



Flammable Liquids Storage: Standard for Refrigerators

In many laboratories, refrigerators are used to store highly volatile flammable liquids. The fire/explosion risk associated with the storage of these liquids can be minimized with the use of specially designed refrigerators. This standard is based on Regulation 388 (the Fire Code) made under the *Fire Protection and Prevention Act*.

Note: In this standard, "worker" includes faculty, staff, students and visitors.

Scope:

All refrigerators used for the storage of flammable liquids.

Responsibilities:

Principal investigators/supervisors and all others in authority shall:

- provide refrigerators for the storage of highly volatile flammable liquids in the laboratory;
- ensure that flammable liquids storage refrigerators, under their jurisdiction, are in compliance with all requirements of this standard; and
- ensure that workers are informed regarding the proper storage of refrigerated flammable liquids; Workers shall:
- store flammable liquids in accordance with this standard

Flammable Liquids Storage Refrigerators

Domestic refrigerators must not be used for the storage of highly volatile flammable liquids. The primary reasons include:

- refrigerator temperatures are often higher than the flash points of flammable liquids stored inside, therefore vapour accumulation can occur;
- there are a number of sources of ignition which are within or exposed to the refrigerated storage area of a standard domestic fridge --- thermostats, light switches, heater strips;
- the compressor and it's circuits are typically located at the bottom of the unit and vapours from flammable liquid spills or leaks can readily accumulate

To safely refrigerate flammable liquids, there are three types of laboratory refrigerators which may be used: "explosion-proof", "laboratory-safe" ("explosion-safe"), and modified domestic models.

1) Explosion-Proof Refrigerators



These units are designed to protect against ignition of flammable vapours both inside and outside the refrigerated storage compartment.

2) Explosion-safe Refrigerators (Laboratory-safe)

These units are intended for the typical laboratory environment. The primary intent is to eliminate ignition of vapours inside the storage compartment by sources which are also inside the compartment. Most laboratory- safe refrigerators also have design features such as thresholds, self-closing doors, friction latches or magnetic door gaskets and special materials for the inner shell. All of these features are intended to control the damage should an explosion occur inside the storage compartment. The compressor and its circuits are located at the top of the unit to reduce the potential for ignition of floor-level flammable vapours. Commercially available "laboratory-safe" refrigerators generally provide a level of safety that is difficult to achieve through modification of domestic fridges.

3) Modified Domestic Refrigerator

This type of refrigerator is a domestic unit in which sources of ignition within the storage compartment have been relocated or removed. Only **manual defrost** refrigerators can undergo this modification process. The self-defrosting models cannot be successfully modified to provide even minimum protection against vapour ignition. The following are the minimum procedures for modifying a domestic manual defrost refrigerator:

- relocate the manual temperature controls to the exterior of the storage compartment --- all points where capillary tubing or wiring formerly entered the compartment must be properly sealed;
- remove all light switches and light assemblies and seal all resulting openings; and
- replace positive mechanical door latches with magnetic door gaskets.

Guidelines for the Use of These Refrigerators

- the unit must be conspicuously labelled to indicate that it is safe to store flammable liquids and to keep open flames or other sources of ignition clear of the unit;
- all materials must be in closed, well-sealed containers to minimize vapour release;
- food and drink must not be stored in these fridges;
- good laboratory practice dictates that users purchase the smallest quantity necessary to do the required job -- this not only reduces storage requirements but it also minimizes the potential hazards associated with flammable liquids.