



**Australian Government**

# **MEM23133 Evaluate rapid tooling applications**

**Release: 1**

# MEM23133 Evaluate rapid tooling applications

## Modification History

Release 1. Supersedes and is equivalent to MEM23133A Evaluate rapid tooling applications.

## Application

This unit of competency defines the skills and knowledge required to evaluate rapid tooling applications for their suitability for purpose and includes additive processes, spray deposition, casting processes, rapid machining, cutting and welding. It requires consideration of product manufacturability, materials, resources and skills, plant and tooling requirements systems and processes, strength, form, fit, function, lead time and sustainability.

It is suitable for people working as manufacturing or maintenance technicians, designers and draftspersons, and those pursuing engineering or related technical qualifications and careers.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

## Pre-requisite Unit

MEM23004 Apply technical mathematics

## Competency Field

Engineering science

## Elements and Performance Criteria

| Elements                                         | Performance Criteria                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|--------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Elements describe the essential outcomes.</i> | <i>Performance criteria describe the performance needed to demonstrate achievement of the element.</i>                                                                                                                                                                                                                                                                                                                                                                                       |
| 1. Determine scope of rapid tooling application  | 1.1 Identify technologies, including software, used or proposed, in rapid tooling application<br>1.2 Confirm stakeholders to be consulted on evaluation<br>1.3 Confirm that appropriate support, including technical and professional assistance, is available<br>1.4 Identify market context for rapid manufacturing product<br>1.5 Identify relevant work health and safety (WHS) and regulatory requirements, standards, codes of practice, risk management and organisational procedures |
| 2. Identify principles                           | 2.1 Determine principles and techniques required to evaluate and                                                                                                                                                                                                                                                                                                                                                                                                                             |

| Elements                                                            | Performance Criteria                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|---------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Elements describe the essential outcomes.</i>                    | <i>Performance criteria describe the performance needed to demonstrate achievement of the element.</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| and techniques required for evaluation of rapid tooling application | optimise rapid tooling process and application<br>2.2 Select appropriate analysis and development software and software validation techniques                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 3. Evaluate rapid tooling application                               | 3.1 Evaluate WHS and regulatory compliance requirements and risk management practices of rapid tooling processes<br>3.2 Assess tooling and rapid tooling processes for sustainability<br>3.3 Assess effectiveness of software used for tool design, rapid tooling process control and process optimisation<br>3.4 Review suitability of facilities, services and plant for rapid tooling processes<br>3.5 Evaluate suitability of materials used in rapid tooling process<br>3.6 Evaluate tooling and process effectiveness, costs, break-even, and comparative costing relative to alternative<br>3.7 Review labour and skill requirements of rapid tooling process<br>3.8 Apply systems thinking, continuous improvement, problem-solving and decision-making, and constraint and contingency management |
| 4. Report results                                                   | 4.1 Record results of evaluation<br>4.2 Provide documentation including tool, product and process analysis, and computer-aided design (CAD) files                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |

## Foundation Skills

This section describes those language, literacy, numeracy and employment skills that are essential to performance.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

## Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

|                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-----------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Rapid tooling applications include:                                                     | <ul style="list-style-type: none"> <li>• small to medium volumes of product using sintered tools</li> <li>• large volumes of product using sprayed metal tools</li> <li>• situations where one-off tooling requirements are common and speed of tooling manufacturing is important.</li> </ul>                                                                                                                                                                                                                                                                                                        |
| Context of rapid tooling processes includes consideration of:                           | <ul style="list-style-type: none"> <li>• global competitive markets</li> <li>• product and process sustainability</li> <li>• lean systems</li> <li>• product manufacturability</li> <li>• facilities, services, plant and tooling requirements</li> <li>• supply chains</li> <li>• material, transfer operations</li> <li>• process control</li> <li>• labour requirements and skills distribution</li> <li>• information flow</li> <li>• systems thinking, continuous improvement, and constraint and contingency management</li> <li>• WHS, regulatory requirements and risk management.</li> </ul> |
| WHS, regulatory requirements and organisational procedures include:                     | <ul style="list-style-type: none"> <li>• WHS acts, regulations and 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>                                                                                                                                                                                                   |
| Appropriate technical and professional assistance includes:                             | <ul style="list-style-type: none"> <li>• technical support and advice relating to elements which have intrinsic dangers</li> <li>• professional support for technologies.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Sustainability includes:                                                                | <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>                                                                                                                                  |
| Continuous improvement implementation includes one or more of the following techniques: | <ul style="list-style-type: none"> <li>• balanced scorecard</li> <li>• current and future state mapping</li> <li>• measuring performance against benchmarks</li> <li>• process improvement, problem solving and decision making</li> <li>• data management, generation, recording, analysing, storing and</li> </ul>                                                                                                                                                                                                                                                                                  |

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|                                                                     | <ul style="list-style-type: none"><li>• use of software</li><li>• training for improvement systems participation</li><li>• technical training.</li></ul>                                       |
| Constraints and contingencies include one or more of the following: | <ul style="list-style-type: none"><li>• financial</li><li>• organisational</li><li>• procedural</li><li>• cultural</li><li>• physical (resource, access and logistical limitations).</li></ul> |

## Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM23133A Evaluate rapid tooling applications.

## Links

Companion Volume implementation guides are found in VETNet -

<https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2>

# Assessment Requirements for MEM23133 Evaluate rapid tooling applications

## Modification History

Release 1. Supersedes and is equivalent to MEM23133A Evaluate rapid tooling applications.

## Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include:

- determining technologies, parameters and context of rapid tooling applications
- investigating sustainability implications of rapid tooling processes
- reviewing features and functions of rapid tooling processes and the fitness for purpose of tooling produced, on at least two occasions
- evaluating rapid tooling processes for efficiency and cost-benefit against alternative tool manufacturing techniques on at least two occasions
- selecting appropriate analysis principles, techniques and software
- identifying and assessing compliance against relevant work health and safety (WHS) and regulatory requirements, and risk management and organisational procedures
- assessing software, facilities, plant, tooling and materials for suitability to rapid tooling applications on at least two occasions
- applying systems thinking, continuous improvement, and constraint and contingency management to evaluation of rapid tooling processes
- reporting and documenting results of evaluation.

Note: Where a volume and/or frequency is not specified, demonstration must be provided at least once.

## Knowledge Evidence

Evidence required to demonstrate the required knowledge for this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include knowledge of:

- rapid tooling applications
- context of rapid tooling processes
- features and functions of additive rapid tooling processes, including:
  - 3D printing (3DP)
  - stereolithography (SLA)
  - selective laser sintering (SLS)
  - electron beam melting (EBM)
  - fused deposition modelling (FDM) and direct metal deposition (DMD)
  - casting (patternless and rapid pattern processes)
  - vacuum forming

- rapid prototyping machines
- metal spray deposition
- materials for additive ‘printing’ processes
- materials for sprayed metal deposition
- materials for rapid casting
- other materials including:
  - thermoplastics for vacuum forming
  - materials for rapid machining and fabrication
- tool features and functions including:
  - functional requirements
  - punches and dies
  - cavity shapes
  - clearances and drafts
  - heat treatment options
  - surface finishing
  - tool component assembly, location and security
- computer-aided design (CAD) design and modelling techniques to suit rapid tooling materials, machines and processes
- sustainability implications of rapid tooling and rapid processes
- typical advantages and disadvantages of rapid tooling compared to alternative or traditional system costings
- sources of support including technical and professional assistance
- rapid tooling software principles and applications
- WHS, regulatory and risk management requirements
- typical facilities, services, plant required for rapid tooling
- systems thinking, continuous improvement, constraint and contingency management, and comparative supply chain performance
- WHS and regulatory requirements, codes of practice, standards, risk management and registration requirements.
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## Assessment Conditions

- Assessors must:
  - have vocational competency in evaluating rapid tooling applications at least to the level being assessed with relevant industry knowledge and experience
  - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015 or its replacement* and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.

- Where possible assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions that cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.
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