

Safe Storage of Flammable Liquids in Refrigeration and Cooling Equipment

Scope: This guidance document applies to all laboratories at UT Health Science Center at San Antonio and is written in accordance with NFPA 45, *Standard on Fire Protection for Laboratories Using Chemicals, 2004 Edition*.

Background: Certain refrigeration and cooling equipment are designed for the safe storage of flammable materials to prevent potentially explosive accidents in laboratories. These units are specially constructed to prevent ignition of flammable vapors. Light switches, defrost features, and thermostats been removed or relocated outside the unit. These modifications are crucial, since the presence of flammable vapors and the addition of an ignition source have caused explosions in other laboratories resulting in injuries and damage. Before purchasing or obtaining a refrigerator, consider whether flammables will be stored in this unit.

A **flammable liquid** is defined by the NFPA (National Fire Protection Association) as having a flash point of less than 100°F (38°C). Below is a list of common laboratory solvents and their flash points that should NOT be stored in general purpose refrigerators. Note, this is not an all encompassing list. Most solvents will have a flash point less than 100°F. In addition, if you need further information regarding a chemical's flashpoint, please refer to the chemical's Material Safety Data Sheet.

Acetone (4°F)	Isopropanol (53°F)	Temed (<21°F)
Acetonitrile (42°F)	Ethyl Alcohol (55°F)	Sigmacote (25°F)
Tetramethylethylenediamine (50°F)	Propyl Alcohol (74°F)	Methanol (54°F)

Labeling of Refrigeration/Cooling Equipment:

Approved refrigeration units storing flammable materials must be properly labeled with signage stating "Approved for Flammable Storage". Below is an example of a proper label:

CAUTION
THIS UNIT IS APPROVED FOR
FLAMMABLE MATERIAL STORAGE.
THIS UNIT HAS NOT BEEN HARD-WIRED AT
INSTALLATION TO BE EXPLOSION-PROOF.

All other refrigerators which are not approved for the storage of volatile materials should also be labeled accordingly. Below is an example:

CAUTION

**THIS BOX IS NOT EXPLOSION-PROOF
INTERNAL WIRING OPERATES WITH
ELECTRICAL ARCS & MAY IGNITE
FLAMMABLE OR EXPLOSIVE MATERIAL**

Please note that storage of flammables in walk-in cold rooms is not recommended due to inadequate ventilation and potential ignition from electrical arcing.

Selection of Refrigeration Equipment: There are three types of refrigerator/freezer models that should be considered, depending on the hazardous materials the unit will store:

I. Laboratory-Safe:

This refrigerator has no internal electrical components (i.e. thermostats, light switches) that could trigger an explosion inside the unit. These must always be used when storing volatile materials. These types of units are available commercially, and include features that control or limit damage should an exothermic reaction occur. Laboratory-safe refrigerators are recommended for many typical laboratory work areas.

II. Explosion Proof:

These units prevent the ignition of interior or exterior explosions in a hazardous environment. The motor and thermostat is designed to prevent arcing or spark production and possible ignition. In addition, they require special hazardous-location wiring, which is very costly. As a result, these types of refrigerators are seldom required in a typical laboratory setting. This type of refrigerator would be required only in locations where a flammable atmosphere may develop, such as solvent dispensing rooms.

III. Modified Domestic Models:

It is possible to modify general purpose refrigerators to relocate ignition sources such as thermostats and light switches and thus reduce the explosive hazard. However, this process would only apply to manual defrost units. Furthermore, modifications can void warranties and can be time-consuming and costly. Environmental Health & Safety does not recommend modification of domestic refrigerators.

The following websites provide information about laboratory-safe refrigerators and pricing:

www.thermo.com

<http://www.vwrsp.com/>

<http://www.so-low.com/>

For additional information or to request labels, contact:

Environmental Health & Safety, 1.343T DTL

(210) 567-2955

<http://research.uthscsa.edu/safety>