



AIR FILTER SELECTION & SERVICE GUIDE

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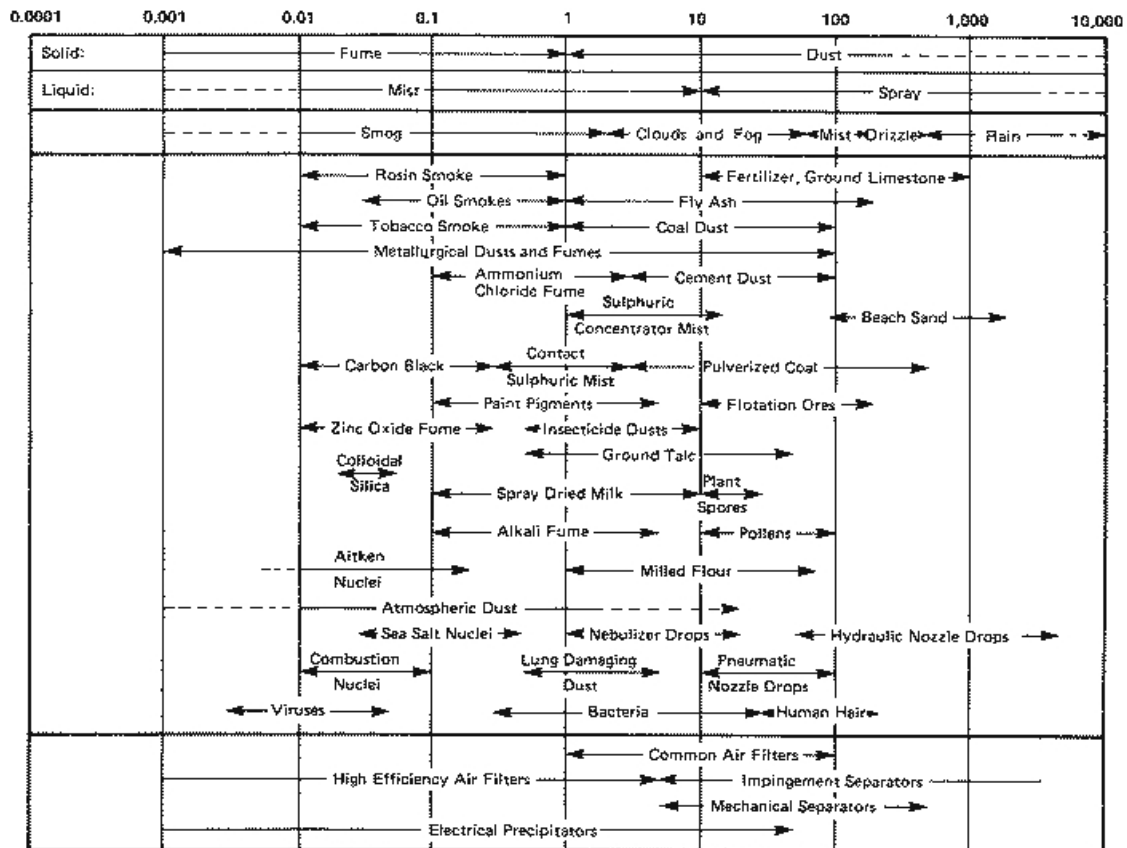
Introduction

This guide provides practical information to building owners, managers and consultants on the selection and application of air filters in commercial, retail, institutional and industrial buildings¹. In addition, it will assist OH&S administrators to meet work place safety laws by ensuring air cleaning standards are maintained within their facilities and OH&S risks minimised. Atmospheric contaminants are identified in OHS Regulation 2001 as a health hazard so ensuring appropriate filtration standards are applied is critical.

The level of air cleaning required in a building will vary depending on the occupants' needs and the processes taking place in the building. Not only does the removal of atmospheric contaminants protect building occupants, but it also protects stock stored in the building and the architectural features of the building. Finally, maintaining clean air handling plant and heat exchangers will ensure on-going energy costs are kept to a minimum.

What's in the Air?

LOGARITHMIC SCALE OF PARTICLE DIAMETERS IN MICRONS



¹ This guide does not deal with the removal of odours and gaseous substances or high volume product dust from industrial processes, which require specialised equipment.

² The Australian Institute of Refrigeration Air-Conditioning & Heating – Air Filters Application Manual.

Solid particles of soot, carbon matter, ashes, earth, sand and silica materials, fibres, road dirt and other animal, vegetable and mineral substances. Mould spores, bacteria, viruses, pollens and volatile organic compounds may also be present.² Some of these substances are known carcinogens and asthma triggers.

Effects of airborne particles

Health effects resulting from poor indoor air quality vary with individual cases, however minimising the levels of airborne particulate will minimise the risk to health. Some well known ailments exacerbated by poor air quality include itchy and watery eyes, sneezing, itchy throat, wheezing, asthma, as well as the spread of infections such as influenza, colds, measles and mumps. Reducing the number of airborne particles through the use of high efficiency air filtration will minimise this risk.

Poor air filtration will also affect the ventilation system itself. High levels of dust contamination will lead to increased duct cleaning costs, increase the risk of corrosion and accelerate refurbishment costs to architectural features. Poor air filtration also reduces heat exchanger efficiency resulting in higher energy inputs and therefore greater operating costs.

Air Filter Standards

As a general guide, Australian Standards are a useful guide to minimum performance standards. Care should be taken when applying minimum standards that they are appropriate to the air quality needs of the building.

Relevant Australian standards and specifications commonly referred to are;

AS1324 parts 1,2 (Air Filters for use in general ventilation and air-conditioning),
AS1668 part 2 (The use of mechanical ventilation and air-conditioning in buildings),
and
AS/NZ 3666.parts 1,2 (Air Handling and Water Systems of Buildings)

Filter Classification - Performance Ratings

The following performance table is found in AS1324 Part 1.2001 and is in common use internationally. It classifies the filter by efficiency and is derived from test results carried out in a certified air filter-testing laboratory.

For most air-handling and air conditioning applications, results from testing with Test Dusts No.1 and No.4 define the performance of an air filter. These test requirements are consistent with tests carried out to US standard ASHRAE 52.1 and European standard EN 779.

Test Dust No.1 tests the ability of an air filter to catch particles of a sub micrometre nature. Test Dust No.4 tests the arrestance (how easily it becomes blocked) of an air filter and is a guide to its likely service life. ASHRAE 52.2 and/or EN779 removal efficiency by Particle Size standards provide a useful method of evaluating filtering applications given the particle size of the contaminant. AS1324.2 notes that special test dusts numbers 2 & 3 are not suitable for testing air-conditioning filters.

AIR FILTER SELECTION CHART

Filter Class	Average Arrestance AS1324.2 Dust No.4	Average Efficiency (%) AS1324.2 Dust No.1	Maximum Final Resistance Pa
	ASHRAE 52.1 Eurovent 4/5 EN779 Gravimetric	ASHRAE 52.1 Eurovent 4/5 EN779 Atmospheric	
G1	A < 65		250
G2	65 ≤ A < 80		250
G3	80 ≤ A < 90		250
G4	90 ≤ A		250
F5		40 ≤ E < 60	450
F6		60 ≤ E < 80	450
F7		80 ≤ E < 90	450
F8		90 ≤ E < 95	450
F9		95 ≤ E	450

* **NOTE:** Filters which are tested with a minimum efficiency of less than 20% shall only be rated as G type arrestance filters.

Most commercial building air handling systems require air filtration with the following efficiencies:

- Test dust No. 1: 20% (minimum) @ 250Pa.
- Test dust No 1: 20% to 40% (average) @ 250 Pa.

AS1324 Filter Types

Type 1

Dry, eg. Woven or non-woven fabrics, which when unused feel dry.

Type 2

Viscous impingement, eg. Woven or non-woven oil or gel coated fabrics, including metal-viscous filters.

Type 3

Electrostatic precipitators.

AS1324 Filter Classes

Class A

Fully disposable (entire cell replaced, including frame).

Class B

Replaceable media (reusable frame).

Class C

Reusable media and frame (after cleaning).

Class D

Self-renewable (in respect of media advancement and cleaning).

Example: Supply Type 1, Class B multi pocket bag filter.

AS/NZ 3666.1 recommends filter performance of more than 20% to No 1 dust and 85% to No 4 dust. Filter classes G1, G2 and some G3 do not meet this recommendation.

Labelling

AS1324 requires all air filters to be labelled with a filter performance rating together with the manufacturers / distributors details.

Testing

In order to ensure compliance to the filter performance rating of any product AS1324 recommends that all products are tested at least every five years and that the air filter media used be tested at least every year. No laboratory test older than five years should be accepted as proof of a **filter performance rating**.

Filter Selection

Property grade will also affect the quality of filters chosen. The following table is the AREMA recommended filter classification for Property Council of Australia (1999 Benchmarks Handbook) building grades.

PCA Grade*	A.R.E.M.A. Minimum recommended filter classification
Premium	F7
A	F7
B	F6
C	F5
D	G4

* Property Council of Australia Benchmarks Handbook.

Filter Selection Steps

When selecting air filters using the above classification table, you should also consider:

- Air flow capacity of system
- final resistance of your filter system between servicing

- Arrestance dust holding capacity
- Filter life
- Comparison of filters should be made at the same final pressure drop i.e. 250, 375 or 450 Pascals.

Other important considerations when selecting your air filter system include:

- Use of prefilters to extend final filter life
- Optimising the surface area of the filter system
- Access for filter replacement and routine service
- Suitability of filter materials and construction for the service conditions

Installation

Pointers to good installation of filters include:

- filter banks sealed between filters and frames to prevent leakage and stiffened to prevent flexing.
- for slide access filters, filter and service doors sealed to prevent air leakage and fitted with sash clamp type catches.
- a permanent notice fixed to the wall near the filter identifying its type and performance rating.
- filter bank installed on a 100 mm high plinth.
- any temporary pre-filter media are removed before commissioning.

Measuring in-service filter performance

Manometers provide a measure of differential pressure across each filter bank. A differential pressure gauge unit, for example a 100mm dial type diaphragm gauge, is suitable. The gauge scale should be calibrated so that full-scale deflection is no more than twice the maximum reading for a dirty filter condition. The gauge should be located outside the filter unit casing in a readily readable location.

Maintenance

Servicing

- Ensure suitable and safe access is provided for air filter inspection & replacement.
- All food preparation areas should be located away from filter service points.
- Air conditioning plant located at height require State OH&S organisation approved ladders, platforms and harness points.

Cleaning

- Washable filters should not be washed on site. Only companies with wastewater treatment facilities which comply with State regulations are able to service washable filters. Many filter service companies are licensed and will remove the filters from site and wash them in their premises.
- A copy of any Trade Waste Agreement should be kept on file to mitigate off site liability under State Environmental Protection Regulations.

Operation and maintenance manual

- Each different filter bank should have an operation and maintenance manual which includes information on performance ratings, replacement filter part numbers and sizes.

References and Website Links

World Health Organisation www.who.int
 US Environmental Protection Agency www.epa.gov
 National Air Duct Cleaning Association www.nadca.com
 US Indoor Air Quality Association www.iaga.org
 American Society of Heating, Refrigeration and Conditioning Engineers
www.ashrae.org
 American Lung Association www.lungusa.org
 Australian Institute of Refrigeration, Air Conditioning and Heating
www.airah.org.au
 CSIRO www.csiro.gov.au
 Clean Air Society of Australia and NZ www.casanz.org.au
 "Indoor Air Quality in Australia, A Strategy for action" The Clean Air Society of
 Australia and New Zealand May 2003 www.casanz.org.au
 State OHS Regulations
 "Air Filter Applications Manual" DA15 AIRAH 1998
 "AIRAH's Reference Guide to AS 1668.2 - Indoor Air Quality" www.airah.org.au
 Property Council of Australia (PCA) previously BOMA www.propertyoz.com.au
 "National Guide to Air Filtration" National Air Filtration Association (NAFA)
www.nafahq.org

(For further information see