or other identification shall not be used and shall be returned to the manufacturer or distributor.
NFPA 51, 4.1.3	**4.5.2.4** Gas name markings shall not be cut into the metal of the cylinder by the user.
CGA P-1, 5.4	**4.5.3** Compressed-gas cylinders shall not be subjected to temperature extremes.

Sources[12]	Consolidated Requirements[10, 11]
ANSI Z-49.1, 10.8.1.8; CGA P-1, 5.4, 5.8.2; NFPA 55, 7.1.10.5; 29 CFR 1910.253(b)(2)(i)	**4.5.3.1** Compressed-gas cylinders shall not be exposed to temperatures exceeding 125°F. Use temperature shall not exceed 120°F.
CGA P-1, 6.2.6; CGA P-1, 5.4; CGA G-1, 5.2; CGA G-1, 6; NFPA 55, 7.1.10.7; 29 CFR 1926.350(b)(3)	**4.5.3.2** Direct flames or heat shall not be applied to a compressed-gas cylinder.
CGA P-1, 5.4; NFPA 55, 7.1.13	**4.5.3.2.1** Cylinders exposed to fire shall not be shipped or used until the manufacturer or supplier requalifies them in accordance with the pressure and vessel code under which they were manufactured.
ANSI Z49.1 10.8.4.13; 29 CFR 1910.253(b)(5)(ii)(I); 29 CFR 1926.350(b)(1)	**4.5.3.2.2** Cylinders shall be kept far enough away from operations such as welding to prevent sparks, hot slag, flames, etc., from reaching them. If cylinders cannot be kept a sufficient distance away, then fire-resistant shields shall be used to separate the cylinders from the hot operations.
CGA P-1, 5.4	**4.5.3.3** Cylinders shall not be subjected to artificially low temperatures without the permission of the supplier. Outside storage is not affected by this requirement.
CGA P-1, 5.4; NFPA 55, 7.1.1.2.1; NFPA 55, 7.1.14.1, 7.1.14.2; 29 CFR 1926.350(c)(3)	**4.5.4** No structurally damaged or defective cylinders shall be used. Damaged or defective cylinders shall be removed from service.
ANSI Z49.1, 10.8.1.2; ANSI Z49.1, 10.8.1.3; CGA P-1, 5.4; CGA G-1, 4.6.6; 29 CFR 1910.253(b)(5)(ii)(M); 29 CFR 1926.350(c)(2)	**4.5.5** No person other than the cylinder supplier shall attempt to mix gases in cylinders. No one except the owner of the cylinder or person authorized by the owner shall refill a cylinder. Used, non-refillable containers shall be disposed of according to the manufacturer's recommendation.
29 CFR 1926.350(c)(2)	**4.5.5.1** No one shall use a cylinder's contents for purposes other than those intended by the supplier.

Sources[12]	Consolidated Requirements[10, 11]
ANSI Z49.1, 10.8.3.4; CGA P-1, 5.3; CGA G-1, 6; 29 CFR 1910.253(b)(5)(ii)(N); 29CFR 1910.253(b)(5)(iii)(H)	**4.5.6** No one shall tamper with safety devices in cylinders or valves.
CGA P-1, 5.3; CGA P-1, 5.4; NFPA 55, 7.1.5.2.1; 29 CFR 1910.253(b)(5)(ii)(R)(1) and (2)	**4.5.6.1** No attempt shall be made to maintain or repair cylinder safety devices. Suppliers' shall be notified promptly and suppliers instructions as to the disposition of the cylinder shall be followed if a cylinder with a faulty valve or safety device is found or if the cylinder is otherwise found to be defective.
29 CFR 1910.253(b)(5)(ii)(R)(3)	**4.5.6.2** Complete removal of the stem from a diaphragm type cylinder valve shall be avoided. *[NOTE: Stems may be removed before cylinder disposal.]*
ANSI Z-49.1, 10.8.4.10; CGA G-1, 5.2; CGA G-1, 6.2; 29 CFR 1910.253(b)(2)(ii); 29 CFR 1910.253(b)(2)(iii); 29 CFR 1910.253(b)(5)(ii)(G); 29 CFR 1910.253(b)(5)(ii)(H); 29 CFR 1926.350(a)(8)	**4.5.7** When compressed gas cylinders are not in use or are empty, their valves shall be closed.
ANSI Z-49.1, 10.8.3.6; CGA G-1, 6; CGA G-1, 5.2; CGA P-1, 5.5; NFPA 55, 7.1.9.2; 29 CFR 1910.253(b)(2)(iv); 29 CFR 1910.253(b)(5)(ii)(A); 29 CFR 1926.350(a)(1)	**4.5.8** Where cylinders are designed to accept valve protection caps, caps shall be in place and hand tight at all times except when connected for use.
CGA P-1, 5.5; NFPA 55, 7.1.9.3.1	**4.5.9** Where valve outlet caps and/or plugs are provided by the manufacturer, the user shall keep the device on the valve outlet at all times except when secured and connected for use.
CGA G-1, 6.4; CGA P-1, 5.5	**4.5.9.1** Valve outlet caps and/or plugs shall be in place and tightened before shipment of the cylinder back to the supplier.
ANSI Z-49.1, 10.8.3.2; 29 CFR 1910.253(b)(5)(ii)(C); 29 CFR 1926.350(a)(5)	**4.5.10** Pry bars shall not be used under valves or valve protection caps to pry cylinders loose when frozen or otherwise affixed to the ground.
29 CFR 1926.350(a)(5)	**4.5.10.1** Warm, not boiling water shall be used to thaw cylinders loose.

Sources[12]	Consolidated Requirements[10, 11]
ANSI Z49.1, 10.8.3.3; CGA P-1, 5.4; CGA G-1, 5.6; 29 CFR 1910.253(b)(5)(ii)(K); 29 CFR 1926.350(c)(1)	**4.5.11** Compressed-gas cylinders shall not be used as rollers or supports.
29 CFR 1926.350(a)(11)	**4.5.12** Compressed-fuel gas cylinders shall not be kept in unventilated enclosures such as lockers or cupboards.
ANSI Z-49.1, 10.8.4.14; CGA P-1, 5.4; CGA G-1, 6; NFPA 55, 7.1.10.10; 29 CFR 1910.253(b)(5)(ii)(J); 29 CFR 1926.350(b)(2)	**4.5.13** Compressed-gas cylinders shall not be placed where they can inadvertently become part of an electrical circuit.
CGA P-1, 5.4	**4.5.13.1** When used in conjunction with electric welding, compressed-gas cylinders shall not be grounded or used for grounding.
ANSI Z49.1, 10.8.4.14; 29 CFR 1926.350(b)(2); 29 CFR 1910.253(b)(5)(ii)(J)	**4.5.13.2** Electrodes shall not be struck against a compressed gas cylinder to strike an arc.
ANSI Z49.1, 10.8.2.5; ANSIZ49.1,10.8.4.12; CGA P-1, 5.8.4,6.2.2; NFPA 45, 10.1.5.1; NFPA 55, 7.1.8.4; NFPA 55, 7.2.1.2.2; NFPA 55, 7.3.1.6.1; NFPA 55, 7.3.1.8; 29 CFR 1926.350(a)(7) and (9); 29 CFR 1926.350(b)(3)	**4.5.14** Compressed-gas, acetylene and liquefied gas cylinders shall be secured in an upright position when being used unless specifically designed for a horizontal application. *[EXCEPTION: Cylinders containing non-flammable liquefied gases may be used in the inverted position when the liquid phase is used.]*
ANSI Z49.1, 10.3.3; CGA G-1, 4.1; CGA P-1, 5.9.7, 5.7; 29 CFR 1926.350(f)(1)	**4.5.15** Oxygen, fuel, and other compressed-gas cylinders, equipment, pipelines, or apparatus shall not be used interchangeably with any other gas and each shall be used only for the service for which it was approved.
ANSI Z49.1, 10.5.2.1; CGA G-1, 6.2; CGA P-1, 5.9.4; NFPA 55, 7.3.1.3.1	**4.5.16** All connections shall be gas tight and no leaks shall be present in the system.
ANSI Z49.1, 10.5.2.1; CGA P-1, 6.2	**4.5.16.1** A flame shall not be used for the detection ofleaks in compressed gas systems. Soapy water is one acceptable method.

Sources[12]	Consolidated Requirements[10, 11]
CGA P-1, 5.9.2; CGA P-1, 5.9.5; NFPA 55, 7.3.1.3.2	**4.5.17** Backflow protection shall be used when the backflow of gas can result in a hazardous condition.
NFPA 55, 7.1.2.1; NPFA 55, 7.5-7.10	**4.5.18** Compressed-gas systems shall be designed for their intended use and shall be designed by persons competent in such design. *[NOTE: Additional requirements for corrosive, flammable, oxidizing, pyrophoric, toxic or highly toxic, and unstable reactive gases can be found in NFPA 55, 7.5-7.10.]*
ANSI Z49.1, 10.8.4.1; CGA G-1, 6.2; CGA P-1, 5.9.3; NFPA 45, 10.1.5.2; NFPA 51, 5.1.3; NFPA 51, 5.2.8; NFPA 51, 5.4.5; 29 CFR 1926.350(d)(3); 29 CFR 1910.253(b)(5)(iii)(I)	**4.5.19** Compressed gases shall never be used from cylinders or high-pressure manifolds without reducing the pressure through a suitable regulator unless the equipment used is designed to withstand full cylinder pressure.
29 CFR 1910.253(b)(5)(ii)(P)	**4.5.19.1** Unless connected to a manifold, oxygen from a cylinder shall not be used without a regulator.
ANSI Z49.1, 10.7.1; ANSI Z49.1, 10.7.2; CGA G-1, 6.2; NFPA 51, 7.6; NFPA 45, 10.1.5.2; 29 CFR 1910.253(a)(3); 29 CFR 1910.253(e)(6)(i)	**4.5.20** Only approved gas regulators and pressure reducing valves shall be used for the gas and pressures for which they are labeled.
29 CFR 1926.350(h)	**4.5.21** Regulators, including their related gauges, shall be in proper working order while in use.
ANSI Z49.1, 10.7.3; 29 CFR 1910.253(e)(6)(iv)	**4.5.21.1** Union nuts and connections shall be inspected before cylinder use to detect faulty seals, which could cause leakage. Faulty nuts and connectors shall be replaced.
ANSI Z49.1, 10.7.6; CGA G-1, 6; 29 CFR 1910.253(e)(6)(ii)	**4.5.21.2** A qualified mechanic shall perform repairs of regulators or their parts.
ANSI Z49.1, 10.7.5; ANSI Z49.1, 10.8.4.11; CGA G-1, 6.2; CGA P-1, 5.9.6; 29 CFR 1910.253(b)(5)(iii)(D); 29 CFR 1926.350(d)(4)	**4.5.22** Before a regulator is removed from a cylinder, the cylinder valve shall be closed and the pressure released from the regulator.

Sources[12]	Consolidated Requirements[10, 11]
ANSI Z49.1, 10.7.5; ANSI Z49.1, 10.8.4.4; CGA G-1, 6.2; CGA P-1, 5.9.1.1; 29 CFR 1910.253(b)(5)(iii)(J); 29 CFR 1926.350(d)(2)	**4.5.23** Cylinder valves shall always be opened slowly to prevent damage to the regulator.
ANSI Z49.1, 10.8.4.4; CGA P-1, 5.9.1	**4.5.23.1** Personnel shall stand to the side and not in front of the regulator orifice when the cylinder valve is opened.
ANSI Z49.1, 10.8.4.7	**4.5.24** When a high-pressure gas (non-liquefied) cylinder is in use, the valve shall be fully opened to prevent leakage around the valve stem.
ANSI Z49.1, 10.8.4.6; CGA G-1, 6.2; CGA P-1, 5.9.1.1; 29 CFR 1910.253(b)(5)(ii)(E); 29 CFR 1910.253(b)(5)(iii)(L)	**4.5.25** Cylinders not having a fixed hand wheel shall have keys, handles or non-adjustable wrenches on valve stems while cylinders are in service.
29 CFR 1926.350(d)(2)	**4.5.25.1** Manifolded or coupled cylinders shall have at least one such wrench always available.
ANSI Z49.1, 10.8.4.5; CGA P-1, 5.9.1.1; CGA G-1, 6.2; 29 CFR 1910.253(b)(5)(ii)(Q)(1)	**4.5.26** Cylinders having hand wheels shall not be opened using wrenches, hammers, or other tools. If the valve cannot be opened by hand, then the manufacturer shall be notified and their directions followed.
ANSI Z-49.1, 10.8.3.10; CGA G-1, 6.1; 29 CFR1910.253(b)(5)(ii)(D); 29 CFR 1926.350(a)(6)	**4.5.27** When cylinders are secured in a suitable hand truck, regulators do not have to be removed and valve protection caps need not be in place before cylinders are moved. When cylinders are to be moved with regulators attached, the cylinder valve must be closed.
ANSI Z-49.1, 10.8.3.5; CGA P-1, 5.9.1; 29 CFR 1910.253(b)(5)(ii)(F); 29 CFR 1926.350(a)(8)	**4.5.28** Cylinder valves shall be closed before moving cylinders.
ANSI Z-49.1, 10.8.3.7; CGA P-1, 5.6; 29 CFR 1910.253(b)(5)(ii)(C); 29 CFR 1926.350(a)(5)	**4.5.29** Valve protection caps shall not be used for lifting cylinders.

Sources[12]	Consolidated Requirements[10, 11]
ANSI Z-49.1, 10.8.3.8; CGA G-1, 6.1; 29 CFR1910.253(b)(5)(ii)(A); 29 CFR 1926.350(a)(2)	**4.5.30** When using a crane, derrick, etc. to transport cylinders, a cradle, boat, pallet, slingboard, or other suitable platform shall be used. Compressed-gas cylinders shall be secured to the lifting device before they are hoisted.
ANSI Z-49.1, 10.8.3.8; CGA G-1, 6.1; CGA P-1, 5.6; 29 CFR 1910.252(b)(5)(ii)(A); 29 CFR 1926.350(a)(2)	**4.5.30.1** Choker slings, ropes, chains, or magnets shall not be used to hoist compressed-gas cylinders.
ANSI Z49.1, 10.8.3.1; CGA G-1, 5.2 and 6.1; CGA P-1, 3.5; 29 CFR 1910.253(b)(5)(ii)(B) and (O); 29 CFR1910.253(b)(5)(iii)(B); 29 CFR 1926.350(a)(3)	**4.5.31** Compressed-gas cylinders shall not be purposely dropped, struck, or permitted to strike each other violently.
ANSI Z-49.1, 10.8.3.9; CGA G-1, 5.2 and 6; 29 CFR 1926.350(a)(4) and (9)	**4.5.32** When compressed-gas cylinders are transported by motor vehicle, they shall be secured in an upright position. They shall be transported in accordance with Department of Transportation (DOT) requirements. Acetylene cylinders should not be transported in passenger vehicles.
29 CFR 1926.350(a)(3)	**4.5.33** When large cylinders are moved by hand, they shall be tilted and rolled on their bottom edge.
ANSI Z49.1, 10.8.4.3; CGA G-1, 6.2; 29 CFR 1910.253(b)(5)(iii)(C); 29 CFR 1926.350(d)(1)	**4.5.34** Before connecting a regulator to an oxygen or fuel cylinder valve, the valve shall be inspected, wiped clean, and the valve shall be opened momentarily and then closed immediately. This process is called “cracking.”
ANSI Z49.1, 10.8.4.3; CGA P-1, 5.4; 29 CFR 1910.253(b)(5)(iii)(C); 29 CFR 1926.350(d)(1)	**4.5.34.1** The person cracking the valve shall stand to one side and not in front of the gas stream. Compressed gas streams shall not be directed towards any person.
ANSI Z49.1, 10.8.4.3; 29 CFR 1910.253(b)(5)(iii)(D); 29 CFR 1926.350(d)(1)	**4.5.34.2** Fuel cylinder valves shall not be cracked near ignition sources such as flames, welding work, sparks, etc.
29 CFR 1926.350(e)(3)	**4.5.34.3** Hose connections shall be kept free of grease and oil.
ANSI Z 49.1, 10.6.1; 29 CFR 1910.253(e)(5)(i)	**4.5.35** Hoses for oxy-fuel gas service shall comply with the Rubber Manufacturers Association IP-7 Specification for Rubber Welding Hose.
ANSI Z49.1, 10.6.2; 29 CFR 1926.350(f)(1)	**4.5.36** Fuel gas hoses shall be red and oxygen hoses shall be green when they are used for welding and cutting activities or color coded according to the Authority Having Jurisdiction (AHJ).

Sources[12]	Consolidated Requirements[10, 11]
ANSI Z49.1, 10.6.3; 29 CFR 1910.253(e)(5)(ii); 29 CFR 1926.350(f)(2)	**4.5.37** When parallel lengths of oxygen and fuel gas hoses are taped together such as in a welding operation, not more than 4 inches out of every 12 shall be covered by tape.
ANSI Z49.1, 10.6.4; 29 CFR 1910.253(e)(5)(v); 29 CFR 1926.350(f)(3)	**4.5.38** All hoses used for welding, cutting, and other hot work that will be used to carry hazardous gas (for example, oxygen, fuel gases, oxidizers) shall be inspected at the beginning of each working shift that they are to be used and any defective hoses shall be removed from service. *[NOTE: Defects in hoses that shall render the hose no longer useable include leaks, burns, and worn places that render the hose unfit for service.]*
ANSI Z49.1, 10.6.5; 29 CFR 1910.253(e)(5)(iii)	**4.5.39** Hose connections shall comply with the CGA Pamphlet E-1, *Regulator Connection Standards*.
ANSI Z49.1, 10.6.5	**4.5.39.1** Hose connections for welding gas lines shall not be compatible with breathing air equipment.
ANSI Z49.1, 10.6.6; 29 CFR 1910.253(e)(5)(iv)	**4.5.39.2** Hose connections shall be able to withstand, without leakage, twice the normal operating pressure and not less than 300 psi.
ANSI Z49.1, 10.6.6; 29 CFR 1910.253(e)(5)(iv)	**4.5.39.3** Oil-free air or an oil-free inert gas shall be used to test hose connections.
29 CFR 1926.350(f)(6)	**4.5.39.4** Storage areas for hoses shall be well ventilated.
ANSI Z49.1, 10,9.3; ANSI Z49.1, 10.9.4; ANSI Z49.1, 10.9.5; NFPA 51; 29 CFR 1910.253	**4.5.40** Fuel gas and oxygen manifolds capacity limits, locations and design criteria shall be in accordance with NFPA 51 and 29 CFR Section 1910.253.
CGA G-1, 6; 29 CFR 1910.253(c)(5)(i)	**4.5.41** Fuel gas and oxygen manifolds shall be installed under the supervision of someone familiar with the proper practices.
ANSI Z49.1, 10.9.2; 29 CFR 1910.253(c)(5)(ii)	**4.5.42** All manifolds and their parts shall be used only for those gases for which they are approved.
ANSI Z49.1, 10.9.1; NFPA 51, 5.2.2, 5.2.1; NFPA 51, 5.1.1; 29 CFR 1910.253(c)(1)(i)	**4.5.42.1** Manifolds shall be approved either separately for each of their components or as an assembled unit if fuel gas is used with oxygen cylinders with a cylinder having a service pressure above 250 psig.
29 CFR 1926.350(e)(1)	**4.5.43** Manifolds shall bear the name of the substance contained inside in letters at least 1 inch high either directly painted upon the manifold or on a sign permanently affixed to the manifold.
NFPA 51, 5.3.5	**4.5.43.1** Low pressure manifolds shall be marked as such to prevent the attachment of high pressure cylinders.
29 CFR 1926.350(e)(2)	**4.5.44** Fuel gas and oxygen manifolds shall be located in safe, well ventilated, accessible locations and not within enclosed spaces.

Sources[12]	Consolidated Requirements[10, 11]
29 CFR 1926.350(e)(3)	**4.5.45** Fuel gas and oxygen manifold hose connections shall be such that hoses cannot be interchanged between fuel gas and oxygen manifolds and supply header connections.
29 CFR 1926.350(e)(3)	**4.5.45.1** Adapters shall not be used to permit the interchange of hoses.
29 CFR 1926.350(e)(4)	**4.5.46** When not in use, fuel gas and oxygen manifold and header connections shall be capped.
29 CFR 1926.350(e)(5)	**4.5.47** Nothing shall be placed on top of a fuel gas and oxygen manifold that will damage the manifold or interfere with the quick closing of the valves.
NFPA 51, 5.4.1	**4.5.48** Portable outlet headers shall not be used indoors except for temporary service as approved by the Occupational Safety and Fire Protection Department.
ANSI Z-49.1, 10.3.1; CGA P-1, 6.4.1; 29 CFR 1910.253(b)(5)(i); 29 CFR 1926.350(i)	**4.5.49** Oxygen cylinders, cylinder valves, couplings, regulators, hoses, and other apparatus shall be kept free from oil, grease, dirt and other flammable or explosive substances. These materials shall not be handled with oily hands or gloves.
29 CFR 1910.253(b)(5)(i); 29 CFR 1926.350(i)	**4.5.49.1** A jet of oxygen gas shall not be directed at an oily surface, greasy clothes, etc.
ANSI Z49.1, 10.7.4; 29 CFR 1910.253(e)(6)(iii)	**4.5.50** Gauges used for oxygen service shall be marked “Use No Oil.”
ANSI Z49.1, 10.3.2	**4.5.51** Oxygen shall not be used as a substitute for compressed air. For example, it shall not be used in pneumatic tools, to blow out pipelines, to dust off clothing or any similar application.
ANSI Z49.1, 10.7.5	**4.5.53** Oxygen regulators shall be drained of oxygen before they are attached to a cylinder or a manifold or before the cylinder valve is opened.
CGA P-1, 6.4.2	**4.5.54** Oxygen in work areas shall not be allowed to exceed 23 percent by volume.
ANSI Z49.1, 10.8.2.5; 29 CFR 1910.253(b)(3)(ii); 29 CFR 1910.253(b)(5)(iii)(A)	**4.5.55** Fuel gas cylinders shall be used valve end up.
NFPA 55, 7.6.3.1	**4.5.56** Where ignition of a flammable gas by static electricity is possible, means shall be provided to prevent static discharge.
ANSI Z49.1, 10.8.4.9; CGA G-1, 6.2; 29 CFR1910.253(b)(5)(iii)(E); 29 CFR 1926.350(d)(2)	**4.5.57** Nothing shall be placed on fuel cylinders while in use that could damage safety devices or interfere with the quick closing of the valve.
ANSI Z49.1, 10.8.4.8; CGA G-1, 6.2; 29 CFR1910.253(b)(5)(iii)(K); 29 CFR 1926.350(d)(2)	**4.5.57.1** Quick opening valves on fuel gas cylinders shall be opened between no more than 1-1/2 (one-and half) turns and preferably ¾ (three fourths) of a turn.

Sources[12]	Consolidated Requirements[10, 11]
ANSI Z49.1, 10.8.4.15	**4.5.58** Withdrawal rates from gas cylinders shall not exceed manufacturer's recommendations.
ANSI Z49.1, 10.8.5.1; CGA G-1, 6.5; 29 CFR 1926.350(d)(5)	**4.5.59** If a leak is found around the valve stem of a fuel gas cylinder, the packing nuts shall be tightened and the cylinder valve closed.
ANSI Z49.1, 10.8.5.2; CGA G-1, 6.5; 29CFR1910.253(b)(5)(iii)(F); 29 CFR 1926.350(d)(5)	**4.5.59.1** If these actions do not stop the leak (because the leak is in the valve stem, valve seat, cylinder fuse plug, etc.) then the cylinder shall be moved from the work area to a safe location outdoors and the cylinder shall be properly marked and the supplier notified for their return.
ANSI Z49.1, 10.8.5.2; CGA G-1, 6.3; 29 CFR1910.253(b)(5)(iii)(G)	**4.5.59.2** Precautionary signs warning of a fire hazard shall be posted where leaking fuel cylinders are located.
ANSI Z49.1, 10.8.5.2	**4.5.59.3** If a leaking fuel cylinder cannot be moved, then the area shall be evacuated and the fire department shall be summoned for assistance.
ANSI Z49.1, 10.8.5.3	**4.5.59.4** Small fires at fuel gas cylinders shall be extinguished if possible without endangering personnel by either shutting off the valve or by the use of water.
ANSI Z49.1, 10.8.5.3	**4.5.59.4.1** Personnel shall evacuate the area and the fire department summoned for assistance if a cylinder fire cannot be easily extinguished.
NFPA 51, 6.4.2; NFPA 51, 6.5.2; 29 CFR 1910.253(d)(5)(ii)	**4.5.60** When compressed gas lines are being purged of air, oxygen or combustible gas, then sources of ignition shall not be allowed near uncapped openings.
NFPA 51, 1.5.1	**4.5.61** The use of liquid acetylene is prohibited.
	4.5.62 Details for the following compressed gases can be found in the listed citations.
29 CFR 1910.102	**4.5.62.1** Acetylene
29 CFR 1910.103	**4.5.62.2** Hydrogen
29 CFR 1910.104	**4.5.62.3** Oxygen
29 CFR 1910.105	**4.5.62.4** Nitrous Oxide
	4.6 Specific Chemicals.
	In addition to the chemical safety controls identified in sections 4.1 through 4.5 of this chapter, there are control requirements for many specific chemicals such as those listed in sections 4.6.1 through 4.6.35 below. Details can be found in the specific citations.
29 CFR 1910.1014	**4.6.1** 2-Acetylaminofluorene
29 CFR 1910.1045	**4.6.2** Acrylonitrile
29 CFR 1910.1011	**4.6.3** 4-Aminodiphenyl

Sources[12]	Consolidated Requirements[10, 11]
29 CFR 1910.1018	**4.6.4** Arsenic, inorganic
29 CFR 1910.1001	**4.6.5** Asbestos
29 CFR 1910.1028	**4.6.6** Benzene
29 CFR 1910.1010	**4.6.7** Benzidine
10 CFR 850	**4.6.8** Beryllium
29 CFR 1910.1051	**4.6.9** 1,3-Butadiene
29 CFR 1910.1027	**4.6.10** Cadmium
29 CFR 1910.1008	**4.6.11** bis-Chloromethyl ether
29 CFR 1910.1044	**4.6.12** 1,2-dibromo-3-chloropropane
29 CFR 1910.1007	**4.6.13** 3'-Dichlorobenzidine (and its salts)
29 CFR 1910.1015	**4.6.14** 4-Dimethylaminoazobenzene
29 CFR 1910.1012	**4.6.15** Ethyleneimine
29 CFR 1910.1047	**4.6.16** Ethylene oxide
29 CFR 1910.1048	**4.6.17** Formaldehyde
NFPA 484	**4.6.18** Hafnium
29 CFR 1910.1025	**4.6.19** Lead
NFPA 484	**4.6.20** Alkali metals (e.g., cesium, francium, lithium, potassium, rubidium, sodium, and alloys of these metals, such as NaK)
NFPA 484	**4.6.21** Aluminum
NFPA 484	**4.6.22** Magnesium solids and powders
29 CFR 1910.1006	**4.6.23** Methyl chloromethyl ether
29 CFR 1910.1052	**4.6.24** Methylene chloride
29 CFR 1910.1050	**4.6.25** Methylenedianiline
29 CFR 1910.1004	**4.6.26** alpha-Naphthylamine
29 CFR 1910.1009	**4.6.27** beta-Naphthylamine
NFPA 484	**4.6.28** Niobium
29 CFR 1910.1003	**4.6.29** 13 Carcinogens (4-Nitrobiphenyl, etc.).
29 CFR 1910.1016	**4.6.30** N-Nitrosodimethylamine
29 CFR 1910.1013	**4.6.31** beta-Propiolactone
NFPA 484	**4.6.32** Tantalum
NFPA 484	**4.6.33** Titanium
29 CFR 1910.1017	**4.6.34** Vinyl chloride
NFPA 484	**4.6.35** Zirconium

Sources[12]	Consolidated Requirements[10, 11]
	4.7 Special Provisions for Specific Hazard Classes
NFPA 400, Chapter 13	**4.7.1** For flammable solids exceeding limits specified for control areas in NFPA 400, Chapter 5, requirements are set for construction, storage, containment, ventilation and clearance from combustibles.
NFPA 400, Chapter 14	**4.7.**2 For organic peroxide quantities exceeding limits specified for control areas in Chapter 5, requirements are set for construction, storage, containment, ventilation and clearance from combustibles. Sprinkler flow requirements are set for Classes I, II, III and IV.
NFPA 400, Chapter 15	**4.7.3** For oxidizer solids and liquid quantities exceeding limits specified for control areas in Chapter 5, requirements are set for construction, storage, containment, ventilation and clearance from combustibles. Sprinkler flow and separation limits are given for Classes 1, 2,3 and 4.
NFPA 400, Chapter 17	**4.7.4** For pyrophoric solids and liquid quantities exceeding limits specified for control areas in Chapter 5, requirements are set for construction, storage, containment, ventilation and clearance from combustibles.
NFPA 400, Chapter 19	**4.7.5** For unstable (reactive) solids and liquid quantities exceeding limits specified for control areas in Chapter 5, requirements are set for construction, storage, containment, ventilation and clearance from combustibles.
NFPA 400, Chapter 120	**4.7.6** For water-reactive solids and liquid quantities exceeding limits specified for control areas in Chapter 5, requirements are set for construction, storage, containment, ventilation and clearance from combustibles.

6.5 Source Documents

ANSI Z49.1 (2012), *Safety in Welding, Cutting, and Allied Processes*

CGA G-1 (2015), *Acetylene*

CGA P-1 (2015), *Safe Handling of Compressed Gases in Containers*

DOE O 420.1C, *Facility Safety, Chg.* 1; *02-27-2015*

DOE-STD-1120-98, *Integration of Environment, Safety, and Health into Facility Disposition Activities*

DOE-STD-1120-2016, *Preparation of Documented Safety Analysis for Decommissioning and Environmental Restoration Activities*, *03-15-2016*

DOE-STD-1189-2016, *Integration of Safety into the Design Process*

DOE-STD-3009-94, *Guide for U.S. DOE Nonreactor Nuclear Facility Safety Analysis*

DOE-STD-3009-2014, *Preparation of Nonreactor Nuclear Facility Documented Safety Analysis, 11-12-2014*

DOE-STD-3011-94, *Guidance for Preparation of DOE O 5480.22 (TSR) and DOE O 5480.23 (SAR) Implementation Plans*

DOE-STD-3011-2016, *Preparation of Documented Safety Analysis for Interim Operations at DOE nuclear Facilities*, *01-22-2016*

DOE-STD-3016-99, *Limited Standard; Hazard Analysis Reports for Nuclear Explosive Operations*

DOE-NA-STD-3016-2016, *Hazard Analysis Reports for Nuclear Explosive Operations (9-06-2016)*

NFPA 30 (2014), *Flammable and Combustible Liquids Code, 2015 ed.*

NFPA 45 (2014), *Standard on Fire Protection for Laboratories Using Chemicals, 2015 ed.*

NFPA 51 (2012), *Standard for the Design and Installation of Oxygen-Fuel Gas Systems for Welding, Cutting, and Allied Processes, 2013 ed.*

NFPA 55 (2015), *Compressed Gases and Cryogenic Fluids, 2016 ed. Code (included in NFPA 400)*

NPFA 400 (2015), *Hazardous Materials Code, 2016 ed.*

NFPA 484 (2014), *Standard for Combustible Metals, 2015 ed.*

10 CFR 830, *Nuclear Safety Management, Subpart B, Safety Basis Requirements.*

10 CFR 850, *Chronic Beryllium Disease Prevention Program*

10 CFR 851, *Worker Safety and Health Program*

10 CFR 1021, *National Environmental Policy Act Implementing Procedures*

29 CFR 1910.101, *Compressed Gases (general requirements)*

29 CFR 1910.102, *Acetylene*

29 CFR 1910.103, *Hydrogen*

29 CFR 1910.104, *Oxygen*

29 CFR 1910.105, *Nitrous oxide*

29 CFR 1910.119, *Process Safety Management of Highly Hazardous Chemicals*

29 CFR 1910.120, *Hazardous Waste Operations and Emergency Response*

29 CFR 1910.132, General Requirements (*Personal Protective Equipment)*

29 CFR 1910.134, *Respiratory Protection*

29 CFR 1910.253, *Oxygen-Fuel Gas Welding and Cutting*

29 CFR 1910.1001, *Asbestos*

29 CFR 1910.1003, *13 Carcinogens (4-Nitrobiphenyl, etc.)*

29 CFR 1910.1004, *alpha-Naphthylamine*

29 CFR 1910.1006, *Methyl chloromethyl ether*

29 CFR 1910.1007, *3'-Dichlorobenzidine (and its salts)*

29 CFR 1910.1008, *bis-Chloromethyl ether*

29 CFR 1910.1009, *beta-Naphthylamine*

29 CFR 1910.1010, *Benzidine*

29 CFR 1910.1011, *4-Aminodiphenyl*

29 CFR 1910.1012, *Ethyleneimine*

29 CFR 1910.1013, *beta-Propiolactone*

29 CFR 1910.1014, *2-Acetylaminofluorene*

29 CFR 1910.1015, *4-Dimethylaminoazobenzene*

29 CFR 1910.1016, *N-Nitrosodimethylamine*

29 CFR 1910.1017, *Vinyl Chloride*

29 CFR 1910.1018, *Inorganic Arsenic*

29 CFR 1910.1025, *Lead*

29 CFR 1910.1027, *Cadmium*

29 CFR 1910.1028, *Benzene*

29 CFR 1910.1044, *1,2-dibromo-3-chloropropane*

29 CFR 1910.1045, *Acrylonitrile*

29 CFR 1910.1047, *Ethylene Oxide*

29 CFR 1910.1048, *Formaldehyde*

29 CFR 1910.1050, *Methylenedianiline*

29 CFR 1910.1051, *1,3-Butadiene*

29 CFR 1910.1052, *Methylene Chloride*

29 CFR 1910.1200, *Hazard Communication*

29 CFR 1910.1450, *Occupational Exposure to Hazardous Chemicals in Laboratories*

29 CFR 1926.21, *Safety Training and Education*

40 CFR 68, *Chemical Accident Prevention Provisions*

48 CFR 970, *DOE Management and Operating Contracts*

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Chapter 7 – Sustainable Pollution Prevention and Waste Minimization

7.1 Introduction

This chapter identifies and consolidates overlapping existing user safety, health, and environmental requirements found in DOE and Federal chemical-related safety and health regulations, Executive Orders, and DOE orders that address ***pollution prevention (P2)*** (see definition) and ***waste minimization*** (see definition) for ***chemicals*** (see definition) and ***chemical products*** (see definition) and new, applicable ***sustainability*** (see definition) requirements. This chapter specifically identifies and consolidates requirements found in the following sources

- Title 42 of the United States Code (USC), *The Public Health and Welfare*;
- Title 40 of the Code of Federal Regulations (CFR), *Protection of Environment*;
- Title 48 of the CFR, *Federal Acquisition Regulations Systems*;
- DOE O 436.1, *Departmental Sustainability* (May 2011); and
- Executive Order (EO) 13693, *Planning for Federal Sustainability in the Next Decade* (March 2015).

This chapter includes links to the sources of those requirements and their citations.

Chemical users' participation in pollution prevention and sustainability arises from their use of chemicals and from their site's procurement, distribution, storage, and disposal of chemicals. Safety and health programs and environmental pollution prevention and sustainability programs are usually mutually beneficial, and their requirements frequently mutually inclusive.

The chemical-related safety, health and environmental requirements and the DOE sustainability goals listed here provide the context for chemical users to incorporate pollution prevention and sustainability into, the planning, execution and evaluation of site activities such as planning, acquisition, operations, waste management and disposal, and to seek continuous improvement in the conduct of such activities. Integrating these into the site environmental management system (EMS), Integrated Safety Management system and Site Sustainability Plan expedites their implementation and demonstrates their mutuality.

This document does not create any new or additional requirements.

7.2 Applicability

The information presented here applies to all locations that use chemicals, chemical products or services that involve the use of chemicals or chemical products. *[NOTE: Throughout this document, the term "chemicals" is used to indicate chemicals or chemical products as described in Glossary Section.]* This chapter is intended only to address health, safety and environmental requirements applicable to chemical user activities. It consolidates the core requirements that all sites must follow when engaged in chemical-related activities.

The requirements included in this chapter come from sources that have different purposes. As a result, some of these requirements may not always be applicable to the work being performed at an individual site or facility. Users are responsible for determining how specific requirements apply to their work and how they are implemented. The reference sources for the requirements included in this chapter can be used to determine the applicability of those requirements to the work being performed.

[NOTE: Because no updates were made since 2011, current (as of 12-31-2015) DOE O 436.1 (including Attachment-1 Contractor Requirements Document) as well as the referenced 48 CFR sections of FAR and DEAR cite the requirements from Executive orders 13423 and 13514, although both EOs were revoked and replaced by EO 13693 on 03-15-2015.]

7.3 Definitions and Acronyms

See Glossary.

7.4 Requirements for Sustainable Pollution Prevention and Waste Minimization Activities

Sources[12]	Consolidated Requirements[10, 11]
	4.1 Hazardous Waste Generator Requirements
RCRA Secs. 3002(b), 3005(h)(1), codified at 42 USC sec. 6922(b), *Waste Minimization* and 6925 (h), *Waste Minimization*, at subsection (1); 40 CFR 264.73 *Operating Record*, at subsection (b)(9); 40 CFR 262.27, *Waste Minimization Certification*	**4.1.1** A chemical user who generates hazardous waste must have a program in place to reduce the volume or quantity and toxicity of such waste to the degree determined by the generator to be economically practicable.
42 USC sec. 6922, *Standards Applicable to Generators of Hazardous Waste*, (a)(6)(B)-(D); 40 CFR 262.41(a)-(b), *Biennial Report*; 40 CFR 264.75, *Biennial Report*; 40 CFR 265.75, *Biennial Report*	**4.1.2** A chemical user who generates hazardous waste is required to submit biennial reports to the EPA Regional Administrator describing: a) efforts undertaken to reduce the volume and toxicity of waste generated; and b) changes in volume and toxicity of waste actually achieved compared with previous years, to the extent that such information is available.
	4.2 Environmental Sustainability Policy
DOE O 436.1, sec 1.	**4.2.1** PURPOSE: Provide requirements and responsibilities for managing sustainability within the Department of Energy (DOE) to: 1) Ensure the department carries out its missions in a sustainable manner that addresses national energy security and global environmental challenges, and advances sustainable, efficient and reliable energy for the future, 2) Institute wholesale cultural change to factor sustainability and ***greenhouse gas (GHG)*** (see definition) reductions into all DOE corporate management decisions, and 3) Ensure DOE achieves the sustainability goals established in its Strategic Sustainability Performance Plan (SSPP) pursuant to applicable laws, regulations and Executive Orders (EO), *[emphasis added]* related performance scorecards, and sustainability initiatives." (DOE Order 436.1, sec. 1)

Sources[12]	Consolidated Requirements[10, 11]
EO 13693, sec. 1	**4.2.2** "Through a combination of more efficient federal operations such as those outlined in this Executive Order, we have the opportunity to reduce agency direct greenhouse gas emissions by at least 40 percent over the next decade... It therefore continues to be the policy of the United States that agencies shall increase efficiency and improve their environmental performance... To improve environmental performance and federal sustainability, priority should first be placed on reducing energy use and cost, then on finding renewable or alternative energy solutions... Employing this strategy for the next decade calls for expanded and updated federal environmental performance goals with a clear overarching objective of reducing greenhouse gas emissions across federal operations and the federal supply chain". (EO 13693 sec. 1)
	4.3 Sustainability and Environmental Management Systems
DOE O 436.1, sec. 4.c (3)	**4.3.1** DOE sites must use EMS(s) as a platform for Site Sustainability Plan (SSP) implementation and programs with **objectives and measurable targets that contribute to the Department meeting its sustainability goals** ***[****emphasis added]*. Sites must maintain their EMS(s) as being certified to or conforming to the International Organization for Standardization's (ISO) 14001:2004 in accordance with the accredited registrar provisions of the International Standard" or approved self-declaration instructions. (DOE O 436.1, sec. 4.c.(3))
DOE O 436.1 Attachment 1; *Contractor Requirements Document* (CRD), sec. 2.b	**4.3.2** "Contractors must develop and implement an environmental management system (EMS) that is certified to or conforms with the International Organization for Standardization's (ISO) 14001:2004…. Site sustainability goals must be integrated into the EMSs." (DOE O 436.1, CRD, sec. 2.b.)
48 CFR 23.9, *Contractor Compliance with Environmental Management Systems* [*Federal Acquisition Regulation* (FAR)]	**4.3.3** "Agencies shall implement environmental management systems (EMS) at all appropriate organizational levels. Where contractor activities affect an agency's environmental management aspects, EMS requirements shall be included in contracts to ensure proper implementation and execution of EMS roles and responsibilities." (48 CFR Subpart 23.902(a))

Sources[12]	Consolidated Requirements[10, 11]
EO 13693, sec. 7(i)	**4.3.4** To ensure successful implementation of the policy established in EO 13693, DOE shall continue implementation of formal Environmental Management Systems (EMS) at organizational levels where those systems have proven effective and deploy new EMSs where appropriate.
	4.4 Environmental Sustainability Planning Goals
DOE O 436.1, sec. 4.a(1); DOE O 436.1 CRD, sec. 2.a; EO 13693, Sec. 3(j); CEQ Implementing Instructions for EO 13693, sec. III.F. *Waste and Pollution Prevention;* 2015 SSPP, Goal 7, *Pollution Prevention and Waste Reduction*	**4.4.1** The following DOE pollution prevention and waste reduction goals are relevant to chemical safety: a) Prevent or reduce pollution at the source whenever feasible; b) Pollutants and waste that cannot be prevented through source reduction will be diverted from entering the waste stream through environmentally safe and cost-effective reuse or recycling to the greatest extent practicable. c) As prescribed by EO 13693, continue efforts to divert at least 50 percent of non-hazardous solid waste and construction and demolition (C&D) debris. d) Reducing or minimizing the quantity of toxic and hazardous chemicals and materials acquired, used, or disposed of, particularly where such reduction will assist the agency in pursuing greenhouse gas emission reduction targets established in section 2 of EO 13693. Special focus should be on chemicals, particularly refrigerants and other specialty gases that have global warming potentials much higher than carbon dioxide (CO2). e) Reporting in accordance with the requirements of sections 301 through 313 of the Emergency Planning and Community Right-to-Know Act of 1986 (42 USC 11001 through 11023). [EO 13693, Sec. 3. (j) (i)]
	4.5 Sustainable Acquisition
DOE 2015 SSPP, Goal 6, *Sustainable Acquisition* EO 13693, sec. 3(i); CEQ Implementing Instructions for EO 13693, Sec. III.E (*Acquisition and Procurement*); 48 CFR 23.4; 42 USC 6962(i)(2)	**4.5.1** To achieve the goals of section 2 (Agency Greenhouse Gas Emission Reductions) of EO 13693, DOE shall promote sustainable acquisition and procurement by ensuring that environmental performance and sustainability factors are included to the maximum extent practicable for all applicable procurements in the planning, award, and execution phases of the acquisition, with purchase preference for: (a) Bio-Preferred and biobased designated products designated by the United States Department of Agriculture, (b) Sustainable products identified by EPA programs including: (i) Significant New Alternative Policy (SNAP) chemicals or other alternatives to ozone-depleting substances and high global warming potential hydrofluorocarbons, where feasible, as identified by SNAP; and (ii) Safer Choice labeled products (chemically intensive products that contain safer ingredients).

Sources[12]	Consolidated Requirements[10, 11]
48 CFR 970.5223-7, *Sustainable Acquisition Program* [*Department of Energy Acquisition Regulation* (DEAR); applicable to M&Os]; 48 CFR 952.223-78, *Sustainable Acquisition Program* [*Department of Energy Acquisition Regulation* (DEAR); applicable to non-M&O other contractors]	**4.5.2** Pursuant to EO 13423 and EO 13514, the Department of Energy "is committed to managing its facilities in an environmentally preferable and sustainable manner that will promote the natural environment and protect the health and well-being of its Federal employees and contractor service providers. In the performance of work under this contract, the Contractor shall provide its services in a manner that promotes the natural environment, reduced greenhouse gas emissions, and protects the health and well-being of federal employees, contract service providers, and visitors." (48 CFR Section 970.5223-7 and 48 CFR Section 970.5223-78 stating language that must be inserted into appropriate contracts) (spelling errors corrected) *[NOTE: Because no updates were made since 2011, referenced 48 CFR sections of FAR and DEAR (current, as of 12/31/2015) cite the requirements from EO 13423 and EO 13514, although both EOs were revoked and replaced by EO 13693 on March 15, 2015]*
	4.6 *Emergency Planning and Community Right-to-Know Act EPCRA* (see definition)
48 CFR Subpart 23.10, *Federal Compliance with Right-to-Know Laws and Pollution Prevention Requirements*; (Federal Acquisition Regulation) 40 CFR Part 372, Subpart B *Reporting Requirements Pollution Prevention Act;* 42 USC 13106, *Source Reduction and Recycling Data Collection*, at Subsections (a) and (b)	**4.6.1** 48 CFR Subsection 23.1004(a) requires federal facilities to comply with the emergency planning and toxic release reporting requirements in EPCRA and the Pollution Prevention Act (PPA) and the toxic chemical and hazardous substance release and use reduction goals of EO 13423. 48 CFR Subsection 23.1004 (b) states that: "Pursuant to EPCRA, PPA, E.O. 13423, and any agency implementing procedures, every new contract that provides for performance on a federal facility shall require the contractor to provide information necessary for the federal agency to comply with…" the EPCRA and PPA reporting requirements and the toxic chemical, and hazardous substance release and use reduction goals of the EO. [See the NOTE for Section 4.5.2 above]

Sources[12]	Consolidated Requirements[10, 11]
CEQ Implementing Instruction for EO 13693, Sec. III.F; EO 13693, sec. 3(j)(i)	**4.6.2 Reporting in accordance with the Emergency Planning and Community Right-to-Know Act and the Pollution Prevention Act:** (1) EPCRA reporting. To advance waste prevention and pollution prevention by reporting in accordance with the requirements of section 301 through 313 of the Emergency Planning and Community Right-to-know Act of 1986 (EPCRA) (42 USC 11001 through 11023), each agency shall continue to comply with the provisions set forth in sections 301 through 313 of EPCRA, as amended, in light of applicable EPA guidance, and without regard to the Standard Industrial Classification (SIC) or North American Industrial Classification System (NAICS) delineations. Each agency reporting under EPCRA section 313 shall do so using Internet reporting as provided in EPA's EPCRA section 313 guidance. The Internet reporting includes elements from the Pollution Prevention Act of 1990 section 6607 (42 USC 13106). (2) Contractor reporting. In addition, as required in section 3(j)(i) of the EO 13693, in contracts providing for contractor performance at Federal facilities, each agency shall include a requirement that the contractor provide the information needed by the Federal facility to comply with EPCRA and the EO. See EPA's website on EPCRA at: http://www2.epa.gov/epcra.
40 CFR 372.22 to 372.38; 42 USC 13106	**4.6.3** Each owner or operator of a facility who is required to file an annual toxic chemical release form under 42 USC 11023, Toxic Chemical Release Form, shall include a source reduction and recycling report for the preceding calendar year for the toxic chemicals on the report. (Reporting requirements are threshold-driven.) *[NOTE: The specific chemical identity of Trade Secrets may be withheld if the generic class or category of the hazardous chemical, extremely hazardous substance, or toxic chemical is provided in its place.]*

7.5 Source Documents

DOE O 436.1, *Departmental Sustainability*, *05-02-2011*. This Order cancels DOE O 450.1A, *Environmental Protection Program*, and DOE O 430.2B, *Departmental Energy, Renewable Energy and Transportation Management.* [NOTE: Last updated 2011; references EO 13423 and EO 13514]

DOE Strategic Sustainability Performance Plan (SSPP), developed annually pursuant to Section 14 of EO 13693. Latest version available at http://energy.gov/sites/prod/files/2015/11/f27/DOE-SSPP-2015.pdf

Executive Order 13514, *Federal Leadership in Environmental, Energy, and Economic Performance, 10-8-2009* [NOTE: Revoked and replaced by EO 13693 on 3-19-2015]

Executive Order 13423, *Strengthening Federal Environmental, Energy, and Transportation Management,* 01-24-2007 [NOTE: Revoked and replaced by EO 13693 on 3-19-2015]

Executive Order 13693, Planning for Federal Sustainability in the Next Decad*e, 03-19-2015*

The White House Council on Environmental Quality, *Implementing Instructions for Executive Order 13693 Planning for Federal Sustainability in the Next Decade, 06/10/2015*

The Resource Conservation and Recovery Act (RCRA) (42 USC sections 6901 to 6992k)

The Pollution Prevention Act of 1990 (PPA) (42 USC sections 13101 to 13109)

Pollution Prevention Act; 42 USC 13106, (a) and (b) *Source Reduction and Recycling Data Collection* at subsections (a) and (b)

The Emergency Planning and Community Right-to-Know Act (EPCRA) (42 USC sections 11001 to 11050)

42 USC sec. 6922(b), *Waste Minimization*, and 6925 (h), *Waste Minimization*

42 USC sec. 6922, *Standards Applicable to Generators of Hazardous Waste*, (a)(6)(C)-(D)

42 USC 6962(i), *Procurement Program* at subsection (2)

40 CFR 262.27, *Waste Minimization Certification*

40 CFR 262.41, *Biennial Reports Report for Large Quantity Generators*, at subsection (a) – (b)

40 CFR 264.73, *Operating Record*, at subsection (b)(9)

40 CFR 264.75, *Biennial Report*

40 CFR 265.75, *Biennial Report*

40 CFR 372.22 to 372.38, *Reporting Requirements*

48 CFR Subpart 23.4, *Use of Recovered Materials and Biobased Products*

48 CFR Subpart 23.9, *Contractor Compliance with Environmental Management Systems*

48 CFR Subpart 23.10, *Federal Compliance with Right-to-Know Laws and Pollution Prevention Requirements*

48 CFR 952.223-78, *Sustainable Acquisition Program*

48 CFR 970.5223-7 *Sustainable Acquisition Program*

Chapter 8 – Chemical Emergency Management

8.1 Introduction

This chapter identifies and consolidates existing user safety and health requirements and National Standards found in DOE and Federal chemical related safety and health regulations that address emergency management for facilities with activities involving ***chemicals*** (see definition) and ***chemical products*** (see definition). State and local codes and requirements are not included. This chapter consolidates potential requirements found in NFPA publications, and requirements found in OSHA standards, and certain EPA regulations and DOE Orders, including technical standards that may be made mandatory by their specific reference within a DOE Regulation, or Order. It specifically consolidates requirements and National Standards found in OSHA regulations 29 CFR Section 1910.38, CFR Section 1910.119, 29 CFR Section 1910.120, 29 CFR Section 1910.1200, and 29 CFR Section 1910.1450; EPA regulations at 40 CFR Part 355 and 40 CFR Part 68; NFPA Standards 471, 472, and 1620; and DOE O 151.1D.

This chapter is intended to list chemical-related safety and health requirements and to consolidate those that are overlapping or duplicative. The list of requirements includes pointers to the sources of those requirements.

This document does not create any new or additional requirements.

8.2 Applicability

The information presented here applies to all locations that use chemicals or chemical products. *[NOTE: Throughout this document, the term "chemicals" is used to indicate chemicals or chemical products as described in Glossary Section.]* This chapter consolidates existing core safety and health requirements that all sites must follow when engaged in chemical-related activities.

The requirements included in this chapter come from sources that have different safety purposes. As a result, some of these requirements may not always be applicable to the work being performed at an individual site or facility. Users are responsible for determining how specific requirements apply to their work and how they are implemented. The reference sources for the requirements included in this chapter can be used to determine the applicability of those requirements to the work being performed.

8.3 Definitions and Acronyms

See **Glossary.**

8.4 Requirements for Chemical Emergency Management

Sources[12]	Consolidated Requirements[10, 11]
	4.1 Emergency Response Plan
DOE O 151.1D, Attachment 3, sec. 1(c); 29 CFR 1910.38(a); 29 CFR 1910.119(n); 29 CFR 1910.120(q)	An emergency response plan shall be prepared that documents the emergency management program and the implementation procedures to handle anticipated emergencies, including operational emergencies, prior to the commencement of emergency response operations.
40 CFR 68.95(b)	**4.1.1** The plan, which shall be in writing, shall include procedures for handling releases and shall be available for inspection and copying by employees and their representatives.
29 CFR 1910.38(a)	**4.1.2** The plan shall cover the designated actions employers and employees must take to ensure employee safety from fire and other emergencies.
DOE O 151.1D, Attachment 3e	**4.1.3** All hazards survey (i.e., qualitative examination) must be used to identify the conditions to be addressed by the comprehensive emergency management program. Much of the hazards survey should already have been done in the course of meeting other DOE and federal agency requirements.
DOE O 151.1D; Attachment 3e, Attachment 4, sec. 2	**4.1.4** A hazardous material screening process must identify specific hazardous materials and quantities that, if released, could produce impacts consistent with the definition of an Operational Emergency. The potential release of these materials to the environment requires further analysis in an Emergency Planning Hazards Assessment (EPHA). The release of hazardous materials less than the quantities listed below does not require quantitative analysis in an EPHA.
DOE O 151.1D, Attachment 3e	**4.1.4.1** All chemicals in a facility or activity with known or suspected toxic properties must be subjected to a hazardous material screening process.

Sources[12]	Consolidated Requirements[10, 11]
DOE O 151.1D, Attachment 3(1)a; NFPA 1620[39]; 29 CFR 1910.38(a); 29 CFR 1910.120(q)(2); 40 CFR 68.95(a)(1)(i)	**4.1.5** Elements of an emergency response plan.[31] The emergency response shall address, as a minimum, the following areas: • Pre-emergency planning and coordination with outside parties such as State, Tribal, and local agencies • Personnel roles including Incident Commander, lines of authority, training/competencies, and internal communications (see NFPA 471, 6.4 for more detailed requirements for internal communications) • Names or regular job titles of persons or departments who can be contacted for further information or explanation of duties under the plan [29 CFR Subpart 1910.38(a)] • Emergency recognition including criteria for quickly determining if an event is an Operational Emergency, response levels (see NFPA 471, 4.2.2 for more detailed requirements on training/competencies and 6.4 for more detailed requirements for internal communications.) and prevention • Emergency shutdown procedures and responsibilities [29 CFR Subpart 1910.38(a)] • Re-entry planning shall include contingency planning to ensure the safety of re-entry personnel, such as planning for the rescue of re-entry teams • Continued operation of critical plant function • Safe distances and places of refuge • Site security and control • Evacuation routes and procedures, including accounting for all employees after the emergency evacuation has been completed • Decontamination (see NFPA 471, Chapter 9 for more detailed requirements) • Rescue and emergency medical treatment and first aid • Emergency alerting, reporting, and response procedures [29 CFR Subpart 1910.38(a)], including prompt initial notification of workers, emergency response personnel, and response organizations, including DOE elements and State, Tribal, local organizations, and the public with continued effective communications throughout emergency as part of a pre-established Emergency Public Information Program • PPE and emergency equipment • Review and update the emergency response plan (see NFPA 471, 4.2.1)

[31] NFPA 471, Chapter 6 requires site safety considerations including a personnel accountability system, provisions for rest and rehabilitation for responders, the elimination of all ignition sources, and the application of control zones.

Sources[12]	Consolidated Requirements[10, 11]
29 CFR 1910.38(f); 40 CFR 68.95(a)(4)	**4.1.6 Plan Review**. The employer shall review the plan with each employee covered by the plan when the plan is developed; whenever the employee's responsibilities or designated actions under the plan change; and whenever the plan is changed.
	4.1.7 Posting.
29 CFR 1910.38(b)	**4.1.7.1** The written plan shall be kept at the workplace and made available for employee review.
29 CFR 1910.1200(g)(2)(vi)	**4.1.7.2** SDSs shall contain emergency procedures.
	4.2 Training
DOE O 151.1D, Attachment 3, Sec 5 (a)(b)(c); 29 CFR 1910.1200(h)(3)(iii); 29 CFR 1910.1450(f)(4)(i)(C); 29 CFR 1910.120(q)(6); 40 CFR 68.95(a)(3)	• Training and other emergency information on site-specific conditions and hazards shall be made available to offsite personnel who may be required to participate in response to an emergency at a DOE or National Nuclear Security Administration (NNSA) site or facility. • To ensure the competencies of all responders, training shall be based on the duties and function to be performed by each responder of an emergency response organization. The skill and knowledge levels required for all new responders shall be conveyed to them through training before they are permitted to take part in actual emergency response to an incident. Employees who participate, or who are expected to participate, in emergency response, shall be trained as described below.
NFPA 472, Chapter 4[32]; 29 CFR 1910.120(q)(6)(i)	**4.2.1 First Responder - Awareness Level** (See definition, of this and other levels of emergency personnel). Shall have sufficient training, or have had sufficient experience, to objectively demonstrate competencies that include, but are not limited to: • An understanding of what hazardous substances are and the risks associated with them in an incident • An understanding of the potential outcomes associated with an emergency created when hazardous substances are present • The ability to recognize the presence of hazardous substances in an emergency • The ability to identify the hazardous substances • An understanding of the role of the first responder awareness individual in the employer's emergency response plan, including site security and control and the DOT Emergency Response Guidebook • The ability to realize the need for additional resources and to make appropriate notifications to the incident response communication center

[32] Details on these and other required competencies are found in NFPA 472, Chapter 4.

Sources[12]	Consolidated Requirements[10, 11]
NFPA 472, Chapter 5[33]; 29 CFR 1910.120(q)(6)(ii)	**4.2.2 First Responder - Operations Level.** In addition to the competencies listed for the awareness level, the employer shall certify that the first responders at the operational level have received at least eight hours of training or have had sufficient experience to objectively demonstrate competencies that include, but are not limited to: • Knowledge of the basic hazard and risk assessment techniques • Know how to select and use proper personal protective equipment provided to the first responder operational level • An understanding of basic hazardous materials terms • Know how to perform basic control, containment, and confinement operations within the capabilities of the resources and personal protective equipment available with their unit • Know how to implement basic decontamination procedures • An understanding of the relevant standard operating procedures and termination procedures
NFPA 472, Chapter 6[34]; 29 CFR 1910.120(q)(6)(iii)	**4.2.3 Hazardous Materials Technician.** The employer shall certify that the hazardous materials technicians have received at least 24 hours of training equal to the first responder operations level and in addition have competencies including, but not limited to: • Knowing how to implement the employer's emergency response plan • Knowing the classification, identification and verification of known and unknown materials by using field survey instruments and equipment • Being able to function within an assigned role in the Incident Command System • Knowing how to select and use proper specialized chemical personal protective equipment provided to the hazardous materials technician • Understanding hazard and risk assessment techniques • Being able to perform advance control, containment, and confinement operations within the capabilities of the resources and personal protective equipment available with the unit. Understanding and being able to implement decontamination procedures • Understand termination procedures

[33] Details on these and other required competencies are found in NFPA 472, Chapter 5.
[34] Details on these and other required competencies are found in NFPA 472, Chapter 6

Sources[12]	Consolidated Requirements[10, 11]
29 CFR 1910.120(q)(6)(iv)	**4.2.4** Hazardous materials specialists shall have received at least 24 hours of training equal to the technician level and in addition have competency in the following areas and the employer shall so certify: • Know how to implement the local emergency response plan • Understand classification, identification and verification of known and unknown materials by using advanced survey instruments and equipment • Know the state emergency response plan • Be able to select and use proper specialized chemical personal protective equipment provided to the hazardous materials specialist • Understand in-depth hazard and risk techniques • Be able to perform specialized control, containment, and confinement operations within the capabilities of the resources and personal protective equipment available • Be able to determine and implement decontamination procedures • Have the ability to develop a site safety and control plan • Understand chemical, radiological and toxicological terminology and behavior
NFPA 472, Chapter 9	**4.2.5** Hazardous materials branch officer must demonstrate competencies including, but not limited to: • Ability to analyze the magnitude of the problem and estimate the potential outcomes • Know how to plan a response taking into account the abilities of the available personnel and equipment • Ability to implement a response that will improve the outcomes consistent with standard operating procedures and the local emergency response plan • Know how to evaluate the on-going progress of the plan implementation and to adjust the plan accordingly • Know how and when to terminate the incident, including critiques, debriefings, and reports
NFPA 472, Chapter 10	**4.2.6** The safety officer (also known as Hazardous Materials Branch Safety Officer in NFPA) must demonstrate competencies including, but not limited to the ability to: • Determine the magnitude of the safety problems involved in the incident • Identify the safety considerations for the response plan • Monitor the safety of personnel involved in the response • Evaluate the progress of the plan implementation as to deviations from safety considerations • Upon incident termination, provide reports, debriefings, and critique of safety

Sources[12]	Consolidated Requirements[10, 11]
NFPA 472, Chapter 7[35]; 29 CFR 1910.120(q)(6)(v)	**4.2.7 Incident Commander.** The employer shall certify that the incident commanders have received at least 24 hours of training equal to the first responder operations level and, in addition, have competencies including, but not limited to: • Know and be able to implement the employer's incident command system • Know how to implement the employer's emergency response plan • Know and understand the hazards and risks associated with employees working in chemical protective clothing • Know how to implement the local emergency response plan • Know of the state emergency response plan and of the Federal Regional Response Team • Know and understand the importance of decontamination procedures
NFPA 472, Chapters 11,12, and 13[36]; 29 CFR 1910.120(q)(4)	**4.2.8** Skilled support personnel shall be given an initial briefing at the site before their participation in any emergency response. The initial briefing shall include instruction in the wearing of appropriate personal protective equipment, what chemical hazards are involved, and what duties are to be performed. All other appropriate safety and health precautions provided to the employer's own employees shall be used to assure the safety and health of these personnel.
29 CFR 1910.38(e)-(f)	**4.2.9 Employee Protection Training and Drills.**
DOE O 151.1D, Attachment 3, sec. 5a	**4.2.9.1** Employee information, training, and drills shall include measures employees can take to protect themselves from exposure to chemicals in emergencies, including specific emergency procedures the employer has implemented to protect employees. This training is required when they are employed, when their expected actions change, or when the emergency plan changes.
DOE O 151.1D, Attachment 3, sec. 5d	**4.2.9.2** Drills shall provide supervised, "hands-on" training for members of emergency response organizations.
29 CFR 1910.38(e)-(f)	**4.2.9.3** Before implementing the emergency action plan, the employer shall designate and train a sufficient number of persons to assist in the safe and orderly emergency evacuation of employees.

[35] Details on these and other required competencies are found in NFPA 472, Chapter 7.

[36] NFPA 472 identifies three such skilled support personnel and specifies, in detail, their required competencies: 1) tank car specialist (Chapter 11), 2) cargo tank specialist (Chapter 12), and 3) intermodal tank specialist (Chapter 13). In general, they must be able to analyze the incident, plan the response, and implement the plan.

Sources[12]	Consolidated Requirements[10, 11]
29 CFR 1910.120(q)(7)	**4.2.10** Trainers shall have either: • Satisfactorily completed a training course for teaching the subjects they are expected to teach, such as the courses offered by the U.S. National Fire Academy, OR • The training, academic credentials, or instructional experience necessary to demonstrate competent instructional skills and a good command of the subject matter of the courses they are to teach
29 CFR 1910.120(q)(8)	**4.2.11 Refresher training**
DOE O 151.1D, Attachment 3, sec. 5b (2), sec. 5b (3) b; 29 CFR 1910.120(q)(8)(i)	**4.2.11.1** Those employees who are trained in accordance with paragraph 4.2 of this chapter shall receive annual refresher training of sufficient content and duration to maintain their competencies, or shall demonstrate competency in those areas at least yearly.
29 CFR 1910.120(q)(8)(ii)	**4.2.11.2** A statement shall be made of the training (and retraining) or competency, and, if a statement of competency is made, the employer shall keep a record of the methodology used to demonstrate competency.
DOE O 151.1D, Attachment 3, sec. 5d (1) and 5d (2), Attachment 3 sec. 10b	**4.2.12 Exercises** • At a minimum, each site or facility shall conduct building evacuation exercises consistent with Federal regulations [e.g., 41 CFR Sections 102-74.360] local ordinances, or NFPA standards. Exercises shall be conducted as often as needed to ensure that employees are able to safely evacuate their work area • For each site or facility, as applicable, the organization responsible for communications with DOE Headquarters, operations/field offices, and offsite agencies shall test communications systems at least annually or as often as needed to ensure that communications systems are operational
	4.3 Implementation
DOE O 151.1D, Attachment 3, sec. 1(c), 1(d), 1(f)	The emergency management program must be documented in an emergency plan that also describes the provisions for response to an operational emergency. Emergency Plan Implementing Procedures must be developed to describe how emergency plans must be implemented.
DOE O 151.1D, Attachment 3, sec. 9	**4.3.1** Minimize the consequences of all emergencies involving or affecting departmental facilities and activities (including transportation operations and activities); protect the health and safety of all workers and the public from hazards associated with DOE/NNSA operations and those associated with decontamination, decommissioning, and environmental restoration; prevent damage to the environment and promote federal interagency emergency plans.

Sources[12]	Consolidated Requirements[10, 11]
DOE O 151.1D, Attachment 3, sec. 3c, Attachment 3, sec. 4; 29 CFR 1910.120(q)(3)(i)	**4.3.2** The senior emergency response official responding to an emergency shall become the Incident Commander (IC). All emergency responders and their communications shall be coordinated and controlled through the IC, assisted by the senior official present for each employer.
29 CFR 1910.120(q)(3)(ii) and (iii)	**4.3.3** The IC shall identify, to the extent possible, all hazardous substances or conditions present and shall address as appropriate site analysis, use of engineering controls, maximum exposure limits, hazardous substance handling procedures, and use of any new technologies. The IC shall also implement appropriate emergency operations and ensure that the personal protective equipment worn is appropriate for the hazards encountered.
29 CFR 1910.120(q)(3)(iv)	**4.3.4** Employees engaged in emergency response and exposed to hazardous substances, which present an inhalation hazard or potential inhalation hazard, shall wear positive pressure SCBA while engaged in emergency response, until such time that the IC determines, through the use of air monitoring, that a decreased level of respiratory protection will not result in hazardous exposures to employees.
DOE O 151.1D, Attachment 3, sec. 9, Attachment 4, sec. 14b	**4.3.5** All individuals involved in re-entry shall receive a hazards/safety briefing prior to emergency response activities consistent with federal, state, and local laws and regulations.
29 CFR 1910.120(q)(3)(v)	**4.3.6** The IC shall limit the number of emergency response personnel at the emergency site, in those areas of potential or actual exposure to incident or site hazards, to those who are actively performing emergency operations. However, operations in hazardous areas shall be performed using the "buddy" system in groups of two or more.
29 CFR 1910.120(q)(3)(vi)	**4.3.7** Backup personnel shall be standing by with equipment ready to provide assistance or rescue. Qualified basic life-support personnel, at a minimum, shall also be standing by with medical equipment and transportation capability.
29 CFR 1910.120(q)(3)(vii)	**4.3.8** The IC shall designate a safety officer who is knowledgeable in the operations being implemented at the emergency response site, with specific responsibility for identifying and evaluating hazards and for providing direction with respect to the safety of operations for the emergency at hand.
29 CFR 1910.120(q)(3)(viii)	**4.3.9** When activities are judged by the safety officer to pose an Immediate Danger to Life or Health (IDLH) or to involve an imminent danger condition, the safety officer shall have the authority to alter, suspend, or terminate those activities. The safety official shall immediately inform the IC of any actions needed to correct these hazards at the emergency scene.

Sources[12]	Consolidated Requirements[10, 11]
29 CFR 1910.120(q)(3)(x)	**4.3.10** When deemed necessary by the safety officer for meeting the tasks at hand, approved SCBAs may be used with approved cylinders from other approved self-contained, compressed-air breathing apparatus provided that such cylinders are of the same capacity and pressure rating. All compressed air cylinders used with self-contained breathing apparatus shall meet DOT and NIOSH criteria.
DOE O 151.1D, Attachment 3, sec. 11b (1), sec. 12; 40 CFR 355.42(a); 40 CFR 355.42(b)	**4.3.11** The owner or operator of a facility subject to this section shall immediately notify the community emergency coordinator for the local emergency planning committee (LEPC) of any area likely to be affected by the release and the State emergency response commission of any state likely to be affected by the release. If there is no LEPC, notification shall be provided under this section to relevant local emergency response personnel. *[EXCEPTION: An owner or operator of a facility from which there is a transportation-related release may meet the requirements of this section by providing the information indicated below in paragraph 4.3.11.1 to the 911 operators, or, in the absence of a 911 emergency telephone number, to the telephone operator. A transportation-related release means a release during transportation or storage incident to transportation if the stored substance is moving under active shipping papers and has not reached the ultimate consignee.]*
DOE O 151.1D, Attachment 3, sec. 11a (6); 40 CFR 355.40(a)	**4.3.11.1** The notice required under this section shall include the following to the extent known at the time of notification and so long as no delay in notification of emergency response results: a) The chemical name or identity of any substance involved in the release b) An indication of whether the substance is an extremely hazardous substance c) An estimate of the quantity of any such substance that was released into the environment d) The time and duration of the release e) The medium or media into which the release occurred f) Any known or anticipated acute or chronic health risks associated with the emergency and, where appropriate, advice regarding medical attention necessary for exposed individuals g) Proper precautions to take as a result of the release, including evacuation (unless such information is readily available to the community emergency coordination pursuant to the emergency plan) h) The names and telephone number of the person or persons to be contacted for further information.

Sources[12]	Consolidated Requirements[10, 11]
CFR 355.40(b)	**4.3.11.2** As soon as practicable after a release which requires notification under 4.3.11 herein, such owner or operator shall provide a written follow-up emergency notice (or notices, as more information becomes available) setting forth and updating the information required under paragraph 4.3.11.1 of this section, and including additional information with respect to: a) Actions taken to respond to and contain the release, b) Any known or anticipated acute or chronic health risks associated with the release, and c) Where appropriate, advice regarding medical attention necessary for exposed individuals.
DOE O 151.1D, Attachment 3, sec. 12, Attachment 4, sec. 13	**4.3.12** Public Information • During the response phase of an emergency, the emergency public information office shall cooperatively ensure that an adequate public information program is established and maintained, commensurate with site hazards, to ensure that information can be provided to the public and the media during an emergency. The emergency public information program shall be adequately staffed with personnel trained to serve as spokesperson and news writer, and to provide support in media services, public inquiry, media inquiry, Joint Information Center management and administrative activities, and media monitoring. Persons with technical expertise about the emergency and with spokesperson training shall also be assigned to the emergency public information staff • In situations involving classified information, the Department will provide sufficient unclassified information to explain the emergency response and protective actions required for the health and safety of workers and the public • An information officer shall be assigned to the emergency public information response team involved in a significant offsite response deployment • A Headquarters official or team shall provide support to the affected Program Offices, Emergency Management Team, or requesting operations or field office, as appropriate • The Director of Public Affairs and the Headquarters Emergency Manager shall be informed of all DOE or NNSA emergency public information actions • Initial news releases or public statements shall be approved by the DOE or NNSA official responsible for emergency public information review and dissemination. Following initial news releases and public statements, updates shall be coordinated with the Director of Public Affairs • An emergency public information communications system shall be established among Headquarters, operations or field office, and on-scene locations

Sources[12]	Consolidated Requirements[10, 11]
	4.3.12 Public Information (Continued) • In situations involving classified information, the Department will provide sufficient unclassified information to explain the emergency response and protective actions required for the health and safety of workers and the public • An information officer shall be assigned to the emergency public information response team involved in a significant offsite response deployment • A Headquarters official or team shall provide support to the affected Program Offices, Emergency Management Team, or requesting operations or field office, as appropriate • The Director of Public Affairs and the Headquarters Emergency Manager shall be informed of all DOE or NNSA emergency public information actions • Initial news releases or public statements shall be approved by the DOE or NNSA official responsible for emergency public information review and dissemination. Following initial news releases and public statements, updates shall be coordinated with the Director of Public Affairs • An emergency public information communications system shall be established among Headquarters, operations or field office, and on-scene locations
	4.4 Additional Requirements for Significant Quantities of Hazardous Chemicals
DOE O 151.1D, Attachment 4 sec. 2; 29 CFR 1910.119(e)(1)(3); 40 CFR 68.95; 40 CFR 355.10	The Operational Emergency Hazardous Material Program adds to the base program. If required, based on the findings of the hazards survey, DOE or NNSA sites and facilities must establish and maintain a quantitative EPHA. The EPHA must be used to define the provisions of the Operational Emergency Hazardous Material Program to ensure the program is commensurate with the hazards identified.
DOE O 151.1D, Attachment 3, sec.8, Attachment 4, sec. 8	**4.4.1** Emergency Classification. Provisions shall be established to categorize and classify emergency events. Events shall be classified based on the potential severity of the consequences, as detailed in Chapter V of DOE O 151.1D.
DOE O 232.2A; 40 CFR 355, Subpart B	**4.4.2 Emergency Planning Notification**
DOE O 151.1D, Attachment 3, sec. 7; 40 CFR 355.20(a)	**4.4.2.1** The owner or operator of a facility subject to this section shall notify the State Emergency Response Commission or Local Emergency Planning Committee that it is a facility subject to the emergency planning requirements of this part. Such notification shall be within 60 days after a facility first becomes subject to the requirements of this section.
40 CFR 68.12(b)(3) 40 CFR 355.20(b)	**4.4.2.2** The owner or operator of a facility subject to this section shall designate a facility representative who will participate on the LEPC as a facility emergency response coordinator.

Sources[12]	Consolidated Requirements[10, 11]
40 CFR 355.20(c)	**4.4.2.3** The owner or operator of a facility subject to this section shall inform the LEPC of any changes occurring at the facility which may be relevant to emergency planning.
40 CFR 355.20(d)	**4.4.2.4** Upon request of the local emergency planning committee, the owner or operator of a facility subject to this section shall promptly provide to the LEPC any information necessary for development or implementation of the local emergency plan.
40 CFR 355.13	**4.4.3 Calculation of Threshold Planning Quantities (TPQs) for solids and mixtures**
40 CFR 355.13	**4.4.3.1** If a container or storage vessel holds a mixture or solution of an extremely hazardous substance, the concentration of extremely hazardous substance, in weight percent (greater than 1 percent), shall be multiplied by the mass (in pounds) in the vessel to determine the actual quantity of extremely hazardous substance therein.
40 CFR 355.15	**4.4.3.2** Extremely hazardous substances that are solids are subject to either of two TPQs, as shown in Appendices A and B of 40 CFR Part 355 (e.g., 500 or 10,000 pounds). The lower quantity applies only if the solid exists in powdered form and has a particle size less than 100 microns[37]; or is handled in solution[38] or in molten form[39]; or meets the criteria for an NFPA rating of 2, 3, or 4 for reactivity. If the solid does not meet any of these criteria, it is subject to the upper (10,000-pound) TPQ, as shown in Appendices A and B of 40 CFR Part 355.
DOE O 151.1D, Attachment 4, sec. 10	**4.4.4** Provisions shall be established to adequately assess the potential or actual on- and offsite consequences of an emergency. Consequence assessments shall (a) be timely throughout the emergency; (b) be integrated with the event classification and protective action process; (c) incorporate monitoring of specific indicators and field measurements; and (d) be coordinated with federal, state, local, and tribal organizations.

[37] The 100-micron level may be determined by multiplying the weight percent of solid with a particle size less than 100 microns in a particular container by the quantity of solid in the container.

[38] The amount of solid in solution may be determined by multiplying the weight percent of solid in the solution in a particular container by the quantity of solution in the container.

[39] The amount of solid in molten form must be multiplied by 0.3 to determine whether the lower threshold planning quantity is met.

Sources[12]	Consolidated Requirements[10, 11]
DOE O 151.1D, Attachment 3, sec. 14(2)	**4.4.5** A formal exercise program shall be established to validate all elements of the emergency management program over a multi-year period. Each exercise shall have specific objectives and shall be fully documented. Exercises shall be evaluated using an established critique process. Corrective actions shall be identified and incorporated into the program.
DOE O 151.1D, Attachment 3, sec. 11	**4.4.6** Provisions shall be established for prompt initial notification of workers and emergency response personnel and organizations, including appropriate DOE and NNSA elements and other federal, state, tribal, and local organizations. Provisions shall also be established for continuing effective communication among the response organizations throughout an emergency.
DOE O 151.1D, Attachment 3, sec. 11(6)	**4.4.6.1** Adherence to notification and reporting requirements shall be demonstrated in all emergency management exercises.
DOE O 151.1D, Attachment 3, sec. 11; sec. 11a(1)(2)	**4.4.6.2** Initial notifications must be made promptly, accurately, and effectively to all appropriate stakeholders. Follow-up notifications must be made when conditions change and when the Operational Emergency is terminated. DOE sites/facilities/activities must accomplish the following: • Provide prompt emergency notifications to emergency response personnel and response organizations • DOE site/facility/activity will provide immediate notification and protective actions to affected employees no later than 10 minutes after the protective actions have been identified in accordance with the emergency management plan and related procedures
DOE O 151.1D, Attachment 3, sec. 11a (4); sec. 12	**4.4.6.3** Notify state and local officials and the DOE or NNSA Field and Headquarters Emergency Operations Centers within 15 minutes of categorization and all other organizations within 30 minutes of the declaration or termination of an Operational Emergency.
DOE O 151.1D, Attachment 3, sec. 11a (5)	**4.4.6.4** Notify the DOE or NNSA Field and Headquarters Emergency Operations Centers within 30 minutes of the declaration of an Operational Emergency not requiring classification.
DOE O 151.1D, Attachment 3, sec. 11a (5)	**4.4.6.5** Notify local, state, and tribal organizations within 30 minutes or as established in mutual agreements for declaration of an Operational Emergency not requiring classification.

Sources[12]	Consolidated Requirements[10, 11]
DOE O 151.1D, Attachment 3, sec. 4	**4.4.6.6** DOE sites/facilities/activities must have an Emergency Operations System to provide centralized collection, validation, analysis and coordination of information related to an emergency. The Emergency Operations System supports on-scene response during an escalating incident by relieving the burden of site-level and external communication and securing additional resources needed for the response. It does not provide tactical direction to the Incident Commander in the field. This can be satisfied through an established EOC.
DOE O 151.1D, Attachment 3, sec. 13c (2)	**4.4.6.7** Emergency status reports shall be forwarded to the next higher Emergency Management Team on a continuing basis until the emergency is terminated.
DOE O 151.1D, Attachment 3, sec.11b (1)(2)	**4.4.6.8** Effective communications methods shall be established between event scene responders, emergency managers, and response facilities.
	4.5 Emergency Equipment and Facilities
DOE O 151.1D, Attachment 3, sec. (9) (10); 29 CFR 1910.120(q) (10); 29 CFR 1910.120(1)(3)(vi); 29 CFR 1910-120(p)(8)(iv)(E); 40 CFR 68.95(a)(2)	Provision of facilities and equipment adequate to support emergency response, including: • The capability to notify employees of an emergency to facilitate the safe evacuation of employees from the workplace, immediate work area, or both; and • Operable PPE to be used by organized and designated Hazardous Materials Response Team (HAZMAT) team members, or to be used by hazardous materials specialists. PPE shall meet the needs determined by the hazards assessment and the requirements noted in sections 4.5.1 through 4.5.5, below
29 CFR 1910.120(g)(3)(i) and (ii)	**4.5.1** PPE shall be selected and used that will protect employees from the hazards and potential hazards they are likely to encounter, as identified during the emergency characterization and analysis.
29 CFR 1910.120(g)(3)(iii)	**4.5.2** Positive pressure SCBAs, or positive-pressure airline respirators equipped with an escape air supply shall be used when chemical exposure levels present will create a substantial possibility of immediate death, immediate serious illness or injury, or impair the ability to escape.
29 CFR 1910.120(g)(3)(iv)	**4.5.3** Totally-encapsulating chemical protective suits (protection equivalent to Level A protection, as recommended in Appendix B of 29 CFR Section 1910.120) shall be used in conditions where skin absorption of a hazardous substance may result in a substantial possibility of immediate death, immediate serious illness or injury, or impair the ability to escape.

Sources[12]	Consolidated Requirements[10, 11]
29 CFR 1910.120(g)(4)(iii)	**4.5.3.1** Totally encapsulating suits shall be capable of maintaining positive air pressure, and preventing inward test gas leakage of more than 0.5 percent.[40]
29 CFR 1910.120(g)(3)(v); 29 CFR 1910.120, Appendix B	**4.5.4** The level of protection provided by PPE selection shall be increased when additional information or emergency conditions show that increased protection is necessary to reduce employee exposures below permissible exposure limits and published exposure levels for hazardous substances and health hazards (see Appendix B of 29 CFR Section 1910.120 for guidance on selecting PPE ensembles). *[EXCEPTION: The level of employee protection provided may be decreased when additional information or site conditions show that decreased protection will not result in hazardous exposures to employees.]*
29 CFR 1910.120(g)(3)(vi); 29 CFR 1910.120(g)(5); 29 CFR 1910, Subpart I	**4.5.5** At a minimum, the personal protective equipment program shall adequately address the following elements: • PPE selection based upon site hazards • PPE use and limitations of the equipment • Work mission duration • PPE maintenance and storage • PPE decontamination and disposal • PPE training and proper fitting • PPE donning and doffing procedures • PPE inspection procedures prior to, during, and after use • Evaluation of the effectiveness of the PPE program and • Limitations during temperature extremes, heat stress, and other appropriate medical considerations
	4.6 Medical Support
DOE O 151.1D, Attachment 3, sec. 6(a)(b); 10 CFR Part 851, Appendix A, Sec.8; 40 CFR 68.95(a)(1)(ii)	• Medical treatment and planning for mass casualty situations shall be provided in accordance with 10 CFR Part 851 • In-house medical consultation and surveillance shall be as noted in sections 4.6.1 through 4.6.8, below
29 CFR 1910.120(q)(9)(i)	**4.6.1** Members of an organized and designated HAZMAT team and hazardous materials specialists shall receive a baseline physical examination that shall be performed as described below in sections 4.6.2 through 4.6.8.

[40] See Appendix A of 29 CFR Section 1910.120 for a test method which may be used to evaluate this requirement.

Sources[12]	Consolidated Requirements[10, 11]
29 CFR 1910.1450(g)(1)(iii)	**4.6.2** Any emergency response employees who exhibit signs or symptoms that may have resulted from exposure to hazardous substances during the course of an emergency incident, either immediately or subsequently, and all employees who are injured, become ill, or develop signs or symptoms due to possible overexposure involving hazardous substances or health hazards from an emergency response, shall be provided with medical consultation as follows: • As soon as possible following the emergency incident or development of signs or symptoms • At additional times, if the examining physician determines that follow-up examinations or consultations are medically necessary
29 CFR 1910.120(f)(4)	**4.6.3** Medical examinations required by section 4.6 shall include a medical and work history (or updated history if one is in the employees file) with special emphasis on symptoms related to the handling of hazardous substances and health hazards, and to fitness-for-duty, including the ability to wear any required PPE under conditions (i.e., temperature extremes) that may be expected at the work site. The content of medical examinations or consultations made available to employees shall be determined by the attending physician. The guidelines in the *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities* should be consulted.
29 CFR 1910.1200(i)(2)	**4.6.4** Where a treating physician or nurse determines that a medical emergency exists and the specific chemical identity is necessary for emergency or first-aid treatment, the chemical manufacturer, importer, or employer shall immediately disclose the specific chemical identity of a trade-secret chemical to that treating physician or nurse, regardless of the existence of a written statement of need or a confidentiality agreement. The chemical manufacturer, importer, or employer may require a written statement of need and confidentiality agreement as soon as circumstances permit.
29 CFR 1910.120(f)(5); 29 CFR 1910.1450(g)(2); 10 CFR 851, Appendix A, Sec.8(g)	**4.6.5** All medical examinations and procedures shall be performed by or under the supervision of a licensed physician, preferably one knowledgeable in occupational medicine, and shall be provided without cost to the employee, without loss of pay, and at a reasonable time and place.

Sources[12]	Consolidated Requirements[10, 11]
29 CFR 1910.120(f)(6); 29 CFR 1910.134; 10 CFR 851, Appendix A, Sec. 8(d)	**4.6.6** The employer shall provide one copy of 29 CFR Section 1910.120 and its appendices to the attending physician, and in addition, the following to each employee: • A description of the employee's duties as they relate to the employee's exposures • The employee's exposure levels or anticipated exposure levels • A description of any PPE used or to be used • Information from previous medical examinations of the employee that is not readily available to the examining physician and • Information required by 29 CFR Section 1910.134
29 CFR 1910.120(f)(7); 10 CFR 851, Appendix A, Sec. 8(g)(1)(h)(1)	**4.6.7** The employer shall obtain and furnish the employee with a copy of a written opinion from the examining physician. The written opinion obtained by the employer shall not reveal specific findings or diagnoses unrelated to occupational exposure, but shall contain the following: • The physician's opinion as to whether the employee has any detected medical conditions which would place the employee at increased risk of material impairment of the employee's health from work in hazardous waste operations or emergency response, or from respirator use • The physician's recommended limitations upon the employee's assigned work • The results of the medical examination and tests if requested by the employee and • A statement that the employee has been informed by the physician of the results of the medical examination and any medical conditions that require further examination or treatment
29 CFR 1910.120(f)(8); 29 CFR 1910.1020; 10 CFR 851, Appendix A, Sec. 8(f)	**4.6.8** An accurate record of the medical surveillance required by this section shall be retained. This record shall be retained for the period specified and meet the criteria of 29 CFR Section 1910.1020. The record required of this section shall include at least the following information: • The name and Social Security number of the employee • Physicians' written opinions, recommended limitations, and results of examinations and tests • Any employee medical complaints related to exposure to hazardous substances and, • A copy of the information provided to the examining physician by the employer, with the exception of the Standard and its appendices

Sources[12]	Consolidated Requirements[10, 11]
DOE O 151.1D, Attachment 3, sec. 11, sec. 13	**4.7 Post-Incident Requirements –** Predetermined criteria for termination of emergencies shall be established.
29 CFR 1910.120(b)–(o); 29 CFR 1910.120(q)(3)(ix); 29 CFR 1910.120(q) (11)	**4.7.1** After emergency operations have terminated, the IC shall implement appropriate decontamination procedures. If it is determined that it is necessary to remove hazardous substances, health hazards, and materials contaminated with them (such as contaminated soil or other elements of the natural environment) from the site of the incident, the employer conducting the cleanup shall comply with one of the following: • Meet all the requirements of paragraphs (b) through (o) of 29 CFR Section 1910.120; OR • Where the cleanup is done on plant property using plant or workplace employees, such shall have completed thetraining requirements of section 4.2 herein and other appropriate safety and health training made necessary by the tasks that they are expected to perform such as PPE use and decontamination procedures. All equipment to be used in the performance of the cleanup work shall be in serviceable condition and shall have been inspected prior to use by a qualified person.
DOE O 151.1D Attachment 3, sec. 13b	**4.7.2** Recovery shall include notifications associated with termination of an emergency and establishment of criteria for resumption of normal operations.
DOE O 151.1D, Attachment 3, sec. 13c (2)	**4.7.3** Following termination of emergency response, and in conjunction with the final Occurrence Report (see DOE O 232.2), each activated Emergency Management Team shall submit a final report on the emergency response to the Emergency Manager for submission to the Director of Emergency Operations.
DOE O 151.1D, Attachment 3, sec. 13	**4.7.4** Provide for investigation of emergency root cause(s) and corrective action(s) to prevent recurrence in accordance with Departmental requirements (see DOE O 225.1B and DOE O 422.1.
DOE O 151.1D, Attachment 3, sec. 14(b)(1)(c)	**4.7.5** Corrective action plans must be developed within 45 working days of the receipt of the final evaluation report.

8.5 Source Documents

DOE O 151.1D, *Comprehensive Emergency Management System, 08-11-2016*

DOE O 225.1B, *Accident Investigations, 03-04-2011*

DOE O 232.2*, Occurrence Reporting and Processing of Operations Information,08-30-2011*

DOE O 232.2A*, Occurrence Reporting and Processing of Operations Information, 01-17-2017*

DOE O 422.1*, Conduct of Operations, 06-29-2010*

NFPA 472 (2012), *Standard for Competence of Responders to Hazardous Materials/Weapons of Mass Destruction Incidents (2013 Edition)*

NFPA 472 (2017), *Standard for Competence of Responders to Hazardous Materials/Weapons of Mass Destruction Incidents (2018 Edition)*

NFPA 1620 (2014), *Standard for Pre-Incident Planning (2015 Edition)*

10 CFR 851, *Worker Safety and Health Program*

29 CFR 1910.38, *Emergency Action Plans*

29 CFR 1910.39*, Fire Prevention Plans*

29 CFR 1910.119, *Process Safety Management of Highly Hazardous Chemicals*

29 CFR 1910.120, *Hazardous Waste Operations and Emergency Response*

29 CFR 1910.134, *Respiratory Protection*

29 CFR 1910.1020, *Access to Employee Exposure and Medical Records*

29 CFR 1910.1200, *Hazard Communication*

29 CFR 1910.1450, *Occupational Exposure to Hazardous Chemicals in Laboratories*

40 CFR 68, *Chemical Accident Prevention Provisions*

40 CFR 355, *Emergency Planning and Notification*

Chapter 9 – Chemical Disposition

9.1 Introduction

This chapter identifies and consolidates existing user safety and health requirements found in DOE and Federal chemical related safety and health regulations and National Standards that address the ***disposition*** (see definition) of ***excess chemicals***[41] (see definition) and ***chemical products*** (see definition), including reutilization until final ***disposal***[42] (see definition) as waste. Requirements for disposition are found in the DOE Property Management Regulations (DOE-PMR), Federal Property Management Regulations (FPMR), and Federal Management Regulations (FMR). This chapter specifically consolidates requirements found in 41 CFR Part 109 (Subchapter H), 41 CFR Part 101 (Subchapter H), 41 CFR Chapter 102 Parts 102-36, 102-37, 102-38, 102-39, and 102-40, and provisions of NFPA code 45, and technical standards that are made mandatory by their specific reference within a DOE Regulation, or Order.

State and local codes and requirements are not included.

This chapter is intended to list chemical related safety and health requirements and to consolidate those that are overlapping or duplicative. The list of requirements includes pointers to the sources of those requirements.

This document does not create any new or additional requirements.

9.2 Applicability

The information presented here applies to all locations that store or use chemicals or chemical products. It consolidates existing core safety and health requirements that all sites must follow when engaged in chemical-related activities. This chapter specifically applies to DOE contractors and field organizations that are involved in the utilization and disposition of chemicals and chemical products. It does not cover requirements related to chemical storage (refer to Chapter 5 of this document), transportation (refer to Chapter 4 of this document), or waste operations, including the identification, storage, handling, transportation, treatment, and disposal of waste.

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[41] DOE offices and designated contractors are responsible [41 CFR Section 109-43.101, 41 CFR Section 102-36.35, 41 CFR Section 102-36.45(e)] for identifying chemicals that are no longer needed at DOE facilities as "excess chemicals" and for making them available to other potential users on site, returning them to the vendor (when practical and economical), or for exploring other avenues of reutilization off-site. The following disposition options may be available to an excess chemical in the prescribed order: screening for utilization at other DOE sites; transfers to other federal agencies; donations, via state government agencies, to approved nonprofit organizations; or sales to the public (e.g., competitive bid sales or auctions).

The DOE-PMR (41 CFR Part 109), Federal PMR (41 CFR Part 101) and FMR (41 CFR Part 102) govern potential off-site reutilization pathways for excess chemicals. Any ***surplus chemicals*** (see definition), remaining after the above disposition routes have been exhausted, should be disposed of under applicable environmental regulations. For certain chemicals (e.g., ethylene glycol, antifreeze solutions, precious metals), recycling and recovery are appropriate options. Pesticides and certain products containing chemicals, including those meeting the OSHA (see Acronyms) Hazard Communication Standard definition of an "article" (29 CFR Section 1910.1200(c)) (such as batteries and fluorescent lamps), are potential candidates for regulation as *"**Universal Waste**"* (see definition) (40 CFR Part 273).

[42] Unused surplus chemicals at the end of the disposition cycle are "commercial chemical products" and do not become solid waste (40 CFR Part 260) unless they are discarded, abandoned, or disposed of.

[NOTE: Throughout this document, the term "chemicals" is used to indicate chemicals or chemical products. For purposes of this document, the terms, "personal property" and "property," as used in the property management regulations, mean chemicals or chemical products, unless otherwise specified.]

This chapter addresses the disposition of chemicals belonging to any of the following categories under DOE-PMR, FPMR, or FMR, namely, ***high-risk (personal) property*** (see definition), ***hazardous property*** (see definition), ***hazardous materials*** (see definition), ***extremely hazardous materials*** (see definition), ***dangerous property*** (see definition), and ***certain categories of property that require special handling*** (see definition). Nuclear materials and radiological materials are excluded from the scope of this chapter.

Among the 10 categories of high-risk personal property, only excess chemicals identified as hazardous property, ***export-controlled property*** (see definition), and ***proliferation-sensitive property*** (see definition) are within the scope of this chapter.

The DOE-PMR (41 CFR Part 109) implements and supplements the FMR (41 CFR Part 102) issued by the General Services Administration (GSA) and will supersede the FPMR in the event of a deviation affecting DOE's personal property management program. The FMR and DOE-PMR apply to all direct operations and to designated contractors. The DOE-PMR does not apply to facilities and activities conducted under EO 12344, *Naval Nuclear Propulsion Program* (February 1, 1982) and Title XVI of Public Law 98-525, *Department of Energy National Security and Military Applications of Nuclear Energy Authorization Act of 1985*.

The FMR (41 CFR Part 102) is the successor regulation to the FPMR and applies to executive agencies such as DOE, unless otherwise extended to Federal agencies in specific parts of the CFR.

The requirements included in this chapter come from sources that have different safety purposes. As a result, some of these requirements may not always be applicable to the work being performed at an individual site or facility. Users are responsible for determining how specific requirements apply to their work and how they are implemented. The reference sources for the requirements included in this chapter can be used to determine the applicability of the requirements to the work being performed.

9.3 Definitions and Acronyms

See **Glossary.**

9.4 Requirements for Chemical Disposition

Sources[12]	Consolidated Requirements[10, 11]
	4.1 Disposition of Excess (or Surplus) Chemicals *[NOTE: Prescribed disposition options, in a descending order of implementation, may include reutilization within the DOE complex, transfer to another federal agency, donation to a nonprofit organization via a state agency, or sale to a public entity. Available disposition options are limited by the hazard, risk, or value characteristics of the chemical. See Appendix A of this chapter for typical screening process steps.]*
41 CFR 102-36.30; 41 CFR 102-36.35(a); 41 CFR 102-36.45(e); 41 CFR 109-43.101	**4.1.1 Identification and Disposition of Excess Chemicals.** DOE offices and designated contractors shall promptly identify chemicals under their control that are excess to their needs and make them available for use elsewhere. They must ensure that final disposition complies with applicable environmental, health, safety, and national security regulations.
DOE-PPL 970-3; 41 CFR 109-1.53	**4.1.2 Disposition of Four Categories of High Risk (Personal Property) Chemicals.** Excess chemicals that fall under any of the four specific categories of high risk personal property, namely, especially designed or prepared property, export controlled property, proliferation-sensitive property, and nuclear weapon components or weapon-like components, shall be subject to the identification, accounting, control, and disposition policy guidance available from DOE-PPL 970-3 (Compliance not required), and 41 CFR Subpart 109-1.53, and 41 CFR 102-40.180(a)(b).
41 CFR 109-1.5303(b)(2)	**4.1.2.1** DOE or its designated contractor shall process high risk (personal property) chemicals in a reutilization/disposition program only after completing the reviews prescribed by the local high risk property management system.
41 CFR 109-1.5303(b)(3); 41 CFR 101, (Subchapter H); 41 CFR 109, (Subchapter H); DOE Guidelines on Export Control and Nonproliferation	**4.1.2.2** The disposition and handling of high-risk property chemicals shall be subject to applicable provisions of Subchapter H of the FPMR (41 CFR Part 101), Subchapter H of DOE-PMR (41 CFR Part 109), and DOE's Guidelines on Export Control and Nonproliferation.
41 CFR 109-1.5303(b)(4)	**4.1.2.3** All applicable documentation, including records related to the chemical's categorization as high risk, shall be included with all property transfers, internal or external to DOE.

Sources[12]	Consolidated Requirements[10, 11]
41 CFR 109-1.5303(b)(5)	**4.1.2.4** Unless an alternative disposition path is available, surplus ***Trigger List*** (see definition) chemicals (e.g., those identified as especially designed/prepared property), proliferation-sensitive property, or export-controlled property, as defined in the Glossary shall either be sold for ***scrap*** (see definition) after being rendered useless for their originally intended function or destroyed, with the destruction verified and documented.
41 CFR 109-1.5303(b)(6)	**4.1.2.5** The Export Restriction Notice specified in 41 CFR Subparts 109-1.5303(b) (6), or an approved equivalent notice, shall be included in all transfers, donations, sales, or other disposition actions.
40CFR 109-43.305-50; SF 120	**4.1.2.6** Excess nuclear-related and proliferation-sensitive chemicals shall not undergo formal internal screening within DOE or be reported to the GSA on Standard Form (SF) 120, *Report of Excess Personal Property*. See Sections 4.1.2.2 and 4.1.2.4 above for control and disposition options (such as destruction, conversion to scrap that can be sold to the public, or other DOE-authorized option).
29 CFR 1910.1200; 41 CFR 102-40.45; 41 CFR 102-40.180(a)(b)	**4.1.3 Identification and Documentation of Hazardous Materials.** Actual or potential hazards associated with an excess hazardous material shall be documented with an SDS (or MSDS) supplied by the manufacturer, distributor, or importer. If an SDS (or MSDS) is not available, a Hazardous Materials Identification System (HMIS) record from the automated DoD database is acceptable. If an SDS (or MSDS) or HMIS record is not available, a hazard identification document prepared by the owning DOE organization that meets the SDS content requirements for hazardous chemicals set forth in the OSHA Hazard Communication Standard (29 CFR S e c t i o n 1910.1200) shall be used.
41 CFR 102-40.20; 41 CFR 102-40.40; 41 CFR 102-40.65	**4.1.3.1** For hazardous items acquired prior to the implementation of the federal acquisition standards (i.e., Federal Standards 313 and 123), the owning or ***holding agency*** (see definition) shall identify and document the potential hazards associated with these items. *[NOTE: Hazardous materials are found in most Federal Supply Classification (FSC) classes. Refer to Table B-1 (list of FSC classes composed predominantly of hazardous items) and Table B-2 (selective list of FSC classes and groups that contain a significant number of hazardous items) in Appendix B of this chapter.]*
41 CFR 102-40.40; 41 CFR 102-40.45	**4.1.3.2** When an item is identified as hazardous, the owning DOE organization shall document the accountable inventory record accordingly.

Sources[12]	Consolidated Requirements[10, 11]
29 CFR 1910.1200; 41 CFR 102-40.40	**4.1.3.3** If the hazardous item (or material) has not been properly labeled by the manufacturer, the owning DOE organization shall label, mark, or tag the item in accordance with the OSHA Hazard Communication Standard requirements regarding the actual or potential hazard associated with the handling, storage, or use of the item (or material).
41 CFR 102-40.45	**4.1.3.4** Hazard and special care or handling information shall be maintained in the item record for use in preparation of reports of excess property, and reassignment or transfer documentation.
41 CFR 101-27.204	**4.1.4** Disposition of Unstable Reactive Chemicals - ***unstable reactive chemicals*** (see definition) that are identified as non-extendable shelf-life items (also known as ***Type I items*** (see definition)) shall be safely discarded at the expiration of their designated shelf life.
NFPA 45, Sec. 8.2.4.4	**4.1.5** If shelf life is unknown, time-sensitive unstable reactive chemicals shall be evaluated (using appropriate methods and pass/fail criteria) at defined inspection frequency intervals, to ensure continued safe use. Any material that has failed the inspection shall be safely discarded.
41 CFR 101-27.204	**4.1.6** Unless shelf life is extended on the basis of technical evaluation (e.g. for **Type II** extendable **s*helf-life items*** (see definition)), hazardous materials with an expired shelf life shall be reclassified as "***hazardous waste***" (see definition), if required by Federal, state or local environmental laws or regulations.
	4.2 Utilization of Excess Chemicals
41 CFR 102-36.425; 41 CFR 109-42.11; 41 CFR 109-43	*Hazardous Materials – General:* The utilization and transfer of hazardous materials and certain categories of property within the Federal Government shall be governed by the special policies and methods prescribed by the GSA in 41 CFR Subpart 101-42.2, 41 CFR Subpart 101- 42.11 and 41 CFR Subpart 102-36 in addition to DOE requirements found in 41 CFR Subpart 109-43 and 41 CFR Subpart 109-42.11.
	4.2.1 Offsite Utilization Within DOE Complex – Internal DOE Screening.
41 CFR 102-36.45(e)(1); 41 CFR 109-43.304-1.50(a)	**4.2.1.1** Prior to reporting excess chemicals to the GSA, ***reportable property*** (see definition) shall be screened for reutilization (or reassignment) within DOE using the ***Energy Assets Disposal System (EADS)*** (see definition) for a 15-day period. *[NOTE: Refer to Appendix A of this chapter for a description of typical disposition steps for an excess chemical.]*
41 CFR 109-43.304-1.50(e)	**4.2.1.2** Simultaneous internal DOE screening and Federal agency excess screening shall not be conducted.

Sources[12]	Consolidated Requirements[10, 11]
SF 122	**4.2.1.3** Transfer of excess chemicals within DOE should be accomplished by the completion of SF 122, *Transfer Order Excess Personal Property*, by the receiving contractor and approval by the cognizant DOE property administrator for the receiving site.
SF 122	**4.2.1.4** Information on the actual or potential hazard shall be included in the SF 122, and the receiving contractor shall identify the nature of the hazard in the accountable inventory record.
41 CFR 102-36.45(e)(3)	**4.2.1.5** The holding DOE organization shall properly store excess hazardous materials and provide necessary safeguards including warning signs, labels, and the use of Personal Protective Equipment (PPE) by utilization screeners when inspecting the excess.
	4.2.2 Utilization Reports of Excess Chemicals – General
41 CFR 102-36.230(a); 41 CFR 102-36.230(b); SF 120	**4.2.2.1** To initiate Federal excess screening at the conclusion of internal DOE screening, reportable property (i.e., excess chemicals) will be electronically submitted by EADS directly to GSAXcess, GSA's online link to the ***Federal Disposal System (FEDS)*** (see definition), OR paper submissions of SF 120 shall be made to the GSA office for the region where the excess chemicals are located.
41 CFR 102-40.55(b)	**4.2.2.2** ***Hazardous waste*** (see definition) shall be disposed of by the DOE organization under the EPA, state, and local regulations and it shall not be reported to GSA on the SF 120.
41 CFR 102-40.50; 41 CFR 102-36.45(e)(2); 41 CFR 102-36.425; SF 120	**4.2.2.3** Hazardous Property/Hazardous Materials/Hazardous Items – Excess chemicals that are identified as hazardous property (including hazardous materials, but excluding hazardous waste and extremely hazardous property) shall be reported promptly on SF 120 to the GSA for further reuse by eligible recipients, together with a full description of the actual or potential hazard associated with the handling, storage, or use of the chemicals.
29 CFR 1910.1200; 41 CFR 102-40.45; SF 120	**4.2.2.4** If available, a copy of the SDS (or MSDS) or HMIS record that describes the hazardous nature of the item shall be included with the SF 120; if not, an SDS-equivalent document shall be provided by the owning DOE organization.
29 CFR 1910.1200; 41 CFR 102-40.45; 49CFR.178-180	**4.2.2.5** The description of the hazard should include a certification by an authorized DOE official that the item has been properly labeled (refer to Section 4.1.3.3, above) and that the container or packaging meets or exceeds DOT specifications for a hazardous material container.
	4.2.3 Exceptions to Utilization Reporting of Excess Chemicals

Sources[12]	Consolidated Requirements[10, 11]
41 CFR 102-36.165; 41 CFR 102-36.170; 41 CFR 102-36.220(b); 41 CFR 102-36.220(c)	**4.2.3.1** DOE or DOE contractors shall not report the following types of chemicals as excess to the GSA on SF 120 to initiate the excess screening process by Federalagencies: • Chemicals determined appropriate for abandonment or destruction (See Section 4.2.4, below) • ***Non-appropriated fund property*** (see definition). Such property may be transferred to a Federal agency with reimbursement or offered for public sale. It shall not be donated • Scrap • Hazardous waste (See Section 4.2.2.2 above); • Controlled substances (refer to 41 CFR Subparts 101-42.1102-3 in Section 4.8.2 below) • Nuclear Regulatory Commission-controlled materials (refer to 41 CFR Subparts 101-42.1102-4 in Section 4.8.2 below) • Property dangerous to public health and safety (e.g., asbestos, ***polychlorinated biphenyls (PCBs)*** (see definition), lead-containing paint) (refer to Sections 4.8.2, 4.8.3, and 4.8.4 below) • Classified items or property determined to be sensitive for reasons of national security (e.g., especially prepared or designed property, proliferation-sensitive property, nuclear components or materials, nuclear technology- related components and materials).
41 CFR 102-40.55(a); SF 120	**4.2.3.2** Excess chemicals determined by the holding DOE organization to be extremely hazardous property shall not be reported on SF 120 unless so directed by the GSA. When such an item becomes excess, the holding DOE organization shall notify the appropriate GSA regional office to obtain guidance on a case-by-case basis on utilization, donation, sales, or other disposition requirements.
	4.2.4 Abandonment or Destruction of Excess or Surplus Chemicals
41 CFR 102-36.35(d); 41 CFR 102-36.305; 41 CFR 109-45.901	**4.2.4.1** The holding DOE organization or designated contractor may abandon or destroy (excess or surplus) property or donate it to public bodies (without reporting to the GSA) only after the DOE ***Departmental Property Management Officer (DPMO)*** makes a written determination that the property has no commercial value or that its continued maintenance cost would exceed its estimated sale proceeds.

Sources[12]	Consolidated Requirements[10, 11]
41 CFR 102-38; 41 CFR 102-36.315(b); 41 CFR 102-36.325	**4.2.4.2** In general, DOE or a DOE contractor must implement sales procedures (in accordance with 41 CFR Part 102-38) in lieu of abandonment/ destruction when an eligible recipient shows interest in purchasing these excess chemicals.
41 CFR 102-36.325; 41 CFR 102-36.330	**4.2.4.3** Exceptions to Public Notice - The required public notice of intent (41 CFR Subparts 102-36.325) to abandon/destroy excess chemicals, including an offer to sell them to the public, prior to their actual disposition is not needed in the following cases: • The value of the material, including any expected sale proceeds, is significantly less than the cost of its care and handling pending abandonment or destruction, or • Abandonment or destruction is required because of health, safety, or security reasons; or • When the original acquisition cost of the item (estimated if unknown) is less than $500.
41 CFR 102-36.310; 41 CFR 109-45.902-2	**4.2.4.4 Abandonment or Destruction without Public Notice.** The head of the DOE field organization shall coordinate, with the OPMO, a review of the findings prepared by a designated official to justify the abandonment or destruction of property without a public notification of the pending action.
41 CFR 102-36.315(a); 41 CFR 102-40; 41 CFR 109-42.11; 41 CFR 109-43.307; 41 CFR 109-44.7; 41 CFR 109-44.702-3; 41 CFR 109-45.9	**4.2.4.5** The owning DOE organization shall not abandon or destroy excess (or surplus) chemicals in a manner that endangers public health or safety. Specific information can be found in 41 CFR Subpart 109-42.11, 41 CFR Subpart 109-43.307, 41 CFR Subpart 109-44.7, 41 CFR Subpart 109-45.9, and 41 CFR Part 101-40.
41 CFR 102-36.35(d); 41 CFR 102-36.320	**4.2.4.6** Donation to a ***public body*** (see definition) - Excess chemicals determined to be appropriate for abandonment or destruction may be donated only to a public body without going through the GSA.
41 CFR 109-44.701	**4.2.4.7** The Director, Office of Administrative Services, and heads of field organizations shall designate officials to make required findings and reviews to justify donation of excess or surplus chemicals to public bodies.
41 CFR 101-40; 41 CFR 109-42.11; 41 CFR 109-44.702-3	**4.2.4.8** The Director, Office of Administrative Services, and heads of field organizations shall ensure that the donation of excess or surplus hazardous materials to public bodies complies with applicable requirements in 41 CFR Subpart 109-42.11 and 41 CFR Part 102-40.

Sources[12]	Consolidated Requirements[10, 11]
	4.3 Off-Site Transfer to Other Federal Agencies – Federal Excess Screening
29 CFR 1910.1200; 41 CFR 102-40.65; SF 122	**4.3.1** *Transfer of Hazardous Materials and Certain Categories of Property* – Excess hazardous materials may be transferred between DOE and other federal agencies except that the SF 122 prepared by the transferee (i.e., receiving agency) shall contain a full description of the actual or potential hazard associated with the handling, storage, or use of each item. The description shall consist of an SDS (or MSDS) or HMIS data record, if available, or a written SDS-equivalent narrative meeting the OSHA Hazard Communication Standard requirements.
41 CFR 102-40.85	**4.3.2** A certification by an authorized DOE official that the hazardous item has been properly labeled and its packaging meets OSHA and DOT requirements (see Section 4.2.2.5 above), shall be included in the description of the hazard.
41 CFR 102-40.75; SF 122	**4.3.3** The transferee agency (i.e., receiving agency) shall document the inventory or control record of the transferred hazardous item to indicate the hazard associated with the handling, storage, or use of the item. If available, an SDS (or MSDS) or HMIS (or equivalent) data record must be filed with the SF 122.
41 CFR 102-40; 41 CFR 102-45; 41 CFR 102-40.65	**4.3.4** Custody of ***extremely hazardous materials*** (see definition). Custody of excess extremely hazardous materials shall be the responsibility of the owning or holding DOE site. Custody of other hazardous materials may be fully or partially transferred to another federal agency with that agency's consent.
41 CFR 102-36.35(c); 41 CFR 102-40.100; 41 CFR 102-40.120	**4.4 Donation or Sale of Surplus Chemicals to the Public** *[NOTE: Surplus chemicals not selected for donation are offered for sale to the public by competitive offerings such as sealed bid sales, spot bid sales or auctions. DOE or DOE contractor may conduct the sale if the GSA is made aware of DOE's intent at the time the excess is reported or the GSA will conduct the sale, by default.]*

Sources[12]	Consolidated Requirements[10, 11]
	4.4.1 General Requirements
41 CFR 102-36.35(b)	**4.4.1.1** To comply with the ***property act*** (see definition), surplus chemicals (i.e., excess chemicals that have not been transferred to federal agencies) may be made available for distribution to eligible recipients by an agency established by each State for this purpose, the ***State Agency for Surplus Property (SASP)*** (see definition).
41 CFR 102-38.65	**4.4.1.2** A need for excess or surplus chemicals expressed by any Federal agency shall take precedence to any disposition action by sale, provided that need is relayed in time for the DOE organization to respond.
41 CFR 102-38; 41 CFR 102-38.20	**4.4.1.3** Although policies and methods prescribed in 41 CFR Part 102.38 for the disposition of surplus chemicals by public sale or abandonment or destruction do not apply to materials acquired for the national stockpile or the supplemental stockpile or to materials acquired under section 303 of the Defense Production Act of 1950, as amended (50 USC. App. 2093), these provisions should be followed to the extent feasible in the disposition of such materials.
41 CFR 102-37.40	**4.4.1.4** All surplus chemicals are available for donation to eligible recipients, except for the following property categories: • Non-appropriated fund property • Property that requires reimbursement upon transfer • Controlled substances • Items that may be specified from time to time by the GSA Office of Government-wide Policy
41 CFR 109-43.307-2.50	**4.4.2 Monitoring of Hazardous Chemicals for Radioactive or Chemical Contamination.** To prevent inadvertent release of hazardous personal property from the DOE sites by transfer or sale to the public, all hazardous or suspected hazardous property chemicals shall be checked for radioactive or chemical contamination[43] by environmental, safety, and health officials.

[43] Examples include radioactively-contaminated chemical containers or chemicals stored or used in radioactively- contaminated areas.

Sources[12]	Consolidated Requirements[10, 11]
41 CFR 109-43.307-2.50	**4.4.2.1** Contamination-free chemicals will carry a certification tag authorizing release for transfer or sale.
41 CFR 109-43.307-2.50	**4.4.2.2** Contaminated chemicals will be referred back to the DOE program office for appropriate action.
41 CFR 109-43.307-2.51	**4.4.3 Holding Hazardous Property Chemicals.** Excess or surplus hazardous property chemicals shall be stored compatibly and not with non-hazardous property chemicals while awaiting disposition action.
	4.4.4 High-Risk Property – Export-Controlled Property
41 CFR 109-43.307-50(a)	**4.4.4.1** DOE or the DOE contractor must obtain the necessary export license when chemicals subject to export controls are to be exported directly.
41 CFR 109-43.307-50(b)	**4.4.4.2** When chemicals subject to export controls are transferred under work-for-others agreements, cooperative agreements, or technical programs, the recipients will be informed in writing about export control restrictions that must be followed in the event of a change in custody of the materials.
	4.4.5 High -Risk Property – Nuclear-Related or Proliferation-Sensitive Personal Property
41 CFR 109-43.307-52(a)	**4.4.5.1** All nuclear-related and proliferation-sensitive ***personal property*** (see definition) shall be physically tagged with a certification from an authorized DOE program official at the time of excess determination.
41 CFR 109-43.307-52(b)	**4.4.5.2** Excess nuclear-related and proliferation-sensitive personal property shall be stripped of all of its distinctive characteristics, as determined by the cognizant program office, prior to disposition. To the extent practicable, such action shall be accomplished without compromising any civilian utility or commercial value of the chemical.
	4.5 *Donation of Surplus Hazardous Materials to Public Agencies* (see definition) **via SASPs.**
41 CFR 102-37; 41 CFR 102-40; 41 CFR 109-42.11; 41 CFR 109-44.702-3	**4.5.1 Donation of Hazardous Materials and Certain Categories of Property (General).** The Director, Office of Administrative Services, and heads of DOE field organizations shall provide the safeguards, notifications, and certifications required for the donation of hazardous materials consistent with the requirements in 41 CFR Subpart 109-42.11, 41 CFR Part 102.37 and 41 CFR Part 102-40. *[NOTE: Donation of hazardous materials and **certain categories of property** (see definition) is governed by the special policies and methods prescribed in 41 CFR Part 102-37.]*

Sources[12]	Consolidated Requirements[10, 11]
41 CFR 102-36; 41 CFR 102-37; 41 CFR 102-40.80	**4.5.1.1** Surplus chemicals identified as hazardous material and not required for transfer as excess chemicals to Federal agencies shall normally be made available for donation.
41 CFR 102-40.85	**4.5.1.2** SASPs shall not acquire hazardous materials without first confirming eligible ***donees*** (see definition) for these products.
41 CFR 102-40.80	**4.5.1.3** Surplus chemicals identified as hazardous may be donated provided the donee is warned about the hazardous nature of the product via a SDS (or MSDS), HMIS data, or equivalent safety documentation and is provided with special handling information.
41 CFR 102-40.85	**4.5.1.4** The donee shall sign a required certification to the effect that he or she is aware of the hazards associated with the chemical product and that he or she is legally responsible for the use, storage, handling, transport, and disposal of the hazardous material.
41 CFR 102-40.50; 41 CFR 102-40.75	**4.5.2 Responsibilities for Donation of Hazardous Materials.** The holding agency (i.e., DOE) shall be responsible for the identification and reporting of hazardous materials (see Section 4.1.3, above).
29 CFR 1910.1200; 41 CFR 102-40.75; 41 CFR 102-40.80; SF 123	**4.5.2.1** The donee, when applicable, shall prepare SF 123, *Transfer Order Surplus Personal Property*. A full description of the actual or potential hazard associated with handling, storage, or use of the item must be provided with an SDS (or MSDS), HMIS data, or an equivalent document that complies with the requirements of the OSHA Hazard Communication Standard.
41 CFR 102-40.85; SF 123	**4.5.2.2** The SASP or donee shall sign the certification stipulated in 41 CFR Subpart 102-40.85 and forward it with the SF 123 to the GSA regional office. The certification is an acknowledgment by the donee of the legal transfer of custody of the hazardous material from the DOE organization and the acceptance of liabilities it may entail to the donee.
41 CFR 102-40.85	**4.5.2.3** Donation of surplus hazardous material distributed by the SASP to the donee shall be effected by the use of state agency distribution document. The donee shall also sign the required certification (see Section 4.5.2.2, above).
41 CFR 102-36.55(b); 41 CFR 102-40.85	**4.5.2.4** DOE and DOE contractors shall obtain approval from the GSA regional office to transfer hazardous materials for donation.

Sources[12]	Consolidated Requirements[10, 11]
41 CFR 102-40.75; 41 CFR 102-40.95	**4.5.3 Special Requirements for Donation of Certain Hazardous Materials** *[NOTE: Special donation requirements for specific hazardous materials are provided in 41 CFR 102-40 Subpart B (responsibilities), Subpart C (Transfer and Donation), and Subpart E (Categories with special handling requirements). Many hazardous materials require special storage and handling. (See Sections 4.8.2, 4.8.3, and 4.8.4 below)]*
41 CFR 102-37.220(d); 41 CFR 102-40.220	**4.5.3.1** A SASP must obtain written certification from the prospective donee, and submit it to GSA along with the transfer request, prior to transfer of items where PCBs are involved (on a temporary basis only).
41 CFR 102-40.65; 41 CFR 102-37.245; 41 CFR 102-40.70	**4.5.3.2** The Federal holding agency or the SASP shall properly store hazardous materials, ensure the use of necessary safeguards, and instruct donation screeners on personal protection when inspecting the surplus.
41 CFR 102-40.40(d); 41CFR 102-40.90; 49 CFR 171 to 180	**4.5.3.3** The SASP or the donee shall comply with DOT regulations (49 CFR Parts 171 to 180) when transporting hazardous materials.
	4.6 Sale of Hazardous Materials to Public Bodies - General
41 CFR 102-38.45; 41 CFR 102-38; 41 CFR 102-39; 41 CFR 109-42	**4.6.1 Holding Agency Sales.** All provisions of 41 CFR Subpart 102-38, 41 CFR Subpart 102-39 and 41 CFR Part 109-42 shall be followed in conducting sales of Federal Government owned surplus chemicals.
41 CFR 109-45.105-3; 41 CFR 102-38	**4.6.1.1** Contractor chemical inventory held by DOE designated contractors is exempted from the GSA-conducted sales provisions of 41 CFR Subpart 102-38.
41 CFR 109-45.300-50	**4.6.1.2** Sales of surplus contractor chemical inventory by designated contractors will be conducted with the approval of program secretarial officers and with oversight by OPMOs and program officials to ensure that chemicals requiring special handling or program office certification are sold in compliance with regulatory requirements.

Sources[12]	Consolidated Requirements[10, 11]
41 CFR 109-45.301-51	**4.6.1.3** The export-import clause specified in 41 CFR Subparts 109- 45.301-51, warning the purchaser not to export the chemicals overseas and to inform the next potential owner about export-import restrictions shall be included in all sales invitations for bid.
41 CFR 102-38; 41 CFR 102-40.100 through 102-40.120	**4.6.2 Sales of Hazardous Chemicals through GSA Regional Offices.**
41 CFR 102-40.100 through 102-40.120; 41 CFR 102-38; 41 CFR 109-45	**4.6.2.1** The sale, abandonment, or destruction of hazardous materials and certain categories of property may be conducted in accordance with the special policies and procedures prescribed in 41 CFR Subpart 102-38, 41 CFR Subparts 102-40.100 through 102-40.120, and 41 CFR Subpart 109-45.
41 CFR 102-40.100	**4.6.2.2** Sale of hazardous materials for DOE and DOE contractors shall be conducted through the regional offices of GSA.
41 CFR 102-40.100; 41 CFR 102-40.105; 41 CFR 102-40.110; 41 CFR 109-45.304	**4.6.2.3** DOE designated contractors and field organizations shall follow sales methods and procedures in accordance with 41 CFR Subparts 109-45.304. These holding agency (DOE) sales of hazardous materials shall meet or exceed the requirements in 41 CFR Subparts 102-40.105.
41 CFR 102-40; 41 CFR 102-38.45	**4.6.2.4** Holding agencies shall prepare hazardous materials for sale as provided for in 41 CFR Subpart 102-38.45 and 41 CFR Subpart 102-40. Pending disposition, each holding agency shall care for and handle its hazardous materials, including posting appropriate warning signs and rendering extremely hazardous property innocuous, or providing adequate safeguards.
29 CFR 1910.1200; 41 CFR 102-40.110	**4.6.3 Identification of Hazards for Sale of Hazardous materials –** The terms and conditions for sale of hazardous materials with special handling requirements shall also include a full description of the actual or potential hazard associated with handling, storage, or use of the item. This description shall be furnished by providing an SDS, MSDS, or the HMIS record when available, or an SDS equivalent narrative that complies with the requirements of the OSHA Hazard Communication Standard.

Sources[12]	Consolidated Requirements[10, 11]
41 CFR 102-38 Subpart B	**4.6.4 Sale Methods and Procedures for Hazardous Materials.** Hazardous materials shall be sold in accordance with the provisions of 41 CFR Subparts 102-38 Subpart B (Sales Process) and the following special methods and procedures:
41 CFR 102-40.105(a)	**4.6.4.1** Sales that offer hazardous materials shall be conducted separately from other sales.
41 CFR 102-40.110; 41 CFR 102-40.115	**4.6.4.2** For a bid to be considered for award, the bidder must sign the certification specified in 41 CFR Subparts 101-42.403(c) to the effect that he/she will comply with all applicable regulations related to the care, handling, storage, shipment, resale, export, or other use of the hazardous material being purchased and that he/she will assume all legal liabilities after the purchase.
29 CFR 1910.1200; 41 CFR 102-40.180	**4.6.4.3** SDSs (or MSDSs), HMIS records, where applicable, or a written description in compliance with the requirements of the OSHA Hazard Communication Standard shall be sent to purchasers of hazardous materials with their notice of award.
	4.6.5 Sale of High-Risk Personal Property
41 CFR 109-43.307-2.50; 41 CFR 109-45.304; 41 CFR 109-45.309; 41 CFR 109-45.309-2.50	**4.6.5.1** ***Suspect*** (see definition) hazardous property shall be made available for sale only after the review and certification requirements for contamination-free status (see Section 4.4.2 above) have been met.
41 CFR 109-43.307-50; 41 CFR 109-45.309-51	**4.6.5.2** Export controlled property shall be made available for sale only after the export license requirements (see Section 4.4.4 above) have been met.
41 CFR 109-43.307-52; 41 CFR 109-45.309-53	**4.6.5.3** Nuclear-related or proliferation-sensitive property shall be made available for sale only after the stripping and certification requirements (see Section 4.4.5 above) have been met.
41 CFR 102-40.120(b)	**4.6.6 Sale of Extremely Hazardous Property.** DOE or DOE contractor shall not sell extremely hazardous property unless authorized by the appropriate GSA regional office. Any authorized sale requires the DOE or DOE contractor to provide adequate safeguards for the material or render it innocuous (without a loss of its utility or commercial value) (see Section 4.6.2.3 above).
41 CFR 102-40, Subpart E; 41 CFR 102-40.105	**4.6.7 Sale of Certain Hazardous Materials.** DOE or DOE contractors shall follow the special sales requirements provided in 41 CFR Subpart 102-.40, Subpart E for certain hazardous materials (e.g., asbestos, polychlorinated biphenyls, controlled substances, etc.) (see Sections 4.8.1 through 4.8.4 below). The holding agency (DOE) shall properly store hazardous items and provide information to ensure that prospective bidders are aware of the hazards, as well as the precautions they should take to protect themselves.

Sources[12]	Consolidated Requirements[10, 11]
	4.7 Abandonment, Destruction[44] or Donation of Surplus Hazardous Materials and Certain Categories of Property.
41 CFR 102-40.125; 41 CFR 102-40.160(e); 41 CFR 102-36.305 through 102-36.330	DOE and DOE contractors shall follow the requirements for the abandonment or destruction of surplus hazardous chemicals as prescribed in 41 CFR Subparts 102-36.305 through 102-36.330. [NOTE: Certain items may not be abandoned; see for example, 41 Subpart CFR 102-40.160(e). Excess property may be donated to a public body in lieu of abandonment or destruction pursuant to 41 CFR Subpart 102-36.320.]
41 CFR 102-36.305; 41 CFR 102-36.320; 41 CFR 102-37.565; 41 CFR 102-37.570; 41 CFR 109-44.701; 41 CFR 109-44.702-3	**4.7.1** A written finding must be made by an authorized DOE official (see Sections 4.2.4.1 and 4.2.4.7 above) that a surplus chemical has no commercial value or that its continued maintenance would cost more than its estimated sale proceeds, before it can be abandoned, destroyed, or donated to public bodies.
41 CFR 102-40.40; 41 CFR 102-40.50; 41 CFR 102-36.305 – 102-36.330; 41 CFR 102-37.570; 41 CFR 109-44.702-3	**4.7.2** In addition to the requirements in 41 CFR Subparts 102-36.305 through 102-36.330, surplus hazardous materials, including empty hazardous material containers, shall be abandoned or destroyed in accordance with appropriate federal, state, and local waste disposal, and air and water pollution control standards.
41 CFR 102-37.35(c); 41 CFR 102-37.125(a)(2); 41 CFR 102-37.125(b); 41 CFR 102-37.570	**4.7.3 Donation[45] to Public Bodies.** The holding DOE organization or designated contractor shall not donate chemicals that require destruction for health, safety, or security reasons (see Section 4.2.4.8, above).
	4.8 Disposition of Special Types of Hazardous Materials and Certain Categories of Property.
41 CFR 102-40, Subpart E	Hazardous material identification is required for all material that, by virtue of its potentially dangerous nature, requires controls to assure adequate safety to life, property, and the environment.

[44] Surplus chemicals remaining after normal donation screening are generally subject to the sale process in accordance with the provisions of 41 CFR Section 102-38 and 41 CFR Part 102-40. However, if the criteria in 41 CFR Subparts 102-36.305 are met, these chemicals may be destroyed. [41 CFR Subparts 102-37.80]

[45] The holding DOE organization may donate surplus chemicals, which would otherwise be abandoned or destroyed, directly to public bodies, without going through the GSA, in accordance with Subpart H of DOE-PMR (41 CFR Part 109) and Subpart B of FMR (41 CFR Part 102). As there is no special form to process donations, the holding agency may use any document that has an audit trail to record the transaction. [41 CFR Subparts 102-37.35(c); 41 CFR Subparts 102-37.575]

Sources[12]	Consolidated Requirements[10, 11]
Appendix A to 41 CFR Part 102-40; Appendix B to 41 CFR Part 102-40; Federal Standard 313 (FED-STD-313E, July 01, 2014)	**4.8.1 FSC Groups and Classes that Contain Hazardous Materials.** *[NOTE: To facilitate identification of hazardous materials or items using FSC groups or classes, two listings, based on Federal Standard 313, are provided in Appendix B of this chapter. Table B-1 contains a complete list of FSC classes composed predominantly of hazardous items and Table B-2 contains a selective listing of FSC classes and groups that contain a significant number of hazardous items.]*
41 CFR Part 102-40, Subpart E	**4.8.2 Special Requirements for Disposition of Certain Hazardous Materials and Certain Categories of Property.** *[NOTE: Special requirements for the utilization, donation, sale, and disposition of chemical products, including those belonging to certain Federal Supply Classes or Groups, that contain hazardous chemicals such as asbestos, PCBs, or explosives are covered in various sections of 41 CFR* Part *102.40, Subpart E:* • *Controlled substances (refer to 41 CFR Subpart 102-40.160)* • *Nuclear Regulatory Commission (NRC)-controlled materials (refer to 41 CFR* Subpart *102-40.210)* • *Drugs, biologicals, and reagents other than controlled substances (refer to 41 CFR* Subpart *102-40.165)* • *Lead-containing paint and items bearing lead-containing paint (refer to 41 CFR* Subpart *102-40.185)* • *U.S. Munitions List items that require demilitarization (refer to 41 CFR* Subpart *102-40.195)* • *Acid-contaminated and explosives-contaminated property (refer to 41 CFR* Subpart *102-40.135)]*
41 CFR 102-40.155	**4.8.3 Asbestos – Special Requirements** *[NOTE: The following disposition requirements apply to chemical products containing friable asbestos (see Section 4.8.3.1, below) and nonfriable asbestos (see Section 4.8.3.2 below)]*
	4.8.3.1 ***Friable Asbestos Materials*** (see definition)
41 CFR 102-40.155(f); 41 CFR 102-40.155(g); SF 120	**4.8.3.1.1** *Utilization* – Excess chemicals known to contain friable asbestos shall not normally be reported to the GSA on SF 120 or transferred among federal agencies. However, the holding agency may, on a case-by-case basis, request approval from GSA, in consultation with EPA, to transfer, sell or donate such property if such action is warranted.

Sources[12]	Consolidated Requirements[10, 11]
41 CFR 102-40.155(h)	**4.8.3.1.2** *Donation and sales*[46] – Surplus chemicals containing friable asbestos shall not be donated or sold except as noted in 4.8.3.1.1.
41 CFR 102-40.155(i); 40 CFR 61.156	**4.8.3.1.3** *Abandonment and destruction* – Excess or surplus personal property, which contains friable asbestos, shall be buried in an EPA- approved site, in accordance with the requirements of 40 CFR Subpart 61.156.
	4.8.3.2 ***Nonfriable Asbestos Materials*** (see definition)
41 CFR 102-36; 41 CFR 102-40.155(d); SF 120; SF 122	**4.8.3.2.1** *Utilization* – Excess chemicals containing nonfriable asbestos shall be reported to GSA and processed routinely, except that a required cancer hazard warning, as specified in 41 CFR 102-40.155(d), shall be included in the Standard Forms 120 and 122.
41 CFR 102-40.155(d)	**4.8.3.2.2** All excess chemical products known to contain nonfriable asbestos shall be labeled with a cancer hazard warning as prescribed in 41 CFR 102-40.155(d).
41 CFR 101-42.1102- 1(c)(2)(i); 41 CFR 102-37; 41 CFR 102-40.155(b); 41 CFR 102-40.155(c); SF 123	**4.8.3.2.3** *Donation* – Surplus chemicals containing nonfriable asbestos may be donated in the normal manner, except that the Standard Form (SF) 123 shall include the cancer hazard warning stipulated in Section 4.8.3.2.1 above.
41 CFR 102-40.155(b); 41 CFR 102-40.155(c)	**4.8.3.2.4** All surplus chemicals to be donated or sold, that contain nonfriable asbestos, shall be labeled as stated in Section 4.8.3.2.2 above.
41 CFR 102-38; 41 CFR 102-40.155	**4.8.3.2.5** *Sale* – Surplus chemicals containing nonfriable asbestos may be sold, except that all sale-related documentation including product literature, advertisements, and post-sale agreements shall include a cancer hazard warning as specified in Section 4.8.3.2.1, above.

[46] Exception: DOE and DOE contractors may, on a case-by-case basis, request approval from the GSA Central Office to transfer, donate, or sell (excess/surplus) chemicals containing friable asbestos. [41 CFR Subpart 102-40.155(f)]

Sources[12]	Consolidated Requirements[10, 11]
41 CFR 102-36.305 - 102-36.330; 41 CFR 102-40.155(e)	**4.8.3.2.6** *Abandonment and destruction* – Surplus chemicals containing nonfriable asbestos which are not transferred, donated, or sold shall be abandoned or destroyed as provided for in 41 CFR Subparts 102-36.305 through 102-36.330. However, if DOE is concerned about the nonfriable asbestos within the chemical product having the potential to become friable during the process of abandonment or destruction, the product shall be disposed of by burial (See Section 4.8.3.1.3 above).
41 CFR 102-40.220	**4.8.4 Polychlorinated biphenyls – Special Requirements**
41 CFR 102-36; 41 CFR 102-37; 41 CFR 102-38; 41 CFR 102-40.220(a);	**4.8.4.1** ***Excluded PCB products*** (see definition) are not subject to federal restrictions and may be transferred, donated, sold, or otherwise processed under 41CFR Subparts 102-36, 102-37, and 102-38, provided such processing conforms to all applicable state[47] and local laws.
41 CFR 102-40.220(b)	**4.8.4.2** All ***PCBs*** (see definition) and ***PCB items*** (see definition) to be transferred, donated, or sold shall be labeled or marked clearly with a toxic hazard warning as specified in 41 CFR 102-40.220(b).
41 CFR 102-40.220(c)	**4.8.4.3** Items containing PCBs or PCB items with an unknown level of concentration of PCBs shall not be transferred, donated, or sold.
41 CFR 102-40.220(a)	**4.8.4.4** Utilization – PCBs and PCB items shall be reported for utilization screening as a hazardous property (see Sections 4.2.2.3 and 4.2.2.4 above).
40 CFR 761; 41 CFR 102-40.220(b); SF 122	**4.8.4.5** To obtain GSA's approval for transfers of excess PCBs or PCB items, (a) the items shall be intact, non-leaking, and totally enclosed, and (b) the SF 122 shall cite the specific provision in 40 CFR Part 761 that allows continued use of the item, and contains a certification that the product has been inspected by the transferee and that it complies with all applicable provisions of 40 CFR Part 761.
40 CFR 761; 41 CFR 102-40.220(b)	**4.8.4.6** When a PCB or PCB item is transferred as excess, the receiving agency shall note in its property accountability records the nature and concentration of the PCB and shall list the provisions of 40 CFR Part 761 authorizing its use.

[47] Some States regulate PCB concentrations more strictly than does the Federal government.

Sources[12]	Consolidated Requirements[10, 11]
40 CFR 761; 41 CFR 102-37; 41 CFR 102-40.85; SF 123	**4.8.4.7** *Donation* – In order for PCB or PCB-contaminated items to be approved by the GSA for donation under 41 CFR Subpart 102-37, the following must be met: • The required toxic hazard certification (see Section 4.8.4.2 above) must appear on the SF 123 • The specific donee must have been selected; and • The "Warning and Certification" provided in 41 CFR 102-40.220(e) must be included in the transfer paperwork by the SASP
41 CFR 102-40.220(b)	**4.8.4.8** All PCBs and PCB items must be in usable condition to be eligible for donation.
41 CFR 102-40.220(b)(1)(i)	**4.8.4.9** Items to be donated must be intact, totally enclosed, and non-leaking.
40 CFR 761; 41 CFR 102-40.220(b)(2)	**4.8.4.10** *Sales* – The GSA or the holding DOE organization normally shall not sell surplus PCBs or PCB items. These items are regarded as extremely hazardous and shall be disposed of by DOE and DOE contractors under the EPA regulations. *[NOTE: Holding DOE organizations may request the authority to sell or that the GSA sell a specific PCB or PCB item, by citing the specific provision in 40 CFR Part 761 that authorizes such sale, along with a justification for sale of the item instead of disposal under EPA regulations.]*
41 CFR 102-40.220(d)	**4.8.4.11** Property containing PCBs should be labeled with a warning such as that provided in 41 CFR Subpart 102-40.220(d).
40 CFR 761; 41 CFR 102-40.220(b)(2)	**4.8.4.12** *Abandonment and destruction* – PCBs and PCB items not disposed of via utilization, donation, or sale shall be destroyed or otherwise disposed of in accordance with the EPA regulation (40 CFR Part 761) and applicable state laws.
10 CFR Part 835; 41 CFR 102-40.135; 41 CFR 109-42.11; 41 CFR 109-42.1100.50; DOE O 458.1	**4.9 Utilization and Disposition of Hazardous Materials that are Radioactively or Chemically Contaminated** *[NOTE: 41 CFR Subpart 109-42.11 sets forth policies and procedures for the utilization and disposition outside of DOE of excess and surplus chemicals, which have been radioactively or chemically contaminated.]*
10 CFR Part 835; 41 CFR 109-42.1100.51; DOE O 458.1	**4.9.1** DOE or DOE contractor shall dispose of contaminated chemicals in accordance with applicable federal regulations governing radiation and chemical exposures and environmental contamination. Appropriate state and local regulations shall be followed in cases where federal regulations do not exist or apply.

Sources[12]	Consolidated Requirements[10, 11]
10 CFR Part 835; 41 CFR 109-42.1102.51(a); DOE O 458.1	**4.9.2** *Suspect Personal Property* – Excess chemicals (including scrap) having a history of use in an area where radioactive or chemical contamination may occur shall be considered suspect and shall be monitored.
10 CFR Part 835; 41 CFR 109-42.1102.51(b); DOE O 458.1	**4.9.3** If economically feasible, every effort shall be made to reduce the level of contamination of excess or surplus chemicals to the lowest practicable level. Contaminated chemicals that exceed applicable contamination standards shall not be utilized or disposed outside of DOE.
10 CFR Part 835; 41 CFR 109-42.1102.51(c); DOE O 458.1	**4.9.4** If contamination is suspected and the property is of such size, construction, or location as to make testing for contamination impossible, the property shall not be utilized or disposed outside of DOE.
10 CFR Part 835; 41 CFR 109-42.1102.52; 41 CFR 109-45.5005-1(a); 49 CFR 171-179; DOE O 458.1	**4.9.5** *Low-Level Contaminated Personal Property* – If monitoring of suspect chemicals indicates that contamination does not exceed applicable standards, they may be utilized and disposed of in the same manner as uncontaminated chemicals, provided the guidance in 41 CFR Subpart 109-45.5005-1(a) has been considered. However, recipients shall be advised of the hazards where levels of radioactive contamination require specific controls for shipment as provided in DOT regulations (49 CFR Parts 171-179) for shipment of radioactive personal property.
10 CFR Part 835; 41 CFR 109-42.1102.52; DOE O 458.1	**4.9.6** When any contaminated chemical is screened within DOE, reported to GSA, or otherwise disposed of, the type and degree of contamination must be clearly indicated on all relevant documents.
DOE-PPL 970-3; 10 CFR Part 835; 41 CFR 109-42; 41 CFR 109-43.307-2.50; 41 CFR 109-43.307-51; 41 CFR 109-43.307-52; 41 CFR 109-45.309; 41 CFR 109-45.50; 41 CFR 109-45.5005-1; DOE O 458.1	**4.9.7** *High-Risk Personal Property* – Excess and surplus chemicals identified as nuclear-related, proliferation-sensitive, low-level contaminated, or classified personal property shall not be transferred, sold, exchanged, leased, donated, abandoned, or destroyed without approval of the cognizant DOE program office. Disposition of such chemicals is subject to the restrictions contained in applicable sections of the DOE-PMR and FPMR.
	4.10 Storage and Handling of Excess or Surplus Chemicals *[NOTE: Chemicals categorized as hazardous materials, extremely hazardous materials, dangerous property, and hazardous property require special handling and storage considerations. Requirements identified in Chapter 5 of this document continue to apply for the storage and handling of excess (or surplus) chemicals while avenues for their disposition are being sought until the time the chemicals are identified as waste for final disposal.]*

9.5 Source Documents

Department of Defense (DoD) Manual 4160.28, Volume 1 (06-07-2011), *Defense Demilitarization: Program Administration*

Department of Energy (July 1999), *Guidelines on Export Control and Nonproliferation*

Department of Energy Personal Property Letter, Issue Number 970-3, Revision 1, *02-03-1998*

Executive Order 12344 (February 1, 1982), *Naval Nuclear Propulsion Program,* 47 Federal Register 4979

Federal Standard 123 (or FED-STD-123), *Marking for Shipment (Civil Agencies)*

Federal Standard 313 (or FED-STD-313E, July 01, 2014), *Material Safety Data, Transportation Data and Disposal Data for Hazardous Materials Furnished to Government Activities*

International Atomic Energy Agency (IAEA), *Guidelines for the Export of Nuclear Material, Equipment and Technology, INFCIRC 254, Part 1 (Rev 13, November 8, 2016)*

International Atomic Energy Agency (IAEA), *Guidelines for Transfers of Nuclear-related Dual-use Equipment, Materials, Software and Related Technology, INFCIRC 254, Part 2 (Rev.10, November 8, 2016)*

NFPA 45 (2014), *Standard on Fire Protection for Laboratories Using Chemicals (2015 Edition)*

Public Law 98-525 (10-19-84), Fiscal Year 1985, Title XV; *Department of Defense Authorization Act*, also called *Department of Energy National Security and Military Applications of Nuclear Energy Authorization Act of 1985*

10 CFR 110, *Nuclear Regulatory Commission*, *Export and Import of Nuclear Equipment and Material*

10 CFR 810, *Department of Energy*, *Assistance to Foreign Atomic Energy Activities*

10 CFR 835, *Occupational Radiation Protection Program*

15 CFR Subtitle B, Chapter VII, Subchapter C (Parts 730 to 774), Department of Commerce, *Export Administration Regulations* (EAR); in particular, 15 CFR 734, *Scope of the Export Administration Regulations*, 15 CFR 744, *Control Policy: End-User and End-Use Based*, and 15 CFR 774, *The Commerce Control List*

22 CFR Chapter 1, Subchapter M (Parts 120-130), *Department of State*, *International Traffic in Arms Regulations* (ITAR), and in particular, 22 CFR 121, *The United States Munitions List*

29 CFR 1910, *Occupational Safety and Health Standards*

29 CFR 1910.120, *Hazardous Waste Operations and Emergency Response*

29 CFR 1910.1001, *Asbestos*

29 CFR 1910.1200, *Hazard Communication*

29 CFR 1926.65, *Hazardous Waste Operations and Emergency Response*

40 CFR 61.156, Cross-reference to other asbestos regulations (*National Emission Standards for Asbestos*)

40 CFR 261, *Identification and Listing of Hazardous Waste*

40 CFR 273, *Standards for Universal Waste Management*

40 CFR 761, *Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions*

40 CFR 763, *Asbestos*

41 CFR 101, *Federal Property Management Regulations* (Parts 101-1 to 101-99); in particular, Subchapter H – *Utilization and Disposal* (Parts 42 to 99)

41 CFR 101-27.2, *Management of Shelf-Life Materials*

41 CFR 102, *Federal Management Regulation* (Parts 102-1 to 102-220); in particular, 41 CFR 102-36, *Disposition of Excess Personal Property* [NOTE: This Part is cross-referenced by 41 CFR 101-43*, Utilization of Personal Property,* which is no longer in print], 41 CFR 102-37, *Donation of Surplus Personal Property* [NOTE: This Part is cross-referenced by 41 CFR 101-44*, Donation of Surplus Personal Property*, which is no longer in print], 41 CFR 102-38, *Sale of Personal Property* [*NOTE: This Part is* cross-referenced by 41 CFR 101-45, *Sale, Abandonment, or Destruction of Personal Property,* which is no longer in print], *and 41 CFR 102-40, Utilization and Disposition of Personal Property with Special Handling Requirements* [NOTE: This Part is cross-referenced by *41 CFR 101-42, Disposition of Personal Property with Special Handling Requirements,* which is no longer in print]

41 CFR 109, *Department of Energy Property Management Regulations*; in particular, Subchapter H – *Utilization and Disposal* (Parts 109-42 to 109-50).

49 CFR 171-180 (Subchapter C), *Hazardous Materials Regulations (HMR)*

49 CFR 171-179*, Hazardous Materials Transportation*

DOE O 458.1, *Radiation Protection of the Public and the Environment, 02-11-2011*

DOE G 580.1-1A, *Personal Property, 06-09-2015*

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Appendix A to Chapter 9 – Typical Screening Process Steps

DISPOSITION OF EXCESS OR SURPLUS CHEMICALS USING FEDS/EADS: DOE-PMR, FPMR, AND FMR REQUIREMENTS

The potential avenues of disposition open to an excess chemical depend on its hazard, risk, and value characteristics. Excess precious metals shall be returned to DOE's Precious Metals Pool located in Oak Ridge, Tennessee. As shown in Table A-1, the first step in the typical disposition cycle is to screen excess chemicals for reutilization within the DOE complex through the EADS for a 15-day period. At the conclusion of internal DOE screening, four categories of high-risk property identified as export-controlled property, proliferation-sensitive property, especially designed or prepared property, and nuclear weapon components or weapon-like components[48] shall be dispositioned in accordance with DOE-PPL 970-3 and 41 CFR *Subpart* 109-1.53, with prior review and approval by the OPMO. An Export Restriction Notice signed by the recipient organization shall accompany any resulting property transfers, sales, or other offerings.

Among the remaining six high-risk property categories is hazardous property (as defined in DOE-PPL 970-3 and 41 CFR *Subparts* 109-1.100-51(a)), which includes hazardous materials as defined in the FMR (41 CFR Part 102, see especially 41 CFR Section 102-40.30). These chemicals may be screened through the FEDS for a period of 21 days after the internal DOE screening has concluded, in accordance with 41 CFR Section 109-42, 41 CFR Part 101-42, and 41 CFR Section 102-36. Excess chemicals may be transferred to another federal agency using the federal excess screening process in FEDS. The remaining surplus chemicals will become eligible for donation (refer to 41 CFR Section 102-37) to nonprofit donees through surplus screening by the SASPs. The next step in the disposition process is a sale (refer to 41 CFR Part 102-38) conducted by the GSA regional office (or by the DOE contractor with approval from GSA) to the public through a competitive bid or auction sale process. The ultimate fate of any remaining surplus chemicals rests with the owning DOE organization, which may elect to put the chemicals back into the disposition cycle or declare them as solid waste (unless they are recyclable under the universal waste provisions) and dispose of them under appropriate EPA, state, and local laws and regulations.

In cases involving excess or surplus chemicals with no market value, when holding a sale is not an economically viable option, abandonment or destruction (see Table A-2) may be permitted, with approval by the authorized DOE property management official. Where feasible, sale to the public as scrap or donation to public bodies (i.e., any public agency, Indian tribe, or agency of the Federal Government) is the preferred option in lieu of abandoning or destroying the property. Donation is not an option for chemical products that require destruction for health, safety, or security reasons. A public notice of intent to destroy shall not be issued in such cases.

[48] Nuclear materials and radiological materials fall outside the scope of this chapter.

Any U.S. Munitions List Item (MLI) or Commerce Control List Item (CCLI) that requires demilitarization is identifiable by an assigned demilitarization code that indicates the type and scope of demilitarization or export controls that must be undertaken before the item can be transferred to a non-DoD entity. For a listing of these codes and additional guidance, refer to DoD Manual 4160.28, Volume 1, *Defense Demilitarization: Program Administration*. Only demilitarized property may be offered for public sale or donated to public bodies.

STANDARD FORMS USED IN CHEMICAL DISPOSITION:

Standard Form 120, *Report of Excess Personal Property* – submitted by the holding agency (i.e., DOE) to the GSA at the end of internal DOE screening to report excess chemicals that are available for federal screening. If DOE plans to conduct a sale after donation screening, it should so inform GSA at this time. *[NOTE: Do not report extremely hazardous property on SF 120 unless so directed by a GSA Regional office or GSA Central office. Do not screen within DOE or report to the GSA any nuclear-related and proliferation-sensitive property.]*

Standard Form 122, *Transfer Order Excess Personal Property* – used for the transfer of excess chemicals among federal agencies, including DOE. Prepared by the transferee (i.e., receiving agency) and approved by the GSA regional office (responsible for the region where the property is located).

Standard Form 123, *Transfer Order Surplus Personal Property* – used to request and document the transfer of federal surplus chemicals for donation to a non-Federal recipient (e.g., a SASP or donee). Prepared by the SASP or donee when applicable and submitted to the GSA regional office (responsible for the region where the property is located) for approval.

GSA ONLINE RESOURCE FOR EXCESS:

GSAXcess® is GSA's website for reporting, searching and selecting excess personal property. For information on using GSAXcess®, access http://www.gsaxcess.gov.

GSA ONLINE RESOURCE FOR SALES OF SURPLUS:

Federal Asset Sales (eFAS) refers to the e-Government initiative (effective April 17, 2008) under which, only an agency designated as a Sales Center (SC) may sell federal property, unless a waiver has been granted by the eFAS Planning Office (within the GSA) in accordance with 41 CFR Section 102-38.360. The eFAS initiative is governed and given direction by the eFAS Executive Steering Committee, with GSA as the managing partner agency. The eFAS Planning Office may be contacted via e-mail at: FASPlanningOffice@gsa.gov.

Appendix A to Chapter 9 - Table A-1.
TYPICAL DISPOSITION OF EXCESS CHEMICALS

DISPOSITION OPTION	DESCRIPTION OF ACTIVITY	ELIGIBLE RECIPIENT	EADS or FEDS	SCREENING PROCESS TIME FRAME	REQUIRED FORMS	REGULATION[49]
1. Unneeded (or Excess) Chemical Reutilization or Redistribution	Internal Screening for transfers within DOE	Any site in DOE Complex	EADS	15-day DOE Reutilization Screening	SF 122 and Approval by DOE for Transfer; SF 120 (Reporting of Excess) for Remaining chemicals	41 CFR 109-43.304-1.50; 41 CFR 109-43.304-1.50(d); 41 CFR 109-43.304-1.51; 41 CFR 102-40; 41 CFR 102-36
EXCESS RELEASE DATE						
2. Excess Chemical Transfer	Excess Screening or Federal Screening	Any federal agency	FEDS/ GSAXcess	21-day Federal Excess Screening	SF 122	41 CFR 109-43; 41 CFR 102-40; FMR; 41 CFR 102-36
EXCESS RELEASE DATE						
3. Surplus Chemical Donation	Donation to public agencies through state government (SASP) screeners	State agency or agency-approved organization	FEDS	Surplus Donation Screening	SF 123	41 CFR 109-44; 41 CFR 109-43.307; 41 CFR 102-40; FMR; 41 CFR 102-37
4. Surplus Chemical Sale	Sale to public by competitive bid sales or auction	Public or private company	FEDS	Sale Process		41 CFR 109-45.3; 41 CFR 101-42.4; 41 CFR 101-42.1102; FMR; 41 CFR 102-37; 41 CFR 102-38

[49]CFR citations listed in the Regulation column are for illustration purposes only, and are not intended to be all-inclusive.

Appendix A to Chapter 9 - Table A-2.
DISPOSITION OF EXCESS OR SURPLUS CHEMICALS SUBJECT TO ABANDONMENT OR DESTRUCTION

DISPOSITION OPTION	DESCRIPTION OF ACTIVITY	ELIGIBLE RECIPIENT	EADS or FEDS	PROCESS PRIOR TO DISPOSITION	REQUIRED FORMS/ APPROVAL	REGULATION[50]
Sale to the Public or Donation to Public bodies	Option in lieu of abandonment or destruction	Sold to public as scrap or donated to public bodies	Not applicable	Public notice/ advertisements of intent to destroy or sell	No Standard Forms to record a donation -- an auditable document suffices	41 CFR 109-44.7; 41 CFR 109-45; 41 CFR 102-36; 41 CFR 102-37; 41 CFR 102-38; 41 CFR 102-40;
Abandonment or Destruction	Applicable to property with no commercial value or estimated maintenance and storage costs exceeding potential sale proceeds, or high-risk property with health, safety, or security concerns	Not applicable	Not applicable	Public notice/ advertisements of intent, to destroy or sell prior to actual disposition; Notice may be waived with DOE review and approval; Some property may be converted to scrap or rendered innocuous or unfit for use	Written justification and approval by DOE, pending disposition action; Eye witness certification of destruction	41 CFR 109-45.9; 41 CFR 109-1.53; 41 CFR 102-40; 41 CFR 102-36.35; 41 CFR 102- 36.305 through 102-36.330; 41CFR 102-36.430; 41 CFR 102-37.80; 41 CFR 102-37.570

[50] CFR citations listed in the Regulation column are for illustration purposes only, and are not intended to be all-inclusive.

Appendix B to Chapter 9

FEDERAL SUPPLY CLASSES AND GROUPS RELATED TO CHEMICALS

Table B-1. List of Federal Supply Classes Composed Predominantly of Hazardous Items

[Refer to FED-STD-313E (July 1, 2014) and Appendix A to 41 CFR Part 102-40]

FSC Code	Federal Supply Class (FSC)
6810	Chemicals
6820	Dyes
6830	Gases: compressed and liquefied
6840	Pest control agents and disinfectants
6850	Miscellaneous chemical specialties
7930	Cleaning and polishing compounds and preparations
8010	Paints, dopes, varnishes, and related products
8030	Preservative and sealing compounds
8040	Adhesives
9110	Fuels, solid
9130	Liquid propellants and fuels, petroleum base
9135	Liquid propellant fuels and oxidizers, chemical base
9140	Fuel oils
9150	Oils and greases: cutting, lubricating, and hydraulic
9160	Miscellaneous waxes, oils, and fats

Table B-2. Selective List of Federal Supply Classes and Groups that Contain a Significant Number of Hazardous Items

[NOTE: The following is shown for illustrative purposes; for a complete listing, see Appendix B to 41 CFR Part 102-40]

Federal Supply Class/ Group	Title	Examples of Hazardous Materials Requiring Identification
1375	Demolition materials	Explosive device
Group 34	Metalworking machinery	Equipment containing hazardous hydraulic fluids, including polychlorinated biphenyls (PCBs)
3433	Gas welding, heat-cutting, and metalizing equipment	Compressed gases
3439	Miscellaneous welding, soldering, and brazing supplies and accessories	Hazardous items such as cleaners, acids, flux and supplies that contain or produce hazardous fumes
3610	Printing, duplicating, and bookbinding equipment	Flammable or toxic lithographic solutions
4240	Safety and rescue equipment	Items which involve oxygen, or compressed gases, or contain emitting charges
*5640	Wallboard, building paper, and thermal insulation materials	Asbestos cloth which has loose fibers or particles that may become airborne and materials containing formaldehyde
5910	Capacitors	Items that contain polychlorinated biphenyls (PCBs) or sulfuric acid
5950	Coils and transformers	Items containing polychlorinated biphenyls (PCBs)
5970	Electrical insulators and insulating materials	Items containing flammable solvents

Table B-2. Selective List of Federal Supply Classes and Groups that Contain a Significant Number of Hazardous Items (Continued)

Federal Supply Class/ Group	Title	Examples of Hazardous Materials Requiring Identification
6135	*Batteries, non-rechargeable	Lead-acid, lithium and mercury batteries and alkaline (with electrolyte)
6140	*Batteries, rechargeable	Items that are wet or moist containing corrosive or other hazardous compounds
6505	*Drugs and biologicals	*Hazardous items as defined in 41 CFR Section 102-40.30 subject to DOT Hazardous Materials Regulations
6508	Medicated cosmetics and toiletries	Hazardous items as defined in 41 CFR Section 102-40.30
6640	Laboratory equipment and supplies	Items containing flammable compounds, mercury, or asbestos
6685	Pressure-, temperature-, and humidity-measuring and controlling instruments	Items containing mercury or compressed gases
6750	Photographic supplies	Items containing hazardous chemicals, solvents, thinners, and cements
7510	Office supplies	Hazardous items, such as thinners, cleaning fluids, flammable inks, and varnishes
8510	Perfumes, toilet preparations, and powders	Shipping containers, and pressurized containers with flammable or nonflammable propellants
8720	Fertilizers	Items containing weed and pest control or other harmful ingredients or because of their composition, are hazardous
9390	Miscellaneous fabricated nonmetallic materials	Items containing flammable solvents or asbestos

* Correction made to conform to the entries in the latest edition of "*Federal Procurement Data System - Product and Service Codes Manual*", August 2015 Edition (Effective date: October 1, 2015), Prepared by: U.S. General Services Administration Federal Acquisition Services, available at https://www.acquisition.gov/?q=PSC_Manual

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Chapter 10 – Training

10.1 Introduction

This chapter identifies and consolidates existing user safety and health requirements found in DOE and Federal chemical-related safety and health regulations and National Standards that address training requirements associated with the handling and use of ***chemicals*** (see definition) and ***chemical products*** (see definition). This chapter specifically consolidates requirements found in OSHA Standards 29 CFR P a r t 1910 and 29 CFR Part 1926, 10 CFR Part 850, 10 CFR Part 851, DOE Order 456.1A, *The Safe Handling of Unbound Engineered Nanoparticles*, and NFPA Codes 55, and 400, including technical standards that are made mandatory by their specific reference within a DOE Regulation, or Order. It should be noted that NFPA 430-2004 and 432-2002 editions may apply to older warehouses that were not upgraded to current building or fire code requirements. In contrast, recently built facilities utilize multiple control areas for chemical storage. References are cited per the convention introduced in Chapter 5, Section 5.1. State and local codes and requirements are not included.

This chapter is intended to list chemical-related safety and health requirements and to consolidate those that are overlapping or duplicative. The list of requirements includes pointers to the sources of those requirements.

This document does not create any new or additional requirements.

10.2 Applicability

This chapter consolidates existing, core safety and health requirements that all sites must follow when engaged in chemical-related activities. It is intended only to address safety and health-related training requirements applicable to chemical user activities. This chapter applies to DOE Contractors and Field Organizations who handle or use chemicals and chemical products. This chapter does not apply to:

- Waste operations (the Resource Conservation and Recovery Act (RCRA) requires training prior to the generation of waste; see 40 CFR Section 264.16);
- Transportation (training requirements for transporting chemicals are covered in Chapter 4, *Transportation*)
- Emergency management (training requirements for emergency management are covered in Chapter 8, *Emergency Management)*

[NOTE: Waste operations are not included in this consolidation of chemical user safety and health requirements. Hence, RCRA is not included in this document. However, 10 CFR 851 and RCRA regulations require training and must be adhered to as appropriate for site/facility operations.]

The information presented here applies to all locations that use chemicals or chemical products. *[NOTE: Throughout this document, the term "chemicals" is used to indicate chemicals or chemical products as described in Glossary Section.]* This chapter consolidates existing, core safety and health requirements that all sites must follow when engaged in chemical-related activities.

The requirements included in this chapter come from sources that have different safety purposes. As a result, some of these requirements may not always be applicable to the work being performed at an individual site or facility. Users must determine how specific requirements apply to their work and how they are implemented. The reference sources for the requirements included in this chapter can be used to determine the applicability of those requirements to the work being performed.

10.3 Definitions and Acronyms

See **Glossary.**

10.4 Requirements for Training

Sources[12]	Consolidated Requirements[10, 11]
	4.1 General Employee Information and Training
29 CFR 1910.1200(h)(1); 29 CFR 1910.1450(f); NFPA 400, 6.1.4, 6.1.4.2.6; DOE O 456.1A, Attachment 1 (CRD), Item 3 (Training)	Employers shall provide employees with effective information and training on hazardous chemicals (including ***Unbound Engineered Nanoparticles (UNP)*** (see definition), covered in DOE O 456.1A) in their work area at the time of their initial assignment and whenever a new physical or health hazard is introduced into their work area on which employees have not previously been trained. Information and training may be designed to cover categories of hazards (e.g., flammability, carcinogenicity) or specific chemicals.
29 CFR 1910.1450(f)(2)	**4.1.1** The frequency of refresher information and training shall be determined by the employer.
29 CFR 1910.1200(h)(1); NFPA 430-2004, 4.7.1.2	**4.1.2** Chemical-specific information must always be available through labels and SDSs (or MSDSs).
29 CFR 1910.1200(h)(2)	**4.1.3** Information – Employees shall be informed of:
29 CFR 1910.1200(h)(2)(i); 29 CFR 1910.1450(f)(3)(i)	**4.1.3.1** The contents of 29 CFR Section 1910.1200 and 1910.1450 and their appendices;
29 CFR 1910.1200(h)(2)(ii)	**4.1.3.2** Any operations in their work area where hazardous chemicals are present; and
29 CFR 1910.1200(h)(2)(iii)	**4.1.3.3** The location and availability of the written hazard communication program, including the required list(s) of hazardous chemicals and SDSs required by this section.
	4.1.4 Training – Employee training shall include, at a minimum:
29 CFR 1910.1200(h)(3)(i); 29 CFR 1910.1450(f)(4)(i)(A)	**4.1.4.1** Methods and observations that may be used to detect the presence or release of a hazardous chemical in the work area (such as monitoring conducted by the employer, continuous monitoring devices, visual appearance or odor of chemicals).
29 CFR 1910.1200(h)(3)(ii); 29 CFR 1910.1450(f)(4)(i)(B); NFPA 430, 4.7.2.1; NFPA 400, 6.1.4.2.1	**4.1.4.2** The physical and health hazards of the chemicals in the work area.

Sources[12]	Consolidated Requirements[10, 11]
29 CFR 1910.1200(h)(3)(iii); 29 CFR 1910.1450(f)(4)(i)(C)	**4.1.4.3** The measures employees can take to protect themselves from these hazards, including specific procedures the employer has implemented to protect employees from exposure to hazardous chemicals, such as appropriate work practices, emergency procedures, and PPE to be used; and
29 CFR 1910.1200(h)(3)(iv)	**4.1.4.4** The details of the hazard communication program developed by the employer, including an explanation of the labeling system and the SDS, and how employees can obtain and use the appropriate hazard information.
	4.2 Chemical Laboratories
29 CFR 1910.1450(f)	In addition to the requirements of Section 4.1 above, employees in chemical laboratories shall also be trained as follows:
29 CFR 1910.1450(f)	**4.2.1** Information:
29 CFR 1910.1450(f)(3)(ii)	**4.2.1.1** The location and availability of the employer's chemical hygiene plan;
29 CFR 1910.1450(f)(3)(iii)	**4.2.1.2** The permissible exposure limits for OSHA-regulated substances or recommended exposure limits for other hazardous chemicals where there is no applicable OSHA standard;
29 CFR 1910.1450(f)(3)(iv)	**4.2.1.3** Signs and symptoms associated with exposures to hazardous chemicals used in the laboratory; and
29 CFR 1910.1450(f)(3)(v)	**4.2.1.4** The location and availability of known reference material on the hazards, safe handling, storage, and disposal of hazardous chemicals found in the laboratory including, but not limited to, SDSs received from the chemical supplier.
29 CFR 1910.1450(f)(4)(ii)	**4.2.2** Training – The employee shall be trained on the applicable details of the employer's written chemical hygiene plan.
	4.3 Respirators
29 CFR 1910.134(k)	The employer shall provide effective training to employees who are required to use respirators. The training must be comprehensive, understandable, and recur at least annually; more often if necessary.
29 CFR 1910.134, App. D	**4.3.1** This paragraph also requires the employer to provide the basic information on respirators found in Appendix D of 29 CFR Section 1910.134 to all employees who wear respirators, including those who do so voluntarily (including dust masks).
29 CFR 1910.134(k)(1)	**4.3.2** The employer shall ensure that each employee can demonstrate knowledge of the following, at a minimum;
29 CFR 1910.134(k)(1)(i)	**4.3.2.1** Why the respirator is necessary and how improper fit, usage, or maintenance can compromise the protective effect of the respirator;
29 CFR 1910.134(k)(1)(ii)	**4.3.2.2** The limitations and capabilities of the respirator;

Sources[12]	Consolidated Requirements[10, 11]
29 CFR 1910.134(k)(1)(iii)	**4.3.2.3** How to use the respirator effectively in emergency situations, including situations in which the respirator malfunctions;
29 CFR 1910.134(k)(1)(iv)	**4.3.2.4** How to inspect, put on and remove, use, and check the seals of the respirator;
29 CFR 1910.134(c)(1)(v); 29 CFR 1910.134(c)(1)(viii); 29 CFR 1910.134(k)(1)(i); 29 CFR 1910.134(k)(1)(v)	**4.3.2.5** The procedures are for respirator cleaning, maintenance, and storage;
29 CFR 1910.134(k)(1)(vi)	**4.3.2.6** Recognizing medical signs and symptoms that may limit or prevent the effective use of respirators; and
29 CFR 1910.134(k)(1)(vii)	**4.3.2.7** The general requirements for respiratory protection found in 29 CFR Section 1910.134.
29 CFR 1910.134(k)(2)	**4.3.3** Training shall be conducted in a manner that is understandable to the employee.
29 CFR 1910.134(k)(3)	**4.3.4** The employer shall provide the training before requiring the employee to use a respirator in the workplace.
29 CFR 1910.134(k)(4)	**4.3.5** An employer who is able to demonstrate that a new employee has received training within the last 12 months that addresses the elements specified in paragraphs 4.3.2.1 through 4.3.2.7 above is not required to repeat such training provided that the employee can demonstrate knowledge of those elements. Previous training not provided by the current employer must be repeated under the auspices of the current employer no later than 12 months from the date of that previous training.
29 CFR 1910.134(k)(5)	**4.3.6** Retraining shall be administered annually and when the following situations occur:
29 CFR 1910.134(k)(5)(i)	**4.3.6.1** Changes in the workplace or the type of respirator render previous training obsolete.
29 CFR 1910.134(k)(5)(ii)	**4.3.6.2** Inadequacies in the employee's knowledge or use of the respirator indicate that the employee has not retained the requisite understanding or skill.
29 CFR 1910.134(k)(5)(iii)	**4.3.6.3** Any other situation arises in which retraining appears necessary to ensure safe respirator use.
29 CFR 1910.134(k)(6); 29 CFR 1910.134, App. D	**4.3.7** The basic advisory information on respirators, as presented in Appendix D, shall be provided by the employer in any written or oral format to employees who wear respirators, when such use is not required by 29 CFR Section 1910.134 or by the employer.

Sources[12]	Consolidated Requirements[10, 11]
29 CFR 1910.119	**4.4** ***Highly Hazardous Chemicals***
29 CFR 1910.119(g)	**4.4.1** Initial Training
29 CFR 1910.119(g)(1)(i)	**4.4.1.1** Each employee presently involved in operating a process, and each employee, before being involved in operating a newly assigned process, shall be trained in an overview of the process and in the operating procedures. The training shall include emphasis on specific safety and health hazards, emergency operations including shutdown, and safe work practices applicable to the employee's job tasks.
29 CFR 1910.119(g)(1)(ii)	**4.4.1.2** In lieu of initial training for those employees already involved in operating a process, an employer may certify in writing that the employee has the required knowledge, skills, and abilities to safely carry out the duties and responsibilities as specified in the operating procedures.
29 CFR 1910.119(g)(2)	**4.4.2** Refresher training shall be provided at least every 3 years, and more often if necessary, to each employee involved in operating a process to ensure that the employee understands and adheres to the current operating procedures of the process. The employer, in consultation with the employees involved in operating the process, shall determine the appropriate frequency of refresher training.
29 CFR 1910.119(g)(3)	**4.4.3** Training documentation – The employer shall ascertain that each employee involved in operating a process has received and understood the training required by this paragraph. The employer shall prepare a record that contains the identity of the employee, the date of training, and the means used to verify that the employee understood the training.
29 CFR 1910.119(h)(3)	**4.4.4** Contract employers shall:
29 CFR 1910.119(h)(3)(i)	**4.4.4.1** Ensure that each contract employee is trained in the work practices necessary to safely perform his or her job;
29 CFR 1910.119(h)(3)(ii)	**4.4.4.2** Ensure that each contract employee is instructed in the known potential fire, explosion, or toxic release hazards related to his or her job and the applicable provisions of the emergency action plan;
29 CFR 1910.119(h)(3)(iii)	**4.4.4.3** Document that each contract employee has received and understood the training required by this paragraph. The contract employer shall prepare a record that contains the identity of the contract employee, the date of training, and the means used to verify that the employee understood the training.

Sources[12]	Consolidated Requirements[10, 11]
29 CFR 1910.119(j)(3)	**4.4.5** Training for process maintenance activities - The employer shall train each employee involved in maintaining the on-going integrity of process equipment in an overview of that process and its hazards and in the procedures applicable to the employee's job tasks to assure that the employee can perform the job tasks in a safe manner.
29 CFR 1926.21	**4.5 Construction Safety Training and Education**
29 CFR 1926.21(b)(2)	**4.5.1** The employer[51] shall instruct each employee in the recognition and avoidance of unsafe conditions and the regulations applicable to his or her work environment to control or eliminate hazards.
29 CFR 1926.21(b)(3)	**4.5.2** Employees required to handle or use poisons, caustics, and other harmful substances shall be instructed regarding their safe handling and use, and be made aware of the potential hazards, personal hygiene, and personal protective measures required to safely handle or use harmful substances.
29 CFR 1926.21(b)(5)	**4.5.3** Employees required to handle or use flammable liquids, gases, or toxic materials shall be instructed in the safe handling and use of these materials and made aware of the specific requirements contained in Subparts D, F, and other applicable subparts of 29 CFR Part 1926.
29 CFR 1926.1204(h); 29 CFR 1926.1207	**4.5.4** All employees required to enter into confined or enclosed spaces shall be instructed as to the nature of the hazards involved, the necessary precautions to be taken, and in the use of protective and emergency equipment required. The employer shall comply with any specific regulations that apply to work in dangerous or potentially dangerous areas.
	4.6 Training requirements for specific materials.
NFPA 55, 4.7	**4.6.1** Compressed gases and cryogenic fluids in portable cylinders – Persons responsible for or working in the areas where compressed gases or cryogenic fluids are produced, stored, handled, or used shall be trained in the chemical and physical properties of the materials and the appropriate emergency response.
NFPA 430, 4.7.2.1 and 4.7.2.3; NFPA 400, 15.2.11.7	**4.6.2** Storage of liquid and solid oxidizers – Persons involved in operations where oxidizers are stored shall receive instruction in handling the materials in a safe manner, including the manufacturer's and processor's recommendations. Particular attention shall be given to proper disposal of spilled material to prevent contamination.

[51] Employers should avail themselves to the safety and health training program provided by the Secretary of Labor.

Sources[12]	Consolidated Requirements[10, 11]
NFPA 432-2002, 4.2; NFPA 400, 6.1.4, 6.1.4.2	**4.6.3** Storage of organic peroxides and other hazardous materials – Personnel involved in operations in organic peroxide or other hazardous material storage areas shall be instructed in proper and safe handling of such materials, proper use of PPE, proper and safe disposal of spilled material, and proper emergency procedures. Manufacturers' instructions shall be consulted for each specific chemical formulation.
29 CFR 1910.253	**4.6.4 Oxygen-fueled gas welding and cutting.**
29CFR1910.253(a)(4)	**4.6.4.1** Workmen in charge of the oxygen or fuel-gas supply equipment, including generators, and oxygen or fuel-gas distribution piping systems shall be instructed and judged competent by their employers before being left in charge. Rules and instructions covering the operation and maintenance of oxygen or fuel-gas supply equipment, including generators, and oxygen or fuel-gas distribution piping systems shall be readily available.
29 CFR 1910.253(e)(6)(ii)	**4.6.4.2** Regulators shall be repaired only by skilled mechanics with appropriate training.
29 CFR 1910.1003-1016; 29 CFR 1926.1103-1116	**4.6.5** OSHA's regulated carcinogens – non-laboratory use of the following 13 carcinogens requires additional training, as prescribed in sections 4.6.5.1 and 4.6.5.2 below. • 4-Nitrobiphenyl (CAS No.) 92933; • alpha-Naphthylamine, CAS No. 134327; • Methyl chloromethyl ether, CAS No. 107302; • 3,3'-Dichlorobenzidine (and its salts) CAS No. 91941; • bis-Chloromethyl ether, CAS No. 542881; • beta-Naphthylamine, CAS No. 91598; • Benzidine, CAS No. 92875; • 4-Aminodiphenyl, CAS No. 92671; • Ethyleneimine, CAS No. 151564; • beta-Propiolactone, CAS No. 57578; • 2-Acetylaminofluorene, CAS No. 53963; • 4-Dimethylaminoazobenzene, CAS No. 60117; • N-Nitrosodimethylamine, CAS No. 62759.
29 CFR 1910.1003(e)(4)(i)	**4.6.5.1** Each employee prior to being authorized to enter a ***regulated area*** (see definition), shall receive a training and indoctrination program including, but not necessarily limited to:
29 CFR 1910.1003(e)(4)(i)(A)	**4.6.5.1.1** The nature of the carcinogenic hazards of a carcinogen addressed by this section, including local and systemic toxicity;
29 CFR 1910.1003(e)(4)(i)(B)	**4.6.5.1.2** The specific nature of the operation involving carcinogen addressed by this section that could result in exposure;

Sources[12]	Consolidated Requirements[10, 11]
29 CFR 1910.1003(e)(4)(i)(C)	**4.6.5.1.3** The purpose for and application of the medical surveillance program, including, as appropriate, methods of self-examination;
29 CFR 1910.1003(e)(4)(i)(D)	**4.6.5.1.4** The purpose for and application of decontamination practices and purposes;
29 CFR 1910.1003(e)(4)(i)(E)	**4.6.5.1.5** The purpose for and significance of emergency practices and procedures;
29 CFR 1910.1003(e)(4)(i)(F)	**4.6.5.1.6** The employee's specific role in emergency procedures;
29 CFR 1910.1003(e)(4)(i)(G)	**4.6.5.1.7** Specific information to aid the employee in recognition and evaluation of conditions and situations that may result in the release of a carcinogen addressed by this section;
29 CFR 1910.1003(e)(4)(i)(H)	**4.6.5.1.8** The purpose for and application of specific first aid procedures and practices;
29 CFR 1910.1003(e)(4)(i)(I)	**4.6.5.1.9** A review of this section at the employee's first training and indoctrination program and annually thereafter.
29 CFR 1910.1003(e)(4)(ii)	**4.6.5.2** Specific emergency procedures shall be prescribed, and posted, and employees shall be familiarized with their terms, and rehearsed in their application.
	4.6.6 Other specific chemicals. In addition to the chemical safety training requirements for the materials above, there are also training requirements for other specific chemicals, as shown in the following. Details can be found in the specific citations.
29 CFR 1910.1045(o)	**4.6.6.1** Acrylonitrile (also see 29 CFR 1926.1145)
29 CFR 1910.1018(o)	**4.6.6.2** Arsenic, inorganic (also see 29 CFR 1926.1118)
29 CFR 1910.1001(j)(7)	**4.6.6.3** Asbestos (also see 29 CFR 1926.1101(k)(9))
29 CFR 1910.1028(j)(3)	**4.6.6.4** Benzene (also see 29 CFR 1926.1128)
10 CFR 850.37	**4.6.6.5** Beryllium
29 CFR 1910.1051(j)(2)	**4.6.6.6** 1,3-Butadiene
29 CFR 1910.1027(m)(4)	**4.6.6.7** Cadmium (also see 29 CFR 1926.1127(m)(4))
29 CFR 1910.1044(n)	**4.6.6.8** 1,2-Dibromo-3-chloropropane (also see 29 CFR 1926.1144)
29 CFR 1910.1047(j)(3)	**4.6.6.9** Ethylene oxide (also see 29 CFR 1926.1147)
29 CFR 1910.1048(n)	**4.6.6.10** Formaldehyde (also see 29 CFR 1926.1148)
29 CFR 1910.1025(l)(1)	**4.6.6.11** Lead (also see 29 CFR 1926.62(l))
29 CFR 1910.1052(1)	**4.6.6.12** Methylene chloride (also see 29 CFR 1926.1152)
29 CFR 1910.1050(k)(4)	**4.6.6.13** Methylenedianiline (also see 29 CFR 1926.60(l)(3))
29 CFR 1910.1017(j)	**4.6.6.14** Vinyl chloride (also see 29 CFR 1926.1117)

Sources[12]	Consolidated Requirements[10, 11]
29 CFR 1910.1052(1)	**4.6.6.12** Methylene chloride (also see 29 CFR 1926.1152)
29 CFR 1910.1050(k)(4)	**4.6.6.13** Methylenedianiline (also see 29 CFR 1926.60(l)(3))
29 CFR 1910.1017(j)	**4.6.6.14** Vinyl chloride (also see 29 CFR 1926.1117)
See the specific standards listed for each chemical above for the source of the requirements listed in the sections that follow.	**4.6.6.15** General training requirements[52] for 14 chemicals listed above:
	4.6.6.15.1 Training shall be provided at the time of initial assignment, or upon institution of the training program, and at least annually thereafter.
	4.6.6.15.2 The employer shall assure that each employee is informed of the following: • The information contained in the appendices in each of the specific chemical requirements cited;[53] • The quantity, location, manner of use, release, or storage, and the specific nature of operations that could result in exposure, as well as any necessary protective steps; • The purpose, proper use, cleaning, maintenance, storage, and limitations of respirators and personal protective clothing; • The purpose for, and a description of, the medical surveillance program required by the chemical-specific regulations cited; • The emergency procedures developed, as required by the chemical-specific regulations cited; • Engineering and work practice controls, their function, and the employee's relationship to these controls; and a review of the chemical-specific regulations cited.
	4.6.6.15.3 The employer shall make a copy of the specific chemical standard and its appendices readily available to all affected employees.

[52] This section contains a summary of the training requirements that are common to most of the chemicals listed. The exact requirements for each chemical may vary, and the chemical specific regulation cited should be reviewed for specific training details.

[53] These appendices contain additional information regarding the chemicals' physical and chemical properties, safety and health data, medical surveillance, emergency actions, etc.

Sources[12]	Consolidated Requirements[10, 11]
	4.7 Oxidizers and Other Hazardous Materials
NFPA 430, 4.7.2.1; NFPA 400, 15.2.11.7; NFPA 400, 6.1.4	**4.7.1** Persons responsible for operating or maintaining oxidizer or other hazardous material storage areas shall be trained on the compatibility of materials being stored there.
NFPA 430, 4.7.3; NFPA 400, 6.1.4.2.3, 6.1.4.5	**4.7.2** Persons responsible for operating or maintaining storage areas with quantities above permitted levels shall be trained to meet all the requirements in 29 CFR Section 1910.120, *Hazardous Waste Operations and Emergency Response*, and the technician level in NFPA 472 for professional competence of responders to hazardous materials events.

10.5 Source Documents

NFPA 55 (2015), *Compressed Gases and Cryogenic Fluids Code, 2016 ed.*

NFPA 400 (2015), *Hazardous Materials Code, 2016 ed.*

NFPA 430 (2004), *Code for the Storage of Liquid and Solid Oxidizers*; Replaced by NFPA 400 Chapter 15

NFPA 432 (2002), *Storage of Organic Peroxide Formulations*; Replaced by NFPA 400 Chapter 14

NFPA 472 (2017), *Standard for Competence of Responders to Hazardous Materials/Weapons of Mass Destruction Incidents, 2017 ed.*

DOE O 456.1A (7-15-2016), *The Safe Handling of Unbound Engineered Nanoparticles*

10 CFR 850, *Chronic Beryllium Disease Prevention Program*

29 CFR 1910.119, *Process Safety Management of Highly Hazardous Chemicals*

29 CFR 1910.134, *Respiratory Protection*

29 CFR 1910.253, *Oxygen-fuel Gas Welding and Cutting*

29 CFR 1910.1001, *Asbestos*

29 CFR 1910.1003, 13 Carcinogens (*4-Nitrobiphenyl, etc.)*

29 CFR 1910.1017, *Vinyl Chloride*

29 CFR 1910.1018, *Inorganic Arsenic*

29 CFR 1910.1025, *Lead*

29 CFR 1910.1027, *Cadmium*

29 CFR 1910.1028, *Benzene*

29 CFR 1910.1044, *1,2-Dibromo-3-chloropropane*

29 CFR 1910.1045, *Acrylonitrile*

29 CFR 1910.1047, *Ethylene Oxide*

29 CFR 1910.1048, *Formaldehyde*

29 CFR 1910.1050, *Methylenedianiline*

29 CFR 1910.1051, *1,3-Butadiene*

29 CFR 1910.1052, *Methylene Chloride*

29 CFR 1910.1200, *Hazard Communication*

29 CFR 1910.1450, *Occupational Exposure to Hazardous Chemicals in Laboratories*

29 CFR 1926.21, *Safety Training and Education*

29 CFR 1926.1204, *Permit-required Confined Space Program*

29 CFR 1926.1207, *Training*

Complete List of Sources [54]

ANSI Z49.1 (2012), *Safety in Welding, Cutting, and Allied Processes*

CGA C-7 (2014), *Guide to Classification and Labeling of Compressed Gases*

CGA G-1 (2015), *Acetylene*

CGA P-1 (2015), *Safe Handling of Compressed Gases in Containers*

DOE (July 1999), *Guidelines on Export Control and Nonproliferation*

DEAR 48 CFR 970.5223-1 *Integration of Environment, Safety and Health into Work Planning and Execution*

DOE-PPL Issue Number 970-3, Revision 1*, February-3-1998*

DOE O 151.1D, *Comprehensive Emergency Management System, August-11-2016*

DOE O 225.1B, *Accident Investigations*

DOE O 420.1C, *Facility Safety*

DOE O 422.1, *Conduct of Operations, November-29-2010*

DOE O 460.1D, *Hazardous Materials Packaging and Transportation Safety, December-20-2016*

DOE O 456.1A, *The Safe Handling of Unbound Engineered Nanoparticles, July-15-2016*

DOE O 458.1, *Radiation Protection of the Public and the Environment, February-11-2011*

DOE-STD-1066-99, *Fire Protection (1999)*

DOE-STD-1066-2016, *Fire Protection, December-22-2016*

DOE-STD-1027-92, *Hazard Categorization and Accident Analysis Techniques for Compliance with DOE O 5480.23*, *Nuclear Safety Analysis Reports*

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29 CFR 1910.1007, *3,3'-Dichlorobenzidine (and its salts)*

29 CFR 1910.1008, *bis-Chloromethyl ether*

29 CFR 1910.1009, *beta-Naphthylamine*

29 CFR 1910.1010, *Benzidine*

29 CFR 1910.1011, *4-Aminodiphenyl*

29 CFR 1910.1012, *Ethyleneimine*

29 CFR 1910.1013, *beta-Propiolactone*

29 CFR 1910.1014, *2-Acetylaminofluorene*

29 CFR 1910.1015, *4-Dimethylaminoazobenzene*

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29 CFR 1910.1450, *Occupational Exposure to Hazardous Chemicals in Laboratories*

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40 CFR 63, *National Emission Standards for Hazardous Air Pollutants for Source Categories*

40 CFR 68, *Chemical Accident Prevention Provisions*

40 CFR 82, *Protection of Stratospheric Ozone*

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40 CFR 261, *Identification and Listing of Hazardous Waste*

40 CFR 273, *Standards for Universal Waste Management*

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40 CFR 370, *Hazardous Chemical Reporting Community Right-To-Know*

40 CFR 761, *Polychlorinated Biphenyls Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions*

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41 CFR 101-27.2, *Management of Shelf-Life Materials*

41 CFR 102, F*ederal Management Regulation* (Parts 102-2 to 102-197); in particular, 41 CFR 102-36, *Disposition of Excess Personal Property* [NOTE: This Part is cross-referenced by 41 CFR 101-43, *Utilization of Personal Property,* which is no longer in print], and 41 CFR 102-37, *Donation of Surplus Personal Property* [NOTE: This Part is cross-referenced by *41 CFR 101-44, Donation of Personal Property,* which is no longer in print]

41 CFR 109, *Department of Energy Property Management Regulations*; in particular, Subchapter H, *Utilization and disposal* (Parts 109-42 to 109-50)

43 CFR Part 3195, *Helium Contracts*

48 CFR, *Federal Acquisition Regulations System*

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48 CFR 952.223-78, *Sustainable Acquisition Program*

48 CFR 970, *DOE Management and Operating Contracts*

48 CFR 970.5223-7, *Sustainable Acquisition Program*

49 CFR 171-180, (Subtitle B, Chapter 1, Subchapter C), *Hazardous Materials Regulations*

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Appendix A: Chapter Overviews

Chapter 1: Hazard Analysis

This chapter consolidates existing DOE and other federal safety and health requirements and national standards that address the identification of chemical hazards. State and local code requirements are not included. The consolidated requirements addressed here apply to all locations involved in the storage and use of **chemicals** and **chemical products** (see definition).

While this chapter is very short, its importance cannot be overstated. Several objectives of the hazard analysis requirements consolidated in this chapter include the:

- Identification and analysis of potential hazards so that appropriate preventive and mitigative measures can be taken to protect workers and the general public;
- Communication of hazards and associated controls to workers;
- Identification of the presence and magnitude of certain hazards to determine the applicability of relevant safety standards (e.g., threshold quantities established in certain Federal regulations).

This chapter is divided into two sections. The first section, 4.1, contains a consolidation of requirements for hazard analysis and communication associated with the general use of chemicals. Section 4.2 details consolidated requirements for analyzing hazards when certain hazardous operations are involved. This section is similar to section 4.1, but contains more specificity and additional rigor regarding hazard analysis methods and documentation.

Key to this chapter is the recognition that hazard identification, though generally implied rather than being directly stated, is an underlying principle of hazard analysis, since without first being properly identified, hazards cannot be analyzed or evaluated for ultimate mitigation.

Chapter 2: Chemical Acquisition

This chapter covers those existing DOE and other federal requirements that govern the acquisition of chemicals, and applies to all locations involved in the storage and use of **chemicals** and **chemical products** (see definition). State and local requirements are not included. It consolidates direct health and safety-related acquisition requirements applicable to the procurement of chemicals and summarizes implied requirements for the acquisition of chemicals and chemical products that are included in various regulations and standards but are not directly mandated by them. This chapter is divided into eight major sections. Each section of the chapter contains consolidated requirements for the procurement of a specific class or type of chemical or chemical product.

Section 4.1 of this chapter consolidates general health and safety requirements that must be addressed when chemicals are procured. The remaining sections of this chapter consolidate additional non-safety and health-related acquisition requirements for specific classes of chemicals and chemical products and are provided for informational purposes only. Section 4.2 consolidates requirements for the procurement of alcohol, section 4.3 requirements for the procurement and usage of helium, section 4.4 requirements for fuel and petroleum, section 4.5 requirements for arms and ammunition, section 4.6 requirements for DOE-specific materials (heavy water, precious metals, lithium), and 4.7 requirements for controlled substances. Section 4.8 directs DOE contractors to implement the DOE Sustainable Acquisition Program.

The first section includes general requirements that are applicable to all chemical procurements. Key to this chapter are the requirements for hazard identification and analysis ***before*** purchasing chemicals that are consolidated in sections:

- 4.1.1 – Pre-purchase hazard identification and analysis.
- 4.1.2 – Pre-purchase evaluation for lower hazard or lower environmental impact.
- 4.1.3 – Pre-purchase determination of packaging and transportation requirements.
- 4.1.4 – Dissemination of hazards information to those individuals or groups which may be involved in the receiving, storage, use, or disposal of the chemicals.
- 4.1.5 – Availability of the manufacturer's SDS for those individuals or groups that may be involved in the receiving, storage, use, or disposal of the chemicals.

It is important to note that, as with all of the requirements consolidated in this document, those associated with the acquisition of all classes of chemicals are consistent with DOE's General Duty Clause contained in* 10 CFR Section 851.10, which requires employers to protect their employees from all recognized hazards in the workplace that are causing or have the potential to cause death or serious physical harm to workers.

* 29 USC 654(a)(1)

Chapter 3: Inventory and Tracking

This chapter identifies and consolidates existing chemical user safety and health requirements that address the inventory and tracking of chemicals and chemical products. It addresses relevant DOE and federal chemical-related regulations and national standards applicable to all locations involved in the storage and use of **chemicals** and **chemical products** (see definition) and excludes state and local code requirements.

Key to this chapter is its inclusion of the many regulations and standards for which an inventory and tracking system is an implied requirement that is necessary for proper compliance. Of additional importance in this regard is that whether direct or implied, requirements for the inventory and tracking of all classes of chemicals are consistent with the General Duty Clause in 10 CFR Section 851.10,* which requires employers to protect their employees from all recognized hazards in the workplace that are causing or have the potential to cause death or serious physical harm to workers.

This chapter is divided into two major sections. The first section, 4.1, includes requirements that are directly applicable to the inventory and tracking of all chemicals. The second section, 4.2, consolidates additional, implied requirements specific to various health and safety regulations.

Section 4.1 consolidates the inventory and tracking requirements for the workplace, and includes specific regulatory reporting requirements. Section 4.2 consolidates those requirements that do not directly require an inventory of hazardous chemicals, but for which use of a chemical inventory and tracking system would be necessary for compliance with mandatory standards, or would facilitate compliance.

The requirements covered include those for:

- Emergency plans and Fire Prevention plans (4.2.1);
- Worker exposure to hazardous chemicals in laboratories (4.2.2);
- Exposure and medical records (4.2.3);
- Hazard assessment in Emergency Management (4.2.4);
- DOE Federal and Contractor worker protection programs (4.2.5);
- Process Safety Management (4.2.6);
- Facility Safety and building codes (4.2.7 and 4.2.8);
- DOE Acquisition Regulations (4.2.9);
- Nuclear Safety Management (4.2.10);
- Chemical Accident Prevention (4.2.11);
- Emergency Planning Notification (4.2.12);
- National Emissions Standards for Hazardous Air Pollutants (4.2.13); and
- Protection of Stratospheric Ozone (4.2.14).

*29 USC 654(a)(1)

Chapter 4: On-Site Chemical Transportation

This chapter identifies and consolidates existing user safety and health requirements found in DOE and other federal chemical-related safety and health regulations and national standards (especially those of the CGA) applicable to all locations involved in the on-site transport of **chemicals** and **chemical products** (see definition). This includes hazardous materials offered for transportation on-site and the packaging, labeling, or marking of hazardous materials for transportation on-site. State and local codes and requirements are not included.

On-site transportation of chemicals is regulated by DOE and other federal hazardous materials regulations, site-specific documents, DOE Orders, and other federal regulations applicable to the transport of specific materials. Section 4.1 consolidates these requirements for the on-site transfers of hazardous materials and addresses acceptable alternatives for sites' compliance with the DOT Hazardous Materials Regulations.

Section 4.2 consolidates the requirements for on-site transport of specific materials, including compressed-gas cylinders, cryogenic liquid containers, and acetylene cylinders. This section covers such subjects as cylinder construction, labeling and marking, securing and lifting, and protection caps.

Of particular note in this chapter is that the CGA uses the word "should" for its non-mandatory requirements. To the extent regulations and DOE Orders incorporate CGA documents by reference, these requirements may be mandatory. Of additional note in this chapter is that packaging and transportation safety requirements apply to the purchasers of hazardous chemicals when they subsequently transfer those chemicals to another location. For on-site transfers, DOE requirements apply; for off-site transfers, DOT rules apply.

Chapter 5: Chemical Storage

This chapter covers those existing DOE and other federal requirements and national standards that govern the storage of **chemicals** and **chemical products** (see definition). State and local requirements are not included. The consolidated requirements addressed here apply to all locations involved in the storage and use of chemicals and chemical products. The chapter is divided into six major sections. Section 4.1 consolidates general storage requirements for chemicals and chemical products, section 4.2 requirements specific to compressed gases and cryogenic fluids, section 4.3 requirements for flammable and combustible liquids, section 4.4 requirements for oxidizers, 4.5 requirements for organic peroxides and 4.6 requirements for other hazardous materials covered in NFPA 400.

The first section (4.1) includes general requirements that are applicable to all areas where chemicals and chemical products are stored. Consolidated requirements concerning quantity limits for each class of chemicals stored in an area and how chemical storage areas must be identified and constructed are addressed in sections 4.1.1, 4.1.2, 4.1.7, and 4.1.9. Storage and use in new facilities are managed either in terms of the Maximum Allowable Quantities (MAQs) per control area for various chemical classes, as specified in the applicable Fire Code (or NFPA codes) or by the use of specific building controls when the stored amounts exceed MAQs. To help manage warehousing operations in older facilities that cannot be modified to accommodate multiple control areas, the last NFPA code editions in effect prior to adoption of the control area concept are identified by the year of issue, when citing an applicable standard.

This chapter also consolidates various requirements for special signage issues associated with the storage of chemicals. For example, there are specific requirements for "No Smoking" signs for chemical storage areas (4.1.4 and 4.1.4.1); hazard identification signs for areas storing compressed gases and cryogenic fluids (4.2.1); and signs conspicuously identifying areas where either oxidizers (4.4.1) or organic peroxides (4.5.1) are stored. Requirements for these signs are primarily intended for visitors and for emergency responders who must be apprised of the hazards that are present when they respond to an upset condition. Other requirements that are consolidated in this chapter are those that address security at chemical storage areas. These are intended to prevent unauthorized entry (4.1.3) and relate to issues such as terrorism, illegal drug manufacturing, and malevolent acts.

Compatible chemical storage is a subject that involves both the storage area and those chemicals being stored. Not only must chemicals be stored to ensure against their reaction with other chemicals (4.1.7.2, 4.2.6, 4.2.6.1, 4.5.3, 4.6.8), but to ensure that they do not come into contact with incompatible building materials or be stored in incompatible secondary containers (4.1.7.1, 4.4.3, 4.4.4, 4.5.3). While the term "incompatible" is used in broad terms in the regulatory literature, the overall intent is to prevent chemicals from interacting in such a way that additional hazards are created. These additional hazards could range from such things as fire or explosion hazards arising from interacting chemicals to reactions with containers that could result in product leakage or the creation of new hazards (e.g., toxic products or flammable gases). It is important to note that requirements for compatible chemical storage apply to all classes of chemicals – not just to those that are described in selected requirement sources (e.g., flammable liquids, compressed gases, cryogenic fluids oxidizers, and organic peroxides). The compatible storage of all classes of chemicals is consistent with DOE's General Duty Clause contained in 10 CFR Section 851.10*, which requires employers to protect their employees from all recognized hazards in the workplace that are causing or have the potential to cause death or serious physical harm to workers.

Other requirements consolidated in this chapter include those regarding the proper and secure labeling of chemicals in storage areas to ensure that each stored chemical is clearly identified (4.1.6), as well as those requirements relating to housekeeping issues intended to minimize potential spills and other accidents (4.1.10). The consolidated requirements for the storage of those chemicals that may generate additional hazards upon prolonged storage (4.1.8) is meant to effectively manage time-sensitive chemicals such as peroxide formers (e.g., diethyl ether) as well as those chemicals whose containers could degrade or that may otherwise become more hazardous over time. Other general requirements consolidated in this chapter address compatibility issues for the storage of specific classes of chemicals.

Of special interest in this chapter are those consolidated requirements intended to protect users of these chemicals from the safety and health hazards associated with the potential energy present in compressed-gas systems (4.2.3); *temperature requirements for compressed gases* (4.2.5), *oxidizers* (4.4.5), and *organic peroxides* (4.5.6); *storage cabinets used for the storage of toxic and highly toxic gases* (4.2.13), *flammable and combustible liquids* (4.3.15), and *organic peroxides* (4.5.7, 4.5.8, 4.5.9); and *required limits on quantities of various chemical types or classes that can be stored in each storage area* (4.2.7 through 4.2.10, 4.3.14, and 4.3.15). Finally, Section 4.6 points to specific chapters in NFPA 400, Hazardous Materials Code for storage requirements pertaining to ammonium nitrate and chemical classes such as flammable solids, pyrophoric, water-reactive, corrosives, toxic and highly toxic solids and liquids, and unstable reactive materials.

*29 USC 654(a)(1)

Chapter 6: Hazard Control

This chapter consolidates existing DOE and other federal safety and health requirements and national standards that address the control of the hazards associated with **chemicals** and **chemical products** (see definition). The consolidated requirements addressed here apply to all locations involved in the use of chemicals and chemical products. State and local code requirements are not included.

Of particular note in this chapter are hazard identification requirements because successful control of chemical hazards begins with the timely and accurate identification of those hazards.

The requirements consolidated in this chapter are divided into seven major sections. The first section, 4.1, addresses requirements for the implementation of a hazard prevention and abatement process and an industrial hygiene program.

Section 4.2 consolidates the requirements for control of **hazardous operations** (see definition), including written operating procedures, safety equipment and engineering controls, safe work practices, and fire prevention and fire protection.

Section 4.3 addresses the requirements for the control of chemicals used in laboratories, including particularly hazardous substances. The requirements consolidated in this section include those that address the preparation of a chemical hygiene plan; fire hazard classification; fire protection plans and equipment; special protections for explosives; the handling, transfer, and transport of flammable, reactive, or toxic chemicals and compressed gases in laboratories; and additional laboratory safety controls.

Section 4.4 consolidates requirements for controlling the hazards associated with operations involving the use of flammable and combustible liquids. Topics include: controlling ignition sources (e.g., smoking, welding, cutting, and other spark-producing operations); work with various classes of liquids and capacity control; safety cans; fire protection equipment; alarms; and dispensing and transfer methods.

Section 4.5 addresses requirements for the safe use of compressed gases, including labeling, temperature control, cylinder valves and caps, electrical protection, cylinder placement and protection, pressure regulators, cylinder transportation, hoses and connections, manifolds, gauges, leaking cylinders, and specific requirements for acetylene, hydrogen, and oxygen.

Section 4.6 references the requirement sources for additional controls for the hazards associated with 35 chemicals such as acrylonitrile, benzene, lead, vinyl chloride and zirconium.

The key theme of this chapter is that the timely and proper implementation of the requirements consolidated here will greatly reduce the probability of a chemical incident and the associated risk of harm to employees, property, the public, or the environment.

Finally, Section 4.7 references NFPA 400 chapters for additional controls or special provisions applicable to specific hazard classes when the storage and/or use amounts exceed the Maximum Allowable Quantities (MAQs) per control area.

Chapter 7: Pollution Prevention and Waste Minimization

This chapter addresses existing DOE and federal chemical-related safety and health requirements applicable to user activities as they relate to pollution prevention and waste minimization. It applies to all locations involved in the use of **chemical**s and **chemical products** (see definition). This chapter includes requirements found in 42 USC, 40 CFR, various Executive Orders and DOE Orders. Note that it does not include EPA reporting requirements for regulatory compliance, nor does it include State and local requirements.

The sections of this chapter consolidate requirements for:

- 4.1 – the establishment of pollution prevention and waste minimization policies;
- 4.2 – the elements and drivers for environmental sustainability programs;
- 4.3 and 4.4 – utilizing Environmental Managemental Systems (EMS) in setting Site Sustainability Plan goals and targets for environmental performance [e.g., pollution prevention at the source, waste minimization by reuse or recycling, reduction in the acquisition, use, or disposal of toxic and environmentally hazardous chemicals];
- 4.5 – the use of sustainable acquisition and purchasing activity to implement and support goals of the greenhouse gas reduction program and to maximize the use of safe alternatives to ozone-depleting substances; and
- 4.6 – completion of an annual toxic chemical release form under the Emergency Planning and Community Right-to-Know Act, which must include a source reduction and recycling report.

Of key importance in the intent of the requirements consolidated in this chapter is the integration of pollution prevention and waste minimization into planning, execution, and evaluation of all site activities. A major message of this chapter is that safety and health programs and environmental pollution prevention programs are usually mutually beneficial and their requirements are frequently mutually inclusive.

Requirements included here provide the context in which the chemical user incorporates pollution prevention into every phase of work, such as planning, acquisition, operations, waste management and disposal, and the continuous improvement in managing a site's chemical-related activities to achieve the goals of pollution prevention and waste minimization.

Chapter 8: Emergency Management

This chapter consolidates existing DOE and federal safety and health requirements and national standards that govern the management of emergencies involving chemicals. State and local requirements are not included. The requirements included here apply to all locations that use **chemicals** or **chemical products** (see definition). If a DOE site or facility engages in activities that involve chemicals, that site or facility must comply with the requirements that are referenced and consolidated in this chapter.

The chapter is divided into seven major sections that consolidate requirements for: the development of emergency response plans (Section 4.1); training (Section 4.2); emergency response plan implementation (Section 4.3); additional requirements for emergencies involving significant quantities of hazardous chemicals (Section 4.4); emergency response equipment (Section 4.5); medical support for chemical emergencies (Section 4.6); and post-incident actions (Section 4.7).

The requirements consolidated in section 4.1 are key to conducting a successful emergency response. They address the basic elements of the written emergency response plan, including a hazards survey; pre-emergency planning and coordination with other government agencies (local, state, and federal); criteria for emergency recognition; personnel titles and roles; emergency shutdown procedures and responsibilities; re-entry plans; security; and evacuation plans.

Section 4.2 covers the knowledge, abilities, and training required for specific emergency responders and their roles in an emergency (e.g., first responders, incident commander, hazardous materials technicians and specialists, safety officer, and other skilled support personnel). This section also consolidates the requirements for general employee training and drills, emergency response training, refresher training courses, and emergency training exercises.

Section 4.3 consolidates the requirements for implementing the emergency response plan commensurate with existing hazards. These requirements include those that address, for example, immediate corrective and mitigating actions; specific actions that must be taken by the Incident Commander; the use of backup personnel; the use of SCBAs; notification of the LEPC and the specific information that must be included in that notification; when to suspend certain operations due to immediate danger to life or health; and details regarding the release of information that must be provided to the public.

Section 4.4 covers the additional requirements for situations involving significant quantities of hazardous chemicals, (i.e., those that exceed the lowest of the threshold quantities listed in the OSHA standard 29 CFR Section 1910.119, or the EPA Rules found at 40 CFR Section 68.130 or 40 CFR Part 355. These requirements address, for example, categorizing and classifying emergencies based on the potential severity of the consequences; additional details regarding emergency planning notification and increased involvement with the LEPC; calculations of threshold planning quantities for solids and mixtures; provisions to adequately assess potential consequences on- and offsite; a documented training exercise program with specific objectives and a critique process; and a written, detailed emergency notification program for employees, the public, and local, state, and federal agencies.

Section 4.5 consolidates requirements for the availability and use of emergency equipment and facilities such as a system to rapidly notify and evacuate employees; operable and appropriate PPE, including totally-encapsulating chemical protective suits, respirators and other breathing apparatus; and other requirements for the selection and use of emergency response PPE.

Section 4.6 consolidates the requirements for medical support for chemical emergencies. It includes requirements for medical planning and treatment for mass-casualty situations; immediate medical consultation and surveillance; baseline physical examinations for hazardous materials response team members and hazardous materials specialists; specifications for the treatment of emergency response employees; and other detailed requirements for emergency response personnel and other employee medical programs and records.

Finally, Section 4.7 consolidates post-incident requirements, including decontamination and cleanup; notifications; final reports; investigations of root causes and corrective actions; and rapid response to external evaluation and assessment findings.

Chapter 9: Chemical Disposition

This chapter consolidates existing DOE and federal safety and health requirements and national standards that address the disposition of chemicals and chemical products (with the exception of nuclear materials and radiological materials) when they are no longer needed at a DOE site. State and local requirements are not included.

This chapter applies to all locations involved in the storage or use of **chemicals** and **chemical products** (see definition). An important point of this chapter is that these consolidated requirements apply until the time the chemicals are identified as solid waste for final **disposal** (see definition) under the provisions of the Resource Conservation and Recovery Act.

The requirements consolidated in this chapter are derived primarily from DOE and federal property management regulations, and are captured in 10 major sections:

- 4.1 Disposition of Excess (or Surplus) Chemicals
- 4.2 Utilization of Excess Chemicals
- 4.3 Off-site Transfer to Other Federal Agencies
- 4.4 Donation or Sale of Surplus Chemicals to the Public
- 4.5 Donation or Sale of Surplus Hazardous Materials to Public Agencies
- 4.6 Sale of Hazardous Materials to Public Bodies
- 4.7 Abandonment or Destruction of Surplus Hazardous Materials
- 4.8 Disposition of Special Types of Hazardous Materials
- 4.9 Utilization and Disposition of Hazardous Materials that are Radioactively or Chemically Contaminated
- 4.10 Storage and Handling of Excess or Surplus Chemicals

Sections 4.1 through 4.9 address various methods available for the disposition of excess or surplus chemicals, and Appendices A and B provide explanatory and supporting material associated with the requirements consolidated in this chapter.

Two key aspects (Section 4.1.3) pertinent to the disposition of a chemical product are:

Identifying actual or potential hazards, and documenting that information with an SDS (or MSDS) or HMIS record, if available. In the absence of either document, an SDS-equivalent document (consistent with the SDS content requirements of the OSHA Hazard Communication Standard, 29 CFR Section 1910.1200, must be prepared by the DOE site. It is important to note that an SDS or equivalent hazard identification document must accompany all offsite transfers, donations, and sales.

Appendix A, including Table A-1, summarizes the sequential steps that constitute the typical disposition process: screening within the DOE complex (Section 4.2.1), screening for utilization at other federal agencies (Sections 4.2.2, 4.2.3, and 4.3), donations to approved state organizations (Sections 4.4 and 4.5), and sales to the public (Sections 4.4 and 4.6). Available disposition routes are limited by the hazard, risk, or value characteristics of the chemical.

Table A-2 in Appendix A displays disposition options for chemicals that are subject to abandonment or destruction (Section 4.7). Such non-typical disposition methods, which require prior DOE authorization, may be appropriate for chemicals identified as **high-risk (personal) property** (see definition; also, Section 4.1.2) that have the potential to adversely impact national security interests, proliferation concerns, public health and safety, or the environment.

Section 4.8 covers the identification of hazardous materials or items using the Federal Supply Classification classes or groups (Section 4.8.1), examples of which are listed in Tables B-1 and B-2 of Appendix B. Section 4.8.2 provides the source references for the consolidated requirements for the disposition of certain types of hazardous materials and certain categories of property (e.g., controlled substances, drugs, biological materials, reagents, lead-containing paint). In particular, Sections 4.8.3 and 4.8.4 consolidate special requirements applicable to hazardous products containing asbestos and PCBs, respectively.

Section 4.9 consolidates requirements for the utilization and disposition outside of DOE of hazardous materials that are radioactively or chemically contaminated.

In general, except for special requirements that apply to high-risk property and **extremely hazardous materials** (see definition), the storage and handling of excess or surplus chemicals (see Section 4.10) must comply with the requirements consolidated in Chapter 5, *Chemical Storage*. Chemical transfers on site must be in compliance with the requirements consolidated in Chapter 4, *On-Site Chemical Transportation*, and off-site, with DOT, state, and local regulations.

A key theme of this chapter is the reuse of chemicals via available disposition routes. Any surplus chemicals still remaining at the end of the disposition cycle may be re-entered or subject to final disposal as solid waste. Exceptions include chemicals that qualify for recycling and recovery (e.g., precious metals, ethylene glycol, antifreeze solutions) or can be classified as **universal waste** (see definition) under applicable environmental regulations. These pollution prevention and waste-minimization activities are covered in Chapter 7, *Pollution Prevention and Waste Minimization*. However, requirements related to waste operations, such as the identification, storage, handling, transportation, treatment, and disposal of waste fall outside the scope of the present chapter on chemical disposition.

Chapter 10: Training

This chapter covers existing DOE and other federal requirements and national standards for the training of employees involved in the handling, storage, and use of chemicals. State and local requirements are not included. The requirements included here apply to all locations that use or store chemicals or chemical products. The key message of this chapter is that those who work with chemicals must be appropriately trained to recognize both the hazards of the chemicals they work with and the ways in which they may protect themselves from those hazards; i.e., they must be trained to safely perform their jobs and follow prescribed procedures.

There are seven major sections of this chapter that consolidate requirements for general information and training for all employees working in areas where chemicals are present (section 4.1); additional training required for employees working in chemical laboratories (section 4.2); specific training for employees who are required to use respirators (section 4.3); additional training required for employees involved with highly hazardous chemicals (section 4.4); training for construction workers (section 4.5); and special training for the use and handling of specific materials; (e.g., compressed gases or organic peroxides). (section 4.6).

Section 4.1 consolidates the requirements for general employee information and training on hazardous chemicals in the workplace such as the location, availability and content of SDSs for the chemicals and chemical products being used or stored, methods to detect the presence of hazardous chemicals, personal protective measures, and the details of the workplace hazard communications program.

Section 4.2 consolidates the requirements specific to chemical laboratory workers such as the location, availability, and details of the employer's chemical hygiene plan; permissible exposure limits; signs and symptoms of exposures; and the availability and location of chemical information sources and reference materials such as SDSs.

Section 4.3 consolidates the requirements for respirator training as found at 29 CFR Section 1910.134, the OSHA Respiratory Protection Standard, including the requirement that each employee can demonstrate sufficient knowledge of respirators. This section also covers the requirements for retraining employees on basic aspects of respirator use such as proper respirator fit, respirator limits, and how to inspect, clean, and store respirators.

Section 4.4 covers training for **highly hazardous chemicals** (see definition), including initial training, refresher training, training documentation, contractor employee training, and training for process maintenance activities.

Section 4.5 consolidates the requirements for the training of construction workers who handle harmful substances such as poisons, caustics, flammable liquids and gases, and other toxic substances. This section also covers the training of employees required to enter enclosed or confined spaces.

Section 4.6 consolidates the special training requirements for specific materials, including compressed and liquefied gases in portable cylinders; the storage of liquid and solid oxidizers and organic peroxides; oxygen-fueled gas welding and cutting; OSHA-regulated carcinogens; and 14 other specific chemicals such as acrylonitrile, beryllium, lead and methylene chloride.

Finally, section 4.7 addresses training requirements for operations personnel responsible for activities involving various classes of hazardous materials.

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Appendix B: Building and Fire Code Overview

The Code of Federal Regulations, 10 CFR Part 851, requires that all DOE facilities comply with applicable building codes and NFPA codes and standards. DOE O 420.1C, Facility Safety, has similar requirements. Two significant sets of locally enforced regulations are building and fire codes. These codes have a significant number of requirements that pertain to chemical safety and lifecycle management and are fairly consistent from code to code. These codes or their latest revised editions usually apply to newly designed buildings and facilities that are permitted for construction after the adoption date of the codes. As an integral part of the "**Code of Record**" (see definition), the building or fire code enforced at the time a facility is constructed is typically the code the facility must follow until the facility is either modified or demolished. However, some or all requirements of a newly promulgated code may retroactively apply to existing buildings and structures, as stipulated in the scope or applicability sections of the code. The contract between DOE and the contractor determines the applicability of the above codes.

This appendix provides an overview of building and fire code regulations that apply to chemical safety and lifecycle management. Because 10 CFR Part 851 and DOE O 420.1C require adherence to applicable NFPA regulations, this appendix will use NFPA 1-2006, *Uniform Fire Code* as the source document to demonstrate those requirements that may apply. When using these NFPA codes, it is important to remember that DOE O 420.1C, *Facility Safety* requires all DOE facilities to be designed to the "**Highly Protected Risk**" (see definition.) level. Also, fire protection provisions of DOE-STD-1066-1999, *Fire Protection Design Criteria,* apply to the design and construction of all DOE facilities erected, modified, or renovated after July 1999.

Applicability

Performance-based model building codes use the concept of "control area" and the "maximum allowable quantity" in establishing requirements for the storage or usage of various hazard classes of material inside or outside of buildings. The provisions of the *Life Safety Code*, NFPA 101, relating to new construction for occupant safety, are included. Potential situations when the building code requirements may apply to existing buildings include (a) modifications, repairs, or additions to the facility, (b) a change of use or occupancy classification, or (c) if the facility condition is deemed damaged, unsafe, or a fire hazard. Only clearly stated, specific provisions of the *Uniform Fire Code*, NFPA 1-2006, apply to existing buildings and those facilities that are permitted for construction before the adoption date of the code.

Facility-specific, inventory-specific, and material-specific requirements for the storage, handling, dispensing, and use of each hazard class and subclasses may be found in building codes, NFPA 1, and other NFPA codes referenced therein.

General requirements for different classes of chemicals have no *de minimis* quantities. However, other special provisions apply to certain classes of chemical hazards when present in excess of defined quantities. (NFPA 1-2006: 60.1.3)

Hazard Classification

All chemicals and chemical products are to be classified according to their hazards. There are approximately 15 main hazard classes (e.g., oxidizer, flammable liquids, water-reactive, cryogenic liquids, toxic) and many subclasses (e.g., organic peroxide I, II, III, IV, V; water-reactive 0, 1, 2, 3; oxidizer 1, 2, 3, 4) that further define the degree of hazard in that class. The total number of classes and. subclasses is approximately 40, and more than one hazard class can be assigned to any given chemical or chemical product. (NFPA 1-2006: 60.1.2)

*For the purposes of this document, this appendix applies only to fire and building code requirements as they apply to chemical safety and lifecycle management.

Maximum Allowable Quantities

Each facility must be evaluated to determine the number and locations of control areas present. No part of a building can be outside a control area. All inventories for each chemical hazard class (or subclass) in a control area shall be summed up and compared to limits that are published in both the building and fire codes. Some limits may be increased due to the presence of a fire suppression system, the use of chemical storage cabinets that meet code standards, or both. Buildings having hazard classes in quantities in excess of published limits could have their occupancy permit revoked. (NFPA 1-2006: 60.1.3)

There are two acceptable options for indoor storage of quantities exceeding maximum allowable quantities. The first option involves the use of multiple control areas in accordance with NFPA 5000 requirements: (a) the number of control areas does not exceed the maximum permissible for the building, (b) each control area contains inventory less than the amount specified for its location; and (c) each control area is separated from its neighbors by prescribed fire barriers. The second option involves the incorporation of specific building-related provisions such as explosion control, local exhaust ventilation, sprinkler systems, alarm and detection systems, and the use of approved storage cabinets and gas cabinets. Storage area must meet occupancy protection-level requirements (see Protection Level section) for the specific hazard class of the chemicals and must be constructed in accordance with applicable NFPA 1 requirements.

If materials need to be stored, used, dispensed, or handled in excess of hazard limits, specialized facilities or specific modifications to existing facilities are required. These facilities are rated specifically for hazardous materials and are built according to defined specifications commensurate with that hazard class. Examples of facility specifications include explosion-proof lighting and electrical systems, emergency power supplies, sumps, specialized ventilation, firewalls, sealed floors, automatic sprinkler systems, use of gas cabinets, and exhausted enclosures. Terms used to identify facility classifications can vary depending upon which code is used. For example, the International Fire Code uses classifications of H-1 through H-9, and NFPA 1 uses Protection Level 1 through 5. (NFPA 1-2006: 60.1.4; NFPA 1-2006: 60.3.1)

Permits

A permit is required for the storage, use, dispensing, or handling of hazardous materials in quantities in excess of listed limits. Permits will also be required to install, repair, abandon, remove, place temporarily out of service, close, or substantially modify a storage area or other regulated location. No storage, use, dispensing, or handling of hazardous materials above those limits specified can be performed until the permit has been approved. (NFPA 1-2006: 60.1.2.3)

Permit applications are submitted to the authority having jurisdiction (AHJ) for approval. Information that may be required includes a hazardous material management plan and a hazardous materials inventory statement. (NFPA 1-2006: 1.2.5)

A hazardous material management plan includes an emergency response training plan and a facility site plan that designates:

- Storage and use areas;
- Maximum amount of each material that can be stored or used in each area;
- Range of container sizes;
- Product-conveying piping containing liquids or gases (other than utility-owned fuel gas lines and low-pressure fuel gas lines);
- Locations of emergency isolation and mitigation valves and devices;
- On and off positions for valves that are of the self-indicating type, and
- Storage plans that are legible and drawn approximately to scale showing the intended storage arrangements, including the location and dimension of aisles (separate distribution systems can be shown on separate pages). (NFPA 1-2006: 60.2.5.1; NFPA 1-2006: Annex D)

A hazardous materials inventory statement pertains to a given building, including its appurtenant structures, and each exterior facility where hazardous materials will be stored. It will list, by class, all hazardous materials stored. The hazardous materials inventory statement includes, for each hazardous material listed:

- Hazard class;
- Common or trade name;
- Chemical name, major constituents, and concentrations, if a mixture;
- Waste category, if a waste;
- Chemical Abstracts Service number

If the product is a pure chemical or mixture,

- Physical state of the product (e.g., solid, liquid, or gas);
- Maximum aggregate quantity that can be stored at any given time, and
- Storage conditions related to the storage type, temperature, and pressure

The hazardous materials inventory statement must be amended within 30 days of any significant changes (i.e., adding a hazard class or increasing by 5 percent or more the quantity of any hazard class present). (NFPA 1: 2006: 60.1.2.5.2; NFPA 1-2006: Annex D)

Prohibited Releases

Releases of hazardous materials into sewers, storm drains, ditches, canals, and rivers is not allowed unless permissions from various federal, state, or local agencies are obtained. When a prohibited release occurs, it must be controlled and cleaned up, and the appropriate authorities must be notified. (NFPA 1: 60.1.2.6)

Signage

Signs must be durable and the size, color, and lettering must comply with national standards. They will be in English and not be obscured or removed. (NFPA 1-2006: 60.1.2.11)

Hazard identification signs per NFPA 704, *Standard System for the Identification of the Hazards of Materials for Emergency Response*, are required:

- On stationary aboveground storage tanks;
- On stationary aboveground containers;
- At entrances to locations where hazardous materials are stored, used, dispensed or handled above permitted quantities; and
- At other locations specified by the authority having jurisdiction. Exceptions to this may be granted by the AHJ. (NFPA 1-2006: 60.1.2.11.2.1).

Individual containers, packages, or cartons shall be marked in accordance with national standards. Rooms or cabinets containing compressed gases shall be conspicuously labeled with signs reading "COMPRESSED GAS – "No Smoking." These signs shall be provided for an entire site, a building, in areas where hazardous materials are stored, used, dispensed, or handled in permitted quantities, within 25 feet of outdoor storage dispensing or open-use areas, or in areas containing flammable gases. (NFPA1-2006: 60.1.2.11.2.2; NFPA 1-2006: 60.1.2.11.2.3; NFPA 1-2006: 60.1.2.11.3)

Security/Protection

Areas used to store, use, dispense, or handle hazardous materials shall be secured against unauthorized entry. These areas will also be safeguarded with such protective features as public safety requires. (NFPA 1-2006: 60.1.2.12)

Guard posts or other means shall be used to provide protection from vehicular damage to storage tanks and their associated pipes, valves, and fittings in dispensing, use, and storage areas. Guard posts, when used, shall be designed to meet specifications. (NFPA 1-2006: 60.1.2.13)

Electrical wiring is required to comply with NFPA 70, the *National Electric Code*. When processes or conditions exist where a flammable mixture could be ignited by static electricity, means shall be provided to prevent the accumulation of a static charge. (NFPA 1-2006: 60.1.2.14)

Materials that are sensitive to light need to be stored in containers to protect them from such exposure, (NFPA 1: 60.1.2.15). Materials that are shock-sensitive need to be padded, suspended, or otherwise protected against dislodgement from accident or seismic activities. (NFPA 1-2006: 60.1.2.16)

Storage

Incompatible materials shall be segregated during storage. Segregation may be accomplished by spacing, separation by a noncombustible partition, or by storage in cabinets. Incompatible materials are prohibited from being stored in the same cabinet or enclosure. (NFPA 1: 60.1.2.17)

Shelves used for the storage of chemicals shall be substantial, adequately braced, and anchored. When shelves are used to store chemicals in excess of permitted quantities, the shelves shall be equipped with lips or guards. Storage of all hazardous materials shall be neat and orderly. (NFPA 1: 60.1.2.19)

Control Areas

Control areas are locations in a facility where the storage, dispensing, use, or handling of hazardous materials does not exceed permitted quantities. Where more than one control area is present in a building, separations using specified fire barriers shall be required between neighboring control areas. (NFPA 1-2006: 60.2.4.1 and 60.2.4.1)

The maximum number of control areas within a building, as well as the amount permitted for storage or use in a given control area, depend upon the building features such as the number of stories, floor location of the control area, and whether the floor is situated above or below grade. Storage or use outside a building is also permitted, using control areas that meet exposure protection requirements of NFPA 5000.

Protection Levels

Facilities containing protection levels shall be used when hazardous materials are to be stored, dispensed, used, or handled at quantities requiring a permit; i.e., when existing inventory exceeds the maximum allowable quantities listed for a control area (See Maximum Allowable Quantities section). Protection levels shall range from 1 to 5. The hazard class of the item to be stored, dispensed, used, or handled will help users determine the protection level required. Construction criteria and types of hazard classes that can be stored within a given protection level are defined. (NFPA 1-2006: 60.3)

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CONCLUDINGMATERIAL

Review Activity:
DOE
AU, EM, NE, SC, NA

Operations Offices
ID, OAK, ORO, RL, SRO

National Laboratories
PNNL, INEEL, LANL, SRS, SNL

Area Offices

External Agency DNFSB

Preparing Activity:
DOE-AU-11
Project Number: SAFT-xxxx