



**Australian Government**

**Department of Education, Employment and Workplace Relations**

# **MEM234017A Design exhaust, ventilation and dust collection systems**

**Release: 1**

## **MEM234017A Design exhaust, ventilation and dust collection systems**

### **Modification History**

New unit

### **Unit Descriptor**

This unit of competency covers the design of commercial and industrial exhaust, ventilation and dust extraction systems in accordance with standards, codes and regulatory requirements. It includes fluid dynamic principles and selection of system components, such as ducting, fans and filters.

### **Application of the Unit**

This unit applies to the design of exhaust, ventilation and dust collection systems across all forms of manufacturing and engineering. Design activities may also include reverse engineering, and design rectification or modifications of an existing design. It is suitable for exhaust, ventilation and dust collection system contractors, consultants, designers and maintenance personnel.

Prior experience in the application of thermo and fluid dynamic principles, mathematics and computer techniques is required.

### **Licensing/Regulatory Information**

Not applicable.

### **Pre-Requisites**

Not applicable.

### **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. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

## Elements and Performance Criteria

- |   |   |     |  |
|---|---|-----|--|
| 1 | Clarify the design task and elaborate the specification | 1.1 | Establish, in consultation with client, features of exhaust, ventilation and dust collection plant and equipment, and performance parameters           |
|   |   | 1.2 | Determine parameters to the brief or contract  |
|   |   | 1.3 | Determine stakeholders to be consulted in design process   |
|   |   | 1.4 | Assess occupational health and safety (OHS), regulatory, sustainability or environmental issues relevant to design task                                |
|   |   | 1.5 | Confirm design brief, including budget and schedule, and provide preliminary advice on feasibility   |
| 2 | Prepare concept proposal                                | 2.1 | Analyse and undertake initial investigations to define exhaust, ventilation and dust collection plant and equipment performance parameters             |
|   |   | 2.2 | Carry out required modelling, simulations and calculations using appropriate techniques, software and validation techniques                            |
|   |   | 2.3 | Generate a range of exhaust, ventilation and dust collection plant and equipment solutions   |
|   |   | 2.4 | Check feasibility and evaluate solutions against design criteria ensuring conformity to OHS, regulatory, sustainability and environmental requirements |
|   |   | 2.5 | Review concept proposals with clients and select preferred solution  |

- 3 Design exhaust, ventilation and dust collection system
  - 3.1 Develop selected exhaust, ventilation and dust collection system designs
  - 3.2 Provide documentation, create computer-aided design (CAD) graphics or models, drawings, specifications and instructions
  - 3.3 Consult with client and stakeholders to obtain sign-off on design
  - 3.4 Monitor installation and commissioning with stakeholders, when required, and make any necessary modifications

## Required Skills and Knowledge

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

### Required skills

Required skills include:

- determining the features and functions of the exhaust, ventilation and dust extraction systems, including OHS, regulatory and risk management requirements
- interpreting parameters to the brief or contract
- interpreting standards
- researching latest trends and techniques in design of exhaust, ventilation and dust collection plant and equipment systems
- investigating and measuring, modelling and calculating for design options
- investigating faults in existing designs and proposing solutions
- simulating and systematically programming and testing design options
- generating a range of solutions and evaluating them for feasibility against design criteria, engineering practice and financial analysis
- communicating, negotiating and reviewing with stakeholders and client throughout process to obtain agreement on proposal and sign-off on design
- documenting design with drawings, specifications and instructions

### Required knowledge

Required knowledge includes:

- contemporary design methods, research and investigation methods for exhaust, ventilation and dust collection plant and equipment
- techniques for:
  - continuous improvement
  - problem solving and decision making
  - root cause analysis (RCA) or failure mode and effects analysis (FMEA) or design review based on failure mode (DRBFM), and Pareto analysis
- documentation, drawings, specifications and instructions required
- OHS, regulatory and environmental requirements for work areas, standards, codes of practice, risk management and organisational procedures related to the design, installation, operation and maintenance of exhaust, ventilation and dust collection systems
- current options and trends in design, performance analysis, and modelling and simulation software, including software validation techniques
- concepts of exhaust, ventilation and dust collection
- system analysis, 3-D arrangement, manufacturing data and simulation software, use and

validation

- fans, selection and application
- ducting design:
  - system sizing and balancing methods
  - air diffusers, outlet design and location
- dust collection systems, selection and application
- system issues:
  - air quality
  - noise attenuation and sound proofing
  - flame proofing

## 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.

<p>Critical aspects for assessment and evidence required to demonstrate competency in this unit</p>	<p>Assessors must be satisfied that the candidate can competently and consistently:</p> <ul style="list-style-type: none"> <li>• design exhaust, ventilation and dust collection systems</li> <li>• apply safe working practices and procedures</li> <li>• communicate, consult, negotiate and review with client and stakeholders</li> <li>• research and respond to issues</li> <li>• measure and investigate sites</li> <li>• investigate options</li> <li>• model and calculate system performance</li> <li>• innovate and create a range of solutions incorporating systems thinking, continuous improvement and constraint and contingency management</li> <li>• obtain sign-off on design</li> <li>• document, create computer-aided design (CAD) graphics, and specify and develop instructions.</li> </ul>
<p>Context of and specific resources for assessment</p>	<ul style="list-style-type: none"> <li>• 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, that is, the candidate is not in productive work, then a simulated working environment 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.</li> <li>• Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability.</li> <li>• Access must be provided to appropriate learning and/or assessment support when required. Where applicable, physical resources should include equipment modified for people with disabilities.</li> </ul>
<p>Method of assessment</p>	<ul style="list-style-type: none"> <li>• Assessment must satisfy the endorsed Assessment Guidelines of the MEM05 Metal and Engineering Training Package.</li> <li>• 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.</li> <li>• Assessment methods must be by direct observation of tasks and include questioning on underpinning knowledge to ensure its correct interpretation and application.</li> <li>• Assessment may be applied under project-related conditions (real</li> </ul>

	<p>or simulated) and require evidence of process.</p> <ul style="list-style-type: none"><li>• Assessment must confirm a reasonable inference that competency is able not only to be satisfied under the particular circumstance, but is able to be transferred to other circumstances.</li><li>• Assessment may be in conjunction with assessment of other units of competency where required.</li></ul>
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.

<b>Client</b>	Client may be: <ul style="list-style-type: none"> <li>• internal or external to the designer's organisation</li> </ul>
<b>Parameters to the brief</b>	The design brief may include the design of new equipment or fault analysis, rectification or modification to an existing design. Parameters to the design brief may include: <ul style="list-style-type: none"> <li>• determination of the degree of innovation and creativity expected by the client</li> <li>• design process limits and budgets</li> <li>• product cost limits and budgets</li> <li>• performance specifications</li> <li>• equipment availability, capacities and restrictions</li> <li>• specified administrative, communication and approval procedures</li> <li>• other special features and limits in the design brief</li> </ul>
<b>OHS, regulatory, sustainability and environmental issues</b>	<b>OHS, regulatory, sustainability and environmental issues</b> may include: <ul style="list-style-type: none"> <li>• OHS Acts and regulations</li> <li>• relevant standards</li> <li>• industry codes of practice</li> <li>• risk assessments</li> <li>• registration requirements</li> <li>• safe work practices</li> <li>• minimising ecological and environmental footprint of process, plant and product</li> <li>• maximising economic benefit of process plant and product to the organisation and the community</li> <li>• minimising the negative OHS impact on employees, community and customer</li> <li>• state and territory regulatory requirements</li> </ul>
<b>Standards and codes</b>	Standards and codes refer to all relevant Australian and international standards and codes applicable to a particular design task

## **Unit Sector(s)**

Engineering practice

## **Custom Content Section**

Not applicable.