



Australian Government

Department of Education, Employment and Workplace Relations

MEM26011A Determine materials and techniques for a composite component or product

Release: 1

MEM26011A Determine materials and techniques for a composite component or product

Modification History

Release 1 New unit

Unit Descriptor

This unit of competency covers 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.

Application of the Unit

This unit focuses in particular on the interactions between a resin system and the reinforcing, and also includes interactions with any core. Flow of fluid in porous media is described by Darcy's Law and this will need to be applied in this unit.

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.

This unit would typically be undertaken by an individual in liaison with relevant stakeholders or it may be undertaken by a team. Determining materials and techniques may be undertaken in an office or laboratory environment or at the worksite.

The completion of the job will be part of a fabrication and may be undertaken by an individual or a team. It may be undertaken in a workshop or factory environment or in the field and may be used to manufacture new products, prototypes and samples, or to make repairs.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

MEM26007A	Select and use reinforcing appropriate for product
MEM26008A	Select and use resin systems appropriate for product
MEM26009A	Select and use cores appropriate for product
MEM09002B	Interpret technical drawing

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. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

1	Interpret product requirements	1.1	Determine requirements of final products
		1.2	Determine requirements of resin systems
		1.3	Determine requirements of reinforcing
		1.4	Determine requirements of cores
		1.5	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
		2.3	Short list suitable reinforcing/reinforcing combinations

- 2.4 Short list suitable 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 process evaluation test (PET) results
 - 3.7 Review match of PET results with product and sustainability requirements
 - 3.8 Review selection and fabrication process
 - 3.9 Make any required changes to appropriate combination or process

- 4 Use selected combination for product
 - 4.1 Identify and control hazards
 - 4.2 Prepare selected reinforcing, as required
 - 4.3 Lay reinforcing in correct direction, as appropriate
 - 4.4 Prepare selected core, as required
 - 4.5 Lay core in correct direction, 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
 - 4.9 Minimise waste
 - 4.10 Review product compared to requirements
 - 4.11 Review material selection and fabrication process

- 4.12 Identify areas for improvement and take appropriate actions
- 4.13 Complete any required documentation/reporting

Required Skills and Knowledge

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

Required skills

Required skills include:

- making choices and justifying decisions
- interpreting design brief
- fabrication skills required to make product
- working unsupervised

Required knowledge

Required knowledge includes:

- cost against known processes, including labour and machine output
- principles of adhesion and substrate/resin interactions
- bonding within and between composites:
 - inter-laminar delamination
 - secondary bonding delamination
- resin/reinforcement compatibility
- resin penetration
- permeability of reinforcement
- Darcy's Law and its application to the flow of resins through porous media (e.g. reinforcing and cores)

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.

Critical aspects for assessment and evidence required to demonstrate competency in this unit	It is essential that the process and equipment be understood and that the importance of critical material properties, settings and readings is known. Competence must be demonstrated in the ability to recognise and analyse potential situations requiring action and then in implementing appropriate corrective action.
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	<p>Consistent performance should be demonstrated. In particular look to see that:</p> <ul style="list-style-type: none">• all reasonably available combinations of resin systems, reinforcing and cores have been considered• an appropriate combination has been chosen• the reasons for choosing the combination are sound• the product meets its required performance. <p>Competence must be demonstrated in the operation of all ancillary equipment to the level required for this unit of competency.</p>
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Context of and specific resources for assessment	Assessment will require the designing and fabricating appropriate composite products or components. Assessment will occur over a range of situations which will include disruptions to normal, smooth operation.
Method of assessment	A single assessment event is not appropriate. On-the-job assessment should be included as part of the assessment process wherever possible. Where assessment occurs off the job, judgement must consider evidence of the candidate's performance in a productive work environment that includes a sufficient range of appropriate tasks and materials to cover the scope of application for this unit. Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways, including direct observation, supervisor's reports, project work, samples and questioning. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. The candidate must have access to all tools, equipment, materials and documentation required. The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.
Guidance information for assessment	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.

Procedures	Procedures may be written, verbal, computer-based or in some other form, and may include: <ul style="list-style-type: none"> • all work instructions • standard operating procedures • formulas/recipes • batch sheets
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	<ul style="list-style-type: none">• temporary instructions• any similar instructions provided for the smooth running of the plant• good operating practice as may be defined by industry codes of practice (e.g. Responsible Care) and government regulations
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Most appropriate combination	<p>Most appropriate combination refers to that combination of resin systems, reinforcing/reinforcing combination and cores which has:</p> <ul style="list-style-type: none"> • compliance with product requirements • greatest ease of manufacture • best financial return • greatest sustainability contribution
Sustainability	<p>Sustainability incorporates the three aspects of:</p> <ul style="list-style-type: none"> • survival of the ecology/physical environment – which means that an enterprise needs to manage the impact of the business to ensure the survival of the physical environment • economic viability – efficiency, cost and waste reduction and competitiveness to support survival of the business • social sustainability – an enterprise needs to manage the impact of the business to ensure its continued survival within the community and the survival of the community, including occupational health and safety (OHS)
Cores	<p>Core is used to cover:</p> <ul style="list-style-type: none"> • materials used to provide thickness and so rigidity (and perhaps thermal insulation) to a laminate, but not significant structural strength, which is provided by reinforcing
Requirements of final product	<p>Requirements of final product may be determined from various sources, including:</p> <ul style="list-style-type: none"> • drawings • product specifications • customer requests • descriptions of required use of product
Requirements of core	<p>Requirements of core include:</p> <ul style="list-style-type: none"> • stiffness/flexibility • directionality • density • operating temperature
Preparing core	<p>Preparing core includes:</p> <ul style="list-style-type: none"> • cutting to size/shape, as required • any pre-treatment required

Preparing reinforcing	<p>Preparing reinforcing includes:</p> <ul style="list-style-type: none"> • cutting to size/shape, as required, • any pre-treatment required
Core direction	<p>Core direction includes considerations such as:</p> <ul style="list-style-type: none"> • directional properties
Reinforcing direction	<p>Reinforcing direction includes considerations such as:</p> <ul style="list-style-type: none"> • fibre orientation • fibre pre-forming
Requirements of resin system	<p>Requirements of resin system include:</p> <ul style="list-style-type: none"> • strength • flexibility/rigidity • surface finish and colour • chemical/ultraviolet (UV)/environmental resistance • operating temperature • recyclability
Resin system adjustments	<p>Adjustments to the resin system chemistry may be as a result of:</p> <ul style="list-style-type: none"> • temperature • humidity • required cure time <p>Adjustments may only be made within the allowable limits of the system being used</p>
Logs and reports	<p>Logs and reports may include:</p> <ul style="list-style-type: none"> • paper or electronic based • verbal reports • items found which require action
Appropriate action	<p>Appropriate action includes:</p> <ul style="list-style-type: none"> • determining problems needing action • determining possible fault causes • rectifying problem using appropriate solution within area of responsibility • following through items initiated until final resolution has occurred • reporting problems outside area of responsibility to designated person
Typical problems	<p>Typical problems may include:</p> <ul style="list-style-type: none"> • cost/benefit of different combinations

	<ul style="list-style-type: none">• selecting a combination suited to the fabrication process• maximising sustainability
Health, safety and environment (HSE)	All operations to which this unit applies are subject to stringent HSE requirements, which may be imposed through state/territory or federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between Performance Criteria and HSE requirements, the HSE requirements take precedence.

Unit Sector(s)

Composites

Custom Content Section

Not applicable.