

Campus Guideline: Refrigerators in Chemical-using Laboratories

The safe storage of chemicals in laboratory refrigerators is often an area of controversy. Specifically, when researchers state that they have no intention of storing any “flammable chemicals” in a proposed new unit and therefore do not wish to pay the extra cost for an approved “flammable storage” unit. However, as delineated in more detail in the attached excerpts from the *CRC Handbook of Laboratory Safety*, these honest intentions are undercut by other facts:

- If a flammable liquid is placed in a normal (household) refrigerator there is a reasonable chance of a powerful explosion that would cause serious injuries or fatalities. Such instances are documented – see attached picture from explosion at UCI.
- Refrigerators can last up to 30 years, and therefore, no one can assure that they will never be misused, particularly with the constantly changing research and personnel of an academic lab. Nor can anyone assure that a given unit will even stay within the same group or lab for its lifetime.
- It is not reasonable to rely on warning signage to assure that refrigerators will never be misused. Signs are often not read, misunderstood, damaged or ignored.

Therefore, it is the strong recommendation of the campus Chemical Safety Committee that the following guidelines be adhered to by PIs and departments when new refrigerators are obtained for their areas employing chemicals. Environmental Health & Safety monitors refrigerators when ordered and during periodic lab inspections.

1. If there is one, or more, existing approved flammable storage refrigerators within a given lab, or suite of adjacent PI labs, then new units do not necessarily have to be the flammable storage type – unless the unit is specifically planned for such use.
2. If a proposed unit is the sole refrigerator present, and if flammable/combustible liquids are used or stored within the room that the refrigerator will occupy, then it should be of the approved flammables storage type.
3. All refrigerators in chemical-using areas must be clearly labeled with directions as to what materials can, and can not, be safely stored there.
4. The modification of domestic refrigerators (“desparking”) to convert them to chemical use is prohibited on campus and is illegal.
5. The committee requests that EH&S enforce these guidelines whenever feasible, but also use their professional judgement when appropriate to make exceptions in unusual situations.



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Laboratory Refrigerators

Excerpts from: *CRC Handbook of Laboratory Safety*, 4th ed., Section 4.5.7

“..... the most dangerous storage units in any laboratory is the ordinary refrigerator..... This is primarily due to the storage of flammable materials within them..... The flash points of many common lab solvents are below or close to the normal operating (about 38°F) of a common refrigerator. Most of these evaporate rapidly so that they quickly reach equilibrium concentrations in a closed space.

Carelessly closed containers, e.g. screw caps that are not firmly tightened or beakers containing solvents covered only with aluminum foil or plastic wrap, will allow vapors to escape from the container and, given sufficient time, build up in the confined space until they reach a concentration in excess of the lower flammability limit. A spark may then cause ignition, and because the reaction is temporarily constrained, very high pressures can build up until the refrigerator door latch fails and a powerful explosion ensues. Many such cases have been documented, and in most cases, workers in the vicinity in front of the refrigeration unit likely would have sustained serious if not fatal injuries.

A normal refrigerator has many sources of ignition – the thermostat, interior light, the light switch on the door, the defrost heater, the defrost control switch, the compressor unit, and the fan. Most of these are located within the space being maintained cool, but self-defrosting units contain an internal drain that can permit internal vapors to flow into the compressor space below....

*Refrigerators can last for as many as 20 to even 30 years. It is not feasible to accept assurances by laboratory managerial personnel that no flammable materials will ever be placed in an ordinary refrigerator, because neither the individual making the promise nor the program for which the refrigerator is purchased is likely to occupy the same laboratory space for such an extended period. It is also **not reasonable to depend upon marking laboratory refrigerators**, no matter how prominently, as not to be used for flammable material storage and count on compliance with the restriction. If there is an ordinary consumer-quality refrigerator in the laboratory, it is virtually certain that someone will eventually use it improperly. **Therefore, it is recommended that all refrigerators to be used in laboratory areas be required to be initially constructed for flammable material storage, and bear an appropriate label on the front that it meets such standards.**”*



**UCI Explosion
Picture**