

Australian/New Zealand Standard™

Safety in laboratories

Part 9: Recirculating fume cabinets



AS/NZS 2243.9:2009

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Australian Institute of Occupational Hygienists
CSIRO
Department of Labour, New Zealand
Department of Primary Industries, Vic.
Ministry of Agriculture and Forestry, New Zealand
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Department of Consumer and Employment Protection, WA
Recirculating fume cabinet manufacturers/suppliers
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Australian/New Zealand Standard™

Safety in laboratories

Part 9: Recirculating fume cabinets

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PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee CH-026, Safety in Laboratories, to supersede AS/NZS 2243.9:2003. It was originally prepared as a result of a request from the Royal Australian Chemical Institute and other organizations for a Standard covering minimum safety requirements for recirculating fume cabinets.

The main changes made to the Standard in preparing this edition are as follows:

- (a) The requirement for the average face velocity to be 0.5 m/s has been replaced with this being the minimum average face velocity and a requirement for individual face velocity readings to be at least 0.3 m/s.
- (b) The recommendation for fan motors to be of brushless and sparkless design has been converted to a requirement for fan motors that are installed in the air stream.
- (c) The requirements and recommendations concerning siting of recirculating fume cabinets have been modified to reduce the likelihood of airflow disturbances at the working aperture.
- (d) The performance and calibration requirements for the anemometer used for face velocity testing have been clarified.

Other Standards in the series promoting safety in laboratories are as follows:

Part 1: Planning and operational aspects

Part 2: Chemical aspects

Part 3: Microbiological aspects and containment facilities

Part 4: Ionizing radiations

Part 5: Non-ionizing radiations—Electromagnetic, sound and ultrasound

Part 6: Mechanical aspects

Part 7: Electrical aspects

Part 8: Fume cupboards

Part 10: Storage of chemicals

The terms ‘normative’ and ‘informative’ have been used in this Standard to define the application of the appendix to which they apply. A ‘normative’ appendix is an integral part of a Standard, whereas an ‘informative’ appendix is only for information and guidance.

CONTENTS

	<i>Page</i>
FOREWORD.....	5
SECTION 1 SCOPE AND GENERAL	
1.1 SCOPE	6
1.2 OBJECTIVE.....	6
1.3 REFERENCED DOCUMENTS	6
1.4 DEFINITIONS	7
SECTION 2 TYPES, SERVICES AND COMPONENTS	
2.1 TYPES OF RECIRCULATING FUME CABINETS.....	9
2.2 LIMITATIONS OF USE	10
2.3 SERVICES	10
2.4 FILTERS	11
SECTION 3 DESIGN AND MATERIALS OF CONSTRUCTION	
3.1 GENERAL	12
3.2 RECIRCULATING FUME CABINET MATERIALS.....	12
3.3 FILTER HOUSING/CASING	14
3.4 RECIRCULATING FUME CABINET DESIGN.....	14
SECTION 4 AIRFLOW, FUME FILTRATION AND VAPOUR ABSORPTION	
4.1 REQUIREMENTS FOR AIRFLOW INTO THE RECIRCULATING FUME CABINET.....	15
4.2 FUME FILTRATION AND ABSORPTION	16
SECTION 5 SITING AND COMMISSIONING	
5.1 SITING.....	17
5.2 COMMISSIONING TESTS	18
SECTION 6 RECOMMENDATIONS AND REQUIREMENTS FOR USE OF RECIRCULATING FUME CABINETS	
6.1 RISK ASSESSMENT PROCESS	20
6.2 GENERAL PROCEDURES	20
6.3 BEFORE USE	21
6.4 DURING USE	21
6.5 AFTER USE	22
6.6 IDENTIFYING FILTER SATURATION.....	22
6.7 FIRE PRECAUTIONS	24
SECTION 7 SERVICING AND MAINTENANCE	
7.1 GENERAL	25
7.2 LOG BOOK.....	25
7.3 CLEANING.....	25
7.4 FILTER CHANGE	25
7.5 MAINTENANCE SCHEDULE.....	26

APPENDICES

A	METHOD FOR CONDUCTING A SMOKE TEST	27
B	METHOD FOR DETERMINING FACE VELOCITY	30
C	EXAMPLE CHECKLIST AND REPORT FORM.....	32

FOREWORD

Recirculating fume cabinets rely on filtration or absorption to remove airborne contaminants released in the cabinet, so that the exhaust air may be safely discharged back into the laboratory atmosphere. Recirculating fume cabinets are suitable for light to moderate use with a limited range of substances. The range of substances for which each cabinet can be used is limited by the need for compatibility with the particular type of absorber or filter fitted to the cabinet.

STANDARDS AUSTRALIA/STANDARDS NEW ZEALAND

Australian/New Zealand Standard**Safety in laboratories****Part 9: Recirculating fume cabinets**

SECTION 1 SCOPE AND GENERAL

1.1 SCOPE

This Standard specifies safety requirements and gives recommendations for the design, manufacture, use and maintenance of recirculating fume cabinets and the test methods to determine their performance.

NOTE: Requirements for fume cupboards (which extract air to the outside atmosphere) are set out in AS/NZS 2243.8.

1.2 OBJECTIVE

The objective of this Standard is to provide manufacturers of recirculating fume cabinets with design and performance requirements for the cabinets and their filtration systems, and users with requirements and recommendations for their appropriate selection, safe use and maintenance.

1.3 REFERENCED DOCUMENTS

The following documents are referred to in this Standard:

AS

- 1807 Cleanrooms, workstations, safety cabinets and pharmaceutical isolators—Methods of test
- 1807.20 Part 20: Determination of sound level at installed workstations, safety cabinets and pharmaceutical isolators
- 2252 Biological safety cabinets (series)
- 2444 Portable fire extinguishers and fire blankets—Selection and location
- 4260 High efficiency particulate air (HEPA) filters—Classification, construction and performance

AS/NZS

- 1530 Methods for fire tests on building materials, components and structures
- 1530.3 Part 3: Simultaneous determination of ignitability, flame propagation, heat release and smoke release
- 1826 Electrical equipment for explosive gas atmospheres—Special protection—Type of protection 's'
- 2208 Safety glazing materials in buildings
- 2243 Safety in laboratories
- 2243.8 Part 8: Fume cupboards
- 2647 Biological safety cabinets—Installation and use
- 3000 Electrical installations (known as the Australian/New Zealand Wiring Rules)

Commonwealth of Australia
National Measurement Act 1960

EN

13792 Colour coding of taps and valves for use in laboratories

NOHSC (National Occupational Health and Safety Commission)

1003 Adopted National Exposure Standards for atmospheric contaminants in the occupational environment

1008 Approved criteria for classifying hazardous substances

New Zealand

Measurement Standards Act 1992

Workplace Exposure Standards

1.4 DEFINITIONS

For the purpose of this Standard, the definitions below apply.

1.4.1 Access window

A transparent safety screen that is positioned between the working chamber and the operator for personal protection during use; and can be temporarily moved out of the way to permit bulky equipment to be loaded into the recirculating fume cabinet (see also definition for sash, Clause 1.4.13).

1.4.2 Negative air pressure

Air pressure lower than the immediate environment external to the cabinet.

1.4.3 Calibrated

Tested against equipment traceable to standards of physical measurement in accordance with the *National Measurement Act 1960* for Australia or the *Measurement Standards Act 1992* for New Zealand.

1.4.4 Carcinogen

A substance that, through exposure, can cause the development of cancer.

NOTE: There are three recognized categories of carcinogenic substances: Category 1, proven, Category 2, suspected and Category 3, possible carcinogen. See NOHSC 1008.

1.4.5 Competent person

A person who has acquired through training, qualifications or experience, or a combination of these, the knowledge and skills enabling that person to safely perform a specific task.

1.4.6 Exposure standard

An airborne concentration of a particular substance in the worker's breathing zone, exposure to which, according to current knowledge, should not cause adverse health effects nor cause undue discomfort to nearly all workers.

NOTE: This is the basic definition used in NOHSC 1003. See NOHSC 1003 for Australia and the Department of Labour *Workplace Exposure Standards* for New Zealand for further information on exposure Standards and their use.

1.4.7 Face velocity

The velocity of the air passing through the working aperture measured in the plane of the same aperture (face).

1.4.8 Fume (as used in the term 'recirculating fume cabinet')

Gases, vapours, aerosols or particulate materials in air.

1.4.9 HEPA filter

A high-efficiency particulate air filter complying with AS 4260.

1.4.10 Make-up air

Air needed to replace that taken from the room by laboratory fume cupboards and other air-exhausting devices.

1.4.11 May

Indicates the existence of an option.

1.4.12 Recirculating fume cabinet

A partially enclosed workstation that contains fume to prevent human exposure, is ventilated by an induced airflow through a working aperture and, by means of a filtration or absorption system, filters specific contaminants and returns the exhaust air to the laboratory.

1.4.13 Sash

A transparent safety screen in the working aperture of a recirculating fume cabinet, which can be positioned between the working chamber and the operator for protection, and adjusted either vertically or horizontally to vary the size of the working aperture and the velocity of the air through it.

1.4.14 Services

Supplies of illumination, electricity, water, vacuum, compressed air, gas or other special requirements, to the recirculating fume cabinet.

1.4.15 Shall

Indicates that a statement is mandatory.

1.4.16 Should

Indicates a recommendation.

1.4.17 Sump

A recess in the base of a recirculating fume cabinet capable of containing liquids spilled within the recirculating fume cabinet. The sump may be connected to a drain or a closed receptacle.

SECTION 2 TYPES, SERVICES AND COMPONENTS

2.1 TYPES OF RECIRCULATING FUME CABINETS

2.1.1 General

Although there is a variety of recirculating fume cabinets available, their designs are generally categorized as either the up-draught type or the down-draught type.

2.1.2 Up-draught cabinets

The up-draught design is the most common type of recirculating fume cabinet because it is the simplest and most versatile design. The base unit is similar in design to a ducted fume cupboard; it has a head unit mounted on top of the base containing the pre-filters, main filter and the fan, which exhausts through the top of the unit (see Figure 1(a)). Operator access to the working chamber is through a transparent adjustable access window or sash which protects the operator from splashes during use and helps to keep the operator's face in a clean air zone.

An open-based recirculating fume cabinet is a variant of the up-draught design that permits location over existing services such as a laboratory bench, sink or gas outlet. The cabinet should be structurally strong and stable and should be carefully sited to ensure adequate performance.

2.1.3 Down-draught cabinets

A down-draught recirculating fume cabinet directs the airstream across or down through the base of the cabinet. This type of cabinet may be more suitable for applications where the fumes are denser than air (see Figure 1(b)).

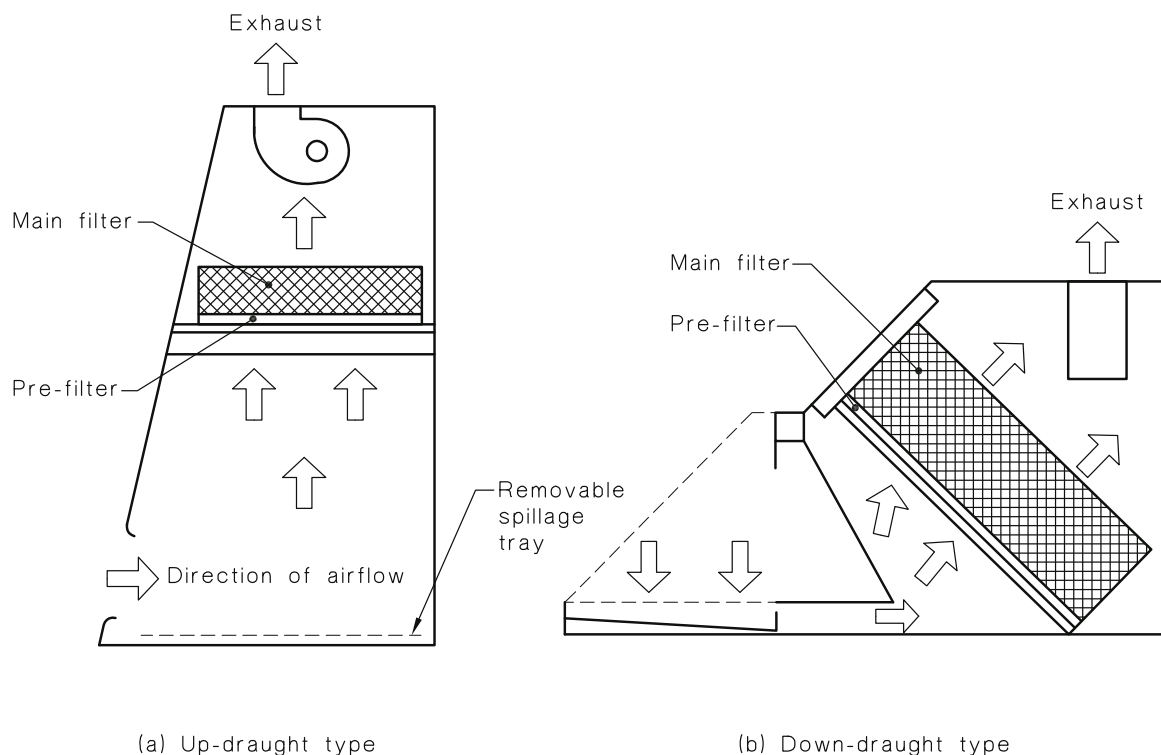


FIGURE 1 RECIRCULATING FUME CABINET TYPES

2.2 LIMITATIONS OF USE

The recirculating fume cabinet shall not be used in the following circumstances (see also Clauses 6.2, 6.6.2.3 and 6.6.2.4):

- (a) For work with organic solvents which are only physically absorbed on the absorber and the solvents—
 - (i) have boiling points less than 75°C; and
 - (ii) are evaporated in quantities of more than 50 mL per day.
- NOTE: Fume from these organic solvents can be insufficiently delayed on the filter unless chemisorption takes place, i.e. a chemical reaction between the absorbent and the solvent fume.
- (b) Where more than 50 mL of corrosive liquids are involved in a reaction or process that generates fumes.
 - (c) Where perchloric acid digestions are carried out.
 - (d) Where other acid digestions are carried out except where these are conducted in closed systems.
 - (e) Where infectious organisms are handled (see AS/NZS 2647 and AS 2252).
 - (f) Where Category 1 and Category 2 carcinogens (see NOHSC 1008), except those which are chemisorbed by the filter, are used.
 - (g) Where radioactive materials exceeding ten times the annual limit of intake for inhalation* are used.
 - (h) Where temperature and humidity extremes can affect filter operation. See Section 5.

2.3 SERVICES

2.3.1 General

Recirculating fume cabinets that are either portable or trolley-mounted need special consideration to prevent problems associated with the provision of services such as gas, water and electricity. Such problems include undue pressure on service lines and cables and access to drainage. Provision should be made to restrict the pressure that can be put on service lines. Trolley-mounted recirculating fume cabinets may be fitted with a sump that can be drained for disposal. When such a sump is fitted, the level of liquid in the sump shall be readily apparent to the operator and the recirculating fume cabinet shall display a warning label specifying the spillage containment volume of the recirculating fume cabinet.

2.3.2 Services to open-based recirculating fume cabinets

An open-based cabinet should be placed only over existing services that conform to the appropriate laboratory services standards.

2.3.3 Electrical services

The electrical services, equipment and controls in recirculating fume cabinets shall be in accordance with AS/NZS 3000.

Where the cabinet is trolley-mounted, the inlet power lead shall be detachable from the main cabinet by means of a jack system, in order to reduce the chance of the trolley being pulled over if moved while connected to the electrical outlet.

* INTERNATIONAL COMMISSION ON RADIOLOGICAL PROTECTION. ICRP-68, *Dose coefficients for intakes of radionuclides by workers*. Oxford: 1995.

2.3.4 Other services

If provided, the outlets to other services (e.g. gas, water) should be located on the inner surface of the cabinet. Service outlets shall be labelled to indicate the service type. The outlets should be colour coded to match control valves in accordance with EN 13792.

2.3.5 Controls

Each service outlet shall be individually controlled. The controls for all services provided should be located on the outer surface of the cabinet or supporting structure. Control equipment, such as knobs or handles, should not protrude beyond the line of the face of the cabinet or its supporting structure. Controls shall be labelled to indicate the service type. Controls shall be unambiguously associated with their outlets. Controls should be colour coded in accordance with EN 13792.

2.3.6 Lights

Lights in the recirculating fume cabinet shall be capable of providing an illumination at the work surface of not less than 400 lux, and shall be either—

- (a) located outside the working chamber behind a sealed transparent or translucent panel; or
- (b) a flameproof, corrosion-proof light installed inside the recirculating fume cabinet (see AS/NZS 1826).

2.4 FILTERS

2.4.1 General

Recirculating fume cabinets shall be fitted with a main filter system. The main filter system may be single or multiple filters, usually treated activated carbon or other absorbent, a HEPA filter, or a combination of these. The main filter(s) used in the recirculating fume cabinet shall be suitable for absorbing the type of fumes being generated in the cabinet.

NOTE: Where a HEPA filter is fitted, a manometer may be included to monitor pressure drop due to loading on the filter.

The recirculating fume cabinets may also be fitted with a pre-filter to reduce the deposition of particulate matter on the main filter(s).

2.4.2 Supply of filters

The filters shall be sealed at manufacture and be able to be clearly identified through the seal to ensure the use of the correct filter material and to minimize absorbance of contaminants for the atmosphere.

2.4.3 Identification of fitted filter(s) in use

When the filter is in use, it shall be able to be unequivocally identified so that the operators are aware of the absorption capabilities and can take appropriate operational precautions. A reference manual, indicating the substances with which the filter material is suitable for use, shall be available.