



**Australian Government**

**Department of Education, Employment and Workplace Relations**

# **MEM26004A Make basic plugs for composites fabrication**

**Release: 1**

## **MEM26004A Make basic plugs for composites fabrication**

### **Modification History**

Release 1 New unit

### **Unit Descriptor**

This unit of competency covers the skills and knowledge required to make plugs for composites for routine or one-off production.

### **Application of the Unit**

This unit covers the fundamental techniques for making basic plugs. These are required to fabricate composite products and simple plugs may be made by the composites tradesperson. Plug making may be undertaken by an individual or by a team. It will typically require liaison with a wide range of stakeholders. It would typically be undertaken in a workshop or factory environment and may be used to manufacture new products, prototypes and samples, or to make repairs.

This unit does not cover the making of the plugs which require specialist patternmaking trade skills. See the relevant metals and engineering units of competency for these situations.

### **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 | Interpret product requirements | 1.1 | Determine requirements of final product              |
|   |                                | 1.2 | Determine features of plug required                  |
|   |                                | 1.3 | Identify or develop procedure to make plug           |
|   |                                | 1.4 | Select tooling required to make plug                 |
|   |                                | 1.5 | Select materials for plug                            |
| 2 | Prepare for work               | 2.1 | Prepare personal work plan                           |
|   |                                | 2.2 | Liaise with mould maker in relation to suitable plug |
|   |                                | 2.3 | Determine plug features                              |
|   |                                | 2.4 | Set up equipment/workplace                           |
| 3 | Prepare materials              | 3.1 | Calculate surface area and required resin volume     |
|   |                                | 3.2 | Develop cutting list for solid materials             |
|   |                                | 3.3 | Mark out and cut out sheet materials, as required    |
|   |                                | 3.4 | Calculate resin content                              |
|   |                                | 3.5 | Develop batch scale formulae for resin system        |
|   |                                | 3.6 | Prepare non-composite materials to be used           |
|   |                                | 3.7 | Measure resin components, as appropriate             |
|   |                                | 3.8 | Minimise waste                                       |

- 4      Make plug
  - 4.1    Identify and control hazards
  - 4.2    Mix resin system
  - 4.3    Fabricate plug
  - 4.4    Detail plug
  
- 5      Clean up and maintain equipment
  - 5.1    Label and store plug for future use
  - 5.2    Clean and replace tools ready for next use
  - 5.3    Undertake any required minor maintenance of tools/equipment
  - 5.4    Clean work area and leave ready for next use

6	Anticipate common problems	6.1	Recognise problem/potential problem and take appropriate actions
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## Required Skills and Knowledge

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

### Required skills

Required skills include:

- using computer-aided design (CAD)/computer-aided manufacturing (CAM) applications
- using hand skills
- interpreting drawings
- using a range of machines (e.g. computer numeric control (CNC) and power routers)
- developing templates
- communicating with relevant personnel

### Required knowledge

Required knowledge includes:

- finishing resins
- tooling materials
- tooling resins
- parting lines
- design criteria/brief
- reverse engineering
- shrinkage
- cure values
- correct release agent
- thermal expansion
- open/closed mould (e.g. flange width and draft)
- resin transfer moulding (RTM) - metal vs composite mould
- closed mould (e.g. A/B side, bag it and silicon blanket)
- corners
- undercuts

## 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.

<p><b>Critical aspects for assessment and evidence required to demonstrate competency in this unit</b></p>	<p>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.</p> <p>Consistent performance should be demonstrated. In particular look to see that:</p> <ul style="list-style-type: none"> <li>• plug functions as intended</li> <li>• plug allows for efficient fabrication of product.</li> </ul> <p>Competence must be demonstrated in the operation of all ancillary equipment to the level required for this unit of competency.</p>
<p><b>Context of and specific resources for assessment</b></p>	<p>Assessment will require the fabrication of suitable plugs using appropriate techniques.</p> <p>Assessment will occur over a range of situations which will include disruptions to normal, smooth operation.</p>
<p><b>Method of assessment</b></p>	<p>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.</p> <p>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.</p> <p>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.</p>

<b>Guidance information for assessment</b>	Assessment processes and techniques must be culturally appropriate and appropriate to the language and literacy capacity of the candidate and the work being performed.
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## 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.

<b>Procedures</b>	Procedures may be written, verbal, computer-based or in some other form, and may include: <ul style="list-style-type: none"> <li>• all work instructions</li> <li>• standard operating procedures</li> <li>• formulas/recipes</li> <li>• batch sheets</li> <li>• temporary instructions</li> <li>• product drawings and/or specifications)</li> <li>• any similar instructions provided for the smooth running of the plant</li> <li>• good operating practice as may be defined by industry codes of practice (e.g. Responsible Care) and government regulations</li> </ul>
<b>Requirements of final product</b>	Requirements of final product may be determined from various sources, including: <ul style="list-style-type: none"> <li>• drawings</li> <li>• product specifications</li> <li>• customer requests</li> <li>• descriptions of required use of product</li> </ul>
<b>Pug features</b>	Plug features include: <ul style="list-style-type: none"> <li>• relief</li> <li>• parting lines</li> <li>• efficient lay-up</li> </ul>
<b>Suitability of plug</b>	Suitability of plug includes: <ul style="list-style-type: none"> <li>• release angles</li> <li>• parting lines</li> </ul>

<b>Detail plug</b>	<p>Detail plug includes:</p> <ul style="list-style-type: none"> <li>• buff</li> <li>• fill</li> <li>• get ready for production</li> </ul>
<b>Routine faults</b>	<p>Typical routine faults may include:</p> <ul style="list-style-type: none"> <li>• gel coat sag</li> <li>• slow curing rates</li> <li>• blistering</li> <li>• wrinkles</li> <li>• pinholes</li> <li>• brush marks</li> <li>• poor surface finish</li> </ul>
<b>Non-routine faults</b>	<p>Non-routine faults, which may have multiple causes, may include:</p> <ul style="list-style-type: none"> <li>• release agents failure</li> <li>• mould release failure</li> <li>• warping or cracking after moulding</li> </ul>
<b>Typical process and product problems</b>	<p>Typical process and product problems may include:</p> <ul style="list-style-type: none"> <li>• structural strength, rigidity and stability of the tooling</li> <li>• dimensional accuracy of the tooling</li> <li>• allowances in the design for shrinkage, deformations and alterations in the process from tooling to mould to finished composite product</li> <li>• placement of flanges, closures, fitments, supports, struts and stiffeners</li> <li>• variations in materials and/or contamination of materials</li> </ul>
<b>Logs and reports</b>	<p>Logs and reports may include:</p> <ul style="list-style-type: none"> <li>• paper or electronic based</li> <li>• verbal reports</li> <li>• items found which require action</li> </ul>
<b>Appropriate action</b>	<p>Appropriate action includes:</p> <ul style="list-style-type: none"> <li>• determining problems needing action</li> <li>• determining possible fault causes</li> <li>• rectifying problem using appropriate solution within area of responsibility</li> <li>• following through items initiated until final resolution has occurred</li> <li>• reporting problems outside area of responsibility to</li> </ul>



	designated person
<b>Health, safety and environment (HSE)</b>	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.