

What really makes a "Safety Can" safe?

What you don't know might
explode in your face

By GLEN CARTER

It is evident from the number of accidents/fires occurring each year in our workplaces, and even in our homes, that we have a long way to go in our basic safety training about the hazards of flammable and combustible liquids. This involves use, storage, and transportation of these fluids. Complacency or ignorance can result in the destruction of our facilities, suffering from physical and emotional scars, and in some cases death (maybe the loss of loved ones). Some businesses never recover from these disasters.

Fortunately, laws have been enacted to help protect workers from workplace dangers, such as the mandated use of a "Safety Can" when handling flammables. But what really makes a Safety Can "safe?" An understanding of basic fire principles and liquid characteristics, along with laws, procedures, and properly designed safety equipment, will result in an intuitive approach to flammable liquid safety. If it is not intuitive, a disconnect occurs — a disconnect that could eventually result in an incident.

Fire and flammable & combustible liquid characteristics

The fire triangle illustrates the elements required for combustion. Only in the proper combination of fuel, oxygen, and heat (the three "legs" of the triangle), will combustion take place. A "Safety Can" is designed to eliminate one or two of the legs required for combustion of its contents.

The heat "leg" can be controlled with common sense measures to stay away from heat sources. Here are some examples of heat sources: open flames, smoking, static electricity, cutting and welding, hot surfaces, electrical and mechanical sparks, and lightning. The heat leg can also be controlled by the use of a flame arrester, discussed later in this article.

An understanding of the characteristics of flammable and combustible liquids will help uncover the means to safeguard the fuel and limit the oxygen — addressing the other legs of the triangle.

Some of the major liquid characteristics are as follows:

☞ It is the **vapors** in combination with oxygen that burn, not the liquid. A closed container and spill prevention controls the creation of vapors.

☞ **Flash point** is the lowest temperature a liquid will form an ignitable vapor and determines the volatility of a material. Liquids with a flash point less than 100°F (37.8°C) are flammable liquids and are considered a higher risk during use, storage and transportation than combustible liquids which have a flash greater than 100°F (37.8°C). Class 1 flammable liquids require grounding or bonding to prevent static discharge and the ignition of vapor during pouring or filling operations between containers. Maximum allowable quantities or maximum allowable container size are defined by the liquid's classification. The maximum allow-

able Safety Can is two-gallon capacity for a Class 1A flammable. All other classi-

fications are allowed to be in five-gallon capacity Safety Cans. The higher flash points of combustible liquids do not mean they are not dangerous.

☞ Vapor pressure increases in a closed container as the temperature of the fluid increases. *Note: Unlike a Safety Can, plastic consumer cans are not designed to relieve pressure in the event of a rapid increase in temperature like a fire; these cans can explode spreading fuel and fire in an area.*

☞ Vapor is heavier than air — closed containers and spill prevention are key here. Flammable liquid vapors are what we refer to as the "invisible enemy." They can travel across the floor, down steps or shafts. Once they find an ignition source, the flame can follow the vapor trail back to the source. *Note: If the source container is not a Safety Can, an explosion may occur.*

☞ Vapor emitted is proportional to the surface area of the fluid exposed to air. Spills are the worst thing that can happen. The vapor given off from one gallon of gasoline in an open top container is dwarfed by the vapor given off by one gallon of gasoline spilled on the floor. To control spills, Safety Cans have spring closing lids so they are automatically closed when not in use, and are designed and constructed to pass rigorous drop tests to ensure they are robust enough for



commercial use.

Required by law

🔥 **"Safety Can"** (as defined by OSHA) "means an approved closed container, of not more than five gallons capacity, having a flash-arresting screen, spring-closing lid and spout cover and so designed that it will safely relieve internal pressure when subjected to fire exposure." Once again, it's important to note that if the liquid is a Class 1A, the maximum to be stored in a Safety Can is only two gallons.

🔥 OSHA further states: "An approved safety can is listed if it is of a kind mentioned in a list which is published by a nationally recognized testing laboratory which makes periodic inspections of the production of such equipment and which states that such equipment meets nationally recognized standards and has been tested and found safe for use in a specified manner."

Underwriters Laboratories and FM Global are independent, third-party nationally recognized laboratories that "list" (UL) or "approve" (FM) Safety Cans to stringent construction and performance (test) criteria. Both have follow-up quality assurance programs that insure compliance to OSHA, the National Fire Protection Association, and give confidence to users in the field.

Testing requirements

🔥 **Requires spring-closing lid(s) (self-closing lid(s))** — This is to ensure that personnel who finish filling a Safety Can, or pouring out of a Safety Can,

cannot walk away leaving the container open. This eliminates the potential of the fluid stored from creating fugitive flammable vapor that could eventually be ignited by a heat source. A closed lid cuts off the supply of oxygen, thereby eliminating a "leg" of the fire triangle and preventing a fire. *Note: Most containers including consumer gasoline cans do not offer this feature.*

🔥 **Requires a Safety Can be designed to safely relieve internal pressure when subjected to fire exposure.** The design performance of this feature is tested. The Safety Can is filled with heptane and set in the middle of a heptanes "bath," or pool. The bath of heptanes is ignited. The flammable liquid inside the Safety Can heats up and turns to vapor. As the vapor pressure builds, the Safety Can vents the vapor and is burned off in place until the entire liquid content of the can is turned to vapor and the vapor is consumed. *Note: Consumer gas cans are closed containers that are not designed to vent. If the flammable liquid vapors inside expand too much due to heat or other causes, the pressure builds and can explode the container and spread the fire.*

🔥 **Flame Arrester** is required in each opening of a Safety Can. It is a very effective screen or perforated metal device that will allow fluid to pour through it. Its purpose is to absorb and dissipate any heat or flame introduced outside of the open container so it will not ignite the vapor on the inside of the container, regardless of how the heat is generated. This feature safeguards

against ignition and explosion of the vapors. *Note: An open container such as a plastic consumer gasoline container filled with flammable vapor that is not fitted with a flame arrester, will explode.*

🔥 **Leakage** — Safety Cans are leak tested under pressure to ensure the seams and construction are robust enough not to leak.

🔥 **Strength** — Safety Can construction is designed not to fail under usage; strength tests are conducted on the pouring spout and handle.

🔥 **Drop test** — Ultimately if a container will not survive a drop test and accidental drop, it could produce a dangerous leak or spill.

🔥 **Compatibility** — It is always important to select a Safety Can that is compatible with the flammable or combustible fluid you are storing. Options include steel or polyethylene construction.

Glen Carter is chief technology officer, Justrite Manufacturing Company. Glenn is a recognized authority on flammable liquids storage and handling. He is currently on the following UL Standards Committees: 30 - Metal Safety Cans; 32 - Metal Waste Cans; 1275 - Flammable Liquids Storage Cabinets. Glenn has served as a member of the NFPA 30 Technical Committee, Flammable and Combustible Liquids Code since 2008. Founded in 1906, Justrite manufactures a wide line of safety containment systems. Contact Justrite at www.justritemfg.com; 847-298-9250; For Customer Service 1-800-798-9250.

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