



**Australian Government**

**MEM23138A Evaluate suitability of  
materials for engineering-related  
applications**

**Release 1**

# **MEM23138A Evaluate suitability of materials for engineering-related applications**

## **Modification History**

Release 1 (MEM05v9).

## **Unit Descriptor**

This unit of competency covers the evaluation of materials for their suitability in engineering-related projects or processes. It requires consideration of materials in regards to design requirements, sustainability, product manufacturability, facilities, services, plant and tooling requirements, and safe use.

## **Application of the Unit**

This unit applies to materials used in manufacturing, engineering or related applications. It is suitable for people working as manufacturing, maintenance, design and drafting technicians or paraprofessionals, and those pursuing manufacturing engineering or related technical qualifications.

## **Licensing/Regulatory Information**

Not applicable.

## **Pre-Requisites**

MEM23004A                      Apply technical mathematics

## 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

- |   |   |     |   |
|---|---|-----|---|
| 1 | Determine scope of materials evaluation             | 1.1 | Identify materials to be evaluated and their related manufacturing or engineering-related applications  |
|   |   | 1.2 | Confirm stakeholders to be consulted on the evaluation  |
|   |   | 1.3 | Confirm that appropriate support, including technical and professional assistance, is available   |
|   |   | 1.4 | Identify relevant work health and safety (WHS) and regulatory requirements, standards, codes of practice, risk management and organisational procedures |
| 2 | Prepare for evaluation                              | 2.1 | Review design information for related products and processes for material specifications  |
|   |   | 2.2 | Identify analysis principles and techniques relevant to the materials, processes, services, plant and tooling covered by the evaluation                 |
|   |   | 2.3 | Identify appropriate analysis software and software validation techniques   |
|   |   | 2.4 | Investigate sustainability implications of materials and related manufacturing or engineering processes   |
| 3 | Evaluate materials and processes for an application | 3.1 | Determine properties of materials under evaluation, including supervising any required tests  |
|   |   | 3.2 | Assess materials and related processes for compliance with WHS and other regulatory and risk management requirements                                    |

- 3.3 Assess material, product and processes for sustainability
  - 3.4 Review materials for product and process suitability and process optimisation
  - 3.5 Apply systems thinking, continuous improvement, problem solving and decision making, and constraint and contingency management principles and techniques to evaluation
- 4 Report results
- 4.1 Record results of evaluation
  - 4.2 Provide documentation, such as tool, product and process analysis, and computer-aided design (CAD) files

## Required Skills and Knowledge

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

### Required skills

Required skills include:

- determining context, specification and performance requirements of materials in manufacturing and engineering-related applications
- investigating sustainability implications of materials in the context of their manufacturing and engineering-related use
- identifying materials processing principles, techniques and requirements, including associated facilities, services, plant, tooling and software
- identifying WHS, regulatory and risk management compliance
- identifying materials and material use and processing for integration with:
  - lean manufacturing systems and techniques
  - manufacturing control software, such as system control and data acquisition (SCADA) software
- applying systems thinking, continuous improvement, and constraint and contingency management to evaluation of materials in manufacturing and engineering applications
- reporting and documenting results of evaluation

### Required knowledge

Required knowledge includes:

- sources of technical and professional assistance
- sustainability implications of materials and related manufacturing and engineering-related products and processes
- WHS and regulatory compliance requirements and risk management practices related to materials, including use of material safety data sheets (MSDS)
- software options for materials and process analysis
- common materials, properties and structures in manufacturing and engineering, including:
  - mechanical, electrical, thermal, optical, chemical and magnetic properties
  - ferrous and non-ferrous metals and alloys
  - polymers
  - ceramics
  - glass
  - composites
- cold working of metals
- metal heat treatment

- processes for working, shaping and joining of materials, including:
  - metal machining
  - metal cutting
  - casting and moulding of metals
  - fabricating and welding of ferrous, non-ferrous metals and plastics
  - injection, compression and blow moulding of plastics
  - extrusion of plastics and metals
  - electroplating
  - powder coating
  - composite lay-up and moulding
  - sintering of plastic and metal powders
  - additive and rapid processes
  - casting of metals
  - stamping, drawing and roll forming of sheet metals
  - forging of metals
  - hot and cold rolling of billets, structural sections and coiled sheet
- systems thinking, continuous improvement, problem solving and decision making, and constraint and contingency management principles and techniques
- reporting and documentation requirements

## 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.

<b>Overview of assessment</b>	A person who demonstrates competency in this unit must be able to evaluate materials used in manufacturing and engineering for safety, economy and fitness for purpose.
<b>Critical aspects for assessment and evidence required to demonstrate competency in this unit</b>	<p>Assessors must be satisfied that the candidate can competently and consistently:</p> <ul style="list-style-type: none"> <li>• determine suitability of materials for manufacturing and engineering applications and processes</li> <li>• investigate sustainability implications for materials and related applications</li> <li>• determine and review material properties related to a range of applications</li> <li>• identify materials processing principles and techniques, including facilities, services, plant and tooling, and analysis techniques and software</li> <li>• evaluate WHS, regulatory and risk management compliance</li> <li>• report and document results.</li> </ul>
<b>Context of and specific resources for assessment</b>	<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, then a simulated working environment must be used where the range of conditions reflects realistic workplace situations.</li> <li>• 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>
<b>Method of assessment</b>	<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</li> </ul>

	<p>application of underpinning knowledge.</p> <ul style="list-style-type: none"> <li>• Assessment methods must be by direct observation of tasks and include questioning on underpinning knowledge to ensure correct interpretation and application.</li> <li>• Assessment may be applied under project-related conditions (real or simulated) and require evidence of process.</li> <li>• 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.</li> <li>• Assessment may be in conjunction with assessment of other units of competency where required.</li> </ul>
<b>Guidance information for assessment</b>	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>Appropriate technical and professional assistance</b>	<p>Appropriate technical and professional assistance may include:</p> <ul style="list-style-type: none"> <li>• technical support and advice relating to elements which have intrinsic dangers, such as: <ul style="list-style-type: none"> <li>• high pressure</li> <li>• energised fluid vessels</li> <li>• high temperatures and heat energy capacity</li> <li>• wiring with high current control voltages above extra low voltage</li> </ul> </li> <li>• professional support for technologies, such as: <ul style="list-style-type: none"> <li>• specialist electric motor drives and controllers</li> <li>• specialist materials, plastics, metal alloys and nano materials</li> <li>• special processes, foundry, alloy welding, heat</li> </ul> </li> </ul>
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	treatment, sealing and fastening
<b>WHS, regulatory requirements and enterprise procedures</b>	<p>WHS, regulatory requirements and enterprise procedures may include:</p> <ul style="list-style-type: none"> <li>• WHS Acts and regulations</li> <li>• relevant standards</li> <li>• codes of practice from Australian and overseas engineering and technical associations and societies</li> <li>• risk assessments</li> <li>• registration requirements</li> <li>• safe work practices</li> <li>• state and territory regulatory requirements applying to electrical work</li> </ul>
<b>Standards and codes</b>	Standards and codes refer to all relevant Australian and international standards and codes applicable to manufacturing processes for engineering or related applications
<b>Sustainability</b>	<p>Sustainability is used to mean the entire sustainable performance of the organisation/plant, including:</p> <ul style="list-style-type: none"> <li>• meeting all regulatory requirements</li> <li>• conforming to all industry covenants, protocols and best practice guides</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 WHS impact on employees, community and customer</li> </ul>

## Unit Sector(s)

### Competency field

Unit sector      Engineering science

## Custom Content Section

Not applicable.