



CS CoP006– Cryogenic material and equipment

006.1 Building design

University Policy is that all bulk cryogenic stores must be of a design that incorporates a three-stage ventilation system;

- Stage 1 – continuous background ventilation 10 ac/hr
- Stage 2 – occupied mode 25 ac/hr, ramp up initiated by movement sensor (PIR)
- Stage 3 – emergency mode 40 ac/hr, further ramp up instigated by an internal oxygen depletion sensor.

There must be to the external of the store a continuous digital display of the % oxygen content of the air within store room and both an audible and visual alarm triggered by the oxygen sensor.

Full details of the technical requirements for the extract ventilation, alarm and other systems to be fitted to bulk cryogenics stores can be had from the Estates Department's Engineering Operations Manager, or see:

https://www.ed.ac.uk/files/atoms/files/estates_design_guideline_no.3_mechanical_engineering_services_2020.pdf

006.2 Cryogenic materials

Liquid oxygen and liquid air are dangerous because substances not normally regarded as easily combustible become highly flammable in their presence. Containers of either must be clearly labelled and not used for any other purpose. Liquid nitrogen or solid carbon dioxide should be used as coolants.

Liquid Nitrogen (LN2) is the medium normally employed for the cooling of freezers and specimen stores in this University.

006.3 Properties

- LN2 is extremely cold (77.3K) which equates to (-196°C) at atmospheric pressure. This can cause severe frostbite.
- On vapourising LN2 expands by a factor of 700; therefore one litre of LN2 becomes 700 litres of nitrogen gas.
- Nitrogen gas is colourless and odourless, thus there are no sensory warnings of its presence.
- Nitrogen gas displaces oxygen and can cause suffocation and death very rapidly without warning.
- Nitrogen is heavier than air so will collect in heavier concentration at low level, thus if a human collapses, due to oxygen depletion of the air



within a room, they are likely to fall into even heavier concentrations of nitrogen gas.

006.4 Precautions when working with LN2

- Always use a 'buddy' system when entering a LN2 storage facility, even if the store is fitted with three-stage ventilation.
- Never enter an LN2 storage facility alone out of hours.
- Should a colleague collapse within an LN2 storage facility call the Fire & Rescue Service immediately via the University's emergency number (2222). Do not attempt to rescue the casualty until the oxygen level has returned to at least 19.5% (normal oxygen content of air 21%)
- Do not allow LN2 to be trapped in clothing near the skin. Always wear a fastened laboratory coat when handling.
- Cryogenic gloves must be worn; these should be loose fitting in order that they can be quickly and easily discarded should liquid pour inside them.
- A full Face Visor must be worn when decanting LN2.
- Use only containers designed and approved for LN2 use, never use domestic thermos flasks.
- Always wear suitable closed footwear when handling LN2, sandals or open toed shoes are not acceptable.
- Great care must be taken to ensure that ingress of air into vessels containing liquid nitrogen does not lead to condensation of oxygen.
- Steps must be taken to ensure that evaporation of liquid nitrogen or solid carbon dioxide does not occur in a poorly ventilated room as this can lower the oxygen concentration to such an extent that a person entering the room can lose consciousness and die.

006.5 Local procedures and training

Local procedures for managing LN2 must be put in place and all staff and students made aware of these.

Training in the safe use, storage and disposal of LN2 must also be provided to all users.