

Laboratory fume cupboards —

Part 1: Specification for safety and performance

UDC 542.19: | 614.8.004.15 | :006.3.8

NO COPYING WITHOUT BSI PERMISSION EXCEPT AS PERMITTED BY COPYRIGHT LAW



Document Sharing Hub

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Laboratory Apparatus Standards Policy Committee (LBC/-) to Technical Committee LBC/18, upon which the following bodies were represented:

- 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
- Royal Society of Chemistry
- Universities Safety Association
- Coopted members

This British Standard, having been prepared under the direction of the Laboratory Apparatus Standards Policy Committee, was published under the authority of the Standards Board and comes into effect on 15 April 1994

© BSI 01-1999

First edition, May 1990
Second edition April 1994

The following BSI references relate to the work on this standard:
Committee reference LBC/18
Draft for comment 92/57859 DC

ISBN 0 580 22703 0

Amendments issued since publication

Amd. No.	Date	Comments

Contents

	Page
Committees responsible	Inside front cover
Foreword	ii
Introduction	1
1 Scope	1
2 References	1
3 Definitions	2
4 General safety	3
5 Materials of construction	5
6 Services	5
7 Performance	5
8 Type test report	8
9 Certificate of compliance with type test	8
Annex A (informative) Design criteria	9
Annex B (normative) Performance type testing	9
Annex C (normative) Commissioning tests	12
Annex D (informative) Method for determining average face velocity with reduced accuracy for routine maintenance purposes	13
Figure B.1 — Permitted grid point separations	11
Figure D.1 — Grid positions over the maximum working aperture for air velocity measurements taken at corners of each cell: example if $n = 3$ (see D.3.1)	14
Figure D.2 — Method of recording and averaging anemometer readings	14
Table 1 — Materials of construction	7
List of references	Inside back cover

Foreword

This Part of BS 7258 has been prepared under the direction of the Laboratory Apparatus Standards Policy Committee and supersedes BS 7258-1:1990 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.

The changes made by this new edition include the following:

- a) changes to the measurement grid for both the type test and the commissioning test, making the grid for the latter a subset of the grid for the former, thereby facilitating direct comparison (see 7.1.4);
- b) the addition of annex D, describing a method for the determination of average face velocity with reduced accuracy for routine maintenance.

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.*

The minimum level of performance of a fume cupboard is established by a performance type test, the procedure of which assesses the pattern and quality of air flow on the basis of measurements of air velocities in the plane of the sash opening.

It is recognized that a fume cupboard producing the required minimum level of performance when tested by the type test procedure may not perform adequately unless installed in a proper manner. Requirements for air flow of the installed fume cupboard are specified to establish that the minimum performance in the type test has not deteriorated after installation.

The performance type test will not allow discrimination between different levels of performance. The minimum level of performance may not be appropriate for some users and, in particular, higher levels of performance may be desired. It is not possible for more than one “minimum” level of performance to be accommodated within this specification and therefore a classification into different grades on the basis of performance has not been proposed.

Part 4 of BS 7258 describes a method recommended for containment testing. Acquisition of data using this and related methods (see the foreword of Part 4) should enable the Technical Committee to establish whether a further specification of performance, based on the results of such testing, is feasible. However, the further development of fume cupboard standards in EC/EFTA countries is likely to be undertaken by the European Committee for Standardization (CEN), rather than by national standards bodies.

Where it is known for particular fume cupboards that the rates of release of hazardous gases and vapours are low, or where the fume cupboards are used intermittently and then only for short periods, the performance type test procedure may be too stringent. In such situations, the requirements of this Part of BS 7258 are not applicable and reference should be made to other appropriate standards such as Design Note 29 *Fume cupboards in schools* [1] issued by the Department for Education. The recommendations found in Part 2 and Part 3 of BS 7258 may, however, be relevant.

Whenever a fume cupboard is used, it will be necessary for the purchaser/user to assess the hazards associated with the materials to be manipulated to ensure that the fume cupboard is satisfactory for its intended purpose and that current exposure limits for toxic substances are not exceeded.

Product certification. Users of this British Standard are advised to consider the desirability of third party certification of product conformity with this British Standard based on testing and continuing product surveillance which may be coupled with assessment of a supplier's quality systems against the appropriate Part of BS 5750.

Enquiries as to the availability of third party certification schemes are forwarded by BSI to the Association of Certification Bodies. If a third party certification scheme does not already exist, users should consider approaching an appropriate body from the list of Association members.

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 to iv, pages 1 to 16, 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

Introduction

The performance of a fume cupboard may be expressed conveniently in qualitative terms as the ability to entrain a pollutant or pollutants (released from a definitive source within the operational zone) within the inward flow of air and to remove the pollutant(s) with no hazardous risk to the user and with the minimum susceptibility to perturbing influences. Perturbing influences include cross draughts, the effect of laboratory make-up air supply jets, operator movement, etc. The combined effects of entrainment and removal result in the containment of fume by a fume cupboard, which is the primary function of this type of protective device.

The patterns of flow within a fume cupboard are very complex and impossible to predict under all circumstances. In general, it is considered desirable for flow to attach to a boundary surface and to pass smoothly over it in preference to flow separation which may produce zones of local flow reversal and eddies. The effectiveness of scavenging of the main working zone of a fume cupboard is critically dependent on the positioning and the relative sizes of components such as back baffles or extract slots. The inward flow of air into a fume cupboard is the mechanism by which the operator is usually protected. It is the nature, quality and stability of flow through a fume cupboard which characterizes the performance of a fume cupboard.

1 Scope

1.1 This Part of BS 7258 specifies minimum safety requirements for general purpose laboratory fume cupboards and describes the methods of test to be used to determine their performance.

1.2 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. or for work where large quantities of heat are released.

NOTE 1 Large quantities of heat create convection currents that adversely affect performance.

This Part of BS 7258 is applicable to fume cupboards for some special applications but such fume cupboards will also have to comply with additional requirements, appropriate to specific hazards of the particular application, which are not covered in this specification.

NOTE 2 Attention is drawn to the provisions of the following regulations.

- a) The Control of Substances Hazardous to Health Regulations 1988 (Statutory Instrument No. 1657)[2] and associated Approved Codes of Practice. Fume cupboards should be regarded as local exhaust ventilation equipment for the purposes of these Regulations.

- b) The Ionizing Radiations Regulations 1985 (Statutory Instrument No. 1333) [3] made under the Health and Safety at Work etc. Act 1974 and any other subsequent regulations made under that Act.

- c) Highly Flammable Liquids and Liquefied Petroleum Gases Regulations 1972 (Statutory Instrument No. 917) [4] (which were made under the Factories Act 1961) and in particular Regulation 10(2). Even when the regulations do not apply to particular premises, the standards they describe should be used as a guide.

- d) The Electricity at Work Regulations 1989 [5]. These regulations may not apply to all premises but the standards described will be a useful guide.

1.3 This Part of BS 7258 is not applicable to microbiological safety cabinets (see BS 5726).

1.4 This Part of BS 7258 is not applicable to specially designed fume cupboards of the following kinds:

- a) "walk in" fume cupboards;
- b) recirculating fume cupboards;
- c) mobile fume cupboards not installed or operated in a manner complying with **3.2** and **3.4** of BS 7258-2:1994;
- d) fume cupboards for demonstrating experiments;
- e) fume cupboards for the storage of chemicals;
- f) industrial and continuous production process enclosures;
- g) fume cupboards with openings on more than one side;
- h) fume cupboards with a direct make-up air supply.

NOTE Design criteria for laboratory fume cupboards are given in annex A.

2 References

2.1 Normative references

This Part of BS 7258 incorporates, by reference, provisions from specific editions of other publications. These normative references are cited at the appropriate points in the text and the publications are listed on page 20. Subsequent amendments to, or revisions of, any of these publications apply to this Part of BS 7258 only when incorporated in it by updating or revision.

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 following definitions apply.

3.1

area of the opening

product of the width of the opening (3.19) and the height of the opening (3.11) in the plane of the sash

NOTE No correction is made for the thickness of any airfoil or equivalent device.

3.2

back baffle

rear baffle situated between the working space and the point of connection to the extract system with the purpose of minimizing the variation of face velocity over the working aperture and encouraging scavenging action throughout the fume cupboard chamber (See 4.4.)

3.3

bypass

arrangement that allows air to flow into a fume cupboard by a route other than through the working aperture, with the objective of preventing excessively high face velocities at low sash openings and allowing a nearly constant total extract rate irrespective of sash position

3.4

chamber

volume inside a fume cupboard above the work surface bounded by the plane of the sash at the front, by the back baffle or rear wall, by the side walls and by the internal ceiling of the fume cupboard

3.5

direct make-up air

air fed directly to the fume cupboard

3.6

extract system

all ductwork and associated equipment installed between the point of connection to the fume cupboard and the point of discharge

3.7

extract volume flow rate

quantity of air extracted per unit time from the fume cupboard

NOTE For the purposes of testing, the minimum required extract volume flow rate is established with the sash set at the normal sash working height.

3.8

face velocity

velocity of air passing through the working aperture measured in the plane of the sash

3.9

fume

gases, vapours, aerosols or particulate materials in air, constituting one or more of the following hazards:

- a) toxicity (all injuries to health including asphyxiation, allergy, narcosis);
- b) flammability (including risks of explosion);
- c) chemical activity (including corrosion);
- d) radioactivity;
- e) discomfort, e.g. lachrymosis, objectionable odours.

NOTE In the field of environmental pollution, fume is defined as an aerosol of solid particles, usually from metallurgical processes, generated by condensation from the gaseous state generally after volatilization from melted substances and often accompanied by chemical reactions such as oxidation.

3.10

fume cupboard

partially enclosed work space that limits the spread of fume to operators and other personnel. It is ventilated by an induced flow of air through an adjustable working aperture that dilutes the fume and, by means of an extract system, provides for the release of fume remotely and safely

3.11

height of the opening

distance between the lower surface of a solid sash handle and the upper surface of the work surface (or raised anti-spill lip) in the plane of the sash at the normal sash working height. For a fume cupboard fitted with an airfoil on the sash handle, the upper limit is taken as the lower surface of the solid part of the sash handle in the plane of the sash. For a fume cupboard fitted with a lower lip foil, the lower limit is taken as the upper surface of the work surface or anti-spill lip in the plane of the sash

NOTE No allowance is made for the thickness of any airfoil or equivalent device.

3.12

laboratory make-up air

air that replaces the air entering the fume cupboard from the laboratory

3.13

maintenance sash height

maximum height of the sash which is reachable by overriding the stop device (see 3.14)

NOTE It is used only for cleaning and maintenance purposes, and for setting up apparatus.