BRITISH STANDARD

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Laboratory furniture — Recommendations for design and installation

The European Standard EN 14056:2003 has the status of a British Standard

ICS 71.040.10

National foreword

This British Standard is the official English language version of EN 14056:2003. It supersedes BS 3202-3:1991 and BS 3202-4:1991, which are withdrawn.

The UK participation in its preparation was entrusted to Technical Committee LBI/18, Laboratory furniture and fittings, which has the responsibility to:

— aid enquirers to understand the text;

— present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;

— monitor related international and European developments and promulgate them in the UK.

A list of organizations represented on this committee can be obtained on request to its secretary.

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Laboratory furniture - Recommendations for design and installation

Mobilier de laboratoire - Recommandations de conception et d'installation

Laboreinrichtungen - Empfehlungen für Anordnung und Montage

This European Standard was approved by CEN on 2 January 2003.

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Foreword

This document (EN 14056:2003) has been prepared by Technical Committee CEN /TC 332 "Laboratory equipment", the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by October 2003, and conflicting national standards shall be withdrawn at the latest by October 2003.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, Spain, Sweden, Switzerland and the United Kingdom.

1 Scope

This European Standard gives recommendations for the installation and design of laboratory benches, storage units and services and their connections and fittings. The recommendations may be used by all parties involved in the design, manufacture, installation and use of a new laboratory or in the refitting of an old laboratory.

NOTE 1. Attention is drawn to national regulations in respect of electricity, water and gas supply.

NOTE 2. Attention is drawn to building regulations and requirements, e.g. for floor loading.

NOTE 3. In the use of laboratory equipment and furniture, risk assessment and appropriate precautions are the responsibility of the organization running the laboratory and the laboratory user.

NOTE 4. Attention is drawn to any national regulations in respect of transfer of liability during the building and installation of laboratories.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text, and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN 12469, *Biotechnology — Performance criteria for microbiological safety cabinets.*

EN 13150, *Workbenches for laboratories — Dimensions, safety requirements and test methods.*EN 61010-1, *Safety requirements for electrical equipment for measurement, control, and laboratory use — Part 1: General requirements (IEC 61010-1:2001).*EN 14175-2, *Fume cupboards — Part 2: Safety and performance requirements.*

3 Storage and handling

Prior to installation, furniture should be stored in a secure space and steps should be taken to minimise the risk of damage or deterioration. Care should be taken in protecting furniture stored or installed in the laboratory before and during decoration and fitting out of the laboratory. Information given by the manufacturer should be followed.

The adequacy of access to the laboratory and any temporary storage space should be checked. In difficult cases, scaffolded access through windows may be necessary. Particular attention should be paid to the following:

a) door dimensions;

b) stairways and landings;

c) elevator load and dimensions;

d) corridor dimensions, changes of corridor direction and potential obstructions.

Information should be exchanged between the furniture supplier and the furniture installer about the space needed for moving the furniture into the laboratory.

4 Laboratory conditions for installation

The furniture should not be installed if the air temperature or relative humidity in the laboratory to receive it is significantly different from that of its storage space.

If furniture has to be installed before new building work has dried out, heating and dehumidification should be applied slowly over a number of days. Dehumidifiers should be used in preference to heaters. If heating only is applied, good ventilation is essential.

Where mobile and relocatable furniture is to be installed, all surfaces, including those to be concealed by the furniture, should be decorated before installation. This minimise redecoration and making good at subsequent layout changes.

It is recommended to complete decoration and floor coverings as far as possible before furniture is installed. Where furniture has already been installed, it should be protected effectively from following trades prior to handover.

5 Fixing floor- and wall-mounted furniture

Fixed furniture items should be fixed to the floor or supporting wall by the method recommended by the manufacturer.

Workbenches shall comply with EN 13150.

NOTE European standards for laboratory storage units and fume cupboards are in development.

Floor-mounted bench substructures of the cupboard pedestal or leg frame type should include a provision for levelling the worktop. A similar provision should be included with wall-mounted furniture. Worktops should be provided with upstands in order that the junction with the wall is located above the general work surface.

If floor covering is to be coved to the furniture, forming a continuous upstand to facilitate cleaning and decontamination, fixed floor furniture may need to be installed before floor covering is laid.

When fixing laboratory furniture, care should be taken to facilitate cleaning.

6 Placing mobile and relocatable furniture

Mobile furniture should be fitted with a locking device and relocatable furniture should be fitted with a levelling device.

Having placed mobile and relocatable furniture in the required positions, these devices should be adjusted to achieve a neat level and line of all components in grouped arrangements. Components should be fixed in accordance with the manufacturer's instructions.

7 Height adjustable furniture

Height adjustable furniture should have a means of adjustment, levelling and locking.

8 Services distribution zone in furniture

Laboratory furniture layouts should include 'spine' zones for services distribution.

Generally a building service distribution run should not be located in the laboratory furniture spine if it continues on to service other areas of the building.

Services should be grouped and coded under the following types:

a) electrical: lighting and power;

b) communications;

c) water;

d) steam: steam and condensate;

e) each gas;

f) drainage.

NOTE Attention is drawn to national regulations or standards that may apply.

Pipes for cold water and steam should have a thermal insulation. All pipes should be fixed in such a way that their deformation during use does not occur.

9 Services input

The location of building services supply connection points depends on the furniture configuration. Electrical connections in the floor should be avoided.

NOTE Floor connections may impose severe restrictions on the rearrangement of services and furniture, unless the laboratory has a raised access floor, duct, service void or some similar arrangement.

Wall connections should be easily accessible.

The provision of a services bollard should be considered where equipment is mobile.

Consideration should be given to the provision of the following:

a) access space for service entry, connection and maintenance;

b) means of isolating branch or bench from supply. Ideally, isolation and protection points should be located adjacent to the exit from the laboratory. Overhead multi-user or teaching environments may necessitate alternatives. Siting an interface at each bench or group offers the advantage of local isolation which does not disturb nearby benches;

c) protection for personnel, e.g. by suitably rated residual current devices or circuit breakers, ‘knock-off’ button, gas or steam valves, pressure-reducing valves.

Separation facilities to be considered for individual services can be as follows:

1) Ventilation. No special facilities;

2) Water. Isolation with a valve or stopcock of suitable materials;

3) Waste. Isolation by siphon or dilution chamber;

4) Steam. Isolation with a valve or stopcock of suitable materials;

5) Gases: general. Isolation and pressure reduction to a level safe for use at bench or fume cupboard outlets. Pressure reduction should occur as near as possible to the source of supply within the laboratory;

6) Gases: combustible. Main stopcock control accessible at exit door of laboratory;

7) Gases: special. Isolation and pressure reduction to a level suitable for the apparatus in use. Pressure reduction should occur as near as possible to the source of supply within the laboratory. Flow limitation is recommended for hazardous gases. For hazardous gases, it is also recommended that the outlet from the safety valve and diaphragm on the pressure reducing valve leads to a safe place outside the building. Final filtration of high purity gases may be provided for the protection of the apparatus served;

8) Electrical. Means of isolation and protection should be provided in accordance with appropriate IEC standards. Emergency tripping facilities should be provided by means of stop push buttons or on load switches to control all bench outlets from at least one position within the laboratory. All bench outlets and certain fixed equipment should be protected;

NOTE Attention is drawn to national regulations.

9) Communications. With regard to communication and data transmission lines, electromagnetic compatibility should be observed.

10 Installing services

Allowance should be made for a degree of misalignment between the location of building services terminations and the furniture that relates to them.

For electrical power and telecommunications, tolerance is provided by the flexibility of cabling and wiring. If the situation demands, conduiting cabling should be considered with piped services.

Fixed furniture requires a different design approach from that of mobile and relocatable furniture.

Service connections for fixed furniture may be either:

a) a rigid hand crafted junction pipe or conduit formed to take up any discrepancy between the location of building site services terminations in furniture; or

b) a flexible junction pipe or conduit adjusted to take up any discrepancy as above.

For mobile furniture assemblies, the use of flexible service connections is essential to allow for movement and to facilitate relocation. The length of flexible service connections should be related to the grid of services outlets on the building site where such a grid is provided for future relocation and reconnection of furniture and equipment.

11 Service outlets

11.1 Bench level outlets

11.1.1 General

Bench outlets should be intended as connection points for apparatus mounted on or adjacent to benches, or for the delivery and disposal of fluids and gases immediately adjacent to the working area.

Modular layout should be considered for both safety and convenience. If more connections are required, multiple outlets should be used.

Electrical outlets should be positioned so as to prevent penetration by liquids.

Each water or steam outlet, except for emergency showers and eyewashes, should have an associated drip-cup, bowl or sink.

There should be no horizontal steam outlets.

Bench outlets should be designed and fitted to withstand normal wear and tear within a laboratory and should be designed with the following in mind:

a) fixings should be rigid and capable of withstanding the force required for frequent connection and reconnection and any accidental stress caused by movement of apparatus whilst still connected to the outlets. Their design should make rigid fixing easy;

b) outlets should be readily identifiable by means of colour coding and marking in accordance with national or international standards. Attention is drawn to EN 13792;

c) dangers arising from the close proximity of incompatible services, e.g. water and electricity, should be minimized so far as is possible commensurate with availability at point of use. Electrical outlets should also be positioned as far as possible from valves for flammable gases. Outlets for different services should be not closer than 75 mm centre to centre, except in the case of specialist combination fittings;

d) means of connection to outlets should be simple, obvious and resistant to improper use. Plugs of non-interchangeable pattern, serrated tapered tails for water and some gas connections and mechanical screwed connections of the nut and olive, or nut and gasket, seal type should be adopted;

e) where appropriate, outlets should be capable of flow control and should be resistant to accidental movement or incremental creep once set;

f) all components and materials should be compatible with the service carried out and should have external finishes which are resistant to all normal laboratory reagents. Combinations of metals which could set up an electrolytic cell in the presence of spillages should be avoided;

g) outlets through the bench should have a moisture resistant and reagent resistant seal;

h) to facilitate connection to outlets, an appropriate space should be provided between horizontal connection points and the bench surface or panel.

11.1.2 Water

Where drip cups are provided, water outlets should be located above them with a minimum distance of 225 mm between bench top and outlets to accommodate utensils beneath.

Valves should have conventional shut off devices for normal use and should be of a specialist design where high pressures and/or fine control of water flow rate is required.

Valves and systems should be designed for working pressures up to a maximum of 6 bar.[1] Special installations may require higher pressures.

11.1.3 Waste water

Water collection devices should be installed to collect drips from beneath water outlets.

Drip cups and insert sinks should be of a suitable material to cope with the liquid waste to be poured down them. If drip cups or sinks are arranged into a working surface of the bench, they may be sealed from below or above, as appropriate. A grating should be incorporated to prevent objects greater than 8 mm in diameter passing through.

Outlets from drip cups should be 38 mm nominal minimum internal diameter connections, either as traps or as direct connections.

Insert bench sinks should meet the criteria outlined above for drip cups and should have self-draining bases.

The uncontrolled flow of spilled liquids entering the water system from the laboratory drip cups or sinks should be avoided. For example, this could mean the use of lipped edges to drip cup/sink areas as well as considering the design of the waste system isolating the contaminants prior to their entry into the water system.

Trapping systems should be incorporated in each bench or bench run. It should be noted that systems incorporating catch pots should not include traps on individual outlets, as air locking will occur unless back venting or special arrangements are included.

[1] 1 bar = 100 kPa

11.1.4 Gases

11.1.4.1 Fuel gases

Outlets for fuel gas services should be gas valves constructed in accordance with national regulations.

NOTE Fuel gases include natural gas, propane, butane or mixtures thereof. Other gases, such as acetylene or hydrogen, are not included.

There should be a clear indication, by the position of the handwheel or operating lever, of when the valve is in the "off" position. Devices should be incorporated to prevent the accidental opening of gas valves.

11.1.4.2 Gases other than fuel gases

Where fine regulation of flow rates or high purity is a requirement, specialist valves should be employed.

Valves for special gases should be suitable for maximum operating pressures not exceeding 10 bar (1000 kPa) above atmospheric pressure.

Certain installations may require much higher pressures than this and should be designed specifically to meet these parameters.

Outlet valves for special gases should be designed specifically for the gas to be handled and manufacturers should ensure that lubricants, seals and materials, such as metals and plastics, are suitable for the avoidance of hazards.

NOTE Examples of particular hazards are oxygen coming into contact with grease and acetylene coming into contact with copper alloys or silver alloys.

11.1.5 Electrical socket outlets

Electrical socket outlets, which include electrical power outlets at normal mains and non-standard voltages, outlets for telecommunication appliances and outlets for computer networks, should be fitted so as to minimise the risk of splashed liquids entering them. Outlets should not be fitted in soffits where plugs may become disconnected inadvertently.

Socket outlets should conform to applicable national regulations and should be either metal clad or of plastics construction, as appropriate. Computer and other communication outlets should meet the relevant international standard.

Where electrical equipment is built into laboratory furniture, the equipment enclosure or protection concept should be selected having regard to the foreseeable ingress of water, particles and corrosive substances or exposure to mechanical damage or flammable gases and vapours and the equipment should comply with any applicable national standards.

For benches designed for electrical engineering, physics (electrical) or electronics, where dangerous voltages may be exposed, the following should apply:

a) so far as is practicable, the work surface and fittings, including socket outlets, should be constructed from insulating materials. Any metalwork, other than laboratory instruments, which is within reach of the person using the bench should be covered with insulating material. This metalwork, and any which remains un-insulated, should be earthed;

b) metalwork in the vicinity of the laboratory bench should be kept to a minimum, i.e. located elsewhere, but that which cannot be removed should be earthed;

c) power sources should be in accordance with applicable national regulations;

d) power installations in laboratory benches shall conform to EN 61010-1 as far as is applicable;

e) each laboratory bench should be located within easy reach of an emergency trip push button or a switchable fuse arranged to disconnect dangerous supplies from the bench and the immediate surroundings.

11.1.6 Communications outlets

Standards exist that give requirements for connections to services provided by telecommunications operators: due account should be taken of those standards.

Connections for computer equipment and networks should be in accordance with 11.1.5.

Consideration should be given to the likely future expansion of such services when planning space for such equipment.

11.2 Mobile services

In addition to the services provided from the mains distribution systems, furniture and equipment may be required to receive and distribute special services to separate outlets. This may also apply to the provision of ordinary services where the demand for these is limited.

The possible need to use equipment such as compressors, vacuum pumps and gas cylinders should be taken into account.

The use of portable equipment can be particularly hazardous where cables, connections and pipework are vulnerable to mechanical damage or misuse. Such equipment should be suitably rated and protected.

Connections for mobile services should be in accordance with 11.1.

12 User manual

Laboratory furniture manufacturers should provide clear recommendations for its operation and maintenance in the form of a printed manual.

The manual should include the following:

a) general information on the furniture elements and fittings and how to install them. This should include guidance on the fixing of floor- or wall-mounted furniture;

b) the properties of the work surface materials and their resistance to chemical attacks, etc., so that the purchaser may ascertain whether it is suitable for its intended purpose;

c) instructions on the care and maintenance of the various components and fittings;

d) available information on decontamination procedures and the ease of decontamination of the surface materials;

e) instructions for altering the layout of demountable and relocatable furniture and the associated services.

13 Space needs and dimensions

13.1 General space needs

Except where national regulations indicate otherwise, the following spaces should be allowed between work surfaces or equipment (see 13.2 for fume cupboards):

a) One worker at bench or equipment where space is not normally required for other persons to pass (see Figure 1 a))

   Minimum distance 1000 mm

   between front of bench or work station and a facing wall, other furniture or equipment or pedestrian route;

b) One worker at bench or equipment where space is required for a second person to pass (see Figure 1 b))

   Minimum distance 1000 mm

   between front of bench or work station and a facing wall, other furniture and equipment;

c) Passage way between benches, furniture or equipment without work spaces either side (see Figure 1 c))

   Minimum distance 900 mm

   allowing passage of one person at a time;

d) Two workers back to back where space is not normally required for a third person to pass (see Figure 1 d))

   Minimum distance 1400 mm

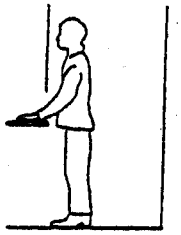
   between front of facing benches, work stations or equipment where people work allowing one worker to pass behind the other;

e) Two workers back to back where space is required for a third person to pass (see Figure 1 e))

   Minimum distance 1450 mm

   between fronts of facing benches, work stations or equipment where people work allowing a third person to pass both workers.

NOTE Where access for disabled people is required, more space may be needed.



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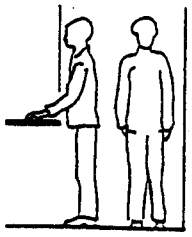

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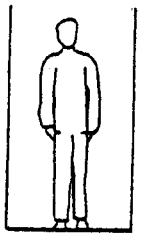

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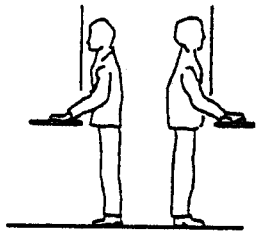

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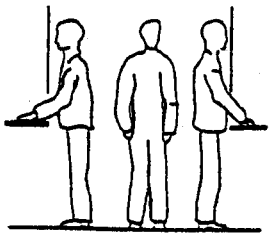

1 e)

Figure 1 — Typical worker/work space configurations

13.2 Fume cupboards and safety cabinets

Consideration should be given to the location of fume cupboards (in accordance with EN 14175-2) and microbiological safety cabinets (in accordance with EN 12469) in relation to laboratory furniture and fittings and air supply outlets.

The installation distances for fume cupboards and microbiological safety cabinets are influenced by:

a) air technical requirements for the performance of the fume cupboard or microbiological safety cabinet;

b) size of emergency ways and access to exits for general laboratory safety.

NOTE Guidance on the above may be found in EN 12469, relevant national standards and EN 14175 (under development).

13.3 Emergency installations

Consideration should be given to the location of emergency drench showers and emergency eye wash units.

Bibliography

EN 13792, *Colour coding of taps and valves for use in laboratories.*

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