

6.17 Bio Bank Requirements (-80°C ULT freezer farms)

6.17.1 General Requirements

- Voltage: 120 or 240V
- Frequency: 60Hz
- ULT efficiency: 16 to 22 kilowatt hours (kWh) per day
- Noise level: <60 dB
- Approvals: CSA or ULC
- Refrigerants: Only Non-CFCs types are acceptable (e.g. R134A, 410A, 404A, 417A, etc.)

6.17.2 Energy Efficiency

Each year of a ULT (Ultra Low temperature) freezer's age translates in to approximately 3% increase in energy consumption. So, it is highly recommended to test every freezer to verify the need for replacement.

Smaller ULT freezers have much higher energy consumption per cubic foot (intensity) than larger freezers; they have a larger surface-volume ratio and smaller compressor motors are less electrically efficient and smaller compressors are less mechanically efficient than larger ones.

Based on the break point in energy intensity it is better to purchase ULT freezers 20 ft³ or larger. To maximize efficient use of large freezers, it is important for a university or research department to acknowledge and support sharing of resources.

ULT freezers must comply with the Energy Start Program latest version.

6.17.3 HVAC requirements and design

- Room to be maintained at $\leq 25^{\circ}\text{C}$
- Room to be ventilated as a storage room and as indicated in ASHRAE 62.1 latest edition.
- Consider heat loads from freezers, lights, transformer (s), and people when calculating heat gains and when sizing cooling equipment.
- Tight humidity control isn't required but should be maintained at normal levels as the rest of the building.
- Cooling system to be provided with metered DCW back-up. Provide lockable type shut-off valves for systems switch over. Tag valves accordingly.
- Controls to match building and vendor type. Provide alarms to the BMS based on the cooling equipment used. Cooling equipment to be controlled by a dedicated t'stat in the room.
- Mechanical cooling systems supporting bio banks/freezer farms must meet the applicable mandatory and prescriptive requirements of ASHRAE 90.1-2013.

- Make provisions for heat recovery when possible. Heat recovered from refrigeration units (e.g. ground sources heat pumps, recovery units, etc.) could be used for DHW heating, HW to fan coils or any other terminal heating equipment.
- Use of CO₂ cylinders for back-up cooling is generally not allowed and may only be used with express consent from Campus Engineering and EH&S. Specific ventilation requirements are mandatory when using such systems.

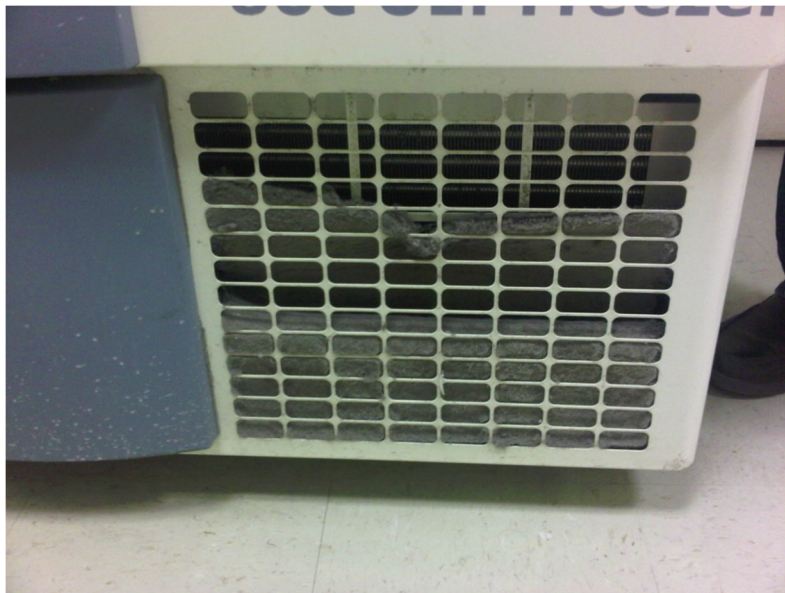
6.17.4 Electrical requirements and design

- Provide emergency/back-up power to rooms (Freezer farms) containing -80°C freezers. UPS aren't an acceptable source, only Building Emergency Generator supported power is acceptable in these cases.
- Provide a dedicated transformer for this room. Heat of rejection to be picked up by the HVAC if transformer is placed within the room boundaries.
- Provide enough emergency and exit lighting within the room as per CEC latest version.

6.17.5 Freezer Maintenance

Regular maintenance improves the operation of ULT freezers by reducing its energy consumption and assisting the unit to achieve its set point temperature on a consistent basis. An unmaintained freezer can use 12% to 25% more energy than a maintained freezer.

Dust or grime buildup on the filter (Figure below) blocks the normal air flow through the condenser, which reduces the ability of the ULT freezer to effectively dissipate heat. Any air flow that bypasses the clogged filter will result in air carrying dirt to deposit on the condenser. Dirt on the condenser increases energy used by the compressor and transferred heat into the environment.



Maintain and inspect door seals. Frost accumulation inside the freezer or around the freezer door creates gaps in seals, which allow cold air to leak out and warm air to enter the freezer.

Frost can also further damage the seals on the freezer. Frost on the doors again increases energy used by the compressor and transferred heat into the environment.

6.17.6 Alarms and monitoring

Freezer alarms will be managed by the end-user. Individual freezer alarms will not be sent neither managed by Campus Security, BMS (Building Management system), FM (Facility Maintenance) or UCIT. The only monitoring system approved by the UC until further notice is the Thermo Scientific Smart-Vue Wireless Monitoring Solution (see picture below)



6.17.7 Security

Provide card access to the room. Card access to match building type and to be supplied and installed by UC preferred vendor(s).

6.17.8 Energy Monitoring

Under Development.

6.17.9 Provisions for Inventory and Insurance

Before you bring an additional ULT freezer into your building, you will notify the zone manager about the additional heat load you will introduce.

6.17.10 List of Approved ManufacturersULT freezer

- Thermo Scientific (Revco and Forma)
- Eppendorf (Innova)
- NuAire
- Fisher Scientific (Revo and Fisher)

ULT freezer monitoring

- Thermo Scientific Smart-View Wireless Monitoring Solution

Revision History

Revision Date	Version	Description
July 2016	1.1	Baseline version
August 10, 2023	1.0	Added Revision History table to end of document and reset to Version 1.0.