

Section 11

Standards for Material Handling, Storage, and Disposal

This section sets forth the requirements for handling, storage, and disposal of material. It specifically addresses the requirements for storing material in an open yard; stacking bagged material; storing material in bulk; storing lumber; storing bricks and masonry blocks; handling and storing cement and lime; handling and storing reinforcing sheet and structural steel; handling and storing pipe, conduit, and cylindrical material; storing sand, gravel, and crushed stone; handling and storing flammable and combustible liquids; handling asphalt and tar products; handling liquified petroleum gas; and housekeeping.

11.1 General Requirements for Storage of Materials

Store materials in a planned and orderly manner that does not endanger employee safety. Ensure stacks, tiers, and piles are stable and stacked to aid safe handling and loading. Store hazardous materials in accordance with the individual requirements.

Store all materials on pallets to discourage rodent infestation. Immediately clean up spills and leaks that create such rodent habitat.

Use slings to hoist bagged material, lumber, bricks, masonry blocks, and similar loosely stacked materials only if the slings are fully secured against falling by straps, sideboards, nets, or other suitable devices.

11.2 Storing Materials in an Open Yard

Storing materials in an open yard requires attention to combustible materials, access, powerlines, and fire protection.

11.2.1 Combustible Materials. Stack combustible materials securely. Stacks or piles must be no more than 16 feet high. Store combustible material at least 10 feet away from a building or structure.

11.2.2 Access. Driveways between and around combustible storage piles must be at least 15 feet wide. Keep them free from accumulations of material or rubbish. Use a map grid system of 50 by 150 feet when planning driveways in open-yard combustible material storage areas.

11.2.3 Powerlines. Do not store materials under power lines or where materials may block egress or emergency equipment.

11.2.4 Fire Protection. Provide portable fire extinguishing equipment rated 2-A:40-B:C at accessible marked locations in the yard so that the nearest extinguisher is no more than 50 feet away for a Class B hazard or 75 feet away for a Class A hazard.

11.3 Requirements for Storing Materials Indoors

Storing materials indoors requires attention to access, fire prevention and protection, floor loading, and overhead hazards. Buildings under construction require special precautions.

11.3.1 Access. Place or store materials so they do not interfere with access ways, doorways, electrical panels, fire extinguishers, or hoistways. Do not obstruct access ways or exits with accumulations of scrap or materials. Aisles must be wide enough to accommodate forklifts or firefighting equipment.

11.3.2 Fire Prevention. When storing, handling, and piling materials, consider the fire characteristics. Store noncompatible materials that may create a fire hazard at least 25 feet apart or separate them with a barrier having at least a 1-hour fire rating. Pile material to minimize internal fire spread and to provide convenient access for firefighting.

11.3.3 Fire Doors. Maintain a 24-inch clearance around the travel path of fire doors.

11.3.4 Sprinklers. Maintain at least an 18-inch clearance between stored materials and sprinkler heads.

11.3.5 Heating Appliances. Maintain at least a 3-foot clearance between stored materials and unit heaters, radiant space heaters, duct furnaces, and flues or the clearances shown on the approval agency label.

11.3.6 Fire Protection. Emergency fire equipment must be readily accessible and in good working order.

11.3.7 Floor Loading. Conspicuously post load limits in all storage areas, except for floors or slabs on grade.

11.3.8 Buildings Under Construction. Store materials inside buildings under construction at least 6 feet away from any hoistway or inside floor openings, and 10 feet away from an exterior wall that does not extend above the top of the material stored.

11.4 Requirements for Stacking Bagged Material

Stack bagged materials by stepping back the layers and cross-keying the bags at least every 10 bags high, except when restrained by walls or partitions of adequate strength.

11.5 Requirements for Storing Material in Bulk

Ensure entry to bulk storage locations, such as silos, hoppers, tanks, or bins (which are also classified as confined spaces) complies with OSHA requirements and local operating procedures.

11.6 Requirements for Lumber Storage

Stack lumber on level and solidly supported sills so that the stacks are stable. Do not pile lumber more than 16 feet high.

11.7 Requirements for Storing Bricks and Masonry Blocks

Stack bricks and masonry blocks on level and solid surfaces.

11.7.1 Bricks. Stack bricks no more than 7 feet high. Step back a loose brick stack at least 2 inches for every foot of height above 4 feet. Stack packaged brick no more than three units high.

11.7.2 Masonry Blocks. Step back masonry blocks one-half block per tier above the 6-foot level.

11.8 Requirements for Handling and Storing Cement and Lime

Handling or storing cement or lime requires a job hazard analysis (JHA). Lime requires careful storage and handling procedures.

11.8.1 Cement and Lime. Employees must wear appropriate personal protective equipment, as specified in the "Personal Protective Equipment" section and as identified in the JHA. Provide washing facilities, hand cream, chemical barrier cream, or similar preparations for protection from dermatitis.

11.8.2 Lime. Store unslaked lime in a dry area and, because it presents a fire hazard, separate it from other materials.

11.9 Requirements for Handling and Storing Reinforcing, Sheet, and Structural Steel

Stack steel to prevent sliding, rolling, spreading, or falling.

Use lagging (sleeve) when steel is handled by a crane or forklift to aid safe rigging.

11.10 Requirements for Handling and Storing Pipe, Conduit, and Cylindrical Material

Make sure cylindrical materials are stable when storing or handling.

11.10.1 Stacking. Place pipe, conduit bar stock, and other cylindrical materials in racks or stack and block them on a firm, level surface to prevent spreading, rolling, or falling. Use either a pyramided or battened stack. Step back battened stacks at least one unit per tier and securely chock them on both sides of the stack.

11.10.2 Removal. Remove round stock (e.g., wood poles, pipe, and conduit) from a stack from the ends of the stock.

11.10.3 Unloading. Unload carriers so that employees are not exposed to the unsecured load.

11.10.4 Taglines. Use taglines when working with round stock.

11.11 Requirements for Storing Sand, Gravel, and Crushed Stone

Locate stockpiles to provide safe access for withdrawing material. Material on vertical faces must not overhang.

Store material against walls or partitions only in an amount that will not endanger the stability of the wall or partition.

11.12 Requirements for Handling Flammable and Combustible Liquids

Unless defined otherwise, terms used in this subsection are the same as those in the flammable and combustible liquids code, NFPA 30, or 29 CFR 1910.106.

11.12.1 Classification of Flammable and Combustible Liquids. Flammable and combustible liquids are classified as follows:

a. **Flammable Liquids (Class I Liquids):**

1. Class I—Flashpoint below 100 °F (38 °C)
2. Class IA—Flashpoint below 73 °F (23 °C) and boiling point below 100 °F (38 °C)
3. Class IB—Flashpoint below 73 °F (23 °C) and boiling point at or above 100 °F (38 °C)
4. Class IC—Flashpoint at or above 73 °F (23 °C) but below 100 °F (38 °C)

b. **Combustible Liquids (Class II and III Liquids):**

1. Class II—Flashpoint at or above 100 °F (38 °C) and below 140 °F (60 °C)
2. Class III—Flashpoint at or above 140 °F (60 °C)

11.12.2 **Class IA Flammable Liquids**

a. **Restricted Use.** Because of the extreme explosion hazard of Class IA liquids, purchase them only after you have reviewed the MSDS and the storage, dispensing, and use procedures have been approved. Submittals for approval must provide the name and description of the liquid, its characteristics, a detailed description of its intended use, the MSDS, and the safety and health precautions. This requirement does not apply to small quantities of aerosol starter fluid used for engines.

b. **Substitute Product.** Wherever practical, use a less hazardous product.

c. **Controlled Use.** A competent person must supervise storage, dispensing, and use of Class IA liquids, including design of the storage and dispensing system.

11.12.3 **Toxicity of Flammable and Combustible Liquids.** Most flammable and combustible liquids are highly toxic. Use them only after determining their toxic characteristics. In handling toxic liquids, follow the appropriate safety and health requirements in the "Occupational Health" section.

11.12.4 **Closed Tanks and Containers**

a. **Approved Types.** Use only the following approved and labeled closed tanks and containers to store, handle, and dispense flammable and combustible liquids.

1. **Original Container.** Store and use flammable and combustible liquids in the original Department of Transportation (DOT) shipping containers, as shown in table 11-1. However, store only up to 1-day’s use in the work area, up to a maximum of 25 gallons of a Class 1A liquid or a maximum of 120 gallons of any other class of liquid. When dispensing and using smaller quantities of flammable and combustible liquids, dispense them into properly labeled, approved safety containers. Exception: You may store and handle highly viscous (extremely hard to pour) liquids in any size original container. Liquids that are transferred from labeled containers to portable containers for immediate use are exempt from labeling.

Table 11-1.—Maximum allowable size of containers and portable tanks, combustible

Container type	Flammable liquids			Liquids	
	Class IA	Class IB	Class IB	Class II	Class III
Glass	1 pint	1 quart	1 gallon	1 gallon	5 gallons
Metal (other than approved DOT drums) or approved plastic	1 gallon	5 gallons	5 gallons	5 gallons	5 gallons
Safety cans	2 gallon	5 gallons	5 gallons	5 gallons	5 gallons
Metal drums (DOT specifications)	60 gallons	60 gallons	60 gallons	60 gallons	60 gallons
Approved portable tanks	660 gallons	660 gallons	660 gallons	660 gallons	660 gallons
Polyethylene DOT specification 34, or as authorized by DOT exemption	1 gallon	5 gallons	5 gallons	60 gallons	60 gallons

2. **Safety Can.** An approved container holding no more than 5 gallons with a spring-closing lid, spout cover, and designed to safely relieve internal pressure when subjected to fire or heat exposure.

3. **Drum/Barrel.** An approved container holding more than 5 gallons but no more than 60 gallons.

4. **Portable Tanks.** An approved, closed storage vessel holding more than 60 but no more than 660 gallons and not intended to be a fixed installation.

5. **Tanks.** Any vessel holding more than 60 gallons, intended for fixed installation, is not used for processing.

11.12.5 Approved Storage Cabinets

a. **General Design and Construction.** The design, construction, and approval of storage cabinets must comply with NFPA 30.

11.12.6 Requirements for Storing Flammable or Combustible Liquids

a. **Indoor Storage.** Do not store flammable and combustible liquids indoors, except as follows:

1. Store no more than 25 gallons in a room or single fire area.
2. Store no more than 60 gallons of Class I or II liquids, or more than 120 gallons of Class III liquids, in an approved cabinet. Locate no more than three such cabinets in a single fire area.
3. You may store larger quantities in separated indoor storage areas when such storage meets the requirements of NFPA 30, Section 4-4, "Design, Construction, and Operation of Inside Storage Areas."
4. Place at least one 2-A:40-B:C fire extinguisher 10 feet to 30 feet away from the stored material or cabinet.
5. Place at least one 2-A:40-B:C fire extinguisher outside of, but not more than 10 feet from, the door opening into an inside liquid storage area.

b. **Outdoor Storage.** Do not store flammable and combustible liquids outdoors, except as follows:

1. Above ground in approved containers with no more than 60-gallon capacity, subject to the following restrictions:
 - (a) The total capacity of any one group of containers stored together must not exceed 1,100 gallons. Each group of containers must be at least 5 feet apart, and each group must be at least 20 feet away from any building or other combustibles.
 - (b) Each group of containers must be adjacent to an access way at least 12 feet wide to facilitate the use of firefighting equipment.
2. Above ground in approved portable tanks with no more than 660-gallon capacity, providing that you:
 - (a) Keep a 5-foot clear area around groups of two or more tanks with a combined capacity of more than 2,200 gallons.
 - (b) Keep portable tanks at least 20 feet away from any building or other combustibles.

- (c) Equip portable storage tanks with emergency venting and other devices, as required in NFPA 30.
 - (d) Locate each tank adjacent to an access way at least 12 feet wide to facilitate use of firefighting equipment.
3. Above ground in approved tanks installed in accordance with NFPA 30, Section 2-3, "Installation of Outside Above Ground Tanks."
 4. Dike storage areas at least 12 inches high or grade and slope them, and seal them with a 50-mil plastic compatible sheeting or equivalent liner to contain leaks and spills equal to the capacity of all tanks or containers in each area. Keep the area free from vegetation or combustible material within 10 feet of the storage area perimeter.
 5. Place at least one portable fire extinguisher unit rated not less than 2-A:40-B:C 25 feet to 75 feet away from each portable tank or group of tanks or containers.

11.12.7 **Handling and Dispensing Flammable or Combustible Liquids**

- a. **Dispensing Area.** Separate areas where you transfer more than 5 gallons of flammable or combustible liquids at a time from other operations by at least 25 feet or by a partition with a minimum 1-hour fire rating. Use drainage or an equally effective method to contain spills.
- b. **Ventilation.** Provide adequate natural or mechanical ventilation to maintain the concentrations of flammable vapor below 10 percent of the lower explosive limit (LEL).
- c. **Grounding.** Transferring Class I flammable liquids from one container to another requires bonding of the containers and the transfer system. Electrically ground and bond all dispensing systems.
- d. **Dispensing.** Withdraw or transfer flammable and combustible liquids into vessels, containers, or tanks only (1) through a closed piping system, (2) from safety cans, (3) by means of a device drawing through the top, or (4) from containers or tanks by gravity or pump through a listed self-closing valve. Do not transfer by injecting pressurized air into a tank or container. Use approved dispensing devices and nozzles. The dispensing units must be protected against collision damage.
- e. **Lighting and Electrical Equipment.** Use only electrical lighting to illuminate areas where Class I flammable liquids are handled or dispensed or where flammable vapor may be present. Wiring and all electrical equipment must meet the requirements of NFPA designation: Class I, Division 2, of the National Electrical Code.

- f. **Covered Containers.** Keep Class I and II liquids in covered containers when not in use.
- g. **Flame and Ignition.** Do not permit open flame, smoking, or other sources of ignition within at least 50 feet of areas where Class I flammable liquids are dispensed or used. Post approved "No Smoking" signs in such areas.
- h. **Leakage or Spillage.** Clean up leaking or spilled flammable or combustible liquids promptly and dispose of them safely.
- i. **Refuse Containers.** Provide self-closing metal refuse containers in all areas where employees use or dispense flammable or combustible liquids.

11.12.8 Requirements for Refueling

- a. **Equipment.** Ensure that the design and installation of tanks and equipment used to refuel vehicles or equipment (fueled with flammable or combustible liquids) comply with the applicable provisions of the NFPA standards or nationally recognized testing laboratories or have the approval of the Government agency having jurisdiction.
- b. **Tank Truck.** Ensure that tank trucks comply with the requirements published in NFPA 385, "Standard for Flammable and Combustible Liquid Tank Vehicles."
- c. **Dispensing Stations.** Mount dispensing devices, except those attached to containers, on a concrete platform elevated at least 5 inches above grade. Use guardrails or posts to protect them from collision with a motor vehicle.
- d. **Dispensing Hose.** To dispense flammable and combustible liquids, use an approved-type hose with an automatic self-closing valve or nozzle without a latch-open device. Ensure that a hanger or hose retracting system is in place to protect the hose from traffic abuse.
- e. **Electrical Equipment.** Ensure that electrical wiring, pumps, and equipment meet the appropriate requirements of NFPA designation, Class I of the National Electrical Code. Provide clearly marked and accessible switches at a location remote from dispensing devices to shut off all power to devices in an emergency.
- f. **Refueling Equipment.** During refueling, shut down vehicles or equipment that use gasoline, liquified petroleum gas (LPG), or other flammable or combustible liquid fuels. An exception is diesel equipment when fueled in accordance with the manufacturer's recommendations. Use guardrails or posts to protect refueling tanks or dispensing islands from vehicular damage.

- g. **Smoking.** Post a "No Smoking Within 50 Feet" sign on all mobile refueling equipment and in established refueling areas.
- h. **Emergency Shut-Off Switch.** Ensure that an emergency shut-off switch is within 50 shall be located within 50 feet of the fuel dispensing equipment. Post a conspicuous sign to identify the switch location.
- i. **Fire Protection.** Provide each refueling area with one or more listed fire extinguishers with a minimum classification of 40B:C. Locate a fire extinguisher within 100 feet of each pump, dispenser, underground fill pipe opening, and lubrication or service room.

11.13 Requirements for Handling Asphalt and Tar Products

Employees who handle or work with these materials must complete a JHA, including exposure determinations. Make available and ensure employees follow the MSDS for storing, handling, and applying these materials.

11.13.1 **Protective Clothing and Equipment.** Give full consideration to protective clothing, respiratory protection, and skin protection, as specified in the "Personal Protective Equipment" section, to protect employees handling or applying these materials.

11.13.2 **Confined Spaces.** In enclosed or confined areas where hot tar, asphalt, enamel, or similar materials are heated or applied, the operation must conform fully with the "Confined Spaces" section.

11.13.3 **Heating Kettles.** Do not leave asphalt or tar kettles unattended, when in use. Place them on a firm, level base and protect them from overturning. Kettles must have an effective lid or hood. They must have an operable temperature indicator and limiting device ensuring the asphalt or tar remains at no less than 50 °F below the flashpoint. Do not use kettles in confined or unventilated spaces, underground, in conduits, or in or on enclosed buildings or structures.

11.13.4 **Fire Protection.** Provide a fire extinguisher, rated not less than 2-A:40-B:C, where heating devices or heating kettles are in use.

11.13.5 **Handling.** Provide adequate unobstructed runways or access ways for employees handling hot materials. Employees must not carry hot materials up or down ladders. Instead, provide adequate hoisting devices.

11.13.6 **Thinners.** Do not use gasoline or similar volatile liquids as thinners.

11.13.7 **Hand Spraying.** The nozzle person applying hot tar asphalt must not work under the hoses supplying the material to the spray nozzle. Use flexible metallic hoses fitted with insulated handles in hand spraying operations.

11.13.8 **Housekeeping.** Keep distributors, retorts, hoses, and related equipment reasonably free of asphalt and tar accumulations.

11.14 **Requirements for Handling Liquefied Petroleum Gas (LPG)**

Store, handle, install, and use LPG and systems in accordance with NFPA 58, 29 CFR 1910.110(f), and 29 CFR 1926.153. Cylinders must meet DOT specifications published in 49 CFR, Part 178, "Shipping Container Specifications."

11.14.1 **Hazardous Locations.** Do not use LPG containers and equipment in unventilated spaces, below grade in pits or trenches, below deck, or in confined areas.

11.14.2 **Tubing.** Use only tubing or piping approved for use in LPG systems. Do not use aluminum or polyvinyl piping or tubing.

11.14.3 **Hose.** Use only hoses labeled "LP-gas or LPG." Hose must have a minimum working pressure of 250 pounds per square inch.

11.14.4 **Valves and Accessories.** Valves, fittings, and accessories connected directly to the container, including primary shutoff valves, must have a minimum working gauge pressure of 250 pounds per square inch and be designed for LPG service.

11.14.5 **Shutoff Valves.** Connections to containers, except safety relief connections, liquid level gauging devices, and plugged openings, must have a shutoff valve located as close to the container as possible. Shutoff valves must not be located between the safety relief device and the container, except when the location of the shutoff valve allows the fully required capacity flow through the safety relief device.

11.14.6 **Safety Relief Valves.** Equip each container with one or more approved safety relief valves. These valves must allow free venting to the outer air. The discharge must be 5 feet away from any building opening. Place container safety relief devices and regulator relief vents at least 5 feet from air openings into sealed combustion system appliances or mechanical ventilation air intakes.

11.14.7 **Dispensing**

- a. **Portable Containers.** Fill portable containers from storage containers outside and at least 50 feet away from the nearest building.

b. **Motor Vehicles.** Fill fuel containers on motor vehicles from bulk storage containers at least 10 feet away from a masonry-walled building and at least 25 feet away from any other building or structure.

c. **Refueling.** Shut down equipment using LPG during refueling.

11.14.8 **Storage of Cylinders and Containers.** Store LPG containers and cylinders not in use outside of buildings or structures, at not less than the following distances away from the nearest building or combustible material storage.

Quantity of LP-gas stored (pounds)	Minimum distance		
	(a) and (b) (feet)	(c) and (d) (feet)	(e) (feet)
720 or less	0	0	5
721 to 2,500	0	10	10
2,501 to 6,000	10	10	10
6,001 to 10,000	20	20	20
Over 10,000	25	25	25

(a) nearest building or storage area; (b) line of adjoining property;
(c) thoroughfares or sidewalks; (d) line of adjoining property used for public gathering; (e) dispensing station.

11.14.9 **Fire Protection.** Provide storage locations with at least one accessible portable fire extinguisher rated not less than 2-A:40-B:C, between 25 feet and 75 feet away from the container.

11.15 Requirements for Storing and Handling Paints, Varnishes, and Thinners

Storing and handling paints, varnishes, or thinners requires special attention to flammability characteristics.

11.15.1 **Storage.** Store and dispense paints, varnishes, lacquers, thinners, and other volatile paints or coatings according to their flammability characteristics. Tightly close containers when not in use; store no more than a 1-day supply in buildings under construction.

11.15.2 **Ventilation.** Provide sufficient ventilation to prevent hazardous concentrations of flammable vapors from accumulating where employees dispense or apply paints or coatings.

11.15.3 Spray Painting. Do not allow smoking, open flame, exposed heating elements, or other sources of ignition where employees spray flammable or combustible paints or coating. Spray painting booths and equipment must be in accordance with NFPA 33, "Standard for Spray Application Using Flammable and Combustible Materials."

11.15.4 Personal Protective Equipment. Make exposure determinations for employees who have been exposed to paints or coatings potentially hazardous to their health to document exposure and, when appropriate, provide appropriate protective equipment and hazard training.

11.15.5 Electrostatic Paint Spraying

- a. **Electrical.** Locate transformers, power packs, control apparatus, and other electrical portions of the equipment, with exception of the gun and its connection to the power supply, outside the spraying area.
- b. **Grounding.** Ground the handle of the spray gun with a conductive device to ensure the gun and the operator are at the same ground potential.

11.16 Housekeeping

Keep work and storage areas clean and orderly and in a sanitary condition. Keep stairways, access ways, and exits free from scrap, supplies, materials, or equipment.

11.16.1 Waste Disposal. Collect, store, and remove combustible waste products at the end of each workday or at the end of each work shift. Use only noncombustible containers to dispose of waste and rubbish and equip them with fitted or self-closing covers. Promptly remove and dispose of spills of flammable or combustible liquids. Place scrap lumber in containers and do not allow it to accumulate in work areas. Remove or bend over protruding nails unless the scrap lumber is placed directly in containers for removal.

11.16.2 Segregation of Materials and Waste. Consider storage segregation precautions for all materials. Use MSDS to determine appropriate storage segregation. Identify and label segregated material containers. Following are some examples of materials that must be segregated:

- a. Ordinary combustibles such as paper, wood, and natural fiber fabrics.
- b. Oily or flammable materials, such as saturated oily or solvent rags.
- c. Corrosive and caustic materials, such as batteries.
- d. Infectious materials that may cause infection, disease, or death.

- e. Reactive materials that may self-decompose or self-ignite because of heat, chemical reaction, friction, or impact.
- f. Radioactive materials.
- g. Toxic materials that may be fatal if inhaled, swallowed, or absorbed through the skin.

11.16.3 Outdoor Housekeeping. Keep the areas adjacent to facilities free from rubbish, waste, and tall, dry vegetation. Minimally, place combustible waste materials stored outdoors to await subsequent disposal at least 20 feet away from facilities.

11.16.4 Tools and Equipment. To prevent tripping or injury, keep floors clear of tools and portable equipment. Adequately secure tools, materials, and equipment where a tripping hazard exists.

11.16.5 Wind. Store loose or light materials on roofs or unenclosed height only if they are safely tied down or secured.

11.16.6 Sacks and Bags. Remove empty bags that contained cement, lime, or other dust-producing material from the work area at least daily.

11.16.7 Working Aloft. Provide containers to store or carry rivets, bolts, drift pins, and similar items. Secure containers against accidental displacement.

11.16.8 Excavated Materials. Keep roads and walkways clear of excavated materials wherever possible. Where this is not possible, adequately post or barricade these areas and provide other access.

11.16.9 Dropping Material. Drop or throw waste material and debris more than 6 feet only if you:

- a. Completely enclose the area into which the material is dropped with barricades at least 6 feet back from the projected edge of the opening or level above. Post signs warning of the hazard at each level.
- b. Install safely designed chutes providing protection for persons below. Fully enclose chutes for debris and scrap for their entire run except for openings for inserting materials. Equip such openings with covers or enclosures.