University of Edinburgh

Engineering Services

Guidelines

Section 5: Special Installations

The University of Edinburgh
Estates and Buildings
Works Division

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5.0 SPECIAL INSTALLATIONS

5.1 Fume Cupboards

Listed below are the specific University requirements for new fume cupboard installations:-

- All fume cupboards shall fully comply with BS 7258 : Parts 1-4 1994
- All Fume Cupboard sashes shall be fitted with mechanical sash locks set at a sash height of 500mm.
- Each Fume Cupboard shall have a double skin construction with external epoxy powder steel, coloured to match the underbench units.
- Each Fume Cupboard sash shall be made with 6mm toughened glass. The sash shall be suspended on stainless steel cables running over ball-raced nylon pulleys with counterbalance weights all arranged on a fail-safe principle in the event of cable failure.
- All fume cupboards shall be complete with 1 no. cold water hand operated spray.
- Ductwork shall be manufactured and installed to the Heating and Ventilating Contractors' Association (HVCA) 'Specification for Plastics Ductwork - Unplasticised Polyvinyl Chloride (uPVC) and Polypropylene (PP), DW / 151.
- All internal PVC ducting shall be reinforced with Scott Bader ' Crytic Fireguard 75 PA' flame retardant coating finish (white)
- Design criteria i.e. transport/efflux velocities shall be in accordance with BS 7258.
- Fume Cupboards shall be supplied c/w 1 metre flexible tails to rear for plumbing services e.g. gases, water etc.
- The types of chemicals/solvents that are to be used within the cupboard shall determine the materials used for the fume cupboard worktop and inner linings/baffles. This decision should be taken after consultation with the University and the users.
- Where the intention is to designate the fume for the use of radio-active materials the worktop/linings shall be formed by a one-piece stainless steel section.
- Each fume cupboard shall be complete with a stainless steel cill.
- Each fume cupboard shall be complete with a glazed light cowl and light tube with internal wiring to a switch and junction box.
- Each fume cupboard shall be fitted with an electronic continuous visual/audible airflow/sash alarm panel.
- Fume cupboard extract fans shall have casings and impellers manufactured from polypropylene. Manufacturer to be approved by the University.
- Extract fan motors to be IP55 rated with protective covers.
- Extract fans shall be sized to achieve the following face velocities at a sash-height of 500mm:-
  0.55m/s General Purpose Fume Cupboards:
  0.75m/s Radio-active Fume Cupboards:
- Consideration shall be given to the use of energy saving methods in both single and multiple fume cupboard installations. These may take the form of inverter controlled extract fans or the use of 'Phoenix' Controls V.A.V. systems or equal and approved.
- A number of fume cupboards are likely to operate 24 hours/day and may require fire protection, depending upon the types of chemicals used. The University should be consulted on whether systems such as 'Fire-Trace' are required in these cases.

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5.2 Lecture Theatres

Heating and ventilation designs for Lecture Theatres shall comply with the following parameters:

- Heating/ventilation system shall be designed to achieve an occupancy temperature of 21 deg. C in the heating season and 24 deg.C during all other times.
- 'Cooling' will normally be achieved by mechanical ventilation unless there are very high internal and solar heat gains.
- Fresh air supply rates shall be based on CIBSE recommendations i.e. 8 litres per person per second though if a displacement system is used then the rate may be higher.
- Air handling unit equipment supplying/extracting air from Lecture Theatres shall incorporate some method of heat recovery. The preferred system of heat recovery is by the use of a plate recuperator c/w face and bypass section or, if suitable, recirculation. Other methods such as a heat pipe should also be considered. Run around coils should only be used as a last option.
- Ventilation plant serving Lecture Theatres shall be designed to achieve noise rating no higher than NR30.
- Occupancy sensors (microwave type) shall be installed within Lecture Theatres to enable the controls system to 'set-back' to a lower temperature set-point of 16 deg.C when no movement is detected (see Controls Section).
- Consideration should be given to the control of supply/extract fans either by the use of inverter or two speed controls. CO2 sensors normally fitted within the extract ductwork would dictate the fan speed. The system should maintain CO2 levels below 0.1% (1000 ppm).

5.3 Microbiological Safety Cabinet Ventilation

All Microbiological Safety Cabinets (MSC) shall fully comply with BS 5726 Parts 1- 4: 1992.
All projects requiring Cat 2 or Cat 3 containment shall be designed in full compliance with “The management, design and operation of microbiological containment laboratories” – advisory Committee on Dangerous Pathogens published by HSE.
Designers should consider carefully the intended method of ventilation where MSC’s and/or fume cupboards are to be installed. Agreement with the Engineering Operations Manager should be obtained before any design work is completed.

5.4 Liquid Nitrogen Installations

Introduction

The use of liquid nitrogen (LN2) occurs in research activity throughout the University. The number of bulk storage installations should be kept to a minimum and should be installed and maintained to a consistent standard following the guidance below.
Generally, university LN2 installations should comply with the latest issue of BCGA Code of Practice CP 21 (British Compressed Gases Association).

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Location

The internal part of the LN2 installation (the LN2 Room) comprises the delivery pipe and valves, cryogenic storage and flask filling facility. An external wall is generally required to permit the high ventilation rates and basements should be avoided. Access must be restricted to authorised personnel only.
The length of the delivery pipe is critical. The location of the internal facility and the bulk storage should be such as to minimise the total length of the delivery pipe. This should be kept below 15m or LN2 waste will be excessive.

Bulk Storage

Location should comply with CP 21 Appendix 2. A vacuum insulated bulk storage tank should be installed within a purpose built compound; this part of the installation is generally leased from the cryogenic gases supplier who will take responsibility for the design, supply and maintenance.

Delivery pipe

The delivery pipe shall be manufactured from high grade stainless steel and be of the super insulated vacuum line type. All isolation and point of LN2 supply valves shall be suitable for cryogenic service. Supply and installation shall be by specialist contractor.
The delivery pipe shall incorporate an electro-pneumatically operated emergency shut off valve adjacent to the bulk storage tank

LN2 Room Layout

An Oxygen Depletion Monitor shall be provided with sensors mounted 1200 mm above finished floor level. The control unit should incorporate an Oxygen % display and be located outside the LN2 Room.
All electrical circuits should be within galvanised conduit. Socket outlets shall be IP65 and 1200 above finished floor level.
A PIR presence detector, emergency “panic” buttons and audio/visual alarm shall be installed.

Ventilation

Very high levels of ventilation are required to cope with spills of LN2. Experience has shown that ductwork should be avoided and multiple axial plate fans fitted at low level and directly on an external wall provide a cost effective solution. High level supply air grilles should be provided. Where cross flow ventilation is not possible a false ceiling can be used as a supply plenum.

Three levels of ventilation are used;
1.0 Continuous background at 10 ac/hr
2.0 Occupancy medium at 25 ac/hr
3.0 Oxygen depletion high at 40 ac/hr

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Controls

A purpose built control panel should be provided outside the LN2 Room adjacent to the access door. This should contain all the control equipment associated with the LN2 supply, alarms and ventilation. A duplicate panic button shall be fitted to the control panel.

The Method of Operation shall be as follows;

1.0 During periods of no occupancy (and assuming > 20% oxygen) the fans shall provide continuous background ventilation at 10 ac/hr.
2.0 Personnel entering the LN2 Room shall be automatically detected (PIR) and the ventilation shall be increased to 25 ac/hr.
3.0 If the oxygen depletion monitor detects levels of <20% oxygen the ventilation shall be increase to high 40 ac/hr.
4.0 If the oxygen depletion monitor detects levels of <19% oxygen or one of the panic buttons are activated, the audio/visual alarm shall sound, the ventilation will increase to high 40 ac/hr and the LN2 emergency shut-off valve shall close. The alarm and shut-off valve shall be manual reset.

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