BRITISH STANDARD

BS 7258-3:
1994

Laboratory fume cupboards —

Part 3: Recommendations for selection, use and maintenance

Committees responsible for this British Standard

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Association for Science Education
Association of the British Pharmaceutical Industry
British Furniture Manufacturers' Federation
British Occupational Hygiene Society
Chartered Institution of Building Services Engineers
Chartered Society of Designers
Chemical Industries' Association
CLEAPSS School Science Service
Department for Education
Department of Health
Department of the Environment (The Buying Agency)
Furniture Industry Research Association
GAMBICA (BEAMA Ltd.)
Health and Safety Executive
Manufacturing Science Finance
Medical Research Council
National Association of Teachers in Further and Higher Education
Royal Institute of British Architects
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Universities Safety Association
Coopted members

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Contents

Foreword

This Part of BS 7258 has been prepared under the direction of the Laboratory Apparatus Standards Policy Committee and supersedes BS 7258-3:1990, which is withdrawn.

This edition introduces technical changes but it does not reflect a full review or revision of the standard, which will be undertaken in due course.

BS 7258 is published in four Parts as follows.

— *Part 1: Specification for safety and performance;*

— *Part 2: Recommendations for the exchange of information and recommendations for installation;*

— *Part 3: Recommendations for selection, use and maintenance;*

— *Part 4: Method for determination of the containment value of a laboratory fume cupboard.*

IMPORTANT NOTE It is essential that this Part be read in conjunction with BS 7258-1.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 8, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

1 Scope

This Part of BS 7258 gives recommendations for the selection, use and maintenance of laboratory fume cupboards.

This Part of BS 7258 is not intended to cover fume cupboards for such special applications as carrying out work on radioactive materials, perchloric acid, etc.

This Part does not cover microbiological safety cabinets (see BS 5726) and the fume cupboards described should not be used for categorized microbiological work.

NOTE A bibliography on laboratory health and safety in respect of fume cupboards is given in annex A.

2 References

2.1 Normative references

This Part of BS 7258 incoporates, by dated or undated reference, provisions from other publications. These normative references are made at the appropriate places in the text and the cited publications are listed on the inside back cover. For dated references, only the edition cited applies; any subsequent amendments to or revisions of the cited publication apply to this Part of BS 7258 only when incorporated in the reference by amendment or revision. For undated references, the latest edition of the cited publication applies, together with any amendments.

2.2 Informative references

This Part of BS 7258 refers to other publications that provide information or guidance. Editions of these publications current at the time of issue of this standard are listed on the inside back cover, but reference should be made to the latest editions.

3 Definitions

For the purposes of this Part of BS 7258, the definitions given in BS 7258-1:1994 apply.

4 Selection

4.1 General

The efficiency of any fume cupboard depends on a number of factors (principally design, siting and use).

The selection of a fume cupboard should be based primarily on the philosophy that the performance should be higher than that demanded by the processes likely to be performed in it. Other considerations that affect the selection, such as economic consequences, the materials of construction, etc. should be secondary.

Before selecting a particular type of fume cupboard, the purchaser should establish that it complies with the performance type test specified in BS 7258-1:1994.

Alternatively, the purchaser may be in a position to make a judgement about a particular model of fume cupboard suiting his needs on the basis of previous test experience. Even so, the purchaser should still verify, by making appropriate tests, that the new or upgraded fume cupboard operates at the correct face velocity and that it does indeed achieve the desired results when installed and in use.

4.2 Health and safety

4.2.1 *General*

Purchasers should give careful consideration to the following health and safety issues when selecting a fume cupboard for a particular application (or when planning to extend or change the application of an existing fume cupboard):

a) whether the design, siting and use of the fume cupboard will be such that it will achieve adequate control of exposures of persons to the airborne toxic substances involved in that application;

b) whether the fume cupboard and the extract system will be otherwise safe and suitable for the application in question, e.g. with respect to the following:

1) materials of construction;

2) provisions for electrical and other services;

3) cleaning and maintenance provisions;

4) location and design of arrangements for the discharge of air from the fume cupboard system.

Since a fume cupboard can be expected to last many years, it can confidently be assumed that a wide variety of processes are likely to be carried out within it. The selection, therefore, should have regard to the most hazardous of these likely processes.

4.2.2 *Regulations*

Under section 2 of the Health and Safety at Work etc. Act 1974 [1] it is the employers' duty to take all reasonably practicable measures to ensure the health and safety of their employees, and under sections 3 and 4 it is their duty to take the same measures for others. Section 6 puts a duty on manufacturers, designers and suppliers of fume cupboards, being articles supplied for use at work, to ensure that they are constructed and designed to be as safe as reasonably practicable. Thus a fume cupboard should be suitable both for the process to be undertaken and for the hazards to the users.

The Control of Substances Hazardous to Health Regulations 1988 (Statutory Instrument No. 1657) [2] requires that local exhaust ventilation systems should be thoroughly examined and tested at least every 14 calendar months. Whilst not specifically mentioned in the Regulations, fume cupboards can be regarded as local exhaust ventilation equipment and will therefore be subject to this legal requirement. Paragraph 61 of the associated Approved Code of Practice, *Control of Substances Hazardous to Health* gives details of records to be kept of each thorough examination and test.

Attention is drawn to the Certificate of Approval No. 1 (F 2434) made in pursuance of the Highly Flammable Liquids and Liquefied Petroleum Gases Regulations 1972 (Statutory Instrument No. 917) [3] and required where flammable materials are to be manipulated or used. Attention is also drawn to BS 476.

There are some occasions where these Regulations will not apply to specific premises but nevertheless the same hazards will exist and therefore the same standards should be applied.

In addition to these Regulations, the Electricity at Work Regulations, 1989 [4] will also be relevant, and particularly so when flammable concentrations may be present.

4.2.3 ***Assessment of risk from toxic materials***

For guidance on the risk in particular applications, the purchaser should refer to both the long and short term exposure limits for airborne chemical substances, which are published annually by the Health and Safety Executive (HSE) [5]. These limits provide guidance on the levels (in terms of concentration and time) to which exposures to airborne toxic substances should be controlled. Reference should also be made to the Control of Substances Hazardous to Health Regulations 1988 (Statutory Instrument No. 1657) [2].

4.2.4 ***Assessment of risk from highly toxic gases and vapours***

A fume cupboard is only a partial enclosure and cannot provide absolute protection against inhalation of substances used within it. In addition, the degree of protection given to the user is highly dependent on other factors, such as the system of work and the nature of the operations to be performed. For highly toxic substances, an assessment, e.g. a containment test (see BS 7258-4) may indicate that the likely protection to be afforded to the user by the proposed work is inadequate. In such cases, the work should not be done in a fume cupboard and a complete enclosure such as that provided by a glove box will be more appropriate.

4.2.5 ***Assessment of risk from flammable substances***

In the case of a fume cupboard application involving the use of a highly flammable liquid, the purchaser should determine whether the manufacturer's recommended airflow rate (Q) (in m^3/s) needs to be increased in order to dilute the concentration of the vapours of that liquid to a safe level. It is recommended that the concentration in the body of the fume cupboard and any duct work should not exceed 10 % of its lower explosion limit (see BS 5345-1 and also **A.2** for the flammable material in question).

The required air flow rate can be calculated by estimating the maximum likely rate of evaporation of the liquid during the intended processes and substituting this value into the following equation:

$$Q_{req} = \frac{22.4r(t + 273)}{ME_L \, 273}$$

where

E_L	is the lower explosion limit (in % (V/V));
M	is the relative molecular mass of the liquid;
Q_{req}	is the required air flow rate (in m^3/s);
r	is the rate of evaporation of the liquid (in g/s);
t	is the air flow temperature (in °C).

NOTE 1 This equation assumes a uniform dilution of the flammable vapour with air, a constant rate of evaporation and a single substance. Where these conditions do not apply other calculations will be necessary.

If the required air flow rate, Q_{req}, can be achieved throughout the fume cupboard (including the ventilation ductwork) the materials of construction need not be fire-resisting to a specific British Standard, e.g. BS 476. They should nevertheless be of as low a combustibility as possible. Where flammable concentrations of vapour can be reasonably expected, the enclosure and/or ducting should be of half-hour fire resistance.

NOTE 2 This is a legal requirement in premises subject to the Highly Flammable Liquids and Liquefied Petroleum Gases Regulations 1972 (Statutory Instrument No. 917)[3].

Fixed electrical equipment within the fume cupboard should be to the Zone 2 requirements of those Regulations.

4.3 Materials of construction

4.3.1 *General*

The materials of construction of those parts of the fume cupboard (excluding services) that are likely to come into contact with the fumes should be selected from those specified in Table 1 of BS 7258-1:1994 to resist the forms of attack listed in items a) to g) below.

The nature of the processes carried out within most fume cupboards changes during their lifetimes. An assessment should therefore be made of the anticipated challenges to which the fume cupboard may be subjected before the purchaser's requirements are given to the manufacturer. Challenges will arise from the following:

a) chemical attack;

b) solvent attack;

c) thermal stress;

d) absorption of hazardous substances;

e) explosions;

f) fire;

g) mechanical stress, e.g. vibration.

Metals, with or without appropriate surface finishes, may be used for the interior surfaces, as may plastics materials, glass, ceramics, fully compressed fibre/cement boards suitably coated with epoxide or chlorinated rubber or, in less demanding and hazardous situations, hardwood. The sash, which should give physical protection from splashes and minor explosions, should be transparent. It may be made from plastics materials or glasses. The work surface may be made from plastics materials, ceramics, cast epoxy, metals, etc.

Where the fume cupboard is likely to be used for work with highly toxic and/or aggressive substances, e.g. concentrated mineral acids, the chamber interior should be free from crevices and ledges, so that decontamination may be effected efficiently.

NOTE This is often more important after the handling of toxic substances than after the handling of radioactive ones.

Corners and joints in metal or plastics should preferably be welded or adequately sealed, and should be generously radiused.

4.3.2 *Stainless steel*

Stainless steel should be used with radionuclides. In particular the acid resisting grades 320S31, 320S33, 316S31 and 316S33 specified in BS 1449-2:1983 are recommended. Some radionuclides, if spilt on the metal, may exchange with the alloying elements and confer some permanent radioactivity. Although stainless steels are susceptible to attack by mineral acids containing chlorine, including perchloric acid (see note), the process is usually slow, and the metal is resistant for a considerable period. However, the metal surrounding welds in stainless steels is degraded by the welding process and, being subject to stress corrosion, is more susceptible to chemical attack.

NOTE Laboratory fume cupboards intended for special applications, such as work with perchloric acid, are beyond the scope of this British Standard (see clause **1**).

4.3.3 *Coated metals*

When the protective layers of a coated metal or ceramic are damaged mechanically or chemically, e.g. by solvents, exposure of the substrate renders it susceptible to chemical attack, and this may not always be evident.

4.3.4 *Glass*

Glass is attacked by hydrofluoric acid, its vapour, and acidic fluorides, as well as by hydrolysis products of some organic compounds containing fluorine, e.g. acyl fluorides. It is resistant to other chemicals and vapours for long periods. All glass is brittle and can be broken by mechanical or thermal shock, although to different degrees depending on the type. Information on the load carrying capabilities of glass under explosion conditions may be obtained from glass manufacturers.

4.3.5 *Wired glass*

Wired glass is not recommended for use in fume cupboard construction, particularly for the sash.

4.3.6 *Laminated glass*

Laminated glass is not recommended for use in fume cupboard construction, but may be used for sashes. It is produced by bonding together two or more panes of annealed glass, alternating with plastics interlayers. Fracture does not cause the glass to separate to any significant extent, although when broken, the pieces are characteristic of the annealed glass used in its manufacture. It is resistant to thermal shock of only 25 K and temperature gradients of only 40 K for each 6 mm thickness. Maximum working temperature is only 345 K. It also has less resistance to pressure than annealed glass of similar thickness.

NOTE For further information, see BS 6206.

4.3.7 ***Toughened glass***

Toughened glass, as defined in BS 952-1, is a safety type glass that provides good mechanical protection and, when fractured, produces small, relatively harmless pieces. When broken, the pieces expand, effectively locking them within the surround or frame. The edges of toughened glass are no less vulnerable than those of annealed glass and edge protection by suitable framing and glazing material is recommended. It is resistant to thermal shock of 250 K and to temperature gradients of 265 K for each 6 mm thickness. Maximum working temperature is 575 K. It can be used to make laminated glass with better fracture performance, but the interlayer is vulnerable to chemicals and heat, it is more expensive, and sealing at the edges is essential.

4.3.8 ***Plastics materials***

The use of plastics materials in the construction of fume cupboards and duct systems may constitute a fire hazard, depending on the nature of the work carried out and the time/temperature characteristic of the ignition source. However, the behaviour of plastics materials in a fire needs to be distinguished from their susceptibility to continuous exposure to temperatures close to their softening points. Polyethylene and polyvinylchloride behave quite differently in these respects. There is always a risk of combustion when flammable materials are being handled, particularly if heat is involved. Induced stress can occur in certain plastics when subjected to organic solvents.

NOTE For recommendations of epoxide surface coatings and chlorinated rubber paints, see BS 6374.

4.3.9 ***Rigid polyvinylchloride (PVC)***

PVC material possesses good resistance to chemical and solvent attack and, although it exhibits poor resistance to elevated temperatures, it does not burn readily. The products of combustion are, however, injurious to electrical equipment and to health.

NOTE PVC material is also suitable for fume cupboards intended for special applications, e.g. work with radioactive materials and perchloric acid. However, such fume cupboards are beyond the scope of this British Standard.

4.3.10 ***Polycarbonates***

Compared with other plastics, polycarbonates have a relatively high mechanical strength and high translucency. They do not discolour with age. Their resistance to chemical and solvent attack is moderate but they are readily affected by petroleum solvents, ammonia and amines. Susceptibility to attack by amines can be overcome by protecting the polycarbonate sheet with a polyester layer. Polycarbonates may be used for sashes or windows.

4.3.11 ***Glass-reinforced plastics materials (GRP)***

GRP materials, provided they contain a high proportion of glass fibre, have a good resistance to heat. Fire-resistant grades are available. They have good mechanical properties when fabricated as a joint-free moulding, and this form is particularly suitable for fume cupboards incorporating wash-down facilities.

NOTE Extreme care in fabricating components from GRP is required in order to avoid pinholes, cavities, crack formation and other faults that are detrimental to quality.

4.3.12 ***Polypropylene***

Polypropylene has good resistance to chemical attack but possesses poor heat resistance. Some grades burn readily but fire-retardant grades are available. When fabricated into a welded unit, it is suitable for fume cupboards incorporating wash-down facilities. It is useful for surfaces on which to handle radioactive materials.

NOTE For further information, see BS 5139.

4.3.13 ***Melamine-formaldehyde laminates***

Melamine-formaldehyde laminates are suitable for working surfaces, if used in thicknesses greater than 6 mm when supported and greater than 10 mm when unsupported.

4.3.14 ***Epoxy resin***

The use of cast epoxy resin slabs is recommended for use as fume cupboard bases and linings provided that any joints are sealed with the same material forming a monolithic structure being non-porous, non-conductive and heat-resistant. Resistance to burning should be in accordance with BS 476.

4.3.15 ***Ceramics***

Quarry tiles, glazed stoneware slabs, vitreous enamels and modern heat-resisting ceramic materials are suitable for work surfaces provided that the framework is sufficiently strong to withstand the weight. Hydrofluoric acid can attack certain ceramics. These ceramics will resist high temperatures and can accommodate heavy mechanical loads. Vitreous tiles are suitable for lining the fume cupboard chamber and for the work surface. They are less heat- and load-resistant than glazed stoneware slabs.

Jointing compounds for these materials should be chosen carefully. Acid-resistant epoxy jointing compounds and furfural resin cements are preferred.

NOTE Some furfural resins are also resistant to hydrofluoric acid.

4.3.16 *Hardwood*

Hardwood is attacked by, and also absorbs, many substances. It should be used only in fume cupboards that are used for a few hours a week for operations with low release rates of corrosive substances. The use of hardwood should be confined to parts that will not normally come into contact with spilt liquids. It is essential that hardwood should not be used in fume cupboards in which perchloric acid or other strong oxidizing agents might be handled.

NOTE Laboratory fume cupboards intended for special applications, such as work with perchloric acid, are beyond the scope of this British Standard (see clause **1**).

4.4 Primary airflow requirements

4.4.1 *Relationship between airflow and performance*

The performance at any particular sash opening which may be consistent with adequate containment is determined by many factors, the most important of which are the aerodynamic features incorporated in the design, and the siting of the fume cupboard. The relationship can only be determined by testing and it should be borne in mind that cross-draughts from open windows, doors and persons passing in front of the cupboard can cause reversals to flow.

NOTE For design criteria relating to airflow, see **A.1** and **A.2** of BS 7258-1:1994.

4.4.2 *Practical considerations*

High velocities can have adverse effects on operations being performed in the fume cupboard, e.g. the cooling of distillation columns, the extinguishing of gas flames, and the dispersal of valuable sample materials being manipulated, such as ashes and powders.

4.4.3 *Consumption of energy*

Excessive extract volume flow rates through the aperture lead to wastage in energy by extracting an unnecessary amount of conditioned air from the laboratory. A single fume cupboard with an average face velocity of 1 m/s, an aperture of 0.5 m and a 10 K difference between the temperature of the air outside the building and that of the laboratory make-up air, will absorb 6.5 kW for every metre of width. Any laboratory make-up air should be in accordance with **3.3** of BS 7258-2:1994.

4.4.4 *Special applications*

The handling of highly toxic or radioactive substances may suggest the need for high face velocities. For such applications advice should be sought from an appropriate specialist. If higher extract volumes are to be used then compliance with testing requirements should be established.

4.5 Specific features of fume cupboard design

4.5.1 *General*

Design criteria are set out in annex A of BS 7258-1:1994. Additional features that may be considered in selecting a fume cupboard are given in **4.5.2** to **4.5.4**.

4.5.2 *Filters*

Fume cupboards should not be fitted with filters except for when the fume cupboard is strictly reserved for work involving dry materials and where there is a definite need to prevent such substances escaping into the environment. Certain filter materials are susceptible to chemical attack from acids and solvents and this will destroy their efficiency. They may become clogged and so lead to a reduction in performance, which could be dangerous. They also concentrate hazardous substances and the safe disposal of the filter would be necessary. Regular performance monitoring and regular replacement of the filters should be undertaken.

4.5.3 *Double sashes*

Many laboratories have a low ceiling or low beams that prevent the installation of fume cupboards with a one-piece sash. Several manufacturers offer fume cupboards with a double sash for laboratories with height restrictions.

4.5.4 *Angled stiles*

Improvements to air flow and thus performance can be achieved by providing a tapered inlet to the aperture by means of angled stiles. The location of service controls on angled stiles should be chosen such as to minimize disturbance of the airflow.

5 Use

5.1 Assessment of potential hazards before use

Before commencing use, assess the potential hazard posed by the intended procedure.

NOTE 1 Advice on potential hazards is given in clause **4**.

If the assessment shows that the fume cupboard will not give adequate protection and a cupboard with the required performance is not available, the work should not be undertaken unless the potential hazard can be reduced to an acceptable level, e.g. by the following methods:

a) working with a reduced sash opening;

b) using reduced quantities of the substances involved;

c) using a lower reaction rate, e.g. by adjusting the process temperature, which will reduce the release rate of the fumes;

d) reducing the amount of substances released into the airflow, e.g. by fitting cold traps, absorption columns or scrubbers.

If none of the above methods reduces the risks sufficiently, seek advice from the laboratory safety officer or individual responsible for safety matters for devising alternative means of carrying out the work.

NOTE 2 Such advice might lead to the use of a total enclosure or the wearing of special clothing and respiratory protection.

5.2 Preparation of use

5.2.1 *Safety precautions*

If the risks warrant it, have somebody nearby. Make sure that those nearby know the hazards likely to be met.

Unless the fume cupboard is fitted with an automatic fire system, check that a suitable fire extinguisher is at hand if flammable materials are to be handled. Make sure that those nearby have adequate first aid equipment and any antidotes appropriate to the hazard, and that they know how to use them.

Lower the sash until the user's face is fully protected. The user may also wear eye protection. The sash should be kept lowered except when actually manipulating apparatus, etc.

When the fume cupboard is to be used for work with flammable liquids, treat the interior of the fume cupboard as a Zone 2 area in accordance with BS 5345-1 for the purpose of selection and use of any electrical apparatus in connection with the work.

5.2.2 *Air movement*

Check that the fume cupboard is in a fit condition for use. Report promptly any defects found (see Control of Substances Hazardous to Health Regulations 1988 (Statutory Instrument No. 1657)[2]).

If leaving any doors and windows open reduces the performance of the fume cupboard, shut them. Check that ventilation grilles are not obstructed and that the ventilation is working correctly.

Look at the airflow indicator to check that the fume cupboard is working correctly.

NOTE It is not enough to know that it is switched on.

5.2.3 *Organization of work*

Where practicable, place everything needed inside the fume cupboard before starting. This reduces the number of arm movements into and out of the working aperture, a major cause of fume escape.

Position apparatus and materials in the fume cupboard so as to minimize disturbance to the airflow at the working aperture. If there is a choice of such bulky items as ovens and hot plates, choose those with legs as they allow air to pass underneath.

Make sure that there is enough room in the fume cupboard to do what is required. Tidy or remove unwanted apparatus.

NOTE If possible, specially designed ventilated cupboards should be used for storage. They are cheaper to run and safer to use.

5.3 After use

Adopt the laboratory's procedure for disposing of substances that should not be poured down the drains.

Leave the fume cupboard in a clean and tidy state.

After finishing the process, lower the sash. Leave the fan on until all release of fume has ceased and the fume cupboard is completely purged.

6 Maintenance

6.1 General

A fume cupboard system should be regularly maintained to prolong its life and to reduce the possibility of hazard to the operator. The recommendations of the supplier should be followed and the whole system, from fume cupboard to discharge stack, should be subject to periodic inspection. Recommendations for maintenance operations at six-monthly and twelve-monthly intervals are given in **6.2** and **6.3**.

The user of the fume cupboard can reduce the need for maintenance by regularly using the water wash facility, if fitted, so that aggressive substances are removed from the interior before damage occurs. The life of the ductwork will be prolonged if spray jets are used regularly to wash out corrosive condensates, the main cause of duct failure.

Staff engaged on maintenance operations should be advised, through the laboratory safety officer, of the need for any decontamination procedures before the work is commenced. The laboratory safety officer's advice on the opening of the inspection cover provided on ductwork should also be sought.

NOTE The Control of Substances Hazardous to Health Regulations 1988 (Statutory Instrument No. 1657) [2] require that all measures provided for the control of exposure to substances hazardous to health are maintained in an efficient state in efficient working order and in good repair. The Regulations also require the thorough examination and testing of local exhaust systems at least every 14 calendar months. Attention is drawn particularly to paragraph 59 to 61 of the associated Approved Code of Practice.

6.2 Six-monthly maintenance

Every 6 months, the following maintenance operations should be carried out, as applicable.

a) Remove the baffle, if fitted, and clean both the baffle and the rear of the chamber.

b) Wash the entire interior surface of the chamber with dilute detergent solution and repair defects as necessary. Linings fabricated from PVC should have a coating of an anti-static compound applied.

c) Inspect the sash mechanism for corrosion and damage.

NOTE BS 6570 gives guidance on criteria for assessment.

d) Inspect the fans, and their motors, drives and bearings for correct running.

6.3 Twelve-monthly maintenance

Every 12 months, the following maintenance operations should be carried out, as applicable.

a) Dismantle the sash mechanism and inspect it for corrosion and damage.

b) Check the spray jet performance in the fume cupboard and in the ducting.

c) Check the condition of the services to the fume cupboard, including their controls.

d) Inspect the fire damper and the release mechanism.

e) Check that the motors of the extract and supply air fans do not overheat and test for worn bearings. Check for excessive noise and the state of the flexible couplings, that the pulleys are tight and correctly aligned and that diffusers and louvres are not obstructed. Measure the fan and motor speeds and the electric current flowing through the motor.

f) Inspect the fan impellers for wear and corrosion

g) Check the stability and condition of the discharge stack.

h) Inspect the condition of the extract ducting, particularly the joints. Check the need for cleaning the interior of the ducting through the inspection ports, particularly at bends where substances may be impacted.

i) Check the extract volume flow rate. Check the laboratory make-up air balance and its temperature.

j) Check the position of the balancing damper.

k) Check the average face velocity (see **7.1.4** and note 3 to **7.2** of BS 7258-1:1994). If it is found that the average face velocity is less than 0.8 × the average face velocity obtained at commissioning or it is found that individual velocities are less than 0.8 × the corresponding value obtained at commissioning, a deterioration in performance is indicated. If this is the case, but no faults have been detected during the checks, a ventilation engineer or the original installer should be consulted.

l) Check the function of the sash stop and the alarm mechanism. Check the visual flow rate indicator to see that the requirements of **4.6** of BS 7258-1:1994 are still being met.

6.4 More frequent maintenance

If a fume cupboard is frequently used for substantial quantities of corrosive substances, the checks in **6.2** should be carried out every month and those in **6.3** every 6 months.

Annex A (informative) Bibliography

A.1 Health and Safety Executive publications

NOTE This list is not exhaustive and changes will be made from time to time. For an up-to-date list refer to the current HSE publications catalogue normally published twice annually.

Guidance notes in the environmental hygiene series

EH2 (Rev), Chromium and its inorganic compounds: health and safety precautions. Revised edition 1991.

EH4, Aniline — health and safety precautions 1979.

EH6 (Rev), Chromic acid concentrations in air: electrolytic chromium processes — monitoring chromic acid mists. Revised edition 1990.

EH7, Petroleum based adhesives in building operations 1977.

EH8 (Rev), Arsenic — toxic hazards and precautions. Revised edition 1990.

EH9, Spraying of highly flammable liquids 1977.

EH10 (Rev), Asbestos — exposure limits and measurement of airborne dust concentrations. Revised edition 1990.

EH11, Arsine — health and safety precautions. Revised edition 1990.

EH13, Beryllium — health and safety precautions 1977.

EH16, Isocyanates: toxic hazards and precautions 1984.

EH17, Mercury — health and safety precautions 1977.

EH19, Antimony — health and safety precautions 1978.

EH20, Phosphine — health and safety precautions 1979.

EH21, Carbon dust — health and safety precautions 1979.

EH22, Ventilation of the workplace. Revised edition 1988.

EH23, Anthrax: health hazards 1979.

EH24, Dust and accidents in malthouses 1979.

EH25, Cotton dust sampling 1980.

EH26, Occupational skin diseases: health and safety precautions 1981.

EH27, Acrylonitrile: personal protective equipment 1981.

EH28, Control of lead: air sampling techniques and strategies 1986.

EH29, Control of lead: outside workers 1981.

EH31, EH33-38, EH42-47, EH49-60 and EH62-67. (See HSE publications list, pages 32 to 33.)

Guidance notes in the chemical safety series

CS 1 Industrial use of flammable gas detectors 1987.

CS 3 Storage and use of sodium chlorate 1985.

CS 4 The keeping of LPG[1] in cylinders and similar containers 1986.

HS/G 34 The storage of LPG at fixed installations 1987.

CS 6 The storage and use of LPG on construction sites 1981.

Code of Practice

Approved Code of Practice for the control of lead at work Regulations 1980 (in support of Statutory Instrument No. 1248) Revised 1985.

A.2 Other publications

ACGIH Committee on Industrial Ventilation 1978. *Industrial Ventilation. A manual of recommended practice.* 15th ed. American Conference of Government Industrial Hygienists, Lansing, Michigan, USA.

SAX. N.I. *Dangerous Properties of Industrial Materials.* 8th ed. Van Nostrand Reinhold, 1992.

[1] Liquefied petroleum gas.

List of references (see clause 2)

Normative references

BSI publications

BRITISH STANDARDS INSTITUTION, London

BS 7258, *Laboratory fume cupboards.*

BS 7258-1:1994, *Specification for safety and performance.*

Informative references

BSI publications

BRITISH STANDARDS INSTITUTION, London

BS 476, *Fire tests on building materials and structures.*

BS 952, *Glass for glazing.*

BS 952-1:1978, *Classification.*

BS 1449, *Steel plate, sheet and strip.*

BS 1449-2:1983, *Specification for stainless and heat-resisting steel plate, sheet and strip.*

BS 5139:1991, *Method of specifying general purpose polypropylene and propylene copolymer materials for marking and extrusion.*

BS 5345, *Code of practice for selection, installation and maintenance of electrical apparatus for use in potentially explosive atmospheres (other than mining applications or explosive processing and manufacture).*

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Other references

[1] Great Britain. Health and Safety at Work etc. Act 1974. London: HMSO.

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[5] Health and Safety Executive guidance note EH 40/93 Occupational exposure limits 1993 (HSE).

Other HSE and other publications (see annex A).

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