Refrigerators in the Laboratory

Refrigerators are used to store chemicals, specimens, and other materials in a wide variety of labs. Improperly storing hazardous materials in a refrigerator can cause explosions, fires, and poisonings.

Hazards

Most flammable materials naturally let off some level of vapor, even when containers are covered and sealed. Storing flammables in a refrigerator allows for the build-up of those vapors in an enclosed space. Cooling elements, internal lights, defrost switches, and timers inside refrigerators are often capable of producing enough of a spark to ignite flammable vapors. Sparks generated by the electrical equipment inside a refrigerator have been known to set off explosions that have destroyed refrigerators and harmed people and parts of the lab around it.

Types of Refrigerators

<table>
<thead>
<tr>
<th>Standard/Domestic</th>
<th>Modified Domestic</th>
<th>Flammable-Safe (laboratory-safe)</th>
<th>Explosion-Proof</th>
</tr>
</thead>
<tbody>
<tr>
<td>• CANNOT be used for flammables</td>
<td>• A domestic refrigerator that has had the electrical components modified to remove or control ignition sources</td>
<td>• Recommended for laboratory storage of flammable materials, as they enclose all sources of potential ignition</td>
<td>• Safe to store flammables in, as well as safe to use in a flammable environment</td>
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<tr>
<td>• Can be used for non-flammable materials only</td>
<td>• If the light in the refrigerator comes on when you open it, it has not been modified</td>
<td>• Often have other safety features, such as thresholds, self-closing doors, magnetic door gaskets, or special materials for inner shell</td>
<td>• No locations at the University should be generating a flammable environment around the refrigerator, so these are generally not needed</td>
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<tr>
<td>• Regular refrigerator, just like ones used in home kitchens</td>
<td>• Only a few types of manual defrost refrigerators can be modified appropriately, so purchasing a flammable-safe refrigerator is the easiest option</td>
<td>• They will often have a label that reads&quot; Flammable materials refrigerator: keep fire away&quot;</td>
<td>• If you think your area needs one, contact your Department Safety Officer to conduct a risk assessment</td>
</tr>
<tr>
<td>• Internal components are capable of producing a spark that could ignite vapors</td>
<td>• If used for food and drink, must not be in lab area, and must be signed appropriately</td>
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</tbody>
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Refrigerator Contents

- Food and drink for consumption should never be stored in a laboratory refrigerator. If a refrigerator is going to be used for food, it should be clearly signed that it is for food and drink ONLY and cannot be in the main laboratory area. Similarly, refrigerators used for laboratory supplies should be marked that no food and drink is allowed.

- All containers should be sealed. Corks, tinfoil, Parafilm, and other “loose” caps should not be used.

- Secondary containment should be used. This will help you reduce spills and access materials without spilling. In case of an accident, using secondary containment limits the area and number of containers affected by the spill, making clean-up easier. In freezers, trays also help reduce the chances of bottles becoming embedded in ice or frost.

- Corrosives that are stored in refrigerators can cause degradation of the lining and components of the equipment. Make sure corrosives are well-sealed, and make sure to clean out the refrigerator often to help prevent damage.

- All contents should be dated and labeled. This helps reduce the amount of “mystery” containers, and helps you keep an eye on expiration dates or decomposition times.

- Make sure contents of the refrigerator are compatible. Make sure to maintain segregation between hazardous chemical classes by storing them within separate secondary containment bins.

- Never store flammables in cold rooms. Because of their closed air circulation systems, they can easily create a high concentration of vapors within the room. This can cause harm to people working in the room because of the potential for inhaling vapors and flammable vapors could lead to a fire or explosion as those vapors pass through the air circulation systems.

Refrigerator Use and Maintenance

- Make sure you are using an appropriate refrigerator for your laboratory. If you need to keep flammables cooled, your lab must have either a modified domestic refrigerator or a flammable-safe refrigerator. Flammables should never be stored in standard domestic refrigerators. Even a very small amount of flammable liquid can generate enough vapors to cause an explosion.

- If your lab uses flammables, consider purchasing ONLY flammable-safe refrigerators, even if you don’t plan to use them all for flammables. This will prevent materials from ever being stored in an unsafe refrigerator. Refrigerators are a long-term investment, so make sure they are as safe as possible for your lab.

- Think about what will happen if your refrigerator breaks down or there is a power outage. Will chemicals become unstable? Will your samples decompose or become unusable? Make a plan for what to do if this occurs, or how you will prevent it. Back-up power outlets are an option for making sure it will always be powered. Some labs have an insulated cooler they use for defrosting, or if they need to transfer fridges.
• Consider posting an inventory on the front of the refrigerator. This is especially useful for refrigerators containing chemicals, as you can know at a glance what is stored inside. This can also preserve energy and keep refrigerator contents cooler, as people may spend less time searching for items inside.

• All refrigerators should be plugged directly into an outlet. Don’t use extension cords.

• Refrigerators should be cleaned out and defrosted on a regular basis. Once a year is recommended, or when ice covers materials or interferes with the ability to shut the door tightly.

• Locate your refrigerator away from laboratory exits, so that in case of a refrigerator incident, you will still have a clear exit from the area.

Signage

Domestic/standard Refrigerators
All the refrigerators in your lab should be signed appropriately for what is allowed to be stored in them. Refrigerators that are unsafe for flammables storage should be signed, clearly indicating the flammables should not be stored there.

Flammable-Safe Refrigerators
Refrigerators that are safe for flammable storage should also be signed, indicating that there are flammables stored inside. Signs like those to the right can be used, or you can make your own. Note that the signs for non-flammable storage and flammable storage can look very similar.

General Chemical Storage Refrigerators – NON-flammable
You should also label the refrigerator with the hazards of any other materials stored in the refrigerator, such as biologicals, toxics, or other materials. You can follow standard labeling guidelines.

Food and Drink Refrigerators
If the refrigerator is only for food and drink, there should be a sign on it indicating that it should not be used for any chemicals or lab supplies, and is for food/drink only.

Temperature-Sensitive Materials
If your refrigerator is storing temperature sensitive materials, it is a good idea to post emergency information on the front. This should include the required storage temperature, emergency contact information, and what to do if the refrigerator is not working.

Questions
If you have any questions about appliances or storing flammables safely, contact your Department Safety Officer, your DEHS Research Safety Professional, or call the DEHS office at (612) 626-6002. A safety professional will be able to provide guidance on appliance purchasing, chemical storage, and other concerns.