



Module Outline

Welcome to the AIRAH 'Air Filters in HVAC&R' course

This course is designed to familiarise participants with the application of air filtration for HVAC systems in buildings.

The purpose of this course is to provide participants with the information required to assist in designing, selecting installing and operating air filter systems. It involves

- identifying the various types of air filters available and their typical uses,
- the selection of the appropriate air filter for a specific application, and
- how to utilise standard air filter test reports and performance criteria.

It also looks at how deficient filter system performance is created and discusses ways to prevent and/or rectify this.

This course covers particulate filters and particle filtration only. Filters and air cleaning devices for removing odours, solvents, volatile organic compounds (VOC) and gasses are not covered.

How to Work Through this Course:

You are able to navigate through the course content by using the navigational arrows in the course content or the table of contents in the side bar. You can return to the main menu at any time by using the link provided in the table of contents

Assessment overview etc

For every one of the Topics in this course, there is a self-assessment section. You need to complete this assessment (which may entail reading articles, visiting websites or referring to one of the reference texts), to demonstrate your knowledge and competency. There are multiple self-assessments methods used including:

- Multiple choice questions
- Drop and Drag to diagram
- Labelling diagrams and other images
- Performing calculations
- Matching statements with answers

Introduction

This course is designed to familiarise you with the application of air filtration for HVAC systems in buildings.

The purpose of this course is to provide participants with the information required to assist in selecting and installing air filters. It involves identifying the distinct types of air filters and their uses, the selection of the appropriate air filter for a specific application and how to utilise standard air filter test reports and performance criteria.

This course covers particulate filters and particulate filtration only. Filters and air cleaning devices for removing odours, solvents, volatile organic compounds (VOC) and gasses are not covered.

Topic 1: Why use air filters?

- Particulates and the nature of dust
- Respiration of dust and health effects of particulates
- Dust in outdoor air and indoor air
- Indoor air quality. Filters and sick building syndrome,
- Reasons for using air filters

Topic 2: Filter performance characteristics

- Air filter properties
- Theory of filtration
- Air capacity, Resistance
- Filter performance
- Efficiency and arrestance
- Filter selection and energy cost
- Effects of increasing filter bank size

Topic 3: Types of air filters

- AS 1324 classifications
- Filter construction characteristics
- Types of dry air filters

Topic 4: Filter test methods

- national and international filter test standards
- filter classification and rating systems
- Comparing filter ratings
- Filter integrity testing

Topic 5: Designing and selecting filters

- Filter as a system
- Objectives for Filter selection
- Filters and outdoor air requirements
- The filter selection process
- Filters and energy use
- Filter Specifications

Topic 6: Filter installation and maintenance

- Filter arrangement and location
- General filter installation
- Filtering outdoor air
- Filter application in specific building types/end uses

Learning Outcomes

This course looks at the basics of air filter selection and installation. It looks at the reasons air filters are used, the different types of filters available and their performance characteristics, testing methods, as well as their selection and installation for a particular application.

At the completion of this course participants will be able to:

- define the nature of atmospheric dust
- identify common sources of particulate contaminants
- explain particulate material (PM) size classifications
- describe the health effects of dust inhalation
- describe the role of particulate in fungal and bacterial contamination of HVAC
- describe how to identify typical particulate levels in the outdoor air
- describe how to identify particulate level goals for indoor air
- list the link between particulates and HVAC hygiene, and indoor air quality
- recognise the causes of “sick building syndrome”
- list the main reasons for using air filters
- define the four key properties of air filters to consider when selecting air filters
- describe the theory behind particulate air filtration
- explain penetration, adhesion and electrostatic effects
- size a filter bank for required air capacity
- define the relationship between resistance, efficiency and arrestance of an air filter
- estimate the service life of filters
- explain the relationship between filter selection and energy consumption
- describe the effects of increasing filter bank size in relation to system costs
- explain AS 1324 classifications of air filters used in general ventilation and air conditioning
- describe the construction and use of dry air filters
- outline the primary types of dry air filters
- describe the types of filters used in general ventilation and air conditioning
- describe the construction and use of high efficiency filters (HEPA, ULPA)
- describe the construction and operation of electrostatic precipitators
- describe the construction, operation and regulatory requirements of grease filters
- identify the various national and international filter test standards
- describe the standard test methods that apply to filters used in general ventilation and air conditioning
- describe the gravimetric test methods for air filter testing; AS 1324.2, ASHRAE 52.1
- describe the sub-micron methods for air filter testing; AS 1324.2, ASHRAE 52.2, EN 779
- explain the relationship between AS 1324, EN 779, ASHRAE 52.1 and ASHRAE 52.2 filter ratings
- describe the new global harmonised filter testing and classification system; ISO 16890:2016
- describe the standard test methods for HEPA/ULPA air filter testing; AS 4260, ISO 29463, and EN 1822.
- look at filters holistically, as a system rather than a component
- define the objectives to consider when selecting air filters

- describe the link between minimum outdoor air flow rates and particulate air filtration
- explain how particulate air filters can be applied to reduce (or enhance) AS 1668.2 minimum outdoor air ventilation rates
- describe the steps in the filter selection process
- describe typical applications and a method to assess competing proposals/designs
- explain the role of performance in filter selection, tested and ongoing performance
- identify the key issues that relate air filters to system energy use
- Calculate energy impacts and describe Energy Efficiency Classifications
- describe the main regulations in Australia regarding the specification of air filters
- describe the main points when considering filter installations for a range of applications
- identify the requirement of AS/NZS 3666.1 for general filter installation
- list the additional installation considerations for HEPA/ULPA filters
- describe the principals for filtering outdoor air
- identify the considerations for air filter application for various building/end-use types
- describe the installation of air filters in various locations.
- describe procedure for on-site testing of filters
- discuss the key issues regarding filter maintenance