



Conserve O Gram

August 2009

Number 14/11

Cold Storage for Photograph Collections – Using Individual Freezer Units

Introduction

Most photograph collections can benefit from cold storage. When collections are relatively small, and space and budget is limited, the use of one or more household “upright” freezers is a viable option. To ensure the collections are properly protected, consider freezer specifications, location, collection size, collection packaging requirements, and inventories when planning to use an upright freezer.

Types of Freezers

This *COG* focuses on the use of household upright freezers because of their ease of availability, low price, and efficiency. The capacity of the largest household freezer is about 20 cubic feet. There are however, several other available freezer options.

Household “chest” freezers are similar in function to the “upright” models. They can work as a cold storage unit, but they are not the best choice for long-term collection storage. Boxes need to be stacked in a chest freezer to best use the interior space. The weight of some boxes may be detrimental to the safety of the lower boxes. Collections are not easily accessed since finding one item in a chest freezer often means removing or displacing several other packages. The less handling of collections the better because film can become more brittle at very cold temperatures.

Specialty freezers such as commercial, industrial, and scientific freezers offer a few more desirable features than household models, depending on the collection. They often allow for more adjustability of shelving placement, which is essential to efficiently pack a collection. Some of these freezers are available in large capacity models, up to 70 cubic feet of capacity.

While these large-capacity freezers can be useful for medium-sized collections, they tend to be more expensive than several upright household units combined. They also usually run louder and produce more heat than most household models. If a large-capacity specialty freezer fails, it places the entire contents at risk. Several smaller household units generally operate reliably. If one fails the rest of the collection is still maintained by the other freezers. Beyond more than a few household freezers, the electrical circuit load could become an issue.

Flammable Material Storage (FMS) Freezers

This specialized freezer accommodates the needs of materials such as cellulose nitrate film. It was designed to contain and isolate vulnerable collections. If your collection contains a large amount of cellulose nitrate film see *COG 14/8* for more information on appropriate storage.

Household “Upright” Freezer Specifications

There are many options in terms of household “upright” freezer design and operation.

Note: This COG does not make specific recommendations as to brand name products as model numbers and features change very rapidly and would soon be outdated. Therefore, always consider the following features when selecting the appropriate freezer to suit your collection needs and maximize available resources:

- **Frost-free or self-defrosting.** The freezer should be “frost-free” or self-defrosting. This eliminates the inconvenience of periodically shutting down and defrosting the unit which necessitates the removal of the collections during that process. During the defrost process the relative humidity (RH) in the freezer increases significantly. However, this is temporary; collections will be protected from experiencing dramatic changes in RH because of proper vapor-proof packaging (see COG 14/12).
- **Energy efficiency.** Current government regulations for federal agencies require that all appliances purchased must qualify as Energy Star® or consume “low energy” whenever possible. This requirement also helps to keep energy costs down, especially when operating several units.
- **Minimal heat generation.** Storage space for collections is often at a premium with freezer units frequently placed within existing collection storage areas. It is therefore important that freezers do not generate a lot of heat during operation. Excess heat given off by the freezer can adversely effect other collections by counteracting climate

control systems. Most freezer specifications do not mention heat generation. Always check with the manufacturer’s sales representative, and if possible visit a local store to see the model in operation before selecting one.

- **Minimal ambient noise.** Seeing the freezer in working mode prior to purchase helps determine the amount of ambient noise given off by the freezer. Freezers may be housed close to office spaces, where noise could be a problem. Some newer models run very quietly.
- **Adjustable shelving.** Adjustable shelves allow for the best use of space based on container sizes. However, many household upright freezers have fixed shelves that limit the available useful space. Look for a model that has the most options for adjustability. Door bins can be used to house narrow boxes and motion picture cans.
- **Removable door bins or door panels.** Some freezers allow individual door bins (see figure 1) or the entire door panel to be removed. If the entire panel is removed it can be replaced with a flat sheet of polystyrene. Either of these options increases the usable space by allowing extra deep or large double-shelved boxes to overhang the shelf and protrude into the door space.



Figure 1. This door bin/shelf can be removed to accommodate the box overhang, allowing for maximum use of space.

- **Heavy-duty wire shelving.** Heavy-duty wire shelving is often preferable to glass shelves because of its rigidity and weight-bearing strength. Heavy collection material may crack a glass shelf. However, the wire shelving can leave an impression on the bottom of your storage box. Line shelves with material such as Ethafoam™ or Coroplast™ or with 3/8" – 1/2" acrylic sheeting (Plexi-glas®) for rigidity (see figure 2).



Figure 2. Ethafoam™ sheets used to line wire shelves.

- **Locking mechanism.** Some freezer models offer locks to help ensure that the door has been closed properly after use. They also help to deter staff from opening the freezer frequently or storing non-collection materials inside.
- **Audible alarms.** Some freezers come with alarms that sound when the inside temperature is too high, indicate that the door is open or there is a system malfunction. An LED temperature read out (digital display) on the outside provides visible confirmation that the unit is operating correctly.
- **Remote monitoring capability.** Freezers with remote monitoring capability dial a 24-hour emergency phone or signal a 24/7 remote monitoring station to alert off-site staff. These include auto-dialer datalogger alarms that insert a sensor into the unit to dial a telephone number if the freezer

warms above a certain temperature. Some units can be hard wired into a building monitoring system. Wireless alarm systems can also be used with building-wide monitoring systems.

- **Service contracts.** Make sure you understand the equipment and maintain service contracts or warranties. If your freezer malfunctions you want to have reliable service providers that can respond quickly and make the needed repairs.

Determining Your Collection Need

When considering the use of household “upright” freezers, obtain a reliable estimate of the overall size of your collection, the dimensions of storage boxes, and potential for growth. This means collection data will need to be gathered through a general survey of collections.

Be aware that the actual capacity of a freezer may be less than is what is stated in the specifications for that model. For example, on average a 20-cubic-foot household upright freezer provides only about 15 cubic feet of space for collection materials. This is due to limitations caused by shelving configurations, various box sizes, the placement of interior air vents that cannot be blocked, (see figure 3), and limited usability of shallow door bins.



Figure 3. Do not cover air vents, such as the slotted ones in the back of this freezer, with boxes.

Housing the Collections

All collections must be boxed, placed in binders, or otherwise housed in an outer container for freezer storage to ensure collections can be safely placed in the freezer.

Measure the outer dimensions of storage boxes, including protruding lids and/or clasps and assume the outer vapor-proof packaging will add ¼” to each dimension. Compare these dimensions with the interior dimensions and configuration of the storage unit. In some cases, rehousing portions of collections may be necessary to best use available space.

Plan how the boxes and binders can be most efficiently configured and shelved within the freezer. For example: consider a standard archival box, approximately the size of a shoebox or 12 x 5 x 6 inches that are often used to house 4 x 5 inch negatives. Shelf dimensions for a 20 cubic foot household freezer are approximately 26 inches wide by 17 to 21 inches deep. Four of these boxes can be stacked two high and two across in about one cubic foot. Due to shelving configuration, approximately 30 to 40 standard shoeboxes can be shelved in a 20 cubic foot household upright freezer. (see figure 4)



Figure 4. A freezer filled with properly packed boxes. Labels face forward for easy retrieval.

Most small collections can be adequately accommodated by using one or two household “upright” freezer units. If the number of freezer unit exceeds ten (10), then consider using a storage vault.

Vapor-proof Packaging for Freezer Storage

Proper use of freezers for storage requires vapor-proof packaging of each box. Items to be stored in freezers require protection from fluctuating and/or high relative humidity within the unit, and from condensation on the boxes when the doors are opened and/or when the boxes are removed to room temperature. The packaging, discussed in *COG 14/12*, involves the use of a double bagging system to create a vapor-proof enclosure for each collection container.

Collection Preparation and Access

Collections stored in freezers cannot be accessed at the box or item level until the vapor-proof package is removed from the unit and allowed to come to room temperature. Once at room temperature, the protective vapor-proof packaging may be removed and the individual item accessed.

Therefore, before collections go into cold storage complete all basic processing, including inventorying, identifying box contents, and creating box lists. This will allow the appropriate boxes to be pulled from the freezer, brought to room temperature, and the particular item retrieved. Post a shelf map of the boxes on the freezer to aid retrieval, reducing the need to leave the freezer door open for long periods and pulling out many boxes unnecessarily.

Maintenance and Equipment Failure

Freezers can provide many years of trouble-free service. However, they do require minimal maintenance such as semi-annual vacuuming of condenser coils, and the rare replacement of door gaskets that no longer seal well. The latter causes frost to build up and the unit to consume excess energy.

The least damaging equipment failure for collections is a power outage or total breakdown of the cold unit when the unit shuts off and gradually warms to ambient conditions. *As long as the freezer is kept closed and unplugged, and the vapor-sealed packages remain intact, there is generally low risk to the contents.* However, rare mechanical failures may cause the unit to heat up inside. In these situations, the power must be shut down and the doors opened to reduce heat or humidity. If contents feel warm or the vapor-barrier has failed remove the containers and allow them to cool and dry out.

Although some freezers may have audible alarms, they may not be heard when staff is not present or during off-hours. Therefore, it is best to have remote monitoring capability that dials a 24-hour emergency phone or signals a 24/7 remote monitoring station, as described above. Where there is 24-hour guard surveillance with periodic rounds, it may suffice to have a remote intercom system that allows the sound of the alarm buzzer to be heard in outer offices or at a guard station.

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