

# To The Point Flammable & Combustible Liquids

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Nearly all industrial facilities use some flammable or combustible liquids. Fuels, solvents, thinners, cleaners, adhesives, paints, waxes, and polishes may be flammable or combustible liquids. One common misconception is that the liquid itself can ignite. It is actually the liquid's vapor that ignites when mixed in certain proportions with air in the presence of an ignition source. Flammable and combustible liquids vaporize and form flammable mixtures with air (for example, in an open container or when leaks occur) at a specific temperature unique to each liquid. Vapors can travel along surfaces, down stairs, under doors, through elevator shafts, or across air ducts to areas far removed from the source.

Regardless of the type or amount, it is imperative to know which liquids are on site and to take proper precautions to store and use these liquids. The primary resource to understand the properties and potential hazards of a specific liquid is its **Safety Data Sheet (SDS)**. When interpreting the SDS, several properties are important for flammable and combustible liquids, including:

- **Flashpoint**, the minimum temperature at which the vapor concentration near

the surface of the liquid is high enough to form an ignitable mixture. The relative hazard of a liquid increases as the flashpoint decreases. The lower the flashpoint of the liquid, the more likely it is that the atmospheric temperature will support the formation of flammable vapors.

- A **flammable liquid** has a flashpoint below 100°F
- A **combustible liquid** has a flashpoint at or above 100°F and below 200°F
- **Auto Ignition Temperature** is the minimum temperature at which a vapor-air mixture will spontaneously ignite without a spark or flame.
- **Vapor Density** is a measure of a vapor's weight when compared to air. Air is assigned a value of 1. Heavier, or denser, vapors have a density greater than 1 and tend to sink to floor level, while lighter, less dense vapors tend to rise toward the ceiling.
- **Water Solubility** or **Miscibility** of the liquid is a measure of whether the liquid will become diluted when water is added.

Risk Engineering Services

# Protect employees and property from these common hazards

## Best Practices

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Substitution of an alternative agent for a flammable or combustible liquid is the best way to reduce the hazard. Although it may not be easy or even possible to find a substitute for a flammable liquid, consideration should be given to find a safer replacement. The chemical's SDS lists possible substitute materials. Review all fire, health, and chemical reactivity hazards of the chemical before making a change in chemical use.

Best practices to protect your employees and your facility from the hazards of flammable and combustible liquids include:

- Review and assess all the hazards associated with the flammable and combustible liquids in your workplace including fire, health, and chemical reactivity.
- Eliminate ignition sources such as sparks, flames, hot surfaces, electric tools and equipment, nonapproved wiring, sparks from grinding operations, and smoking in flammable and combustible liquid areas.
- Eliminate ignition sources that result from static electricity found in rotating belts, mixing operations, or the improper transfer of flammable or combustible liquids.
- Verify approved equipment, storage containers, and rooms for flammable and combustible liquids.
- Implement employee training and housekeeping procedures to minimize the hazards associated with flammable and combustible liquids including:
  - Train employees to use the SDSs for all flammable and combustible liquids in your workplace.
  - Conduct routine inspections and follow-up procedures for deficiencies in storage and use of flammable and combustible liquids.
  - Keep containers closed when not in use.

- Practice good housekeeping and equipment maintenance.
- Establish protocols for emergencies such as fires and spills.

## Proper Storage

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Safe storage of flammable or combustible liquids is imperative to help minimize their exposure to ignition sources while segregating them from the rest of the facility. The most common storage scenarios are flammable liquid cabinets, flammable liquid rooms, and outside flammable liquid buildings. Specifications for the proper use and fire protection of these and other storage scenarios are detailed in NFPA 30.

Proper ventilation for areas with flammable and combustible liquids is essential. A well-designed and well-maintained ventilation system can remove flammable vapors and reduce the fire and health hazards presented by those vapors. Regular cleaning of ducts and filters decreases the fire hazard and reduces the likelihood of spontaneous combustion. Ventilation equipment installed to remove solvent vapor should be approved for such use.

**Flammable liquid storage cabinets** can be used to store up to 120 gallons (460 L) of liquids in portable containers. An approved cabinet has been designed and constructed to protect the contents from external fires. The cabinet doors and portable containers should remain sealed when liquids are not being dispensed. This retains the integrity of this storage configuration and limits exposure to flammable vapors.

**Interior flammable liquid storage rooms** (inside rooms and cutoff rooms) are also very common. These are interior rooms in buildings designed specifically for the storage of flammable and combustible liquids.

Design features of these rooms include:

- Generally 2-hour fire-rated walls and ceilings are required, with masonry walls preferred over drywall.
- Electrical wiring, lighting, and equipment should be rated for use in hazardous environments, generally rated for Class 1 Division 1 or Class I Division 2 per NFPA 70, Article 500.
- Adequate ventilation (low level in most cases) to vent flammable vapors that could accumulate.
- Explosion venting or deflagration panels/walls that are designed to allow the pressure from an explosion in the room to vent out of the room and building to prevent them from being severely damaged.
- Adequate spill containment in the form of diking, underground drainage, spill reservoir, etc.
- Fire protection in the form of automatic sprinklers or a water-based foam extinguishing system (AFFF or AR-AFFF).
- **Outside/detached flammable liquid storage buildings** isolate flammable and combustible liquids and limit the exposure to the primary buildings. These buildings may have the design features of interior flammable liquid storage rooms. Required protection for these rooms is often determined by the local **Authority Having Jurisdiction (AHJ)**, the value of the liquids stored in the outside storage building (both replacement cost and lost production cost), and the proximity of the building to other valuable buildings and property lines.

## **Proper Handling**

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**Production Floor** - At all times, the amount of flammable and combustible liquids on a production floor should be limited to the amount that is necessary for

one shift and should be stored in safety cans when on the floor. A safety can has these features:

- UL-listed container
- Capacity not more than 5.3 gallons (20 L)
- Spring-closing lid and spout cover
- Designed to safely relieve internal pressure when subjected to fire exposure

**Dispensing** - The preferred method of dispensing flammable and combustible liquids from drums or 5-gallon cans is by means of a laboratory-tested hand pump drawing through a dip leg that extends from the top of the container. This minimizes the probability of spills and leakage. Gravity dispensing from drums is acceptable if approved or listed self-closing faucets and drum vents are used.

Static electricity can build up during the dispensing of liquids and could result in ignition and/or explosion of the flammable vapors. The following precautions can minimize this exposure:

- **Grounding** uses a conductive wire to connect the drum to a ground pipe or metal post.
- **Bonding** uses a conductive wire to connect the dispensing drum to the metal container into which the flammable liquid is being dispensed
- **Disposal** - Just as the storage, dispensing, and use of flammable liquids can present significant fire exposures, disposal of liquids and materials soaked with flammable liquids presents a significant fire exposure. Spontaneous combustion is one of the leading causes of fires due to improperly disposed of rags and clothing. The following precautions can minimize this exposure:
  - Waste containers should be approved and provided.
  - Waste should be removed from the premises at the close of each shift.

Rags or waste impregnated with flammable materials shall be deposited immediately into these containers.

- Waste containers for flammable liquids should be located in ventilated areas in the same manner as the stored materials.
- Waste containers should be grounded.

**Sprinkler Protection** - Automatic sprinkler protection requirements for manufacturing or processing utilizing flammable and combustible liquids is provided by the National Fire Protection Association in NFPA 13 and NFPA 30. Protection requirements for spray application using flammable or combustible materials are detailed in NFPA 33.

## **Resources**

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NFPA 13 Standard for the Installation of Sprinkler Systems

NFPA 30 Flammable and Combustible Liquids Code

NFPA 33 Standard for Spray Application Using Flammable or Combustible Materials

NFPA 70 National Electrical Code

OSHA 29 CFR 1910.106 Flammable and Combustible Liquids  
[www.osha.gov](http://www.osha.gov)

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