CS CoP003 - Laboratory Design and Layout

When new build or refurbished laboratories are being planned the following criteria and advice should be noted. It is essential that the designers/architects consult at an early stage with the users as to specific requirements and it is recommended that a member of the University's corporate Health and Safety Department is invited to attend early project and design meetings along with users representatives.

This CoP applies solely to chemical/general laboratories, if biological work is being undertaken cognisance must also be taken of the information at: http://www.ed.ac.uk/schools-departments/health-safety/biosafety/policy/guidance-rules/lab-management

If radiological work is being undertaken cognisance must also be taken of the information at: http://www.ed.ac.uk/schools-departments/health-safety/radiation-protection/policy-guidance/codes-of-practice

003.1 Floor coverings

The floor should be covered with an impervious chemical and slip resistant material in continuous sheet if possible. The covering should be coved to the walls to a height of about 15 cm contiguous with the floor surface. All edges at the walls should be sealed or welded to prevent seepage of spilled materials.

Joints between sheets are not recommended, but may be permitted if the joints are welded and inspected to ensure the absence of a seepage path for contamination.

Any non slip sealant material used to facilitate cleaning may be applied provided that spilled materials can be easily removed during the decontamination procedure. Generally, epoxy resin coatings are easily decontaminated.

As an alternative to a sheet material covering (such as PVC), an epoxy resin coating may provide an acceptable finish on smooth concrete.

003.2 Walls and Ceilings

Walls should generally be smooth and painted with a hard gloss or high quality waterproof vinyl emulsion to facilitate cleaning. Both solid and suspended ceilings are generally acceptable in chemical/general laboratory areas, with the exception of when work with radioactive substances is being undertaken when suspended ceilings may potentially cause problems due to penetration of contamination. All service penetrations in walls and ceilings should be sealed.

003.3 Fume cupboards

All fume cupboards must comply with BS EN 14175 Parts 1 - 6 2003 – 2006. In particular the recommendations in 4.1 – 4.5 for installation of fume cupboards in (DD CEN/TS 14175-5:2006) must be adhered to. In addition to this fume cupboards must not be sited directly opposite the open end of a work bay formed by peninsular benching.

A recent development in design is the 'dynamic low flow' fume cupboard, which design of internal baffles allows for full containment at a much reduced face velocity (0.3m/s versus the normal 0.55m/s) thus this design of cupboard allows for much reduced make-up air and reduced extract fan sizing resulting in lower running costs and a lower carbon footprint. Consequently this design of fume cupboard is becoming the norm for general purpose fume cupboards fitted in this University.

Face velocities of 0.55m/s are required for conventional design fume cupboards and 0.3m/s for dynamic low-flow design fume cupboards, both at a sash-height of 500mm, extract fans should sized accordingly.

Users must be consulted as to the type(s) of hazardous substances that are to be worked with as this will have a bearing on the materials to be used for the internal construction and whether a particular cupboard may need to have incorporated a water wash down or scrubber system.

Further information on fume cupboards can be found in the Code of Practice CS CoP004 Fume cupboards

Further technical specifications can be obtained on the University's Estates Department website at https://www.ed.ac.uk/estates/about-us/design-guidelines/engineering-design

003.4 Laboratory furniture

When fitting out a laboratory it is important that the user's views and requirements are given the highest priority, however cognisance must also be given to the recommendations of BS EN 14056:2003 'Laboratory furniture. Recommendations for design and installation'.

In particular;

- Wherever possible under bench cupboards and drawer units should be free standing and moveable in order to aid cleaning, this especially at times of spill of hazardous substances.
- Working surfaces should be smooth, hard and non-absorbent and have necessary heat and chemical resistant properties.
- Bench tops should be coved (upstand) at the rear against walls and gaps should be sealed with a silicone, or other suitable, type material

When designing new laboratories consideration should be given to ensuring that write-up areas are separate from the main working area of the laboratory and that they are, where practicable, sited between the working area and the exit/entrance. The former to reduce the risk of contamination of written materials and office equipment the latter to reduce the risk of contamination of personal clothing and to reduce the risk of entrapment in the case of fire, explosion or major spill of volatile chemicals

003.5 Washbasins and emergency showers/eye wash stations

There must be provided sufficient dedicated hand washbasins, in addition to the required number of workplace sinks, dependant on the size and occupation numbers of the laboratory.

If a risk assessments deems it necessary, there should be supplied at appropriate hand basins a plumbed-in eyewash unit. Cognisance must be taken of BS EN 15154-2:2006 ‘Emergency safety showers. Plumbed-in eye wash units’ for design, installation, maintenance and training in use.

There are virtually no scenarios within a higher education general laboratory function that would require the installation of a whole body shower, however in the rare situation of a risk assessment highlighting the necessity for such a shower, cognisance should be taken of the detail in BS EN 15154-1:2006 ‘Emergency safety showers. Plumbed-in body showers for laboratories’ for design, installation, maintenance and training in use.

As detailed in BS EN15154-1 section NA.4.1, plumbed in emergency showers ‘should be activated weekly to verify proper operation and ensure that the stored water does not stagnate.’ Also, NA.6. all ‘emergency shower, eye bath and eye/facewash equipment should be serviced and cleaned at least once every 6 months.’ Records must also be held for at least 5 years. As per the University Legionella Policy, it is the responsibility of the building occupiers to ensure these test and checks are undertaken.

003.6 Pressurised gas supplies

University buildings must be designed and fitted out in such a manner that all pressurised gas cylinders supplying the building can be connected to a manifold sited external to the building and the gas under pressure piped into the building and individual laboratories.

In such cases the supply pipes should be of stainless steel construction marked with identification of the gas type and direction of flow. There should be a gas shut of valve, lever or solenoid, sited in a position near to the laboratory exit so that this can be safely operated at times of emergency.

This design requirement is particularly important in the case of flammable or toxic gases, but all gas cylinders, regardless of their gas content, are potentially dangerous when exposed to fire and may explode, consequently the Fire and Rescue Service may no longer enter buildings that contain

pressurised gas cylinders in a fire situation because of the high risk of explosion and danger to their personnel. In such a case the fire is then only fought from the outside of the building and there is therefore the potential for greater loss of research work as well as well as building fabric where gas cylinders are involved in areas of fire.

Further information can be found in the Code of Practice CS CoP005 Pressurised gas

003.7 Storage facilities for pressurised gas cylinders

There must be constructed for the storage of full and empty gas cylinders a well ventilated store, preferably in the open air. There must be within this store sufficient space and facilities to separate full and empty cylinders. There must also be sufficient space and facilities to store cylinders of oxidising gases separate from cylinders of flammable gases. Toxic and/or corrosive gases must always be stored separately, as should LPG. Separation distances can be relaxed in some instances by the construction of separating fire walls. For more information see; BCGA Guidance Note GN2 Rev 3: 2005

The entrance to the store must have affixed to it proper and appropriate mandatory prohibitory signage in compliance with the Health and Safety (Safety Signs and Signals) Regulations 1996 (e.g. No Naked Flames) and any appropriate hazard warning signage in compliance with both the COSHH and DSEAR Regulations see; BCGA Guidance Note GN2 Rev 3: 2005

In the unlikely event that it is not reasonably practicable to store cylinders external to a building they must be stored in a part of the building specifically designed for this purpose, constructed of materials that will give appropriate fire and explosion integrity, appropriate and adequate ventilation, intrinsically safe lighting and switching and appropriate fire and/or smoke detection. If detailed information is required contact the University Health and Safety Department's Fire Safety Adviser fire@ed.ac.uk

All gas storage areas and manifold areas must be secure and lockable.

Further information can be found in the Code of Practice CS CoP005 Pressurised gas and CS CoP007 Storage of hazardous substances

003.8 Liquid Nitrogen Storage areas

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 10ac/hr Stage 2 – occupied mode 25ac/hr, ramp up initiated by movement sensor (PIR) Stage 3 – emergency mode 40ac/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.

Further information can be found in the Code of Practice CS CoP006 Cryogenic material and equipment

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/estates/about-us/design-guidelines/engineering-design