



Australian Government

MEM26011 Determine materials and techniques for a composite component or product

Release: 1

MEM26011 Determine materials and techniques for a composite component or product

Modification History

Release 1. Supersedes and is equivalent to MEM26011A Determine materials and techniques for a composite component or product

Application

This unit of competency defines the skills and knowledge required to select and use resin system/reinforcing combinations for a composite product. It includes the science of reinforcing, and core and resin interactions. It also includes basic design of a composite component/product but does not include structural design.

This unit builds on the units covering the selection and use of reinforcing and resins and in particular covers the interactions between resins and reinforcement.

Flow of fluid in porous media is described by Darcy's Law and this will need to be applied in this unit.

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

Band: A

Unit Weight: 6

Pre-requisite Unit

MEM09002	Interpret technical drawing
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM26007	Select and use reinforcing appropriate for product
MEM26008	Select and use resin systems appropriate for product
MEM26009	Select and use cores and fillers appropriate for product

Competency Field

Composites

Elements and Performance Criteria

Elements describe the essential outcomes.

Performance criteria describe the performance needed to demonstrate achievement of the element.

- | | | | |
|---|---|-----|--|
| 1 | Determine product requirements | 1.1 | Follow standard operating procedures (SOPs) |
| | | 1.2 | Comply with work health and safety (WHS) requirements at all times |
| | | 1.3 | Select and use appropriate personal protective equipment (PPE) in accordance with SOPs |
| | | 1.4 | Determine requirements of resin systems from specifications, drawings, job sheets or work instructions and customer requests |
| | | 1.5 | Determine requirements of reinforcing and cores |
| | | 1.6 | Select appropriate process to be used to fabricate product |
| | | | |
| 2 | Identify suitable resin/reinforcement/ core systems | 2.1 | Examine previous laminate schedules for similar requirements |
| | | 2.2 | Short list suitable resin systems, reinforcing/reinforcing combinations and cores |
| | | | |
| 3 | Evaluate properties of different resin/ reinforcement/ core combinations | 3.1 | Determine interactions between resin systems and reinforcing and cores |
| | | 3.2 | Select most appropriate combination of resin systems, reinforcing and cores |
| | | 3.3 | Develop a laminate schedule to meet all requirements |
| | | 3.4 | Fabricate a sample of the most appropriate combination |
| | | 3.5 | Conduct/organise for relevant tests |
| | | 3.6 | Evaluate test results against product and sustainability requirements |
| | | 3.7 | Review selection and fabrication process and make any required changes to appropriate combination or process |

Elements describe the essential outcomes.

Performance criteria describe the performance needed to demonstrate achievement of the element.

4 Use selected combination for product

- 4.1 Identify and control hazards
- 4.2 Prepare selected reinforcing, including cutting to size/shape and any pre-treatment, as required
- 4.3 Lay reinforcing in correct direction, including fibre orientation and fibre pre-forming, as appropriate
- 4.4 Prepare selected core, including cutting to size/shape, and any pre-treatment, as required
- 4.5 Lay core in correct direction, including directional properties, as appropriate
- 4.6 Make any appropriate adjustments to the resin system recipe
- 4.7 Mix selected resin system, as required
- 4.8 Fabricate product using selected process and minimise waste
- 4.9 Review product compared to requirements
- 4.10 Review material selection and fabrication process
- 4.11 Identify areas for improvement and take appropriate actions
- 4.12 Complete any required documentation/reporting according to SOPs

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

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.

Most appropriate combination includes the following:

- compliance with product requirements
- greatest ease of manufacture
- best financial return
- greatest sustainability contribution

Requirements of core include the following:

- stiffness/flexibility
- directionality
- density
- operating temperature
- provision of thickness
- provision of some rigidity
- thermal and acoustic insulation where appropriate
- but not the significant structural strength provided by reinforcing

Requirements of resin system include the following:

- strength
- flexibility/rigidity
- surface finish and colour
- chemical/ultraviolet (UV)/environmental resistance
- operating temperature
- recyclability

Resin system adjustments include one (1) or more of the following:

- temperature
- humidity
- required cure time

Adjustments may only be made within the allowable limits of the system being used

Areas for improvement include one (1) or more of the following:

- cost/benefit of different combinations
- selecting a combination suited to the fabrication process
- maximising sustainability

Sustainability includes the following:

- survival of the ecology/physical environment
- economic viability
- social sustainability

Unit Mapping Information

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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 MEM26011 Determine materials and techniques for a composite component or product

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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 on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, formulas/recipes, batch sheets, product drawings and customer requests for determining materials and techniques for a composite component or product
- considering all reasonably available combinations of resin systems, reinforcing and cores
- fabricating a sample and conducting/organising relevant test and evaluating the test results and making any required changes, as appropriate
- fabricating the final product using selected process and minimising waste as per specifications
- identifying areas for improvement and taking appropriate action
- completing all documentation and reports, including items requiring further action, in accordance with SOPs.

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:

- safe work practices and procedures and use of personal protective equipment (PPE)
- current state/territory work health and safety (WHS) legislation, standards and codes of practice relevant to using materials and techniques for a composite component or product
- cost against known processes, including labour and machine output
- principles of adhesion and substrate/resin interactions
- bonding within and between composites, including:
 - inter-laminar delamination
 - secondary bonding delamination
- resin/reinforcement compatibility
- resin penetration
- permeability of reinforcement
- sustainability considerations

- Darcy's Law and its application to the flow of resins through porous media (e.g. reinforcing and cores).

Assessment Conditions

- Assessors must:
 - have vocational competency in determining materials and techniques for a composite component or product 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. This must 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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