1.0 Purpose
The purpose of this SOP is to describe how research grade cold storage facilities should be managed to ensure safe and efficient storage of samples.

2.0 Scope
The scope of this SOP includes freezers operating at -150C, -80C, -70C, and -20C. It targets all such freezers storing materials designated for research purposes, particularly medical and life sciences research.

3.0 Introduction
Cold storage is a constantly-growing need in research, particularly in life sciences and medicine. Materials crucial for drug testing, clinical trials and various studies are stored with the expectation that they are secure. Valuable biological material contained in one ultra-low temperature (ULT) freezer can easily exceed £100,000 – or they may be simply irreplaceable. This SOP aims to ensure that all samples have adequate and efficient facilities for their safe and secure storage.

4.0 Sample Management
4.1 Samples should be stored in a racked system or in such a way as to enable quick and easy removal for defrosting or in an emergency.

4.2 All samples should be labelled using barcodes or Quick Response codes.

4.3 All labels should clearly identify the owner(s), associated laboratory, contents, date of storage, expiry date or when the sample should be disposed of, and quantity where applicable in case of defrosting or emergency removal.

5.0 Risk Assessment
5.1 All freezers operating in centralised freezer rooms should have, at a minimum, a secondary temperature probe with temperatures externally visible. Temperatures should be centrally monitored.

5.2 All freezers operating in centralised freezer rooms should have temperatures checked and logged once per day.

5.3 All freezers running at -40C or colder should be assessed for alarm necessity. Should an alarm system be decided against, an explanation must be recorded and logged. Alarms should be centrally-monitored with clear protocols for call-out in case of emergency.
5.4 All concerns surrounding freezer running temperatures should be directed to a designated member of the laboratory or facilities staff who has access to logged freezer temperatures.

5.5 In an emergency situation, freezer doors should not be opened unless absolutely necessary.

5.6 Each freezer should have the following easily viewable: alarm/external temperature monitor, a current list of owners of the freezer contents, any special instructions for handling of contents in the absence of the owner, current first, second, and third points of contact in case of emergency.

5.7 Emergency protocols should be in place not only for single freezers, but as part of building, campus, or institutional emergency planning.

5.8 Secondary temperature monitors or alarms should be considered for all cold storage units in research spaces, although this is at the owner’s discretion. Out-of-hours responses, centralisation of data, and response hierarchy should also be considered.

6.0 Freezer Procurement, Maintenance, and Disposal

6.1 Whole-life costing should be incorporated into the purchase of each ULT freezer, as well as racking requirements.

6.2 There should be no domestic units in research spaces.

6.3 Mixed fridge-freezers units should not be purchased unless necessary, as they reduce running efficiency by 25%. Instead, separate units should be purchased. Fridges should never be stacked on top of freezers.

6.4 Purchasers should consider long-term storage requirements and purchase larger ULT freezer and -20C freezer models, unless absolutely certain their requirements will not increase.

6.5 All ULT freezers should have their filters cleaned no less than every 3-6 months by a designated member of staff.

6.6 Staff should ensure running temperatures of all fridges and freezers are standardised: ULT freezers should run between -60C and -80C; depending on requirements, normal freezers should run at -20C (not -25C or colder); and fridges should be set for 4C.

6.7 All freezers should be set on an 18-month defrost cycle and alternative storage space should be available for short periods to enable this. Should an alternative storage space be unavailable, freezers should be defrosted manually by scraping the interior (particularly in areas which can compromise seals).

6.8 There should be no boxes or materials blocking airflow at the back of fridges/freezers.

6.8 All ULT and -150C freezers should be serviced annually; responsibility for organising servicing should be given to a designated member of laboratory staff. Maintenance contracts should be paid for via inclusion in grant applications for research concerning stored materials.
6.9 Research staff should have clear lines of contact with the Estates Services Facilities Management team (in the case of an FM-managed building) or their Building Manager, in case of emergencies.

7.0 Freezer Facilities

7.1 ULT freezers should not be located in the laboratory if possible.

7.2 Freezer filters, fans, vents, or heat exchange coils should be kept clear to maintain ventilation.

7.3 All facilities containing more than five ULT freezers of any sort should have backup power available in case of an emergency. The use of liquid nitrogen or carbon dioxide gas should be considered for ULT/-150C freezers containing critical samples, to maintain temperature within these units.

7.4 Freezer rooms storing materials at -60C or colder should maintain an ambient temperature of 15C to 22C, with an optimal temperature being 15C.

7.5 Mechanical cooling and air conditioning should only be provided where a clear business case exists.

7.6 Heat load should be directly considered when moving or introducing a new freezer. ULT freezers produce significant amounts of heat, which can have negative effects on the efficiency of other equipment, including freezers.

7.7 Working and efficient units which are designated for replacement should be offered for sharing internally prior to sending for disposal, unless there are mechanical issues that have rendered the unit a risk to maintain.

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