

Storage and Control of Flammable and Combustible Liquids

The National Fire Protection Association (NFPA) provides standards for the storage and controls of flammable and combustible liquids. They are published in NFPA 30 and updated regularly. A flammable liquid is defined as a liquid whose flash point does not exceed 100°F, when tested by closed-cup test methods, while a combustible liquid is one whose flash point is 100°F or higher, also when tested by the same methods. These broad groups are further classified as follows:

- Class IA - Flash Point less than 73°F; Boiling Point less than 100°F
- Class IB - Flash Point less than 73°F; Boiling Point equal to or greater than 100°F
- Class IC - Flash Point equal to or greater than 73°F, but less than 100°F
- Class II - Flash Point equal to or greater than 100°F, but less than 140°F
- Class IIIA - Flash Point equal to or greater than 140°F, but less than 200°F
- Class IIIB - Flash Point equal to or greater than 200°F

Note: The boiling point is only used to distinguish between Class IA and Class IB. Class IA liquids are extremely volatile, but there are very few liquids that are so classed.

Some common examples of the various flammable and combustible liquids classified by NFPA 30 are:

Flammable Liquids

- Class IA- Diethyl Ether, Ethylene Oxide, some light crude oils
- Class IB- Motor and Aviation Gasolines, Acetone, Lacquers, Lacquer Thinner
- Class IC- Mineral Spirits, Turpentine, some paints, some solvent-based cements

Combustible Liquids

- Class II- Diesel Fuel (including ULSD), Kerosene, Home heating oil
- Class IIIA- Linseed oil, Motor oils, Hydraulic oils
- Class IIIB- Ethylene Glycol (anti-freeze)

General Rules for Flammable and Combustible Liquids:

- A maximum of 60 gallons of flammable liquids or 120 gallons of combustible liquids may be stored inside a building within a UL- listed flammable liquids storage cabinet. No additional flammable liquids should be stored outside this storage cabinet, unless they are in UL- listed safety cans.
- All flammable liquids in use during daily operations should be kept in UL-listed safety cans and labeled as to their contents. Such containers should have spring-loaded caps with tight fitting closures and flame arrestors inside the spouts.
- Wiring and lighting in buildings storing hazardous material should be approved for that building in accordance with the current edition of the National Electric Code (NFPA 70).
- Dip tanks using flammable liquids should have a cover that closes automatically in the event of a fire.
- Spray painting operations should meet the standards of NFPA 33; i.e., metal spray booth with a fire resistance rating of at least one hour, a fixed pipe automatic extinguishing system, UL approved electrical system for hazardous location, filtered explosion-proof mechanical ventilation, explosion proof light fixtures, appropriate signage, cleaning program, among other considerations.
- Oxygen and fuel gas cylinders should be separated by a minimum distance of 20 feet, or separated by a non-combustible barrier at least 5 feet high and having a fire resistance rating of at least one-half hour.
- Fuel cylinders should be stored in an upright position, secured by a substantial chain, or placed in a storage rack. Cylinders should have their valves closed and protection caps in place.
- LP gas cylinders should never be stored within a building. They should be secured upright, in a locked rack or cage outside the building, protected from vehicular traffic.
- If large amounts (more than 60 gallons) of flammable liquids are required to be within your building for your daily operations, a flammable liquids storage room should be installed. The room should meet the minimum standards in accordance with the current edition of NFPA 30, to reduce the hazards associated with the presence and use of flammable liquids. The minimum standards for these storage rooms are:
 - Location: The storage room should be on the ground floor. Upper floor storage may cause problems for fire fighters and present floor leakage problems. Basement locations for liquids with a flash point below 100 degrees Fahrenheit should be avoided. Storage of liquids with a flash point of 100 degrees Fahrenheit and above is permissible in basements only if the storage area has an automatic fire sprinkler system.

- **Construction:** The construction should be of fire resistive material with fire rating of at least two hours. It is desirable for one wall of the room to be an outside wall.
- **Openings:** Door openings should be protected by a UL-listed fire door assembly, with a fire resistive rating equal to the wall. The doors should be self-closing or automatic closing. Non-combustible liquid-tight sills 6 inches in height should be provided at the door opening.
- **Explosion Venting:** Explosion venting apertures that provide at least one square foot of vent area for every 50 cubic feet of room volume should be provided.
- **Electrical Equipment:** All electrical equipment such as lights, motors, electrical fixtures, exhaust fans, etc., should be approved for Class I, Division I, Hazardous locations, as defined in the current edition of the National Electrical Code (NFPA 70).
- **Ventilation:** The storage room should be provided with a continually operating positive ventilating system, sufficient to remove flammable vapors. Exhaust air should be taken from a point near a wall on one side and within twelve inches of the floor, with one or more make-up inlets located on the opposite side of the room within 12 inches from the floor. Since most flammable liquid vapors are heavier than air, the ventilation system should be capable of removing one cubic foot of air per minute, per square foot of floor area, but not less than 150 cubic feet per minute total capacity.
- **Protection:** The flammable liquid storage room should be protected by an automatic extinguishing system.

Bonding and Grounding:

Proper grounding while dispensing flammables will help to eliminate the build-up of a static spark that could cause a fire or explosion.

- All drums used for the dispensing of flammable liquids should be provided with UL-listed pressure relief devices designed to relieve internal pressure when the drums are subjected to fire.
- All faucets, spigots and transfer pumps on drums used for dispensing flammable liquids should have UL-listed self-closing, spring loaded devices and flame arresters to help prevent static spark, which could flash back into the drum.
- A grounding wire and clamp should be provided on all drums used to dispense flammable liquids.
- Drum dispensing nozzles and equipment should be positively bonded to the container being filled. Proper bonding while dispensing flammables will help to eliminate the build-up of a static spark that could cause a fire or explosion.

Bulk Fuel Storage Tanks:

Above-ground fuel storage tanks (AST's) should have a containment structure or dike in accordance with NFPA 30. A general rule of thumb is if the tank is over 650 gallons a dike is required. Some tanks less than 650 gallons must also have containment, depending on location, fuel, etc. Regulations vary from state to state, and it is strongly recommended that you contact your state Fire Marshal's Office, as well as your state's environmental agency to determine what other regulations may apply. Other items to consider to protect both the tank and the surrounding property and structures from damage:

- Post signage on all AST's identifying their contents and hazards.
- Clear a twenty-five (25) foot area around each above ground tank. This area should be kept clear of high weeds, grass, brush or other combustibles.
- Post "No Smoking Within 50 Feet" signs on all AST's
- Post emergency instructions including the location of the emergency shut-off switch
- Use a double-walled tank or place a single-walled tank in a containment vessel capable of holding the contents of the tank
- Dispensing nozzle should be connected to the tank with an emergency breakaway hose
- To protect an AST from physical damage, it should have perimeter protection such as chain-link fencing, jersey barriers, or concrete-filled steel pipe bollards

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