Module Outline

Welcome to the AIRAH 'Duct system design course'

The purpose of this course is to provide participants with the information required to assist in sizing a ductwork system and ensure its efficiency.

This module is designed to provide you with the information

Some prior knowledge and/or experience in basic ductwork design will help ensure participants gain optimum benefit from the course.

How to Work Through this Course:

You can 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

Activities / 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 looks at the basics of ductwork design. Starting from the fundamental objectives for the ductwork system this course explains the pressure losses that occur in a system and how to calculate them. The course steps through the duct design procedures, looks at ways of sizing the system and concludes with an overview of some other aspects of duct design including materials selection, noise, duct sealing/leakage and delivering energy efficient ductwork solutions.

This course is designed to familiarise you with the design, selection, and application of ductwork systems in HVAC applications

This course is broken into seven topics. The topics covered are:

Topic 1: Factors affecting ductwork system design

- Major factors affecting ductwork system design
- Identify the effects of ductwork system layout
- Understand the potential outcomes of poor duct design

Topic 2: Understanding system pressure losses

- Air quantities delivered by a ductwork system
- Pressure in ductwork systems
- Friction losses in a ductwork system

Topic 3: Duct Sizing Methods

- Duct sizing process and the steps involved
- Calculate total system pressure losses for the system
- Constant Pressure Gradient Method

Topic 4: Pressure Loss of Fittings

- Total loss coefficients
- Fitting interaction with air flow

Topic 5: Designing a Ductwork System

- Step-by-step procedure for designing a ductwork system
- System resistance calculations

Topic 6: Other aspects of duct design

- Materials available for duct manufacture
- Noise in ductwork systems
- Duct leakage and energy efficient ductwork systems

Topic 7: Duct design calculation example

- Worked Example – system resistance calculation

Learning Outcomes

At the completion of the course, you will be able to:

- Understand the main objectives for ductwork design
- identify the major factors affecting ductwork system design
- Identify the key features of Australian duct construction standards
- describe typical air handling systems
- identify the design considerations for ductwork system layout
- determine the factors affecting duct layout
- Understand the potential outcomes of poor duct design
- Apply the principles of good duct design
- Describe the features of a good duct layout
- calculate air quantities to be delivered by a ductwork system
- applying diversity to system airflows
- identify the fundamentals of pressure in ductwork systems
- explain the relationship between static pressure, velocity pressure and total pressure
- describe the pressure changes that occur in a duct system
- quantify the pressure changes and friction losses in an air handling system
- use appropriate formulas and charts to determine friction losses in a ductwork system
- define the duct sizing process and the steps involved
- outline the various alternative methods of duct sizing available
- use the constant pressure gradient method for duct sizing
- Identify the index run for an individual system
- calculate total system pressure losses for the system
- read duct selection charts
- convert circular duct to equivalent rectangular duct sizes
- use flexible duct selection charts
- use the alternative Equivalent length duct and fitting pressure loss calculation method
- Identify pressure losses in fittings as a combination of friction losses and dynamic losses
- calculate fitting pressure losses in terms of total and/or dynamic losses
- explain how total loss coefficients are used to calculate fitting pressure losses
- determine total loss coefficient k_T for a range of fittings
- explain the interaction between fittings and the airflow
- demonstrate pressure drop die to interaction between fittings
- define methods to promote laminar flows in duct systems
- outline the step-by-step procedure for designing a ductwork system
- explain the different pressures at play in the duct system
- describe the design differences between round duct and rectangular duct
- Incorporate the pressure drop of ducts, fittings and components in the design considerations
- Explain system resistance calculations, including the ‘index run’ and the ‘system effect’
- Modify system resistances by manipulating the selection of duct size
- list the primary design considerations for supply air outlets

- describe the use of duct sizing tools such as design charts, computer software and manual calculation aids like Ductulators
- outline the “Effective Length” method of calculating the pressure drop within a ductwork system
- Describe the range of materials available for duct manufacture
- Describe the considerations of noise associated with ductwork systems
- Explain noise selection for outlets and noise mitigation within ducts
- Explain the impacts of duct leakage and identify the appropriate test procedures
- Describe how duct design can improve system energy efficiency
- Identify particular requirements for specific duct applications