



Australian Government

MEM23132 Evaluate rapid manufacturing processes

Release: 1

MEM23132 Evaluate rapid manufacturing processes

Modification History

Release 1. Supersedes and is equivalent to MEM23132A Evaluate rapid manufacturing processes.

Application

This unit of competency defines the skills and knowledge required to evaluate rapid manufacturing using additive, spray deposition and casting processes and includes evaluating the processes for their applicability, market competitiveness and sustainability. It requires consideration of product manufacturability, materials, systems and processes maintainability, plant and tooling requirements.

It is suitable for people working as technicians, designers and draftspersons, and those pursuing manufacturing 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 manufacturing processes and application	1.1 Identify technologies, including software, used or proposed, in rapid manufacturing application 1.2 Confirm stakeholders to be consulted as part of evaluation 1.3 Confirm that appropriate support, including technical and professional assistance, is available 1.4 Identify market context for rapid manufacturing product 1.5 Determine relevant work health and safety (WHS) and regulatory requirements, standards, codes of practice, risk management and organisational procedures

Elements	Performance Criteria
<i>Elements describe the essential outcomes.</i>	<i>Performance criteria describe the performance needed to demonstrate achievement of the element.</i>
2. Identify principles and techniques required for evaluation of rapid manufacturing application	2.1 Determine principles and techniques required to evaluate and optimise the rapid manufacturing application 2.2 Select appropriate analysis and development software and software validation techniques
3. Evaluate rapid manufacturing processes	3.1 Assess WHS and regulatory compliance requirements and risk management practices of rapid manufacturing processes 3.2 Assess effectiveness of software used for product design, rapid manufacturing process control and process optimisation 3.3 Review suitability of facilities, services, plant and tooling for rapid manufacturing processes 3.4 Assess products and rapid manufacturing processes for sustainability 3.5 Assess materials against specifications in design and suitability for rapid manufacturing processes 3.6 Assess process for appropriate degree of automation and other technical efficiency aspects 3.7 Review rapid manufacturing application for competitiveness, including supply chain performance, costs, break-even and comparative performance of alternative manufacturing methods 3.8 Review labour and skill requirements 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.

Rapid manufacturing applications include:	• medical and biomedical prosthetics and implants • custom musical instruments • jewellery • consumer products • toys • any small to medium quantity item, particularly involving high set-up cost associated with using alternative or traditional methods.
Context of manufacturing processes includes consideration of:	• global competitive markets • product and process sustainability • lean systems • product manufacturability • system maintainability • facilities, services, plant and tooling requirements • supply chains • material and product flow • transfer operations • process control • labour requirements and skills distribution • information flow • systems thinking, continuous improvement, and constraint and contingency management • WHS and regulatory requirements and risk management.
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 include:	• 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 applying to electrical work.
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).
Automation includes:	• manual operations with manual information generation, handling, analysis and storage • islands of automation, supported by manual interfaces with some electronic information processing • systems with major automation and networked data handling.
Labour requirements and skills distribution include:	• well trained employees for flexibility of deployment options and minimisation of labour waste • continuous training to match skills to process improvements and developments • proactive maintenance participation and skills development.

Unit Mapping Information

Release 1. Supersedes and is equivalent to MEM23132A Evaluate rapid manufacturing processes.

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 MEM23132 Evaluate rapid manufacturing processes

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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 manufacturing applications
- investigating sustainability implications of rapid manufacturing processes and associated products
- reviewing technologies, including software, used in rapid manufacturing applications
- evaluating rapid manufacturing processes for efficiency and cost-benefit against alternative manufacturing techniques on at least two occasions
- selecting appropriate analysis principles and 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 manufacturing applications on at least two occasions
- applying systems thinking, continuous improvement, and constraint and contingency management to evaluation of rapid manufacturing 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 manufacturing applications
- context of manufacturing processes
- range, features and applications of rapid manufacturing 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
- process competitiveness
- sources of support, including technical and professional assistance
- sustainability implications of rapid manufacturing processes
- WHS, regulatory and risk management requirements relevant to rapid manufacturing applications
- relationship between process and product in rapid manufacturing technologies including:
 - using printing or SLA processes in low strength paper or plastic applications
 - higher component strength applications in plastics or sintered metals
 - applications using tool steels, brass, stainless steel, carbon steel and aluminium alloy including metal spray deposition or lost wax for cast products
- materials for additive ‘printing’ processes
- materials for sprayed metal deposition
- materials for rapid casting
- thermoplastics for vacuum forming
- labour and skills requirements for rapid manufacturing processes
- systems thinking, continuous improvement, and constraint and contingency management
- computer-aided design (CAD) functions, features and techniques related to rapid manufacturing, including relevant file formats.
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Assessment Conditions

- Assessors must:
 - have vocational competency in evaluating rapid manufacturing processes 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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