Australian Government

Department of Education, Employment and Workplace Relations

MEM26002A Lay up composites using vacuum closed moulding techniques

Release: 1

INDUSTRY SKILLS COUNCILS

Creating Australia's Future

MEM26002A Lay up composites using vacuum closed moulding techniques

Modification History

Release 1 New unit

Unit Descriptor

This unit of competency covers the skills and knowledge required to fabricate composites using a vacuum infusion processing (VIP) or other vacuum closed mould technique.

Application of the Unit

This unit covers one of the fundamental techniques for fabricating a composite product – vacuum closed moulding techniques. There are many closed moulding techniques and this unit includes an awareness of all common forms of vacuum closed moulding and competence in at least one vacuum technique. Closed moulding may be undertaken by an individual or by a fabrication 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. This unit is one of three units covering the basic composite fabrication techniques, the other two being MEM26001A Lay up composites using open moulding techniques and MEM26003A Lay up composites using pressure closed moulding techniques, which together are intended to ensure the composite tradesperson can undertake a basic fabrication using these methods.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Not applicable.

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	Select process	1.1	Identify product requirements
		1.2	Select vacuum closed mould technique most appropriate to product requirements
		1.3	Identify or develop required procedures to make product using selected process
2	Set up mould equipment	2.1	Select required items of equipment and ancillary equipment
		2.2	Prepare equipment and ancillary equipment, as required
		2.3	Pack mould according to procedures/laminate schedule
		2.4	Assemble all equipment ready for use as required by procedure
3	Prepare materials	3.1	Identify required reinforcing/reinforcing system
		3.2	Determine quantity of reinforcing required
		3.3	Prepare reinforcing, as required
		3.4	Identify required resin system
		3.5	Determine quantity of resin components required
		3.6	Check adequate quantities are available
		3.7	Mix resin
		3.8	Minimise waste

		3.9	Test resin
4	Fabricate and adjust equipment and materials, as required	4.1	Identify and control hazards
		4.2	Apply gel coat as required
		4.3	Introduce resin to mould
		4.4	Ensure air is vented, as required
		4.5	Ensure required resin distribution
		4.6	Cure product
		4.7	Remove product from mould when ready
5	Clean up and maintain tools and equipment	5.1	Clean all moulding and mixing equipment
		5.2	Undertake minor maintenance, as required
		5.3	Prepare for next use or storage, as required
		5.4	Inspect equipment and take appropriate action
		5.5	Store equipment, as required
		5.6	Minimise waste
		5.7	Dispose of waste, as appropriate

Required Skills and Knowledge

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

Required skills

Required skills include:

- resin infusion:
  - applying tack tape
  - applying bag (pleats, sits well, and so on)
  - inlet and outlet plumbing (connect/disconnect)
  - managing flow medium (e.g. cloth)
  - managing cores, as required
  - managing flow and gel times (relationship to positioning and spacing of lines)
  - managing and monitoring vacuum pressure
  - monitoring cure cycles
  - checking for leaks
- accessing and operating relevant computer programs
- vacuum bagging:
  - see infusion + protect bag from contamination
  - applying breather cloth/films
  - applying of peel ply
- achieving correct ply location and orientation
- using release processes

Required knowledge

Required knowledge includes:

- reinforcement and lay-up schedules (e.g. layers of reinforcement, direction and darts)
- release systems and processes
- tool sealing
- gel coating
- sealing of mould (use of tack tape (e.g. butyl (or other) mastic and mechanical seals and clamps)
- vacuum and vacuum systems, adjustment and measurement, and vacuum control (e.g. switches, controls and regulators)
- resin systems applicable to process (e.g. vacuum infusion or vacuum bagging – polyester and epoxy)

- gel times and working times
- initiator/catalyst or hardener rates to temperature (hot/cold)
- free amine/amine blushes
- heat curing requirements and how it is done (e.g. ovens, hot bonders (blankets), and autoclaves)
- heat curves
- TG (glass transition)
- understand design briefs (e.g. tool design and part lines)
- 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	Assessment for this unit of competency will be on the job. 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. Consistent performance should be demonstrated. In particular look to see that: • waste is minimised • product is made efficiently and to standard • tools and equipment are appropriately maintained. Competence must be demonstrated in the operation of all ancillary equipment to the level required for this unit of competency.
Context of and specific resources for assessment	Assessment will require the fabrication of suitable objects using closed mould techniques. Assessment will occur over a range of situations which will include disruptions to normal, smooth operation.
Method of assessment	Typically, persons engaged in composites trade work are required to apply their skills and techniques across a range of jobs and specifications.

	A single assessment event is not appropriate. On the job assessment must be included as part of the assessment process. Assessment judgements 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: • all work instructions • standard operating procedures • formulas/recipes • batch sheets • 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
Requirements of product	Requirements of product may be determined from various sources, including: • drawings • product specifications • customer requests • descriptions of required use of product
Closed moulding techniques	Closed moulding techniques include techniques which may have several names, including: • resin infusion under flexible tooling (RIFT) • vacuum bagging This may also be applied to other closed moulding techniques
Mould equipment	Mould equipment includes major items and ancillary items and may also include consumable equipment, such as: • airlines • catchpots • moulds and mould components • infusion system for laminate
Prepare reinforcing	Preparing reinforcing includes: • cutting to size/shape, as required • any pre-treatment required
Logs and reports	Logs and reports may include: • paper or electronic based • verbal reports • items found which require action
Appropriate action	Appropriate action includes: • 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	Typical problems may include: • dead spots trapping air

	• resin curing too quickly • resin curing too slowly
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.