



Australian Government

MEM23131 Evaluate rapid prototyping applications

Release: 1

MEM23131 Evaluate rapid prototyping applications

Modification History

Release 1. Supersedes and is equivalent to MEM23131A Evaluate rapid prototyping applications.

Application

This unit of competency defines the skills and knowledge required to evaluate rapid prototyping applications using additive processes, spray deposition and 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 applies to rapid prototyping for engineering-related applications and is suitable for people working as manufacturing or maintenance technicians, designers and draftspersons, and for 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. Establish scope of rapid prototyping application	1.1 Identify technology, including software, used in rapid prototyping application 1.2 Identify purpose and product of rapid prototyping application 1.3 Confirm stakeholders to be consulted as part of evaluation 1.4 Confirm that appropriate support, including technical and professional assistance, is available 1.5 Determine relevant work health and safety (WHS) and regulatory requirements, standards, codes of practice, risk management 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>
	organisational procedures
2. Identify principles and techniques required for evaluation of rapid prototyping application	2.1 Determine principles and techniques required to evaluate and optimise the rapid prototyping applications 2.2 Select appropriate analysis and development software and software validation techniques
3. Evaluate rapid prototyping application	3.1 Assess WHS and regulatory compliance requirements and risk management practices of rapid prototyping processes 3.2 Assess effectiveness of software for product design, process analysis and optimisation 3.3 Determine suitability of facilities, services, plant and tooling for rapid prototyping processes 3.4 Assess materials against specifications in design and suitability for rapid prototyping processes 3.5 Review prototypes for compliance with specifications and process efficiency 3.6 Review rapid prototyping cost-effectiveness, including break-even and comparative costing relative to alternatives 3.7 Review labour and skills requirement of rapid prototyping application 3.8 Investigate sustainability implications of rapid prototyping application 3.9 Apply systems thinking, continuous improvement, problem-solving and decision- making, and constraint and contingency management
4. Report results	4.1 Record results of evaluation 4.2 Provide documentation including drawings, calculations, 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.	
Appropriate technical and professional assistance includes:	- technical support and advice relating to elements which have intrinsic dangers - professional support for technologies.
WHS, regulatory requirements and organisational procedures includes:	- WHS acts, regulations and relevant standards - codes of practice from Australian and overseas engineering and technical associations and societies - risk assessments - registration requirements - safe work practices - state and territory regulatory requirements.
Sustainability includes:	- meeting all regulatory requirements - conforming to all industry covenants, protocols and best practice guides - minimising ecological and environmental footprint of process, plant and product - maximising economic benefit of process plant and product to the organisation and the community - minimising the negative WHS impact on employees, community and customer.
Continuous improvement implementation includes one or more of the following techniques:	- balanced scorecard - current and future state mapping - measuring performance against benchmarks - process improvement, problem solving and decision making - data management, generation, recording, analysing, storing and use of software - training for improvement systems participation - technical training.
Constraints and contingencies include one or more of the following:	- financial - organisational - procedural - cultural - physical (resource, access and logistical limitations).

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM23131A Evaluate rapid prototyping 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 MEM23131 Evaluate rapid prototyping applications

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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 prototyping applications
- evaluating suitability of a rapid prototyping application against alternative processes
- reviewing features and functions of rapid prototyping processes
- selecting appropriate rapid prototyping principles and techniques, analysis techniques and software on at least two occasions
- determining work health and safety (WHS) and regulatory requirements, and risk management and organisational procedures
- assessing software, facilities, plant, tooling and materials
- analysing labour and skills distribution requirements, degree of automation and competitiveness, costs and break-even
- evaluating rapid prototyping against alternative methods and technologies on at least two occasions
- 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 prototyping applications
- range, features and applications of rapid prototyping processes including:
 - digitisers and reverse engineering processes
 - selective laser sintering (SLS)
 - fused deposition modelling (FDM)
 - stereolithography (SLA)
 - laminated object manufacturing (LOM)
 - electron beam melting (EBM)
 - 3D printing (3DP)
 - solid freeform fabrication

- sprayed metal deposition
- direct metal deposition (DMD)
- casting (patternless and rapid pattern processes)
- vacuum forming
- rapid machining (subtractive) options
- rapid cutting options, including computer driven gas and laser cutting
- robot and auto welding
- common applications for rapid prototyping including:
 - concept modelling
 - multiple design iterations at low cost
 - form, fit and function testing prior to committing to tooling
 - market design verification prior to mass production
 - masters for vacuum forming and investment casting
 - one piece thermoplastic jigs and fixtures
 - one-off full-strength plastic, cast, direct deposited metal or sprayed metal components
- sources of technical and professional assistance
- sustainability implications of rapid prototyping applications and processes
- rapid prototyping principles, techniques and software
- WHS, regulatory and risk management requirements relevant to rapid prototyping applications
- facilities, services, plant and tooling required for rapid prototyping applications
- materials used in 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
- component design processes and computer-aided design (CAD) techniques relevant to rapid prototyping processes and applications including:
 - size limitations
 - combining components
 - digitising
 - reverse engineering
- labour and skills requirements relevant to rapid prototyping
- systems thinking, continuous improvement, and constraint and contingency management techniques
- 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 prototyping 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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