

JOB AID

Flammable and Combustible
Liquids

Flammable and Combustible Liquids

Flammable and Combustible Liquid Danger

Flammable and combustible liquids tend to let off vapors that mix with the air, where oxygen makes them ignitable. Each liquid is classified by its **flashpoint** – the lowest temperature at which its vapors reach an ignitable concentration in the air. Temperatures hotter than the flashpoint cause more evaporation, making the liquid even more dangerous.

Flammable liquids have lower flashpoints than combustible liquids (ignitable vapors are possible at lower temperatures). A flammable liquid has a flashpoint under 100 °F (38 °C). Gasoline, or petrol, for instance, has a flashpoint of about -45 °F (-43 °C), so its vapors can ignite on even an extremely cold day. Common flammable liquids include acetone, benzene, ethanol and petrol.

Combustible liquids have flashpoints at or above 100 °F (38 °C) and below 199 °F (93 °C). Common combustible liquids include diesel fuel, motor oil, kerosene, and oil-based paints. See Appendix A for reference to other agencies/organizations categorization.

Flammable and combustible liquid vapors:

- Often settle in low-lying areas
- Can travel to connect liquids to ignition sources (flashback)
- May also be toxic, corrosive or otherwise hazardous
- May cause dangerous chemical reactions, such as with oxidizers

Contact with flammable and combustible liquids and vapors causes skin and eye irritation. Flammable and combustible liquids and vapors are also commonly toxic. Symptoms of inhalation, ingestion and skin absorption include headaches; lightheadedness and dizziness; nausea and/or vomiting; confusion and mood changes; and difficulty breathing.

Labels on containers of flammable and combustible liquids have a GHS pictogram of a flame inside a red diamond. Labels may also include the words FLAMMABLE or COMBUSTIBLE. DANGER indicates more severe hazards than WARNING. You can also find information about flammable and combustible liquids in the Safety Data Sheet (SDS).

General Safety Procedures

To prevent or extinguish fires, essentially remove any one of the components of fire (fire, heat, oxygen, and chemical chain reaction). Keep ignition sources away from flammable and combustible liquids. Ignition sources include:

- Open flames
- Cigarettes
- Lightning
- Static electricity
- Friction
- Cutting
- Welding
- Grinding
- Radiant heat
- Electrical arcing or sparks
- Mechanical sparks
- Heat-producing chemical reactions

Bonding and Grounding

Use bonding and grounding to prevent static electricity. Bonding and grounding only work when you create an electrically continuous (e.g., metal-to-metal) connection.

- **Bonding:** Connecting objects with wire so that electrons that move between the objects will travel through the wire, not the air
- **Grounding:** Creating a metallic path between an object and the ground

Proper Storage

Storage rooms for flammable and combustible materials:

- Have ventilation systems that prevent flammable vapors from accumulating to unsafe levels
- Are liquid-tight where the walls meet the floor
- Have varying capacity limits that people must not exceed (ask your supervisor)
- Are NOT safe if you keep too much in them (observe limits set by your company)
- Should have fire protection systems, such as overhead sprinklers

Flammable and Combustible Liquid Cabinets

Cabinets should:

- Be conspicuously labeled “Flammable – Keep Fire Away”
- Be able to pass a standard fire test and have special fire-resistant features

Flammable and Combustible Liquid Outside of Storage/Cabinets

The amount of flammable or combustible liquid that can be outside of a storage room, cabinet or fire area depends on the liquid and type of container, as well as on applicable regulations.

The less you have out, the safer you are. The more dangerous the liquid, the less you should have out at one time. Follow your company's policies. Take only what you need for a task, half-shift or shift and always put it back in the storage room or cabinet as soon as you are done with it.

Containers

Choose containers designed, constructed and/or listed to meet the safety standards of appropriate safety organizations. **Safety cans** often have spring-closing lids and spout covers to prevent vapor from escaping, prevent over-pressurization, and may also have flame arrester screens.

Safety Principles and Procedures

Transferring Flammable and Combustible Liquids

It is best to only transfer flammable and combustible liquids by using:

- Safety cans
- An approved self-closing safety faucet
- A closed piping system
- A safety pump

Bond and ground your containers when you transfer flammable and combustible liquids!

Minimize the rate and height at which you pour to limit air mixing, splashing and static charge. Leave free space in containers to allow for liquids to expand without overflowing; this will help prevent leaks or ruptures.

Housekeeping

Even very small amounts of flammable and combustible liquids can give off enough vapor to form an explosive atmosphere inside containers. Flammable and combustible liquids can easily be trapped in a seam or be present as a very thin film on the inner surface of containers or drums. Welding, cutting, drilling, or opening drums with spark-producing tools can lead to vapor flash fires and deadly explosions.

Keep storage rooms, cabinets and your work area tidy, close containers and cabinets immediately, and put liquids back after use.

Know your company's procedures for reporting and cleaning up spills BEFORE you begin working. Ask your supervisor if you have questions. Only employees who are qualified to clean up spills should do so. Prompt cleanup by qualified people can help prevent hazard exposures and fast-spreading fires. Large spills and the materials that responders used to clean them up can present serious fire, explosion and health hazards. Make sure responders are aware of the liquids involved and have relevant Safety Data Sheets (SDSs).

Appropriate fire control devices, such as appropriately rated fire extinguishers and hoses, should be available where flammable and combustible liquids are stored. Only extinguish fires if you are properly trained to do so.

Appendix A: NFPA, OSHA, and DOT Classification guidelines for Flammable and Combustible liquids

NFPA:

Class I Flammable – flash point below 37.8°C (100 °F)

Class II Combustible – flash point of 37.8°C (100 °F) up to 60°C (140 °F)

Class IIIa Combustible – flash point above 60°C (140°F) and below 93°C (200 °F)

OSHA:

Category 1: Flashpoint below 23°C (73.4 °F) and boiling point at or below 35° C (95 °F)

Category 2: Flashpoint below 23°C (73.4 °F) and boiling point above 35° C (95 °F)

Category 3: Flashpoint at or above 23°C (73.4 °F) and at or below 60 °C (140 °F)

Category 4: Flashpoint above 60 °C (140 °F) and at or below 93 °C (199.4 °F)

DOT:

Flammable liquid: *Flammable liquid* (Class 3) means a liquid having a flash point of not more than 60 °C (140 °F)

Combustible liquid: *Combustible liquid* means any liquid that does not meet the definition of any other hazard class specified in this subchapter (49 CFR § 173.120) and has a flash point above 60 °C (140 °F) and below 93 °C (200 °F)