



Australian Government

MEM23139A Design a basic single zone duct distribution system

Release: 1

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Modification History

Release 1 (MEM05v9).

Unit Descriptor

This unit of competency covers the skills and knowledge required to use air flow and distribution principles used in heating, ventilation, air conditioning and refrigeration (HVAC/R) systems and to identify different system configurations to design a single, one-air distribution system and service related system components.

Application of the Unit

The unit applies to the design of single, one-air distribution system and service-related system components, including meeting environmental and cost control requirements. The unit may be applied to individuals working alone or as part of a design team.

The unit is suitable for people working as supervisors, technicians and HVAC/R draftspersons, and those pursuing manufacturing engineering or related technical qualifications and careers.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

MEM23004A	Apply technical mathematics
MEM23006A	Apply fluid and thermodynamics principles in engineering
MEM30031A	Operate computer-aided design (CAD) system to produce basic drawing elements
MEM30033A	Use computer-aided design (CAD) to create and display 3-D models

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.

Performance criteria describe the performance needed to demonstrate achievement of the element.

Elements and Performance Criteria

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| 1 | Determine design specification for basic single zone duct distribution system | 1.1 | Obtain and implement work health and safety (WHS) and environmental requirements for a given work area |
| | | 1.2 | Determine design requirements for the single zone duct distribution system from customer requirements, job specifications, and briefings or discussions with appropriate personnel |
| | | 1.3 | Identify and interpret relevant codes and standards |
| | | 1.4 | Prepare final specifications for the design and obtain relevant approvals |
| | | 1.5 | Identify sources of professional and technical assistance |
| | | 1.6 | Establish coordination and contingency management requirements of design work with other HVAC/R and building systems team members |
| | | 1.7 | Obtain resources required for the design task in accordance with enterprise procedures |
| 2 | Design basic single zone duct distribution system | 2.1 | Review options for basic single zone duct distribution system design and compare against specified requirements |
| | | 2.2 | Select most suitable single zone duct distribution system design to meet requirements |
| | | 2.3 | Use 3-D CAD system to design layout and other features of single zone duct distribution system against requirements |

- 2.4 Select appropriate duct materials and duct system components, including an appropriate fan for distribution
 - 2.5 Consult as appropriate on any design adjustments required to meet contingencies and unexpected situations
 - 2.6 Review design for cost reductions and compliance with environmental and regulatory requirements, as appropriate
 - 2.7 Review final design with appropriate personnel and make any required adjustments
- 3 Evaluate and finalise design
 - 3.1 Prepare final design documentation, including construction documentation if required
 - 3.2 Prepare final report according to enterprise procedures

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

Required skills include:

- selecting air-diffusion
- sizing the system
- selecting fans
- designing duct work
- applying cost controlling strategies
- using 3-D CAD systems effectively
- interpreting drawings and specifications
- communicating effectively with others
- working in teams with others
- communicating technical and procedural requirements to others
- dealing effectively with unexpected situations

Required knowledge

Required knowledge includes:

- differentiation between static, velocity and total pressure in air distribution ducts
- laminar and turbulent flow
- use of Moody diagram for flow rate and pressure drop
- friction and dynamic pressure loss
- Colebrook-White formula
- sources of heat and pressure leakage and loss calculation
- noise minimisation
- fan laws
- control cost parameters
- duct design parameters, including:
 - standard duct sizes and gauges
 - available access and space
 - system performance requirements
- system sizing and balancing methods
- dual and single duct constant volume air systems
- variable volume air system
- multi-zone systems

Evidence Guide

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment	A person who demonstrates competency in this unit must be able to design basic single zone duct distribution systems to meet customer requirements, including cost specifications, and WHS and other regulatory requirements.
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors must be satisfied that the candidate can competently and consistently: <ul style="list-style-type: none"> • implement WHS workplace procedures and practices, including risk control measures • design basic single zone duct distribution systems to customer performance and cost requirements • select and size appropriate components, including fans and duct work • communicate technical requirements to others, including preparation of required drawings, CAD files and reports.
Context of and specific resources for assessment	<ul style="list-style-type: none"> • This unit may be assessed on the job, off the job or a combination of both on and off the job. Where assessment occurs off the job, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations. • The competencies covered by this unit would be demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.
Method of assessment	<ul style="list-style-type: none"> • Assessment must satisfy the endorsed Assessment Guidelines of the MEM05 Metal and Engineering Training Package. • Assessment methods must confirm consistency and accuracy of performance (over time and in a range of workplace relevant contexts) together with application of underpinning knowledge. • Assessment methods must be by direct observation of tasks and include questioning on underpinning knowledge to ensure correct interpretation and application.

	<ul style="list-style-type: none"> • Assessment may be applied under project-related conditions (real or simulated) and require evidence of process. • Assessment must confirm a reasonable inference that competency is not only able to be satisfied under the particular circumstance, but is able to be transferred to other circumstances. • Assessment may be in conjunction with assessment of other units of competency where required.
Guidance information for assessment	Assessment processes and techniques must be culturally appropriate and appropriate to the language and literacy capacity of the candidate and the work being performed.

Range Statement

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

WHS requirements	<p>WHS requirements include:</p> <ul style="list-style-type: none"> • relevant legislation • protective equipment • material safety management systems, including use of material safety data sheets (MSDS) • hazardous substances and dangerous goods code • local safe operation procedures • WHS provisions in relevant awards and agreements
Environmental requirements	<p>Environmental requirements include:</p> <ul style="list-style-type: none"> • relevant legislation, regulations and codes • correct handling and disposal of liquid and solid waste • elimination or minimisation of gas, fume, vapour and smoke emissions, including fugitive emissions • dust elimination, minimisation and control • minimisation of energy and water use • elimination or control of excessive noise • use and recycling of refrigerants
Single zone duct distribution	A single zone duct distribution system is a basic central

system	system which can supply a constant air volume or a variable air volume at low, medium or high pressure through a single duct
Appropriate personnel	Appropriate personnel may include: <ul style="list-style-type: none"> • supervisor • leading hand • foreman • manager • engineer • technician • trainer • mentor • team member • customer • client
Enterprise procedures	Enterprise procedures may include: <ul style="list-style-type: none"> • use of tools and equipment • operating instructions, including job sheets, plans, drawings and designs • reporting and communication • manufacturer specifications • site operational procedures • references to industry standards
Resources	Resources may include: <ul style="list-style-type: none"> • reference manuals • scientific calculator • 3-D CAD software • computer workstation and software, either stand alone or networked • test apparatus • appropriate tools of trade, equipment and materials • standard duct sizes and gauges
Contingencies and unexpected situations	Contingencies and unexpected situations that arise during the course of the design process may include: <ul style="list-style-type: none"> • cost or time overruns • unavailability of required components • changes in customer requirements after design process has started • regulatory change • site or building features not on plans or drawings

	<ul style="list-style-type: none">• other situations not included in customer brief or normal enterprise procedures
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Unit Sector(s)

Competency field

Unit sector Engineering science

Custom Content Section

Not applicable.