

SUPPLEMENTAL POLICY GUIDANCE FOR COLD STORAGE EQUIPMENT

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PURPOSE

This Office of Research policy document provides additional recommendations for use of cold storage equipment to supplement the University of California Davis Safety Services Use of Refrigerators and Freezers in Laboratories (SafetyNet #31, [Use of Refrigerators and Freezers in Laboratories | Safety Services](#)).

Proper use and preventative maintenance of critical research equipment, particularly cold storage equipment, is vital to the research mission of the University of California Davis. Loss of temperature control can damage research materials, destroy patient samples, and result in irrevocable clinical and research losses. UC Davis' large research enterprise means that it also has a high risk of potential loss due to cold storage failure. Cold storage equipment failure risks include delayed/lost research outcomes, damaged institutional reputation, loss of grant/contract funding, loss of irreplaceable research materials, principal investigator (PI)/student career setbacks, and other financial losses.

DEFINITIONS

Cold storage equipment (may be referred to as "equipment" in this document) is defined as standard (-20 degrees C) freezers, ultra-low temperature (ULT or -70/-80 degrees C) freezers, refrigerators, refrigerator/freezer combination units, or liquid nitrogen units.

COLD STORAGE EQUIPMENT PURCHASES

All cold storage equipment should be designated "commercial" or "laboratory grade." If such grade is not available, please consult your local College/School Dean's Office to discuss risk and feasibility.

Residential Refrigerators and Freezers

Residential refrigerators and freezers may be used for storing aqueous solutions. No flammable materials should be stored in these units. Absolutely no food or drinks are allowed to be stored in laboratory refrigerators containing reagents, samples, and any other research materials. All refrigerators and freezers should be labeled using appropriate UC Davis Environmental Health and Safety signage ([Store No](#)

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[Flammables/Food](#)). Conversely, if food and drinks are stored in a unit near a laboratory, the unit should be labeled as "Refrigerator for Food Only".

All cold storage equipment should be appropriate for the materials that will be stored in it. For example, if flammable or volatile laboratory chemicals are stored in cold storage equipment, it must be certified by the National Fire Protection Association and the US Occupational Safety and Health Administration to meet this safety need. Flammable material refrigerators and freezers are designed for the storage of flammable solids and liquids. There is no internal switching or wiring that can arc, spark, or generate a source of ignition. The compressor and other circuits usually are located at the top of the unit to reduce the potential for ignition of flammable vapors. These refrigerators also incorporate features such as thresholds, self-closing doors, and magnetic door gaskets. Special inner shell materials limit damage should an exothermic reaction occur within the storage compartment. We recommend labeling flammable storage units (i.e., identifying the equipment contains flammables).

Explosion Proof Cold Storage Equipment

Explosion proof cold storage equipment is designed to be operated in areas where the atmosphere outside of the unit could become explosive. This type of cold storage equipment is usually not necessary in a typical laboratory setting. Consult your local College/School Dean's Office, Facilities Management (hs-contracts@ucdavis.edu for UC Davis Health or facilities@ucdavis.edu for UC Davis), and Fire Prevention (hs-fireprevention@ucdavis.edu for UC Davis Health or fireprevention@ucdavis.edu for UC Davis) or (facilities@ucdavis.edu) if you have a scientific need for one of these units.

Questions regarding cold storage equipment purchases should be directed to UC Davis Research Safety (researchsafety@ucdavis.edu).

COLD STORAGE EQUIPMENT INSTALLATION

The local responsible department/unit should ensure that proper setup and operational procedures are followed. The department/unit must consult with Facilities Management (hs-contracts@ucdavis.edu for UC Davis Health or facilities@ucdavis.edu for UC Davis) to confirm the building has appropriate electrical capabilities and to certify suitable installation to prevent overloads.

Ultra-low temperature (ULT) freezers expel a significant amount of heat requiring the rooms in which they are installed to be well-ventilated to avoid strain on the ULT freezers' compressors. Failure to install the ULT in an appropriately ventilated room can increase energy consumption and increase the likelihood of failure. Larger HVAC system exhaust and increased air conditioning may be required to maintain the appropriate room temperature to support a ULT freezer.

Verification of a reliable power source and surge protection should be a primary concern. Best practices recommend users plug freezers into outlets that are serviced by backup generators to prevent research loss in case of power outages. If the laboratory is limited to UPS application, a nitrogen backup freezer or dry ice storage should be arranged in case of an extended outage.

If practical and feasible, it may also be prudent to:

- Separate research and samples into more than one freezer, in case of a single freezer failure.
- Duplicate research samples wherever practical and store duplicate samples in a separate freezer location. Ideally, the second location would be located on a separate power line/source.

Cold storage equipment should be kept in a secure and alarmed room or building with an appropriate monitoring system and established backup systems/strategies in the event of freezer failure. If alarming the location where cold storage equipment is housed is neither practical nor fiscally feasible, users should consider and document alternative strategies to ensure access is limited to authorized users.

Cold storage facilities must be air-conditioned (temperature controlled) and have adequate fire detection. Questions regarding cold storage equipment installation should be directed to UC Davis Research Safety (researchsafety@ucdavis.edu).

COLD STORAGE EQUIPMENT LABELING

Once cold storage equipment has been purchased, a responsible individual (i.e., lab manager, principal investigator) should be identified and communicated to College/School Dean's Office. The designated individual is responsible for all cold storage equipment contents, including those items that may belong to another individual or area sharing/using the equipment. If the cold storage equipment holds samples for a research project, the principal investigator is ultimately responsible for ensuring that their items are stored appropriately.

Each laboratory containing cold storage equipment that is subject to the UC Davis Laboratory Inspection Program will be visited regularly by UC Davis Environmental Health and Safety.

Cold storage equipment should be labeled with the information outlined in Table 1 as/if applicable. See [Cold Storage Emergency Contact Information Fillable.pdf | Powered by Box](#) for a fillable form. c The cold storage equipment PI/responsible individual is accountable for ensuring that all individuals on the contact list know their role and their responsibility to promptly respond once contacted. The cold storage equipment Emergency Contact Information should be reviewed and updated at least annually and when there are material category/inventory changes.

All cold storage equipment should include a notice on the unit prohibiting outlet or power disconnection without written permission.

Store only compatible chemicals according to UC Davis SafetyNet #42 General Guidelines for Storage and Management of Laboratory Chemicals ([General Guidelines for Storage and Management of Laboratory Chemicals | Safety Services](#)).

COLD STORAGE EQUIPMENT CONTENT INVENTORY

The PI/responsible individual should develop and maintain a cold storage equipment content inventory. The inventory should identify the PI/responsible individual (name, email, and telephone number) as well as the date of storage and contents by material category, such as:

- Patient samples
- Human tissues and body fluids
- Animal tissues and body fluids
- Bacteria
- Viruses

- Recombinant DNA
- Hazardous chemicals
- The estimated value of contents in the event of loss

This information can be crucial in determining the replacement value and any applicable compensation should a system failure or loss occur. The extent of reimbursement will be evaluated on a case-by-case basis. The content inventory should be included with any property loss claim report.

The PI/responsible individual should retain an easily accessible hard copy or electronic version of the content inventory. An electronic copy of the inventory could also be attached to the cold storage equipment's BioRAFT page or submitted to the College/School Dean's Office.

Cold storage equipment inventories should be reviewed and updated at least annually and when there are material category/inventory changes. Both the hard and electronic copies of the inventory should be updated/maintained according to this schedule.

If patient information is included in the cold storage equipment inventory, it should be de-identified or encoded in a manner where no personal information is noted, and any other compliance measures are met.

COLD STORAGE EQUIPMENT PREVENTATIVE MAINTENANCE

The following preventative maintenance activities are considered best practices for cold storage equipment operations.

- Doors should be defrosted monthly.
- Gaskets and seals should be checked for ice buildup monthly.
- At a minimum, preventative maintenance should be completed annually and include annual cleanouts; testing for proper mechanical operation and filter cleanings; periodic testing of alarms (system check as well as battery check with replacements as/if appropriate); and training procedures for new lab and department/unit employees. Professional maintenance by an appropriate service technician should be conducted a minimum of once per year.
- Additional preventative maintenance could include annually defrosting and removing dust from freezer intake or coils.

Table 1: Recommended Cold Storage Equipment Exterior Label

COLD STORAGE EQUIPMENT INFORMATION			
Metasys ID or Alarm #		Freezer/Refrigerator Name/No.	
Building/Room		Freezer Set Point Temperature	
High Temperature Alarm Set Point		Low Temperature Alarm Set Point	
Principal Investigator's Name ²			
DAY/NIGHT CONTACT LIST			
Name		Phone Number	
Name		Phone Number	
Name		Phone Number	
MATERIAL IN COLD STORAGE EQUIPMENT			
BUA#(S)		RUA#(S)	
Inventory Manager		Phone Number	
Annual Inventory Date		Defrost Date	
CHECK APPLICABLE HAZARDS			

	<input type="checkbox"/>	Acute Toxicity		<input type="checkbox"/>	Biohazard BSL-2		<input type="checkbox"/>	Corrosive
	<input type="checkbox"/>	Environmental Hazard		<input type="checkbox"/>	Explosive		<input type="checkbox"/>	Flammable
	<input type="checkbox"/>	Harmful		<input type="checkbox"/>	Health Hazard		<input type="checkbox"/>	Oxidizer
							<input type="checkbox"/>	Radioactive Material

² If cold storage equipment contains materials belonging to multiple researchers/individuals, we recommend including the contact information for all investigators.

COLD STORAGE EQUIPMENT USE

To prevent overcrowding in -20 and -80 degrees C freezers, UC Davis recommends storage of chemicals at the temperature the supplier/company recommends and nothing colder.

The use of cold storage equipment should follow good lab practices, the Code of Federal Regulations, or any other use/maintenance guidelines applicable to the laboratory or business unit. It is critical that responsible individuals follow any other compliance conditions required by the sponsor, department/unit or college/school, or government funding source.

The PI/responsible/individual/department or unit should have a maintenance contract for all cold storage equipment containing items of value. If the PI/responsible/individual/department or unit has equipment that is covered by UC Davis insurance programs, the unit must have a maintenance agreement. Absent a maintenance agreement or contract, a loss of samples, reagents, or other resources may not be covered for reimbursement in the event of a systems failure.

Each department/unit should maintain a location list of all freezers in the responsible unit including the relevant equipment information (location, model number, vendor, date purchased, activation date, responsible individual [Name, Email, and Telephone Number], and sponsor compliance conditions, if applicable). Departments/units could collect the relevant cold storage equipment labels and inventories to serve as the recommended list. Departments/units should consider conducting a comprehensive cold storage equipment audit annually to ensure accurate records are maintained.

Safe handling and operating procedures include, but are not limited to, the following.

- Label all materials with the contents, owner, date of acquisition, and any associated hazards. Readily identifiable coding to a reference document (laboratory notebook, posted inventory, etc.) may be used.
- Follow all chemical compatibility storage guidelines.
- Properly cap and seal all materials. Avoid the use of foil or parafilm as a primary method for sealing the container.
- Ensure shelves are compatible with the materials stored and secondary containment should be used when storing liquids.
- Avoid using frost-free refrigerators and freezers.

If investigators have material stored in non-University-owned cold storage equipment, they are strongly encouraged to retain duplicates or aliquots in UC Davis facilities.

TEMPERATURE MONITORING

Integrated freezer alarm systems are encouraged. If implemented, the PI/responsible individual should consider the following best practices.

- Install a web-based alarm system to trigger notification in the event of a failure.

- Set appropriate alarm range triggers to allow ample time to react before a loss. Local alarms or standard thermometers alone may not be sufficient.
- Alarms linked to text and/or email alerts may be mandatory for some research.
- Temperature change alarms should ensure that a designated employee is notified.

Cold storage equipment should be placed in facilities with appropriate equipment and environmental temperature alarm systems whenever possible. Ideally, the system(s) should provide room monitoring for temperature, humidity, etc. and provide real-time cloud-based monitoring that can send alerts via text message, voice calls, and/or email. The system should also allow real-time viewing of temperature and door status of all storage units via mobile app.

Absent the use of an automated equipment alarm system, the PI/responsible individual should coordinate with UC Davis Environmental Health and Safety to develop and implement suitable temperature monitoring strategies paying careful attention to compliance with requirements defined by law, rule, policy, or regulation/regulatory agency (e.g., US Drug Enforcement Agency, National Institutes of Health 26101-16 Management of Ultra-Low Temperature and Lab Grade Freezers and Refrigerators to Promote Energy Efficiency in Cold Storage for Biomedical Research [<https://policymanual.nih.gov/26101-16>] , Centers for Disease Control and Prevention, and/or Food and Drug Administration).

EMERGENCY PROCEDURES

Principal Investigators/responsible individuals should prepare an emergency plan for power loss.

- Ensure that all necessary resources will be available.
- Planning should account for all potential interruptions such as public utilities, adverse weather, etc.

If there are power outlets connected to an emergency generator where the cold storage equipment is housed, the equipment must be plugged into these outlets to diminish the chance power outages will damage cold storage contents. If the PI/responsible individual has questions regarding the appropriate outlets, contact Facilities Management (hs-contracts@ucdavis.edu for UC Davis Health or facilities@ucdavis.edu for UC Davis).

Colleges/schools should consider developing a plan to make cold storage equipment available for defrosting of equipment and for emergency use. The college/school and/or department/unit should provide equipment available for use in an emergency or when defrosting a freezer as well as appropriate points of contact during normal business hours and outside of normal business hours.

If a freezer loss should occur, the PI/responsible individual should report any loss of research or resources to Risk Management Services (hs-riskmanagement@ou.ad3.ucdavis.edu for UC Davis Health and rms@ucdavis.edu for UC Davis) within 24 to 48 hours or as soon as possible for a determination of compensation eligibility by Risk Management Services. A fully documented account of the incident should be submitted within 30 days following UC Davis policy for reporting property loss/damage (<https://safetyservices.ucdavis.edu/units/risk-management-services/forms>). Examples of documentation that may be requested as an appendix to the loss report could include:

- Copies of purchase records, invoices, receipts, etc. (to evidence proof of UC Davis ownership of the cold storage equipment).
- Relevant police reports, photos of lost or damaged resources, damaged lab equipment, etc.
- The cold storage equipment information and contents inventory.
- Itemized quotes for the replacement value of lost materials or contents.
- Any other documentation relevant to the loss incident.

If a failure incident should occur, and the cold storage equipment is unable to hold the set temperature, the laboratory/department/unit is responsible for subsequent actions, including thaw and leakage clean-up and decontamination in consultation with Environmental Health and Safety.

DISPOSAL AND TRANSFER OF EQUIPMENT

Principal investigators/responsible individuals are ultimately responsible for their stored materials. Before cold storage equipment can be disposed of or transferred to another department/facility, the stored materials must be properly transferred or disposed of by the individual responsible for the cold storage equipment. To properly dispose of biological materials, materials must be autoclaved or sent offsite as medical waste. If the pharmaceutical is RCRA (i.e., hazardous waste), the researchers can just place a waste pickup request via WASTE. If it is not RCRA, the PI/responsible individual can dispose of it via Stericycle (or whatever third-party vendor is used by their department) or follow what the SDS states for disposal of that pharmaceutical.

All cold storage equipment to be removed from a room or disposal or transfer to another space must be decontaminated with a 10% household bleach mixture, 70% ethanol, or other EPA registered disinfectant. After decontamination, Aggie Surplus must be contacted for certification and to engage a disposal vendor.

To dispose of decontaminated equipment, the refrigerant must also be removed. Contact Aggie Surplus who will facilitate removal of the refrigerant and disposal of the equipment with the UC Davis contracted vendor.

In the event a principal investigator or other responsible individual leaves the institution, a laboratory closes, or the cold storage equipment is no longer needed, and the equipment has not been properly disposed of or transferred, the responsibility for the disposition of the equipment and its contents rests with the department chair/unit head. The department chair/unit head will determine the appropriate disposition of the equipment. The department/unit should work with Environmental Health and Safety (labcloseout@ucdavis.edu) on possibly affected use authorizations (e.g., BUA, Chemical inventories, Controlled Substance inventories, RUA).