This course has been accredited under Parts 4.4 and 4.6 of the Education and Training Reform Act 2006. It has been entered on the State Register of Accredited Courses and Recognised Qualifications and the www.training.gov.au web site.

Accredited for the period: 1 January 2012 to 31 December 2016

Document Status
This document is an exact copy of the document, which is listed on the State Register of Accredited Courses and Recognised Qualifications and the www.training.gov.au web site.
Version 1: Accredited from 1 January 2012 to 31 December 2016
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### Section A: Copyright and course classification information

| 1. Copyright owner of the course | Copyright of this document is held by the Department of Education and Early Childhood Development, Victoria.  
© State of Victoria 2011  

Day to day contact:  
Engineering Industries Curriculum Maintenance Manager  
CMM Number: 5128  
Box Hill Institute of TAFE  
465 Elgar Road  
Box Hill Victoria 3128  
Postal address:  
Private Bag 2014  
Box Hill Victoria 3128  
Email: g.adda@bhtafe.edu.au  
Telephone: (03) 9286 9880  
Facsimile: (03) 9286 9991 |
| 2. Address | Department of Education and Early Childhood Development  
Executive Director  
Pathways, Participation and Youth  
PO Box 266  
Melbourne VIC 3001 |
| 3. Type of submission | This submission is for the accreditation of a new course. |
| 4. Copyright acknowledgement | Copyright of this material is reserved to the Crown in the right of the State of Victoria.  
© State of Victoria (Department of Education and Early Childhood Development) 2012  

The following units of competency are from the MEM05- Metals and Engineering Training Package administered by the Commonwealth of Australia:  
© Commonwealth of Australia  
MEM09002B Interpret technical drawing  
MEM24008B Perform ultra sonic testing |
| 5. Licensing and franchise | This work is licensed under a Creative Commons Attribution-NoDerivs 3.0 Australia licence (http://creativecommons.org/licenses/by-nd/3.0/au/). You are free to use, copy and distribute to anyone in its original form as long as you attribute the, Department of Education and Early Childhood Development as the author, and you license any derivative work you make available under the same licence  
Copies of this publication can be downloaded free of charge from the Training Support Network website:  
http://trainingsupport.skills.vic.gov.au |
| 6. Course accrediting body | Victorian Registration and Qualifications Authority (VRQA)  
Level 6, 35 Spring Street  
Melbourne Victoria 3000  
Telephone: (03) 9651 3204  
|---------------------------|------------------------------------------------------------------|
| 7. AVETMISS information   | **Classification codes for:**  
**ANZSCO** [Australian and New Zealand Standard Classification of Occupations]  
399999 Technicians and Trades Workers nec  
**ANZSIC code**  
(Australia and New Zealand Standard Industrial Classification – industry type)  
C1919 Other Polymer Product Manufacturing  
**ASCED Code – 4 digit**  
(Field of Education)  
0307 Mechanical and Industrial Engineering and Technology  
**National course code**  
To be provided by the VRQA once the course is accredited |
| 8. Period of accreditation | 1 January 2012 to 31 December 2016 |
**Section B: Course information**

<table>
<thead>
<tr>
<th>1. Nomenclature</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1.1 Name of the qualification</strong></td>
</tr>
<tr>
<td><strong>1.2 Nominal duration of the course</strong></td>
</tr>
</tbody>
</table>

| 2. Vocational or educational outcomes of the course |  
|-----------------|----------------|
| **Standard 1 for Accredited Courses** | Graduates of the course will have the skills and knowledge to fabricate detailed parts using composite materials and assemble composite structures used in aircraft manufacturing. |

<table>
<thead>
<tr>
<th>3. Development of the course</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Standards 1and 2 for Accredited Courses</strong></td>
</tr>
<tr>
<td><strong>3.1 Industry /enterprise/ community needs</strong></td>
</tr>
</tbody>
</table>
Certificate III qualifications, but these are not specific to aircraft manufacturing using composite materials.

Boeing has traditionally employed those trained in the fabrication trade, but the advent of fibre composites in aircraft manufacturing structures has necessitated a change to the training focus.

The *Course in Fibre Composites Aircraft Structures* course is based on the draft fibre composite units within a proposed *Certificate III in Fibre Composites Trade* qualification for the *MEM05 – Metals and Engineering* Training Package.

The intention is that the accredited *Course in Fibre Composites Aircraft Structures* course will be used to address the immediate training needs of the industry for existing tradespeople and apprentices and then retired on the endorsement of the proposed qualification in *MEM05 – Metals and Engineering* Training Package.

It is expected that enrolments in the new course will be approximately 10 per annum at Boeing.

Initially a Working Group was established to conduct a DACUM session to determine the skills and knowledge requirements, specifically for Boeing apprentices and to clarify the optimum way forward to meet these needs. The outcomes of the Working Party deliberation then informed the activities of a Project Steering Committee. (See Appendix 1)

A Project Steering Committee was established to advise on the development of the course and to confirm its alignment to industry needs. Members of the Steering Committee were:

- **Paul Kennett** Manufacturing and Engineering Skills Advisory Board (MESAB)
- **Peter Canavan** Australian Industry Group (AIG)
- **Brian Scholes** Boeing Aerostructures Australia
- **Russell Gambling** Kangan Institute of TAFE
- **Greg Warren** Australian Manufacturing Workers Union (AMWU)
- **George Adda** Box Hill Institute of TAFE

In attendance:

- **Sam McCurdy** Dewhurst Consultancy Pty Ltd

The Project Manager was George Adda, Executive Officer, Engineering Industries Curriculum Maintenance Manager, Box Hill Institute of TAFE.

Minutes of the Steering Committee meetings are provided as Appendix 2

Course contents Endorsement forms are provided as Appendix 3.
Letters of support for this course are provided as Appendix 4 and include the following organisations:
- Australian Manufacturing Workers Union (AMWU)
- Australian Industry Group (AIG)
- Boeing Aerostructures Australia
- coManufacturing and Engineering Skills Advisory Board (MESAB)

<table>
<thead>
<tr>
<th>3.2 Review for re-accreditation</th>
<th>Not applicable</th>
</tr>
</thead>
</table>

### 4. Course outcomes

**Standards 1, 2 and 3 for Accredited Courses**

#### 4.1 Qualification level

This course does not align with any specific AQF level.

#### 4.2 Employability skills

**Standard 4 for Accredited Courses**

**Communication**
- following work and organisational instructions
- understanding input from specialist personnel and technical representatives
- negotiating with other team members or supervisors regarding timing and progress of work activities
- understanding and interpreting regulations, procedures, instructions and maintenance publications
- completing relevant documentation
- reading drawings related to aircraft structures
- use computers to obtain manufacturing data and complete documentation
- networking with other team members regarding work planning and execution

**Teamwork**
- performing tasks as an individual while being responsive to supervisors and allowing for relevant human factors
- working effectively with others who may be of different ages, gender, race, religion and political persuasion
- assisting other team members with tasks and providing advice on work processes

**Problem solving**
- identifying problems in a timely manner and developing practical solutions to problems not fully covered by manufacturing data
- proposing solutions to problems as modifications or amendments to specified maintenance processes
- constantly reviewing problem solving skills and ability to effectively apply competencies to solve problems within the limits permitted by regulatory and organisational guidelines
- responding to emergencies or accidents in accordance with regulatory and organisational requirements

**Initiative and enterprise**
- adapting to new situations that arise as a consequence of
regulatory changes, revised manufacturing data, practices and procedures
- varying work practices and behaviour as a result of performance feedback from peers and supervisors
- evaluating ideas to ensure that technical and regulatory aspects have been fully covered before proposing action that may result in modification or changes to work processes
- applying human factors to avoid errors and maintain quality standards
- adapting competencies to the performance of a wide range of manufacturing tasks
- contributing to a process of continuous improvement and a willingness to support and participate in the effective introduction of new work practices

Planning and organisation
- clarifying task objectives and required outcomes through discussion with supervisors and other team members
- monitoring the time taken to complete tasks against team requirements or targets provided by supervisors
- collecting, analysing and organising information relating to assigned tasks and confirming the purpose and required work outcomes
- identifying the extent of impact on assigned work of changes to procedures, work instructions or regulatory requirements

Self-management
- accepting responsibility for managing individual workload to meet target completion times or fit in with team milestones
- assessing personal knowledge and skills
- actively seeking opportunities to develop skills and apply them across a range of tasks

Learning
- taking advantage of learning opportunities that arise through training courses provided by the organisation or external providers and through mentoring and on-job training
- adapting skills to accommodate new ideas and techniques
- using feedback from supervisors and peers to identify ways in which skills can be improved

Technology
- operating equipment and troubleshooting equipment faults
- testing the performance and calibration of equipment
- storing and caring for equipment
- amending various forms of manufacturing data
| **4.3 Recognition given to the course (if applicable)** | Standard 5 for Accredited Courses  
Not Applicable |
|---|---|
| **4.4 Licensing/ regulatory requirements (if applicable)** | Standard 5 for Accredited Courses  
No licensing, legislative, regulatory or certification requirements apply to this course at the time of publication. |
| **5. Course rules** |  |
| **5.1 Course structure** | Standards 2, 6 and 7 for Accredited Courses  
To be awarded the *Course in Fibre Composites Structures* participants are required to complete the three core units and three elective units of competency, as indicated in Table 1 below.  
Where all units are not completed, a Statement of Attainment will be issued listing those units successfully completed. |
### Table 1:

<table>
<thead>
<tr>
<th>Unit of competency/module code</th>
<th>Field of Education code (6-digit)</th>
<th>Unit of competency,module title</th>
<th>Pre-requisite</th>
<th>Nominal hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Core units</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VU20797</td>
<td>030199</td>
<td>Layup fibre composites using open moulding techniques</td>
<td>None</td>
<td>80</td>
</tr>
<tr>
<td>VU20798</td>
<td>030199</td>
<td>Layup fibre composites using vacuum closed moulding techniques</td>
<td>None</td>
<td>80</td>
</tr>
<tr>
<td>VU20799</td>
<td>030199</td>
<td>Layup fibre composites using pressure closed moulding techniques</td>
<td>None</td>
<td>80</td>
</tr>
<tr>
<td><strong>Elective units (Select any three units)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VU20800</td>
<td>030199</td>
<td>Mark and cut out sheets for fibre composite use</td>
<td>None</td>
<td>40</td>
</tr>
<tr>
<td>VU20801</td>
<td>030199</td>
<td>Select and use reinforcing appropriate for product</td>
<td>None</td>
<td>40</td>
</tr>
<tr>
<td>VU20802</td>
<td>030199</td>
<td>Select and use resin systems appropriate for product</td>
<td>None</td>
<td>40</td>
</tr>
<tr>
<td>VU20803</td>
<td>030199</td>
<td>Select and use cores appropriate for product</td>
<td>None</td>
<td>20</td>
</tr>
<tr>
<td>VU20804</td>
<td>030199</td>
<td>Store and handle fibre composite materials</td>
<td>None</td>
<td>20</td>
</tr>
<tr>
<td>VU20805</td>
<td>030199</td>
<td>Determine materials and techniques for a composite component or product</td>
<td>MEM09002B</td>
<td>60</td>
</tr>
<tr>
<td>VU20806</td>
<td>030199</td>
<td>Select and use fibre composite process or systems appropriate for product</td>
<td>None</td>
<td>40</td>
</tr>
<tr>
<td>VU20807</td>
<td>030199</td>
<td>Select and apply repair techniques</td>
<td>None</td>
<td>60</td>
</tr>
<tr>
<td>VU20808</td>
<td>030199</td>
<td>Select and use joining techniques</td>
<td>None</td>
<td>60</td>
</tr>
<tr>
<td>VU20809</td>
<td>030199</td>
<td>Prepare composite/substrate surfaces</td>
<td>None</td>
<td>40</td>
</tr>
<tr>
<td>VU20810</td>
<td>030199</td>
<td>Finish a fibre composite product</td>
<td>None</td>
<td>40</td>
</tr>
<tr>
<td>MEM09002B *</td>
<td>030199</td>
<td>Identify and interpret required standards for composites</td>
<td>None</td>
<td>20</td>
</tr>
<tr>
<td>MEM24008B **</td>
<td>030199</td>
<td>Interpret technical drawings</td>
<td>None</td>
<td>40</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Perform ultra sonic testing</td>
<td></td>
<td>60</td>
</tr>
</tbody>
</table>

**Total nominal duration** 300-420

**Notes:**

* This unit is a prerequisite for unit ‘VU20805 - Determine materials and techniques for a composite component or product’.
** The inclusion of the unit MEM24008B - Perform ultra sonic testing in the course may create a potential demarcation problem at a national level.
### 5.2 Entry requirements

**Standard 9 for Accredited Courses**

Entrants to the *Course in Fibre Composites Structures* should already be employed in the manufacturing industry in order to provide the appropriate workplace context for training.

Learners are best equipped to achieve the course outcomes if they have minimum language, literacy and numeracy skills that are equivalent to Level 2 of the Australian Core Skill Framework.

Details can be found on website: [http://www.acsf.deewr.gov.au](http://www.acsf.deewr.gov.au)

### 6. Assessment

#### 6.1 Assessment strategy

**Standard 10 for Accredited Courses**

All assessments, including Recognition of Prior Learning (RPL) must be consistent with the requirements of Standard 1, Element 1.5 of the AQTF: *Essential Conditions and Standards for Continuing Registration*.

This requires that assessment:
- meets the requirements of the relevant Training Package or accredited course
- is conducted in accordance with the principles of assessment and the rules of evidence, and
- meets workplace and, where relevant, regulatory requirements
- is systematically validated.

Notwithstanding the above, course providers are required to adopt an assessment strategy that:
- incorporates continual feedback of individual progress toward, and achievement of competencies;
- addresses skills and knowledge required for performance;
- gathers sufficient evidence to judge achievement of progress towards determining competence;
- utilises a variety of different processes/sources, i.e. written, oral, observation, projects;
- recognises achievement of elements/competencies regardless of where the learning took place;
- fosters a collaborative and co-operative relationship between the learner and assessor;
- is flexible in regard to the range and type of evidence provided by the learner;
- provides opportunity for the learner to challenge assessment provisions and participate in reassessment;

- is equitable and fair to all learners;
- does not unnecessarily restrict the progress of a learner through the course;
- comprises a clear statement of both the criteria and assessment process;
• selects assessment tools to suit the needs of particular clients or client groups (e.g. clients with special needs) or to suit the needs of an enterprise;
• incorporates the employability skills within industry specific competencies
• includes arrangements to advise prospective students of and facilitate RPL processes.

Where possible, an integrated approach to assessment is suggested in relation to the competency outcomes of the course. Integration, in this instance, refers to elements and performance criteria from the unit of competency being linked together for assessment.

It should be noted that the principles of competency-based training allow for assessment at the element level as the work outcome and that the performance criteria indicate the standards by which the element should be assessed. Assessment need not be undertaken at the end of each element. The individual needs of the learner and/or characteristics of the enterprise should be reflected in assessment methods that are chosen in relation to the unit of competency.

Assessment methods must include the demonstration of techniques and practical skills in a fibre composites workplace, or under conditions which simulate a work environment and may also include:
• oral presentations
• written assignments, tests or projects
• role plays
• simulations
• work-based projects.

### 6.2 Assessor competencies

**Standard 12 for Accredited Courses**

Assessor competencies for this course must be consistent with the requirements of Standard 1, Element 1.4 of the *AQTF: Essential Conditions and Standards for Continuing Registration*.

Standard 1.4 requires that assessors:
• have the following units of competency from the *TAE10-Training and Education* Training Package, or their equivalent:
  - TAEASS401B Plan assessment activities and processes
  - TAEASS402B Assess competence
  - TAEASS403B Participate in assessment validation
• have the relevant vocational competencies at least to the level being delivered or assessed, and
• can demonstrate current industry skills directly relevant to the training/assessment being undertaken and
• continue to develop their VET knowledge and skills as well as their industry currency and trainer/assessor competence.
In addition to the above it is recommended that assessors have comprehensive and current knowledge of the product manufacturing using fibre composite materials and the job or role against which performance is being assessed. Assessors should also have appropriate interpersonal and communication skills.

Alternatively, a panel, team or partnership approach involving assessors and technical experts whereby the assessment is conducted by a team/panel/partnership in which at least one assessor has the competencies determined by the National Skills Standards Council (NSSC) and the other assessor(s) have the relevant vocational competencies, at least to the level being assessed.

<table>
<thead>
<tr>
<th>7. Delivery</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>7.1 Delivery modes</strong></td>
</tr>
</tbody>
</table>

**Standard 11 for Accredited Courses**

This course is available for full or part-time study. However, participants must already be employed in a fibre composite structures environment, in order to provide the appropriate workplace context for training. Providers should endeavor to be flexible in the way the training is delivered to ensure they meet the needs of the client group.

Delivery strategies should be selected to reflect the nature of the fibre composites industry specific competencies, incorporating employability skills, and the needs of the learner. The course aims to develop practical competencies within an aircraft manufacturing industry setting. Practical demonstrations and opportunity for application are considered to provide the most suitable strategy to reflect the objectives of the course and the background to it development.

Delivery methods may include, but are not limited to:
- classroom presentation
- work-based projects
- case study analyses
- practical work
- projects

An emphasis on safety must be integrated and reinforced at all times.
### 7.2 Resources

**Standard 12 for Accredited Courses**

Successful delivery of this course requires access to current composite fibre fabrication and assembly systems and equipment. For this to occur, training providers and manufacturing enterprises may form partnerships to deliver realistic and authentic training and assessment.

The resources that should be available for this course relate to normal work practice using procedures, information and resources typical of the workplace. This should include:

- Access to a real & simulated fibre composites work environments
- OH&S policy and work procedures and instructions;
- operational access to relevant machines, tools, materials and consumables
- access to relevant plans, drawings and work instructions
- manufacturer's specifications/manuals

Trainer competencies must be as specified in Standard 1.4 of the AQTF: Essential Conditions and Standards for Continuing Registration, i.e., the registered training organisation must ensure that training is delivered by trainers who:

- have the qualification TAE40110 – Certificate IV in Training and Assessment from the TAE10-Training and Education Training Package, or equivalent competencies and
- have the relevant vocational competencies at least to the level being delivered or assessed, and
- can demonstrate current industry skills directly relevant to the training/assessment being undertaken and
- continue to develop their VET knowledge and skills as well as their industry currency and trainer/assessor competence

### 8. Pathways and articulation

**Standard 8 for accredited courses**

Pathways include:

- National recognition
- Recognition of Prior Learning (RPL).

Credit transfer is available for those participants who have already completed any of the two imported endorsed units of competency from the MEM05 - Metals and Engineering.

Additionally, this course may be used as a pathway into a range of fibre composites occupations
<table>
<thead>
<tr>
<th>9. Ongoing monitoring and evaluation</th>
<th><strong>Standard 13 for accredited courses</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Ongoing monitoring and evaluation of the course is the responsibility of the Engineering Industries Curriculum Maintenance Manager throughout the period of accreditation. Ongoing monitoring and evaluation will ensure that:</td>
<td></td>
</tr>
<tr>
<td>• the course continues to meet current and changing needs of the manufacturing and engineering industry</td>
<td></td>
</tr>
<tr>
<td>• changes in legislation and regulations are monitored</td>
<td></td>
</tr>
<tr>
<td>• development of any relevant national competency standards are monitored</td>
<td></td>
</tr>
<tr>
<td>• developments in assessment methodology are reflected</td>
<td></td>
</tr>
<tr>
<td>• feedback from clients is reflected.</td>
<td></td>
</tr>
<tr>
<td>To assist with this a reference committee will be established by Curriculum Maintenance Manager, comprising relevant representatives from the industry and registered training organisations, to advise on any changes relating to ongoing delivery of this course. The committee will meet at the mid-point of the accreditation period to formally review the course; and, monitor and evaluate course standards, delivery and assessment. In providing advice for required changes, it will include a consideration of client feedback as provided through training organisations. Any documented changes will be reported to the VRQA.</td>
<td></td>
</tr>
<tr>
<td>Course maintenance and review procedures may also indicate that the course in total should be expired if a suitable qualification becomes available through the development, review or continuous improvement process of a Training Package.</td>
<td></td>
</tr>
</tbody>
</table>
## Section C: Units of Competency

### Core Units of Competency

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>VU20797</td>
<td>Layup fibre composites using open moulding techniques</td>
<td>17</td>
</tr>
<tr>
<td>VU20798</td>
<td>Layup fibre composites using vacuum closed moulding techniques</td>
<td>21</td>
</tr>
<tr>
<td>VU20799</td>
<td>Layup fibre composites using pressure closed moulding techniques</td>
<td>26</td>
</tr>
</tbody>
</table>

### Elective units (Select any three)

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>VU20800</td>
<td>Mark and cut out sheets for fibre composite use</td>
<td>31</td>
</tr>
<tr>
<td>VU20801</td>
<td>Select and use reinforcing appropriate for product</td>
<td>36</td>
</tr>
<tr>
<td>VU20802</td>
<td>Select and use resin systems appropriate for product</td>
<td>41</td>
</tr>
<tr>
<td>VU20803</td>
<td>Select and use cores appropriate for product</td>
<td>46</td>
</tr>
<tr>
<td>VU20804</td>
<td>Store and handle fibre composite materials</td>
<td>52</td>
</tr>
<tr>
<td>VU20805</td>
<td>Determine materials and techniques for a composite component or product</td>
<td>57</td>
</tr>
<tr>
<td>VU20806</td>
<td>Select and use fibre composite process or systems appropriate for product</td>
<td>62</td>
</tr>
<tr>
<td>VU20807</td>
<td>Select and apply repair techniques</td>
<td>67</td>
</tr>
<tr>
<td>VU20808</td>
<td>Select and use joining techniques</td>
<td>71</td>
</tr>
<tr>
<td>VU20809</td>
<td>Prepare composite/substrate surfaces</td>
<td>76</td>
</tr>
<tr>
<td>VU20810</td>
<td>Finish a fibre composite product</td>
<td>80</td>
</tr>
<tr>
<td>VU20811</td>
<td>Identify and interpret required standards for composites</td>
<td>84</td>
</tr>
<tr>
<td>MEM09002B</td>
<td>* Interpret technical drawings</td>
<td></td>
</tr>
<tr>
<td>MEM24008B</td>
<td>Perform ultra sonic testing</td>
<td></td>
</tr>
</tbody>
</table>
### Unit Code
VU20797

### Unit Title
Layup fibre composites using open moulding techniques

### Unit descriptor
This competency covers the knowledge and skills needed to fabricate fibre composites using hand layup, chopper gun and/or other open moulding techniques.

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

### Employability skills
This unit contains employability skills. Refer to the Employability Skills Summary for the qualification in which this unit resides.

### Application of the unit
This unit covers one of the fundamental techniques for fabricating a fibre composite product – open moulding techniques. These are the traditional method of fibre composite fabrication and provide great flexibility in application. Open moulding may be undertaken by an individual or may undertaken 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, samples or to make repairs.

### ELEMENT
Elements describe the essential outcomes of a unit of competency.

### PERFORMANCE CRITERIA
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.

<table>
<thead>
<tr>
<th>ELEMENT</th>
<th>PERFORMANCE CRITERIA</th>
</tr>
</thead>
</table>
| 1. Select process. | 1.1. Identify **product requirements**  
1.2. Select **open moulding technique** most appropriate to those requirements  
1.3. Identify or develop required **procedures** to make product using selected process. |
| 2. Set up equipment/workplace | 2.1. Select required items of **equipment** and ancillary equipment  
2.2. Prepare equipment and ancillary equipment as required  
2.3. Assemble all equipment ready for use as required by procedure. |
| 3. Prepare materials | 3.1. Identify required reinforcing/reinforcing system(s)  
3.2. Determine quantity of reinforcing required  
3.3. **Prepare reinforcing** as required  
3.4. Identify required resin system(s)  
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, adjust equipment and materials as required
   4.1. Identify and control hazards
   4.2. Apply gel coat as required
   4.3. Apply resin and reinforcing as required
   4.4. Ensure required resin distribution
   4.5. Cure product
   4.6. Remove from mould when ready
   4.7. Perform final verification of meeting product requirements

5. Clean up and maintain 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:
- Working safely and using PPE
- removing included air,
- using rollers, brushes, and/or chopper gun,
- performing vacuum leak testing
- doing minor maintenance to chopper guns and pump systems (reciprocating airless pumps with air support),
- operating and maintaining solvent cleaner (filter),
- undertaking mechanically assisted movement of large parts (e.g. forklift, chain hoist)
- assembling, cleaning, preparing simple and complex moulds,
- releasing product from simple and complex moulds (using jacks, air and water),
- applying release systems (wax)
- ensuring compliance to specifications

Required knowledge:
- preparation schedules, terminology and information relevant to standard work instructions
- applicable codes and regulations
- safe work practices and correct use of PPE
- release agent surface tension,
- managing layup teams,
- gel coat application,
- reinforcement layup,
- finishing off (e.g. roll, check consistency and evenness of resin/glass, air entrapment, check with light),
• managing post cure requirements (air cure, oven cure),
• effect of humidity (e.g. epoxy backbone),
• effect of temperature,
• managing hazardous environments e.g. styrene levels,
• function of accelerators,
• control of overspray,
• storage of moulds,
• housekeeping,
• waste disposal

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.

Product requirements may be determined from various sources including:
• drawings
• product specifications
• customer requests
• descriptions of required use of product

Open moulding technique may include:
• hand layup
• chopper gun

This may also be applied to other open moulding techniques.

Procedures
• written
• verbal
• computer-based
• in some other form
• They include:
  • all work instructions
  • standard operating procedures
  • formulas/recipes
  • batch sheets
  • temporary instructions
  • any similar instructions provided for the smooth running of the plant.
• ‘Procedures’ also include good operating practice as may be defined by industry codes of practice (e.g. Responsible Care) and government regulations.
• All work will comply with procedures.

Equipment includes
• moulds and mould components
• resin application and dispersion tools

Prepare reinforcing includes:
• cutting to size/shape as required,
• any pre-treatment required
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.

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 a plant or in a workshop or a simulated plant/workshop environment.
- 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 to standard and efficiently
  - 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 a suitable object(s) using open mould techniques.
- Assessment will occur over a range of situations which will include disruptions to normal, smooth operation.
- Competence in this unit will require competence in at least two different open mould techniques. These techniques have been used in a repair situation or in a new fabrication.
- A bank of scenarios/case studies/what ifs and questions will be required to probe the reasoning behind observable actions.
| **Method of assessment** | • Demonstration of skills  
• Simulation or case studies/scenarios may be required to allow for timely assessment of parts of this unit of competency.  
• Simulation should be based on the actual process/equipment and include ‘walk-throughs’ of the relevant competency components. |
| **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. |
Unit Title: Layup fibre composites using vacuum closed moulding techniques

Unit descriptor: This competency covers the knowledge and skills needed to fabricate fibre composites using a VIP (vacuum infusion processing) or other vacuum closed mould technique.

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

Employability skills: This unit contains employability skills. Refer to the Employability Skills Summary for the qualification in which this unit resides.

Application of the unit: This unit covers one of the fundamental techniques for fabricating a fibre 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 may undertaken 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, samples or to make repairs.

ELEMENT | PERFORMANCE CRITERIA
--- | ---
1. Select process. | 1.1 Identify *product requirements*
 | 1.2 Select vacuum *closed moulding technique* most appropriate to those 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 *mould equipment* and ancillary equipment as required
 | 2.3 Pack mould as per 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(s)
 | 3.2 Determine quantity of reinforcing required
 | 3.3 *Prepare reinforcing* as required
 | 3.4 Identify required resin system(s)
 | 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, 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 Check for and correct *typical problems*  
4.5 Ensure air is vented as required  
4.5 Ensure required resin distribution  
4.6 Cure product  
4.7 Remove 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:**  
- Resin infusion  
  - apply tack tape,  
  - apply bag (pleats, sits well etc),  
  - inlet and outlet plumbing (connect/disconnect),  
  - manage flow medium (e.g. cloth),  
  - manage cores as required,  
  - manage flow and gel times (relationship to positioning and spacing of lines),  
  - manage and monitor vacuum pressure  
  - monitor cure cycles  
  - check for leaks,  
- Accessing and operating computer programs  
- Vacuum bagging  
  - see infusion + protect bag from contamination,  
  - apply breather cloth/films,  
  - application of peel ply.  
- Achieving correct ply location  
- Using release processes
Required knowledge:
- reinforcement and layup schedules (layers of reinforcement, direction, darts etc),
- 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, vacuum control (switches, controls, regulators etc),
- resin systems applicable to process (vacuum infusion or vacuum bagging - polyester, epoxy,
- gel times, working times,
- initiator/catalyst or hardener rates to temperature (hot/cold),
- free amine/amine blushes,
- heat curing requirements and how it is done (ovens, hot bonders (blankets), other, autoclaves),
- heat curves,
- TG (glass transition),
- understand design briefs (such as tool design, part lines)
- Darcy’s Law and its application to the flow of resins through porous media (reinforcing, cores)

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.

Product requirements may be determined from various sources including:
- drawings
- product specifications
- customer requests
- descriptions of required use of product

Closed moulding technique includes techniques which may have several names including:
- RIFT (Resin Infusion under Flexible Tooling)
- vacuum bagging
- This may also be applied to other closed moulding techniques

Procedures may be:
- written
- verbal
- computer-based
- in some other form
- They include:
  - all work instructions
  - standard operating procedures
  - formulas/recipes
  - batch sheets
  - temporary instructions
  - any similar instructions provided for the smooth running of the plant.
- ‘Procedures’ also include good operating practice
VU20798 – Layup fibre composites using vacuum closed moulding techniques

as may be defined by industry codes of practice (e.g. Responsible Care) and government regulations.
- All work will comply with procedures.

Mould equipment includes:
- major items
- ancillary items
- consumable equipment and may include items such as:
  - airlines,
  - catchpots,
  - moulds and mould components
  - infusion system for laminate

Prepare reinforcing includes:
- cutting to size/shape as required,
- any pre-treatment required

Typical problems may include:
- dead spots trapping air
- resin curing too quickly
- resin curing too slowly

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.

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 a plant or in a workshop or a simulated plant/workshop environment.
- 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 to standard and efficiently
  - tools and equipment are appropriately maintained
- Competence must be demonstrated in the operation
Context of and specific resources for assessment

- Assessment will require the fabrication of a suitable object(s) using closed mould techniques.
- Assessment will occur over a range of situations which will include disruptions to normal, smooth operation.
- Competence in this unit will require competence in at least one vacuum and one pressure technique.
- A bank of scenarios/case studies/what ifs and questions will be required to probe the reasoning behind observable actions.

Method of assessment

- Demonstration of skills
- Simulation or case studies/scenarios may be required to allow for timely assessment of parts of this unit of competency.
- Simulation should be based on the actual process/equipment and include ‘walk-throughs’ of the relevant competency components.

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.
## VU20799 – Layup fibre composites using pressure closed moulding techniques

<table>
<thead>
<tr>
<th><strong>Unit Code</strong></th>
<th><strong>Unit Title</strong></th>
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<tr>
<td>VU20799</td>
<td>Layup fibre composites using pressure closed moulding techniques</td>
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</tbody>
</table>

### Unit descriptor
This competency covers the knowledge and skills needed to fabricate fibre composites using a resin transfer moulding (RTM – resin under pressure), or other pressure closed mould technique.

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

### Employability skills
This unit contains employability skills. Refer to the Employability Skills Summary for the qualification in which this unit resides.

### Application of the unit
This unit covers one of the fundamental techniques for fabricating a fibre composite product – pressure closed moulding techniques.

There are many closed moulding techniques and this unit includes an awareness of all common forms of pressure closed moulding and competence in at least one pressure technique. Closed moulding may be undertaken by an individual or may undertaken 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, samples or to make repairs.

### ELEMENT | PERFORMANCE CRITERIA
---|---
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.

1. **Select process.**
1.1 Identify *product requirements*
1.2 Select pressure *closed moulding technique* most appropriate to those 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 *mould equipment* and ancillary equipment as required
2.3 Pack mould as per 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(s)
3.2 Determine quantity of reinforcing required
3.3 *Prepare reinforcing* as required
3.4 Identify required resin system(s)
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, 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 Check for and rectify typical problems
4.7 Cure product
4.8 Remove 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:
- tool management,
- use of release agents,
- application of gel coats/surface finishes,
- use of catalyst systems for different resins and techniques,
- achieving correct ply location and orientation
- application of mastic tape and sealing bag for resin infusion
- checking for bag sealing leaks
- connecting resin plumbing-inlet/outlet points
- accessing and operating computer programs
- monitoring curing cycles

Required knowledge:
- reinforcement and layup schedules (layers of reinforcement, direction, darts etc),
- release systems,
- gel coating,
- sealing of mould
- tool sealing
VU20799 – Layup fibre composites using pressure closed moulding techniques

- resin systems applicable to process (RTM - polyester, epoxy,
- pressure systems and process monitoring
- gel times, working times,
- initiator/catalyst or hardener rates to temperature (hot/cold),
- free amine/amine blushes,
- heat curing requirements and how it is done (ovens, hot bonders (blankets), other, autoclaves),
- heat curves,
- TG (glass transition),
- understand design briefs (such as tool design, part lines)
- Darcy’s Law and its application to the flow of resins through porous media (reinforcing, cores)

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.

Product requirements may be determined from various sources including:

- drawings
- product specifications
- customer requests
- descriptions of required use of product

Closed moulding technique includes techniques which may have several names including:

- RTM (Resin Transfer Moulding)
- compression moulding

This may also be applied to other closed moulding techniques.

Procedures may be:

- Written
- Verbal
- computer-based
- in some other form.

They include:

- all work instructions
- standard operating procedures
- formulas/recipes
- batch sheets
- temporary instructions
- any similar instructions provided for the smooth running of the plant.

‘Procedures’ also include good operating practice, as may be defined by industry codes of practice (e.g. Responsible Care) and government regulations.

All work will comply with procedures.

Mould equipment includes:

- major items
- ancillary items
- consumable equipment
VU20799 – Layup fibre composites using pressure closed moulding techniques

- items such as:
  - moulds and mould components
  - infusion system for laminate

**Prepare reinforcing** includes:
- cutting to size/shape as required,
- any pre-treatment required

**Typical problems** may include:
- dead spots trapping air
- resin curing too quickly
- resin curing too slowly

**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.

**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.
- Consistent performance should be demonstrated. In particular look to see that:
  - waste is minimised
  - product is made to standard and efficiently
  - 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 for this unit of competency will be on a plant or in a workshop or a simulated plant/workshop environment.
- Assessment will occur over a range of situations which will include disruptions to normal, smooth operation.
- Competence in this unit will require competence in at least one vacuum and one pressure technique.
- A bank of scenarios/case studies/what ifs and questions will be required to probe the reasoning
behind observable actions.

Method of assessment

- Demonstration of skills
- Assessment will require the fabrication of a suitable object(s) using closed mould techniques.
- Simulation or case studies/scenarios may be required to allow for timely assessment of parts of this unit of competency.
- Simulation should be based on the actual process/equipment and include ‘walk-throughs’ of the relevant competency components.

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.
VU20800 – Mark and cut out sheets for fibre composite use

Unit Code  
VU20800

Unit Title  
Mark and cut out sheets for fibre composite use

Unit descriptor  
This competency covers the knowledge and skills needed to orient, mark out, create templates/lay flats for reinforcing, including woven, nonwoven, prepreg, cores, filler material etc.

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

Employability skills  
This unit contains employability skills. Refer to the Employability Skills Summary for the qualification in which this unit resides.

Application of the unit  
The marking out/cutting out of sheets used for fibre composites can be significantly different to the marking out/cutting out of other materials such as metals. Sheets used in fibre composite fabrication often have significant directionality which must be considered. As a result of this fibre composite design often includes different physical properties in one direction to another and so sheets must be marked and cut to align the required directional properties of the product with those of the sheets used in the fabrication.

Marking out/cutting out may be undertaken by an individual or may undertaken by a team. The mark out/cut out may be for use by the Composites Tradesperson themselves or they may be doing it to support production personnel. It may be undertaken in a workshop or factory environment or in the field and may be used to manufacture new products, prototypes, samples or to make repairs.

ELEMENT

Element 1. Interpret product requirements.

PERFORMANCE CRITERIA

1.1 Determine requirements of final products

1.2 Determine requirements of sheet material to be used

1.3 Identify procedures to be used to fabricate product

Element 2. Develop geometric shape as required

PERFORMANCE CRITERIA

2.1 Develop lay flats for regular solid rectilinear shapes

2.2 Develop lay flats for regular curved/circular shapes

2.3 Develop lay flats for transition pieces

2.4 Develop lay flats for complex 3D shapes

Element 3. Orient required shape to suit directional differences of sheet

PERFORMANCE CRITERIA

3.1 Identify directional properties in sheets

3.2 Identify sheet related directional requirements of product

3.3 Identify orientations and alignment of lay flats with sheet.
4. Mark out and cut sheet as required

4.1 Identify and control hazards
4.2 Place lay flat on sheet as required
4.3 Arrange lay flats to minimise waste
4.4 Prevent lay flat moving while in use
4.5 Mark sheet if required using lay flat
4.6 Address typical problems encountered in the process
4.7 Cut sheet using lay flat

5. Store templates/drawings etc as required.

5.1 Clean lay flats after use as required
5.2 Label lay flat using identification protocol
5.3 Record required directionality information with lay flat
5.4 Store according to procedures

REQUIRED SKILLS AND KNOWLEDGE

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

Required skills
- Interpreting drawings
- Use of hand tools, such as scissors, knives, pizza wheels and slab cutters
- CNC machine operation

Required knowledge
- orientation of plies/reinforcing,
- direction of fibres (unidirectional, quad directional, on bias),
- weaves (plain, twill, satin),
- use for curves and compound curves,
- creating patterns for a lay flat,
- 3D development of shapes.

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.

Requirements of final products may be determined from various sources including:
- drawings
- product specifications
- customer requests
- descriptions of required use of product

Requirements of sheet material include:
- strength
- flexibility/rigidity
- thickness
- density
- directionality
- drape
Procedures may be written, verbal, computer-based or in some other form. They include:
- all work instructions
- standard operating procedures
- formulas/recipes
- batch sheets
- temporary instructions
- any similar instructions provided for the smooth running of the plant.

‘Procedures’ also includes good operating practice as may be defined by industry codes of practice (e.g. Responsible Care) and government regulations.

All work will comply with procedures.

Lay flats are:
- the geometric development of a three dimensional (3D) shape into a two dimensional (2D) template which will allow the 3D shape into be fabricated from a 2D sheet. The lay flat may not take into account the required directionality.

Lay flats may be:
- physical (e.g. board, sheet metal)
- virtual (e.g. coordinates, laser beam)

Regular rectilinear shapes include:
- rectangular prisms
- cubes
- portions of the above
- similar shapes

Regular curved/circular shapes include:
- cylinders
- spheres
- segments of the above
- similar shapes

Transition pieces include:
- cones
- pyramids
- portions of the shapes above
- similar shapes

Complex 3D shapes include:
- other 3D shapes which may need to be fabricated and which may be composed of a number of components of the above shapes.

Sheets include:
- reinforcing,
  - woven
  - nonwoven,
VU20800 – Mark and cut out sheets for fibre composite use

- prepreg,
- cores,
- filler material

**Alignment** may make reference to:
- warp
- weft
- selvedge
- other features of the sheet

**Typical problems** may include:
- identifying directionality in sheet
- identify a feature to provide alignment
- products requiring multidirectional properties

**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.
- Consistent performance should be demonstrated. In particular look to see that:
  - product fabricates from cut sheet efficiently
  - directionality is observed
  - other sheet properties are observed as relevant
- 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 for this unit of competency will be on a plant or in a workshop or a simulated plant/workshop environment.
- Assessment will require the marking and cutting out of a range of suitable sheets used in fibre reinforced composite fabrication.
- Assessment will occur over a range of situations which will include disruptions to normal, smooth operation.
- A bank of scenarios/case studies/what ifs and questions will be required to probe the reasoning behind observable actions.

**Method of assessment**
- Demonstration of skills
- Simulation or case studies/scenarios may be required to allow for timely assessment of parts of this unit of competency.
- Simulation should be based on the actual
VU20800 – Mark and cut out sheets for fibre composite use

process/equipment and include 'walk-throughs' of the relevant competency components.

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.
**Unit code**  
VU20801

**Unit Title**  
Select and use reinforcing appropriate for product

**Unit descriptor**  
This competency covers the knowledge and skills needed to select specified reinforcement for a nominated job from what is normally used by organisation, as well as what is available commercially. It includes the science of reinforcing.

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

**Employability skills**  
This unit contains employability skills. Refer to the Employability Skills Summary for the qualification in which this unit resides.

**Prerequisite units**  
- VU20797 Layup fibre composites using open moulding techniques
- VU20798 Layup fibre composites using vacuum closed moulding techniques
- VU20799 Layup fibre composites using pressure closed moulding techniques

**Application of the unit**  
This unit does not cover the selection of reinforcing for a structurally designed composite, although it may include working with a person undertaking a structural design. It may cover the redesign of an existing product, e.g. using a different process or the design of a new product similar to an existing product.

This unit does not include the selection of a suitable resin system. Where the resin system also needs to be chosen see also FCT06 Select and use resin system.

Reinforcing selection may typically be undertaken by an individual in liaison with relevant stakeholders or it may undertaken by a team. Selection may be undertaken in an office environment or at the worksite.

Use of the reinforcing will be as 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, samples or to make repairs.
VU20801 – Select and use reinforcing appropriate for product

ELEMENT
Elements describe the essential outcomes of a unit of competency.

PERFORMANCE CRITERIA
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.

1. Interpret product requirements
   1.1 Determine requirements of final products
   1.2 Determine requirements of reinforcing
   1.3 Select appropriate procedures to be used to fabricate product

2. Select most appropriate reinforcing for job
   2.1 Compile specification of required reinforcing properties
   2.2 Compare required properties with specifications of available reinforcing
   2.3 Determine the most viable option

3. Evaluate selected reinforcement.
   3.1 Fabricate a sample using the selected reinforcing and nominated resin system.
   3.2 Conduct/organise for relevant tests
   3.3 Evaluate PET (process evaluation test) results
   3.4 Review match of PET results with product requirements
   3.5 Review fabrication process
   3.6 Make any required changes to reinforcing or process

4. Fabricate 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 Mix nominated resin system as required
   4.5 Fabricate product using selected process.
   4.6 Minimise waste to support sustainability
   4.7 Review product compared to requirements
   4.8 Review reinforcing selection and fabrication process
   4.9 Identify areas for improvement
   4.10 Take appropriate action to address typical problems
   4.11 Complete any required documentation/reporting.

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.

Required skills:
• interpreting quality control and quality assurance requirements,
• interpreting specifications.
Required knowledge

- coloured fibres,
- fibre types, costs, source (country/company),
- life cycle assessment,
- types of weave,
- types of material,
- non-woven reinforcing (unidirectional, milled, chopped),
- how you buy reinforcing (toe, strands, gsm, width, weight in product),
- how the reinforcing is arranged,
- exotic and hybrid reinforcing

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.

Requirements of final products may be determined from various sources including:

- drawings
- product specifications
- customer requests
- descriptions of required use of product

Requirements of reinforcing include:

- strength
- flexibility/rigidity
- directionality
- drape
- operating temperature

Procedures may be:

- written
- verbal
- computer-based
- some other form.

They include:

- all work instructions
- standard operating procedures
- formulas/recipes
- batch sheets
- temporary instructions
- any similar instructions provided for the smooth running of the plant.

‘Procedures’ also includes good operating practice as may be defined by industry codes of practice (e.g. Responsible Care) and government regulations.

All work will comply with procedures.
**Most appropriate reinforcing** refers to:

- that reinforcing/reinforcing combination which has:
  - compliance with product requirements
  - greatest ease of use in manufacture
  - best financial return
  - greatest sustainability contribution

**Prepare selected reinforcing** includes:

- cutting to size/shape as required,
- any pre-treatment required

**Correct direction** includes considerations such as:

- fibre orientation,
- fibre performing

**Sustainability** incorporates the three aspects of:

- 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. This also includes OHS.

**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** may include:

- cost/benefit of different reinforcing systems
- selecting a reinforcing suited to the fabrication process

**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.
- Consistent performance should be demonstrated. In particular look to see that:
  - all reasonably available reinforcing has been
VU20801 – Select and use reinforcing appropriate for product

considered
- an appropriate reinforcing has been chosen
- the reasons for choosing the reinforcing are sound
- the product meets its required performance.

• 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 for this unit of competency will be in a work environment.
• Assessment will require the selection and use of appropriate reinforcing for specified fibre composite job(s).
• Assessment will occur over a range of situations which will include disruptions to normal, smooth operation.
• A bank of scenarios/case studies/what ifs and questions will be required to probe the reasoning behind observable actions.

Method of assessment

• Demonstration of skills
• Simulation or case studies/scenarios may be required to allow for timely assessment of parts of this unit of competency.
• Simulation should be based on the actual process/equipment and include ‘walk-throughs’ of the relevant competency components.

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.
Unit code: VU20802
Unit Title: Select and use resin systems appropriate for product

Unit descriptor:
This competency covers the knowledge and skills needed to select appropriate resins and resin systems for a job from what is normally used by organisation, as well as what is available commercially. It includes the chemistry of resins.

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

Employability skills:
This unit contains employability skills. Refer to the Employability Skills Summary for the qualification in which this unit resides.

Prerequisite units:
- VU20797 Layup fibre composites using open moulding techniques
- VU20798 Layup fibre composites using vacuum closed moulding techniques
- VU20799 Layup fibre composites using pressure closed moulding techniques

Application of the unit:
This unit may cover the redesign of an existing product, e.g. using a different process or the design of a new product similar to an existing product.

This unit does not include the selection of a suitable reinforcing system. Where the reinforcing system also needs to be chosen see also VU20801 - Select and use reinforcing appropriate to the product.

Resin selection may typically be undertaken by an individual in liaison with relevant stakeholders or it may undertaken by a team. Selection may be undertaken in an office environment or at the worksite.

Use of the resin will be as 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, samples or to make repairs.

ELEMENT
Elements describe the essential outcomes of a unit of competency.

PERFORMANCE CRITERIA
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.

1. Interpret product requirements.
   1.1 Determine requirements of final products
   1.2 Determine requirements of resin system(s)
   1.3 Select appropriate procedures to be used to fabricate product
## VU20802 – Select and use resin systems appropriate for product

### 2. Determine best resin/resin system for job

<table>
<thead>
<tr>
<th>Task</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1</td>
<td>Determine performance outcomes required from resin</td>
</tr>
<tr>
<td>2.2</td>
<td>Interpret specifications of available resins</td>
</tr>
<tr>
<td>2.3</td>
<td>Compare required properties with specifications of available resin systems</td>
</tr>
<tr>
<td>2.4</td>
<td>Interpret MSDS for possible resin systems</td>
</tr>
<tr>
<td>2.5</td>
<td>Select <strong>most appropriate resin</strong> for the job</td>
</tr>
</tbody>
</table>

### 3. Evaluate selected resin system(s).

<table>
<thead>
<tr>
<th>Task</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.1</td>
<td>Identify current conditions impacting on resin chemistry.</td>
</tr>
<tr>
<td>3.2</td>
<td>Identify adjustments which may be made to meet these conditions</td>
</tr>
<tr>
<td>3.3</td>
<td>Make allowable adjustments and monitor result</td>
</tr>
<tr>
<td>3.4</td>
<td>Fabricate a sample using the selected resin system and nominated reinforcing.</td>
</tr>
<tr>
<td>3.5</td>
<td>Conduct/organise for relevant tests</td>
</tr>
<tr>
<td>3.6</td>
<td>Evaluate PET (process evaluation test) results</td>
</tr>
<tr>
<td>3.7</td>
<td>Review match of PET results with product requirements</td>
</tr>
<tr>
<td>3.8</td>
<td>Review fabrication process</td>
</tr>
<tr>
<td>3.9</td>
<td>Make any required changes to resin system or process</td>
</tr>
</tbody>
</table>

### 4. Fabricate product.

<table>
<thead>
<tr>
<th>Task</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.1</td>
<td>Identify and control hazards</td>
</tr>
<tr>
<td>4.2</td>
<td><strong>Prepare nominated reinforcing</strong> as required</td>
</tr>
<tr>
<td>4.3</td>
<td>Lay reinforcing in <strong>correct direction</strong> as appropriate</td>
</tr>
<tr>
<td>4.4</td>
<td>Make any appropriate <strong>resin system adjustments</strong> to the recipe</td>
</tr>
<tr>
<td>4.5</td>
<td>Mix selected resin system as required</td>
</tr>
<tr>
<td>4.6</td>
<td>Fabricate product using selected process.</td>
</tr>
<tr>
<td>4.7</td>
<td>Minimise waste to support <strong>sustainability</strong></td>
</tr>
<tr>
<td>4.8</td>
<td>Review product compared to requirements</td>
</tr>
<tr>
<td>4.9</td>
<td>Review reinforcing selection and fabrication process</td>
</tr>
<tr>
<td>4.10</td>
<td>Identify areas for improvement</td>
</tr>
<tr>
<td>4.11</td>
<td>Take <strong>appropriate action</strong> to address <strong>typical problems</strong></td>
</tr>
<tr>
<td>4.12</td>
<td>Complete any required documentation/reporting.</td>
</tr>
</tbody>
</table>

## REQUIRED SKILLS AND KNOWLEDGE

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

### Required skills

- interpreting quality control and quality assurance requirements,
- interpreting specs.
- interpreting product data sheets and MSDSs.
Required knowledge:

- physical and chemical properties of resins,
- resin types, cost, source,
- catalyst types and systems (polyester, vinyl ester),
- hardener types (epoxy, phenolic),
- fillers (mineral extenders, milled (1.5 - 12 mm) and cut fibre (12mm - 300mm),
- catalyst hazards (SADTs)

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.

Requirements of final products

may be determined from various sources including:

- drawings
- product specifications
- customer requests
- descriptions of required use of product

Requirements of resin system(s)

include:

- strength
- flexibility/rigidity
- surface finish, colour
- chemical/UV/environmental resistance
- operating temperature
- recyclability

Procedures may be:

- written
- verbal
- computer-based
- some other form.

They include:

- all work instructions
- standard operating procedures
- formulas/recipes
- batch sheets
- temporary instructions
- any similar instructions provided for the smooth running of the plant.

‘Procedures’ also includes good operating practice as may be defined by industry codes of practice (e.g. Responsible Care) and government regulations.

All work will comply with procedures.

Most appropriate resin

refers to that resin system(s), which has:

- greatest ease of use in manufacture
- best financial return
- greatest sustainability contribution

Prepare reinforcing

includes:

- cutting to size/shape as required,
VU20802 – Select and use resin systems appropriate for product

- any pre-treatment required

**Correct direction** includes considerations such as:
- fibre orientation,
- fibre performing

**Resin system adjustments** may be as a result of:
- temperature
- humidity
- required cure time

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

**Sustainability** incorporates the three aspects of:
- 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. This also includes OHS.

**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** may include:
- cost/benefit of different resin systems
- selecting a resin system suited to the fabrication process

**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.
- Consistent performance should be demonstrated. In particular look to see that:
VU20802 – Select and use resin systems appropriate for product

- all reasonably available resin systems have been considered
- an appropriate resin system has been chosen
- the reasons for choosing the resin system are sound
- the product meets its required performance.

- 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 for this unit of competency will be on a plant or in a workshop or a simulated plant/workshop environment.
- Assessment will require the selection and use of appropriate resin and resin system(s) for specified fibre composite job(s).
- Assessment will occur over a range of situations which will include disruptions to normal, smooth operation.
- A bank of scenarios/case studies/what ifs and questions will be required to probe the reasoning behind observable actions.

Method of assessment

- Demonstration of skills
- Simulation or case studies/scenarios may be required to allow for timely assessment of parts of this unit of competency.
- Simulation should be based on the actual process/equipment and include ‘walk-throughs’ of the relevant competency components.

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.
<table>
<thead>
<tr>
<th>Unit Code</th>
<th>Unit Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>VU20803</td>
<td>Select and use cores appropriate for product</td>
</tr>
</tbody>
</table>

**Unit descriptor**

This competency covers the knowledge and skills needed to select appropriate core/s and fillers for a job from what is normally used by organisation, as well as what is available commercially. It includes purposes of cores and fillers, typical applications of core materials, strengths and weaknesses.

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

**Employability skills**

This unit contains employability skills. Refer to the Employability Skills Summary for the qualification in which this unit resides.

**Prerequisite units**

<table>
<thead>
<tr>
<th>Unit Code</th>
<th>Unit Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>VU20797</td>
<td>Layup fibre composites using open moulding techniques</td>
</tr>
<tr>
<td>VU20798</td>
<td>Layup fibre composites using vacuum closed moulding techniques</td>
</tr>
<tr>
<td>VU20799</td>
<td>Layup fibre composites using pressure closed moulding techniques</td>
</tr>
</tbody>
</table>

**Application of the unit**

This unit may cover the redesign of an existing product, e.g. using a different process or the design of a new product similar to an existing product.

This unit does not include the selection of a suitable resin system. Where the resin system also needs to be chosen see also VU20802 - Select and use resin systems appropriate for product.

This unit does not cover the selection of suitable reinforcing. Where reinforcing also needs to be chosen see also VU20801 - Select and use reinforcing appropriate for product.

Core and filler selection may typically be undertaken by an individual in liaison with relevant stakeholders or it may undertaken by a team. Selection may be undertaken in an office environment or at the worksite.

Use of the core and filler will be as 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, samples or to make repairs.
**ELEMENT**

Elements describe the essential outcomes of a unit of competency.

**PERFORMANCE CRITERIA**

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.

1. Interpret product requirements (drawings, specs).
   1.1 Determine **requirements of final products**
   1.2 Determine **requirements of core** and/or **filler**
   1.3 Select appropriate **procedures** to be used to fabricate product

2. Determine the best core(s)/fillers for job
   2.1 Compile specification of required composite properties relevant to the core/filler
   2.2 Compare required properties with specifications of available cores and fillers
   2.3 Select **most appropriate core/filler**

3. Evaluate selected core/filler.
   3.1 Fabricate a sample using the selected core(s)/fillers and nominated resin and reinforcing system.
   3.2 Conduct/organise for relevant tests
   3.3 Evaluate PET (process evaluation test) results
   3.4 Review match of PET results with product requirements
   3.5 Review fabrication process
   3.6 Make any required changes to core, filler or process

4. Fabricate product.
   4.1 Identify and control hazards
   4.2 **Prepare selected core/filler** as required
   4.3 Lay core in **correct direction** as appropriate
   4.4 **Prepare nominated reinforcing** as required
   4.5 Lay **reinforcing in correct direction** as appropriate
   4.6 Mix nominated resin system as required
   4.7 Incorporate fillers as required
   4.8 Fabricate product using selected process.
   4.9 Minimise waste in support of **sustainability**
   4.10 Review product compared to requirements
   4.11 Review core/filler selection and fabrication process
   4.12 Identify areas for improvement
   4.13 Take **appropriate action** to address **typical problems**
   4.14 Complete any required documentation/reporting.
REQUIRED SKILLS AND KNOWLEDGE

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

Required skills:
• interpreting quality control and quality assurance requirements,
• interpreting specs.
• interpreting product data sheets and MSDSs

Required knowledge:
• types of cores,
• chemical makeup of cores, (urethane, PVC, wood/cellulose (e.g. phenolic coated paper), PP, PE,
• types of fillers
• machining techniques,
• function of core,
• bonding of cores,
• function of fillers,
• wetability of the filler by the resin
• properties of cores and fillers and their contributions to the properties of the composite.

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.

Requirements of final products may be determined from various sources including:
• drawings
• product specifications
• customer requests
• descriptions of required use of product

Requirements of core include:
• stiffness/flexibility
• directionality
• density
• operating temperature

Cores are:
• used to cover materials used to provide thickness and so rigidity (and perhaps thermal insulation) to a laminate, but not significant structural strength otherwise. Structural strength is provided by reinforcing.
• Some industry usage includes cores as a subset of reinforcing, but they are separated in this qualification for purposes of clarity.

Fillers include:
• particulate materials which may be added to the composite to vary the bulk, stiffness, density or other properties of the final composite.
**Procedures** may be:
- written
- verbal
- computer-based
- some other form.

They include:
- all work instructions
- standard operating procedures
- formulas/recipes
- batch sheets
- temporary instructions
- any similar instructions provided for the smooth running of the plant.

‘Procedures’ also includes good operating practice as may be defined by industry codes of practice (e.g. Responsible Care) and government regulations. All work will comply with procedures.

**Most appropriate core/filler** refers to that core(s)/filler which has:
- compliance with product requirements
- greatest ease of use in manufacture
- best financial return
- greatest sustainability contribution

**Prepare selected core/filler** includes:
- Core:
  - cutting to size/shape as required,
  - any pre-treatment required
- Filler
  - weighing
  - any other required preparation

**Correct direction** includes consideration of:
- Core:
  - directional properties
- Filler
  - fibre orientation,
  - fibre preforming

**Prepare nominated reinforcing** includes:
- cutting to size/shape as required,
- any pre-treatment required

**Reinforcing in correct direction** includes considerations such as:
- fibre orientation,
- fibre performing

**Sustainability** incorporates the three aspects of:
- 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. This also includes OHS.

**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** may include:
- cost/benefit of different core/filler systems
- selecting a core/filler suited to the fabrication process

**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.
- Consistent performance should be demonstrated. In particular look to see that:
  - all reasonably available cores/fillers have been considered
  - an appropriate core/filler has been chosen
  - the reasons for choosing the core/filler are sound
  - the product meets its required performance.
- 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 for this unit of competency will be on a plant or in a workshop or a simulated plant/workshop environment.
- Assessment will occur over a range of situations which will include disruptions to normal, smooth operation.
- A bank of scenarios/case studies/what ifs and questions will be required to probe the reasoning behind observable actions.
Method of assessment

- Demonstration of practical skills
- Assessment will require the selection and use of appropriate core(s) and core system(s) for specified fibre composite job(s).
- Simulation or case studies/scenarios may be required to allow for timely assessment of parts of this unit of competency.
- Simulation should be based on the actual process/equipment and include ‘walk-throughs’ of the relevant competency components.

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.
**Unit Code**  VU20804  
**Unit Title**  Store and handle fibre composite materials

**Unit descriptor**  
This competency covers the knowledge and skills needed to recognise hazards, shelf life, commercial and other issues controlling appropriate storage and handling of materials used to make fibre composites and then doing it.

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

**Employability skills**  
This unit contains employability skills. Refer to the Employability Skills Summary for the qualification in which this unit resides.

**Application of the unit**  
Storage of materials used to make fibre composites is subject to a range of influences including the:

- chemical hazards (including fire)
- physical hazards (manual handling)
- cost hazards (economic purchasing quantity vs shelf life)
- efficiency hazards (having the material where you need it when you need it)

This unit covers the determining of appropriate storage and handling protocols and procedures as well as storing and handling materials in accordance with these procedures.

Determining storage and handling requirements may typically be undertaken by an individual in liaison with relevant stakeholders or it may undertaken by a team. This decision making may be undertaken in an office environment or at the worksite.

Storing and handling of materials in accordance with the procedures should be followed by all relevant personnel.

<table>
<thead>
<tr>
<th>ELEMENT</th>
<th>PERFORMANCE CRITERIA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elements describe the essential outcomes of a unit of competency.</td>
<td>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.</td>
</tr>
</tbody>
</table>

1. Identify properties and characteristics of materials used.  

   | 1.1 List all materials used on site  
   | 1.2 Interpret MSDS for each material  
   | 1.3 Identify relevant manual handling issues  
   | 1.4 Identify environmental hazards for each material  
   | 1.5 Define the hazards for each material  
   | 1.6 Categorise materials into groups based on their hazards  
   | 1.7 Determine appropriate *hazard controls* |
2. Identify key factors effecting storage and handling
   2.1 Identify requirements for Dangerous Goods licence
   2.2 Identify environmental regulation requirements
   2.3 Identify OHS requirements
   2.4 Identify usage patterns and frequencies
   2.5 Identify cost sensitivity to volume purchased
   2.6 Identify shelf life

3. Determine appropriate storage and handling protocols
   3.1 Check manufacturer’s storage and handling recommendations/requirements
   3.2 Check MSDS
   3.3 Check DG/EPA/OHS requirements
   3.4 Check company usage requirements
   3.5 Resolve conflicts between different requirements
   3.6 Prepare storage and handling procedure for material

4. Store and handle materials in accordance with protocols
   4.1 Identify and control hazards
   4.2 Use required handling aids
   4.3 Move material in accordance with procedures
   4.4 Store materials in accordance with procedures
   4.5 Monitor storage and handling of materials
   4.6 Take appropriate action to address typical problems.

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.

Required skills:
- manual handling,
- using mechanical handling devices

Required knowledge:
- MSDS and product data sheets,
- material registers (set up hazardous goods register, maintain it, use it),
- PPE required (for reinforcement, resins and catalyst/hardener),
- bunding,
- ventilation,
- handling and storage and impact on product,
- contamination (e.g. from water),
- storage temperature (e.g. low temp for catalyst)
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.

**Hazard controls** should be based on the hierarchy of control:

- eliminate
- substitute
- isolate
- engineering controls
- administrative controls
- PPE

**Dangerous Goods license** may:

- vary between states and councils but will typically cover conditions related to:
  - fire,
  - storage
  - and the fee payable

**Environmental regulation** may be from any tier of government and will include:

- trade Waste
- atmosphere
- other wastes
- other emissions

**Procedures** may be:

- written
- verbal
- computer-based
- some other form.

They include:

- all work instructions
- standard operating procedures
- formulas/recipes
- batch sheets
- temporary instructions
- any similar instructions provided for the smooth running of the plant.

‘Procedures’ also includes good operating practice as may be defined by industry codes of practice (e.g. Responsible Care) and government regulations.

All work will comply with procedures.

**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
VU20804 – Store and handle fibre composite materials

- reporting problems outside area of responsibility to designated person.

*Typical problems* may include:
- conflicting requirements
- inadequate storage facilities

**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.
- Consistent performance should be demonstrated. In particular look to see that:
  - all hazards are appropriately identified
  - appropriate hazard controls are determined
  - appropriate storage and handling procedures are developed
  - appropriate storage and handling is practiced.
- 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 for this unit of competency will be on a plant or in a workshop or a simulated plant/workshop environment.
- Assessment will occur over a range of situations which will include disruptions to normal, smooth operation.
- A bank of scenarios/case studies/what ifs and questions will be required to probe the reasoning behind observable actions.

**Method of assessment**

- Demonstration of practical skills
- Assessment will require the determining appropriate storage and handling protocols and procedures and then using them for fibre composite materials.
- Simulation or case studies/scenarios may be required to allow for timely assessment of parts of this unit of competency.
- Simulation should be based on the actual process/equipment and include ‘walk-throughs’ of the relevant competency components.
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.
VU20805 – Determine materials and techniques for a composite component or product

Unit Code  
VU20805

Unit Title  
Determine materials and techniques for a composite component or product

Unit descriptor  
This competency covers the knowledge and skills needed to select and use resin system/reinforcing combinations for a fibre composite product. Includes science of reinforcing and core and resin interactions. Basic design of composite component/product and does not include structural design.

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

Employability skills  
This unit contains employability skills. Refer to the Employability Skills Summary for the qualification in which this unit resides.

Prerequisite units  
VU20797 Layup fibre composites using open moulding techniques
VU20798 Layup fibre composites using vacuum closed moulding techniques
VU20799 Layup fibre composites using pressure closed moulding techniques
VU20801 Select and use reinforcing appropriate for product
VU20802 Select and use resin systems appropriate for product
MEM09002B Interpret technical drawing

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

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 typically might be undertaken by an individual in liaison with relevant stakeholders or may 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 as 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, samples or to make repairs.
**ELEMENT**

Elements describe the essential outcomes of a unit of competency.

**PERFORMANCE CRITERIA**

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.

<table>
<thead>
<tr>
<th>ELEMENT</th>
<th>PERFORMANCE CRITERIA</th>
</tr>
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</table>
| 1. Interprete product requirements (drawings, specs) | 1.1 Determine **requirements of final products**  
1.2 Determine **requirements of resin system(s)**  
1.3 Determine **requirements of reinforcing**  
1.4 Determine **requirements of core(s)**  
1.5 Select appropriate *procedure* to be used to fabricate product |
| 2. Identify suitable resin/reinforcement/core systems | 2.1 Examine previous laminate schedules for similar requirements  
2.2 Shortlist suitable resin systems  
2.3 Shortlist suitable reinforcing combinations  
2.4 Shortlist suitable *core(s)* |
| 3. Evaluate properties of different resin/reinforcement combinations | 3.1 Determine interactions between resin systems and reinforcing and cores  
3.2 Select *most appropriate combination* of resin system(s), reinforcing and core(s)  
3.3 Develop a laminate schedule to meet all requirements  
3.4 Fabricate a sample of most appropriate combination  
3.5 Conduct/organise for relevant tests  
3.6 Evaluate PET (process evaluation test) 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 in the job | 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 *resin system adjustments*, as required  
4.7 Mix selected resin system as required  
4.8 Fabricate product using selected process |
4.9 Minimise waste to support sustainability
4.10 Review product compared to requirements
4.11 Review material selection and fabrication process
4.12 Identify areas for improvement
4.13 Take appropriate action to address typical problems
4.14 Complete any required documentation/reporting.

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.

Required skills:
• making choices,
• applying the skills and knowledge from VU20797 – VU20802

Required knowledge:
• interpret design brief,
• cost against known processes including labour and machine output,
• produce product unsupervised,
• justify choices made
• principles of adhesion and substrate/resin interactions
• bonding within and between composites:
  – interlaminar 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 (reinforcing, cores)

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.

Requirements of final products may be determined from various sources including:
• product specifications
• customer requests
• descriptions of required use of product

Requirements of resin system(s) include:
• strength
• flexibility/rigidity
• surface finish, colour
• chemical/UV/environmental resistance
• operating temperature
• recyclability

Requirements of reinforcing include:
• strength
• flexibility/rigidity
• directionality
• drape
• operating temperature

Requirements of core(s) include:

Requirements of core include:
• stiffness/flexibility
• directionality
• density
• operating temperature

Procedure may be:

• written
• verbal
• computer-based
• some other form.

They include:

• all work instructions
• standard operating procedures
• formulas/recipes
• batch sheets
• temporary instructions
• any similar instructions provided for the smooth running of the plant.

‘Procedures’ also includes good operating practice as may be defined by industry codes of practice (e.g. Responsible Care) and government regulations.

All work will comply with procedures.

Core(s) is used to:

• Cover materials used to provide thickness and so rigidity (and perhaps thermal insulation) to a laminate, but not significant structural strength otherwise. Structural strength is provided by reinforcing.

• Some industry usage includes cores as a subset of reinforcing, but they are separated in this qualification for purposes of clarity.

Most appropriate combination refers to:

• that combination of resin system(s), reinforcing/reinforcing combination and core(s) which has:
  – compliance with product requirements
  – greatest ease of manufacture
  – best financial return
  – greatest sustainability contribution

Prepare selected reinforcing includes:

• cutting to size/shape as required,
• any pre-treatment required

Prepare selected core includes:

• cutting to size/shape as required,
• any pre-treatment required
**Correct direction** includes considerations such as:

- **Core:**
  - directional properties
- **Reinforcing:**
  - fibre orientation,
  - fibre performing

**Resin system adjustments** include:

- Adjustments to the resin system chemistry may be as a result of:
  - temperature
  - humidity
  - required cure time
- Adjustments may only be made within the allowable limits of the system being used

**Sustainability** incorporates the three aspects of:

- 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. This also includes OHS.

**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** may include:

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

**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.
VU20805 – Determine materials and techniques for a composite component or product

- Consistent performance should be demonstrated. In particular look to see that:
  - all reasonably available combinations of resin systems, reinforcing and core(s) have been considered
  - an appropriate combination has been chosen
  - the reasons for choosing the combination are sound
  - the product meets its required performance.

- 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 for this unit of competency will be on a plant or in a workshop or a simulated plant/workshop environment.
- Assessment will occur over a range of situations which will include disruptions to normal, smooth operation.
- A bank of scenarios/case studies/what ifs and questions will be required to probe the reasoning behind observable actions.

Method of assessment

- Demonstration of practical skills
- Assessment will require the designing and fabricating an appropriate fibre composite product or component.
- Simulation or case studies/scenarios may be required to allow for timely assessment of parts of this unit of competency.
- Simulation should be based on the actual process/equipment and include ‘walk-throughs’ of the relevant competency components.

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.
Unit Code: VU20806
Unit Title: Select and use fibre composite process or systems appropriate for product

Unit descriptor:
This competency covers the knowledge and skills needed to choose the one most appropriate process for a job from all common fibre composite processes. 'Appropriate' includes technical, practical, cost and sustainability criteria.

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

Employability skills:
This unit contains employability skills. Refer to the Employability Skills Summary for the qualification in which this unit resides.

Prerequisite units:
- VU20797 Layup fibre composites using open moulding techniques
- VU20798 Layup fibre composites using vacuum closed moulding techniques
- VU20799 Layup fibre composites using pressure closed moulding techniques

Application of the unit:
This unit covers the selection of process or systems for the redesign of an existing product, e.g. using a different process or the design of a new product similar to an existing product.

This unit does not include the selection of suitable materials. Where the materials also need to be chosen see also FCT09 Determine materials and techniques for a composite component or product.

Process/system selection may typically be undertaken by an individual in liaison with relevant stakeholders or it may be undertaken by a team. Selection may be undertaken in an office environment or at the worksite.

Use of the process/system will be as 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, samples or to make repairs.

ELEMENT
Elements describe the essential outcomes of a unit of competency.

PERFORMANCE CRITERIA
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.

1. Identify process requirements of job.
   1.1 Determine physical characteristics of product
   1.2 Determine chemical characteristics of product
   1.3 Determine aesthetic characteristics of product
VU20806 – Select and use fibre composite process or systems appropriate for product

1.4 Determine production volume and delivery schedule
1.5 Determine regulatory requirements for the job

2. Select most appropriate process/system

2.1 Identify processes which can deliver these requirements
2.2 Determine the capability of the organisation to meet the requirements and use the processes
2.3 Evaluate each process against the requirements
2.4 Choose most appropriate process
2.5 Fabricate a sample using most appropriate process
2.6 Conduct/organise for relevant tests
2.7 Evaluate PET (process evaluation test) results
2.8 Review match of PET results with product and sustainability requirements
2.9 Review selected fabrication process
2.10 Make any required changes to process

3. Use process to make job

3.1 Identify and control hazards
3.2 Fabricate product using selected process
3.3 Minimise waste to support sustainability
3.4 Review product compared to requirements
3.5 Review fabrication process
3.6 Identify areas for improvement
3.7 Take appropriate action to rectify typical problems
3.8 Complete any required documentation/reporting.

REQUIRED SKILLS AND KNOWLEDGE

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

Required skills:
- technical communication,
- decision making.

Required knowledge:
- cost analysis for each process to choose best process,
- technical standards/ suitability,
- mechanical stresses,
- life cycle assessment for each process,
- ease of manufacture,
- testing criteria,
- FMEA
- typical applications of each major type of process, strengths and weaknesses
- grid analysis
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.

**Physical characteristics** include:

- size,
- shape,
- weight,
- requiring one/two part mould
- light weight,
- high strength
- erosion resistant

**Chemical characteristics** include:

- corrosion resistant,
- fire retardant
- UV resistant

**Aesthetic characteristics** include:

- finish (gloss, buffed, matt etc)
- colour

**Regulatory requirements** include:

- Dangerous Goods,
- OHS,
- EPA

**Appropriate process** involves consideration of:

- technical,
- practical,
- cost and
- sustainability criteria.

**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** may include:

- cost/benefit of different processes
- selecting a process suited to the customer needs
- selecting a process within the organisation capability
- maximising sustainability
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.
- Consistent performance should be demonstrated. In particular look to see that:
  - all reasonably available processes have been considered
  - an appropriate process has been chosen
  - the reasons for choosing the process are sound
  - the product meets its required performance.
- 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 for this unit of competency will be on a plant or in a workshop or a simulated plant/workshop environment.
- Assessment will occur over a range of situations which will include disruptions to normal, smooth operation.
- A bank of scenarios/case studies/what ifs and questions will be required to probe the reasoning behind observable actions.

Method of assessment

- Demonstration of practical skills
- Assessment will require the selection of an appropriate fibre composite process or system and the using of that to make the required product/component.
- Simulation or case studies/scenarios may be required to allow for timely assessment of parts of this unit of competency.
- Simulation should be based on the actual process/equipment and include ‘walk-throughs’ of the relevant competency components.

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.
Unit Code  VU20807
Unit Title  Select and apply repair techniques

Unit descriptor
This competency covers the knowledge and skills required to select an appropriate repair technique and then carry it out.

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

Employability skills
This unit contains employability skills. Refer to the Employability Skills Summary for the qualification in which this unit resides.

Prerequisite units
VU20797  Layup fibre composites using open moulding techniques
VU20798  Layup fibre composites using vacuum closed moulding techniques
VU20799  Layup fibre composites using pressure closed moulding techniques

Application of the unit
This unit cover the diagnosis of an area needing repair and selecting the appropriate repair techniques and then making the repair. It includes any incidental design which may be relevant to the repair. It may not be appropriate in situations where repair techniques are highly specified and controlled.

This unit does not include the selection of a suitable resin system. Repair technique selection may typically be undertaken by an individual in liaison with relevant stakeholders or it may undertaken by a team. Selection may be undertaken partially in an office environment or at the worksite.

Use of the repair technique and may be undertaken by an individual or a team. It may be undertaken in a workshop or factory environment or in the field.

ELEMENT  PERFORMANCE CRITERIA

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.

1. Diagnose the item needing repair.
   1.1 Clean out damaged area
   1.2 Determine accessibility of area to be repaired
   1.3 Inspect damaged area
   1.4 Identify original materials of construction
   1.5 Determine cause of failure to the extent possible

2. Establish the requirements of the repair
   2.1 Check insurance status
   2.2 Confirm intended usage of composite
2.3 Determine extent of repair required (structural, cosmetic)
2.4 Undertake appropriate *incidental design*
2.5 Agree on the scope of repair with *stakeholders*

3. Select most appropriate repair technique for job
   3.1 Check the availability of standard repair kits/components and techniques
   3.2 Shortlist suitable repair techniques and materials
   3.3 Evaluate suitability of possible repair techniques and materials
   3.4 Select *appropriate repair process*
   3.5 Select appropriate materials for repair
   3.6 Conduct PET (process evaluation tests) as appropriate

   4.1 Identify and control hazards
   4.2 Create necessary access to damaged area
   4.3 Prepare area requiring repair
   4.4 Prepare tools and equipment required for repair
   4.5 *Prepare materials* required for repair
   4.6 Undertake required repair
   4.7 Minimise waste to support *sustainability*
   4.8 Review repaired product compared to requirements
   4.9 Review material selection and fabrication process
   4.10 Identify areas for improvement
   4.11 Take *appropriate action* to address *typical problems*
   4.12 Complete any required documentation/reporting.

REQUIRED SKILLS AND KNOWLEDGE

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

*Required skills:*
- hand mould skills,
- hand layup skills
- resin infusion techniques,
- taper sanding techniques
- syringe techniques,
- use of UV curable
- other open and closed mould techniques.

*Required knowledge:*
- different repair techniques, (patch repair, H/comb repair, resin surface repair) uses/limitations,
- dedicated repair materials,
- blocking techniques,
• hot bonders,
• temporary moulds,
• repairing internal or external surfaces,
• repairing against a mould,
• mixing and using gel coat and gel coat additives (filler, wax, catalyst, pigment),
• laminate defects such as air entrapment, moisture entrapment, osmosis, delamination

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.

Incidental design includes:
• minor design which is incidental to conducting a repair and which:
  - improves on an original design weakness (e.g. such as might be shown up by the failure being repaired)
  - changes the original design to incorporate current techniques, materials or practices
  - better meets customer needs

Stakeholders may include:
• clients
• management
• supervisors
• fellow workers

Appropriate repair process refers to:
• that combination of materials and fabrication techniques which has:
  - compliance with product requirements
  - greatest ease of execution
  - best financial return
  - greatest sustainability contribution

Prepare materials may involve:
• cutting to size and shape as required
• any pretreatment required
• calculating amount of resin and resin components required
• mixing resin system(s)

Sustainability incorporates the three aspects of
• 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. This also includes OHS.
**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** may include:

- cost/benefit of different repair techniques and materials
- customer wants more improvement than is technically feasible
- customer wants more improvements than insurance will pay for

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**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.
- Consistent performance should be demonstrated. In particular look to see that:
  - all reasonably available repair techniques and materials were considered
  - an appropriate technique and materials have been chosen
  - the reasons for choosing the technique and materials are sound
  - the product meets its required performance.
- 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 for this unit of competency will be on a plant or in a workshop or a simulated plant/workshop environment.
- Assessment will occur over a range of situations which will include disruptions to normal, smooth operation.
- A bank of scenarios/case studies/what ifs and questions will be required to probe the reasoning behind observable actions.
Method of assessment

- Demonstration of practical skills
- Assessment will require the diagnosis of an item requiring repair, the selection of a suitable method, justifying the method chosen, and then repairing the item using that method.
- Simulation or case studies/scenarios may be required to allow for timely assessment of parts of this unit of competency.
- Simulation should be based on the actual process/equipment and include ‘walk-throughs’ of the relevant competency components.

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.
Unit Code  
VU20808

Unit Title  
Select and use joining techniques

Unit descriptor  
This competency covers the knowledge and skills required to join fibre composites to other fibre composites components or other materials, either as part of manufacturing or for a repair. The bond will also need to conform to the requirements of the job and so may need to be rigid or flexible, water, UV, chemical or fire resistant or have other properties as well as bond the two surfaces adequately. It includes adhesives as well as fasteners such as pop rivets, screws, bolts, compression bushes etc.

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

Employability skills  
This unit contains employability skills. Refer to the Employability Skills Summary for the qualification in which this unit resides.

Application of the unit  
This unit covers joining which may include:
- Bonding – adhesive, gluing, methacrylate, sikaflex, epoxy
- using FC materials (e.g. Probond, Divelett, K-Lite, Eurmere)
- Secondary bonding – cured FC to cured FC
- Using mechanical fasteners such as bolts, rivets etc,

Selection of the joining technique may typically be undertaken by an individual in liaison with relevant stakeholders or it may undertaken by a team. Selection may be undertaken in an office environment or at the worksite.

Use of the joining technique 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, samples or to make repairs.

ELEMENT  
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.

1. Determine characteristics required of the join  
1.1 Determine finished application properties
1.2 Develop required technical specifications of join
1.3 Identify properties of surfaces to be joined

2. Select most appropriate joining system  
2.1 Shortlist suitable joining techniques and materials
2.2 Compare technical properties of different joining systems with requirements
2.3 Check MSDS of joining materials
2.4 Determine requirements for preparation of surfaces to be
2.5 Select **most appropriate joining system**

2.6 Make sample join using the system.

2.7 Conduct/organise for relevant tests

2.8 Evaluate PET (process evaluation test) results

2.9 Review match of PET results with product requirements

2.10 Review fabrication process

2.11 Make any required changes to system

3. **Complete the required join**

3.1 Identify and control hazards

3.2 Prepare surface as required

3.3 Prepare tools and equipment required for join

3.4 Prepare materials required for join

3.5 Undertake required join

3.6 Minimise waste to support **sustainability**

3.7 Review joined product compared to requirements

3.8 Review materials and techniques selected

3.9 Identify areas for improvement

3.10 Take **appropriate action** to address **typical problems**

3.11 Complete any required documentation/reporting.

**REQUIRED SKILLS AND KNOWLEDGE**

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

**Required skills:**

- surface preparation,
- hand eye coordination skills with power tools,
- assembly techniques,
- bonding techniques,
- joiner application.

**Required knowledge:**

- adhesives (e.g. plexus – methylmethacrylate),
- sealants (e.g. sikaflex – silicon or butyl mastic),
- mechanical joining,
- substrates and interactions with joiner,
- surface preparation of substrate,
- application methods,
- clamping forces (minimum and maximum),
- adhesive/sealant thickness,
- primers,
- design rules around fastening (e.g. minimum area for pop rivets, rivet spacing, rivet patterns etc),
• edge finish of pilot holes,
• quality requirements with the hole preparation,
• quality requirements with the installation of fasteners,
• radius of edge of laminate,
• effect of flatness and smoothness of joining surfaces,
• substrate composition in joining area.

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.

Finished application properties
include:
• permanent/removable
• waterproof/chemical resistant
• structural rigidity
• strength (tensile, compressive, shear, torsional)
• aesthetic

Properties of surfaces to be joined
include:
• materials of construction
• physical properties (such as strength, rigidity)
• surface properties (such as surface finish, surface treatment/coatings)
• size and shape

Joining system include:
• the techniques and materials such as:
  - Bonding – adhesive, gluing, ethacrylates, sikaflex, epoxy
  - using FC materials (e.g. Probond, Divelett, K-Lite, Eurmere)
  - Secondary bonding – cured FC to cured FC
  - Using mechanical fasteners such as bolts, rivets etc,

Preparation of surfaces may
include:
• solvent or other chemical cleaning
• chemical etching
• mechanical preparation such as blasting, buffing
• surface smoothing such as machining
• making of holes or other physical locking features

Most appropriate joining system
refers to:
• that system which has:
  - compliance with product requirements
  - greatest ease of joining
  - best financial return
  - greatest sustainability contribution

Sustainability incorporates the three aspects of:
• 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. This also includes OHS.

**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** may include:

- incompatible requirements
- hazardous materials/preparation methods
- non-uniform join

**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.
- Consistent performance should be demonstrated. In particular look to see that:
  - all reasonably available joining techniques and materials were considered
  - an appropriate technique and materials have been chosen
  - the reasons for choosing the technique and materials are sound
  - the product meets its required performance.
- 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 for this unit of competency will be on a plant or in a workshop or a simulated plant/workshop environment.
- Assessment will occur over a range of situations which will include disruptions to normal, smooth operation.
- A bank of scenarios/case studies/what ifs and questions will be required to probe the reasoning behind observable actions.

Method of assessment

- Demonstration of practical skills
- Assessment will require the selection of joining methods, justifying the selection made and the making of a number of joints using both mechanical and adhesive joining techniques.
- Simulation or case studies/scenarios may be required to allow for timely assessment of parts of this unit of competency.
- Simulation should be based on the actual process/equipment and include ‘walk-throughs’ of the relevant competency components.

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.
Unit Code: VU20809
Unit Title: Prepare composite/substrate surfaces

Unit descriptor: This competency covers the knowledge and skills required to prepare, by abrasive or chemical means, a composite surface prior to bonding or coating with other than composite resins. It includes the preparation of composite surfaces and other surfaces which are used in conjunction with composites e.g. metal surfaces.

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

Employability skills: This unit contains employability skills. Refer to the Employability Skills Summary for the qualification in which this unit resides.

Application of the unit: This unit includes preparation of composite surfaces either as a finish or in preparation for further work such as coating or joining. Surface preparation 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, samples or to make repairs.

This unit complements VU20808 - Select and use joining techniques.

ELEMENT

PERFORMANCE CRITERIA

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.

1. Determine characteristics required of substrate.

1.1 Identify the chemistry of materials to be applied to the surface

1.2 Identify the surface chemistry of the substrate

1.3 Determine any chemical treatments needed to make the substrate compatible with the material to be applied

1.4 Interpret MSDS for materials which may be used

1.5 Identify the current physical state of the substrate

1.6 Identify possible required physical states of the substrate

2. Select most appropriate preparation technique for job

2.1 Compile specification for required substrate preparation

2.2 Compare possible substrate preparation methods with specification

2.3 Select most appropriate substrate preparation(s)

2.4 Conduct and evaluate PET (process evaluation test) as appropriate

2.5 Review selection and substrate preparation

2.6 Make any required changes to substrate preparation
3. Prepare substrate

3.1 Identify and control hazards
3.2 Prepare substrate as required
3.3 Minimise waste to support **sustainability**
3.4 Review result compared to requirements
3.5 Review substrate preparation process
3.6 Identify areas for improvement
3.7 Take **appropriate action** to address **typical problems**
3.8 Clean up and perform any routine maintenance required on equipment
3.9 Complete any required documentation/reporting.

**REQUIRED SKILLS AND KNOWLEDGE**

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

*Required skills:*
- control of blasting equipment,
- hand operation of abrasive equipment,
- use of chemical treatment equipment.

*Required knowledge:*
- methods of abrasive cleaning,
- purposes for abrasive cleaning,
- types of abrasives and their applications, (sand, bead, shot, soda, grit),
- protection of non blasted surfaces,
- waste control, reuse and disposal,
- OHS&E issues,
- surface preparation standards (surface measurement, surface finish)
- types of chemical cleaning (etching, solvents)
- aniline preparation of aluminium.

**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.

*Most appropriate substrate preparation(s) refers to:*  
- that substrate preparation(s) which has:
  - compliance with product requirements
  - greatest ease of preparation
  - best financial return
  - greatest sustainability contribution

*Sustainability* incorporates the three aspects of:  
- 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. This also includes OHS.

**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** may include:
• incompatible surface applications with substrates
• non-uniform substrate preparation
• the use of hazardous materials

**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.
• Consistent performance should be demonstrated. In particular look to see that:
  - all reasonably suitable substrate preparation methods have been considered
  - an appropriate substrate preparation(s) has been chosen
  - the reason for choosing the substrate preparation are sound
  - the product meets its requirements.
• 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 for this unit of competency will be on a plant or in a workshop or a simulated plant/workshop environment.
- Assessment will occur over a range of situations which will include disruptions to normal, smooth operation.
- A bank of scenarios/case studies/what ifs and questions will be required to probe the reasoning behind observable actions.

Method of assessment

- Demonstration of practical skills
- Assessment will require the selection of an appropriate substrate preparation method, justification of that choice, and then the application of that method to prepare a given substrate for an application
- Simulation or case studies/scenarios may be required to allow for timely assessment of parts of this unit of competency.
- Simulation should be based on the actual process/equipment and include ‘walk-throughs’ of the relevant competency components.

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.
Unit Code: VU20810  
Unit Title: Finish a fibre composite product

Unit descriptor: This competency covers the knowledge and skills required to mechanically finish a fibre composite product. There are a range of mechanical techniques used and the appropriate technique needs to be selected for a job and then used. Techniques might include trimming, forming holes (drilling, hole saw or other penetration) using hand, power or machine tools, using jigs and fixtures, removing burrs etc.

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

Employability skills: This unit contains employability skills. Refer to the Employability Skills Summary for the qualification in which this unit resides.

Application of the unit: This unit covers the selection and use of the appropriate mechanical finishing technique for a composite product. This unit does not cover gel coating or similar but may include gel coat repairs, moulding imperfection repairs, repairs to moulds well, and detailing.

Finishing technique selection may typically be undertaken by an individual in liaison with relevant stakeholders or it may undertaken by a team. Selection may be undertaken in an office environment or at the worksite.

Use of the finishing technique will be as 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, samples or to make repairs.

ELEMENT

Elements describe the essential outcomes of a unit of competency.

PERFORMANCE CRITERIA

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.

1. Interpret product requirements
   1.1 Determine requirements of final products
   1.2 Determine finish requirements

2. Select most appropriate finishing for job
   2.1 Compare required finish with results of different finishing methods
   2.2 Select most appropriate finishing method(s)
   2.3 Conduct a PET (process evaluation test) where appropriate and review finishing method as required
3. Finishing product

3.1 Identify and control hazards

3.2 Prepare finishing equipment, tools and materials as required

3.3 Finish product using selected process.

3.4 Minimise waste

3.5 Review finished product compared to requirements

3.6 Identify areas for improvement

3.7 Take **appropriate action** to address **typical problems**

3.8 Complete any required documentation/reporting.

**REQUIRED SKILLS AND KNOWLEDGE**

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

*Required skills*

- using hand tools
- using power tools and
- using machine tools

*Required knowledge:*

- deburring,
- sanding,
- surface preparation,
- preparing cut edges,
- drill bits and sizes,
- measurement of tools and relationship to finished size,
- choice of tool
- gel coat repair, metal flake, dual colour, touch up chips.

**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.

*Requirements of final product* may be determined from various sources including:

- product specifications
- customer requests
- descriptions of required use of product

*Finishing method(s)* may include:

- machining,
- polishing
- buffing
- blasting
- etching
- making holes
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 may include:

- damage to laminate from finishing process

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.
- Consistent performance should be demonstrated. In particular look to see that:
  - all reasonably appropriate finishing methods have been considered
  - an appropriate finishing procedure has been chosen
  - the reasons for choosing the finishing process are sound
  - the product finish meets its requirements.
- 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 for this unit of competency will be on a plant or in a workshop or a simulated plant/workshop environment.
- Assessment will occur over a range of situations which will include disruptions to normal, smooth operation.
- A bank of scenarios/case studies/what ifs and questions will be required to probe the reasoning behind observable actions.
### Method of assessment

- Demonstration of practical skills
- Assessment will require the selection of a mechanical finishing method, justifying the choice and then finishing the product(s) using that method(s).
- Simulation or case studies/scenarios may be required to allow for timely assessment of parts of this unit of competency.
- Simulation should be based on the actual process/equipment and include ‘walk-throughs’ of the relevant competency components.

### 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.
Unit Code: VU20811
Unit Title: Identify and interpret required standards for composites

Unit descriptor: This competency covers the knowledge and skills required to identify a relevant standard for a job such as an agreed quality assurance/quality control external standard (e.g., AS, ISO, OEM spec, CASA, DoD, EDI, ADR) and taking the actions required to produce a product which complies with the standard(s). This can be more important for 'specials' where there is no agreed, standardised work process designed to deliver the required standard.

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

Employability skills: This unit contains employability skills. Refer to the Employability Skills Summary for the qualification in which this unit resides.

Application of the unit: This unit covers the identification and selection of relevant standards for a job as may be relevant to the redesign of an existing product, e.g., using a different process or the design of a new product similar to an existing product or the undertaking of a repair.

Standard selection may typically be undertaken by an individual in liaison with relevant stakeholders or it may undertaken by a team. Selection may be undertaken in an office environment or at the worksite.

Use of the standard will be as 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, samples or to make repairs.

ELEMENT PERFORMANCE CRITERIA

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.

1. Identify relevant standard(s)
   1.1 Review available standards
   1.2 Identify standard(s) which may have relevance to the job
   1.3 Select the appropriate standard.

2. Determine requirements to meet standard
   2.1 Interpret standard
   2.2 Identify application of standard to job
   2.3 Compile specifications which will ensure job meets standard
3. Undertake required work

3.1 Ensure procedures will produce a product which meets standard
3.2 Ensure any required testing/metrics gathering is undertaken
3.3 Monitor production to ensure it complies with the procedures
3.4 Minimise waste

4. Check conformance to standard as required.

4.1 Check final product complies with the standard as required
4.2 Identify areas for improvement

4.3 Take appropriate action to address typical problems
4.4 Complete any required documentation/reporting.

REQUIRED SKILLS AND KNOWLEDGE

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

Required skills:
- create documents to support QC.

Required knowledge:
- relevant standards,
- interpretation of standards,
- evidence to support meeting of standard,
- accessing standards,
- copyright of AS,
- using standards.

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.

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 may include:
- standard may not lead to practical procedure
- compliance with standard may take precedence over sustainability
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.
- Consistent performance should be demonstrated. In particular look to see that:
  - all reasonably relevant standards are considered
  - an appropriate standard is chosen
  - the reasons for choosing the standard are sound
  - the procedure delivers a product which meets the standard.
- 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 for this unit of competency will be on a plant or in a workshop or a simulated plant/workshop environment.
- Assessment will occur over a range of situations which will include disruptions to normal, smooth operation.
- A bank of scenarios/case studies/what ifs and questions will be required to probe the reasoning behind observable actions.

Method of assessment

- Assessment will require the selection of an appropriate standard and then monitoring a job to ensure it complies with that standard.
- Simulation or case studies/scenarios may be required to allow for timely assessment of parts of this unit of competency.
- Simulation should be based on the actual process/equipment and include ‘walk-throughs’ of the relevant competency components.

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.
Appendix 1

Report on a meeting to develop a course for Aircraft Structures-Manufacturing

Meeting held at Box Hill Institute of TAFE on Monday 8 August 2011

Present: Brian Scholes, Peter Canavan, Ian Stirling, George Adda, Sam McCurdy

1. Background

George Adda provided a background to the course, which was to develop an apprenticeship course to meet the needs of Boeing in producing aircraft mechanical structures. Boeing hoped to have the course available for delivery at the beginning of 2012 and the project has been funded and supported by Skills Victoria.

The members were advised that a draft Training Package qualification has been developed for the MEM05-Metal and Engineering Training Package as a Certificate III in Fibre Composites Trade – MEM31111. This qualification is being considered for approval as an apprenticeship and may meet the training requirements of Boeing.

2. Determination of required skills

The group decided that the job title for graduates of the proposed course would be Aircraft Mechanic-Manufacturing and proceeded to identify the skills required. In the ensuing discussion the Aircraft Mechanic-Manufacturing needs to be able to:

A. Fabricate detailed parts using composite materials

B. Assemble composite structures

C. Repair fabricated components

D. Perform engineering measurements

E. Perform computations

F. Comply with OH & S requirements

G. Maintain quality standards

H. Communicate effectively within the industry

I. Apply relevant technology

J. Apply sustainable work practices

K. Contribute to training

3. Determination of required composite materials skills

The group then considered the skills A-B to identify the specific tasks involved and the following information emerged.

A. Fabricate detailed parts using composite materials
A1. Use the computer to access the relevant work instruction
A2. Select the correct tools and equipment for the job
A3. Clean, polish and coat the relevant tool(s)
A4. Verify relevant materials are received for the job
A5. Contribute to cutting plies
A6. Assemble the plies in the lay-up mandrill/tool, incorporating
   - bagging
   - calibration of the tool
   - orientation of the plies
   - computing
   - honey-combing.
A7. Conduct the curing cycle
A8. Trim the component to shape
A9. Conduct non-destructive inspection
A10. Clean up tool according to established procedures

B. Assemble composite structures
B1. Use the computer to access the relevant work instruction
B2. Select appropriate tools, equipment and jigs
B3. Verify that all detailed parts have been received, as per the work instruction
B4. Assemble the component using relevant tools/jigs and detailed parts
B5. Forward the component to the next stage of the process

4. Review of the Certificate III in Fibre Composites Trade – MEM31111

Peter Canavan advised the group that the core units of were common to other apprenticeship courses and therefore should be used to meet the Boeing needs. Brian Scholes confirmed that the core units would indeed be required for the Boeing training.

The group then considered the Group A electives listed for the Composite Trade stream and Brian advised that contextualising the following units could meet the Boeing requirements.

FCT01 Layup fibre composites using open moulding techniques
   (It was suggested that this unit should split to separate “chopper gun” techniques from other moulding techniques)
FCT021 Layup fibre composites using vacuum closed moulding techniques
FCT022 Layup fibre composites using pressure closed moulding
FCT04 Mark and cut out sheets for fibre composite use
FCT06 Select and use resin systems appropriate for product
FCT07 Select and use cores appropriate for product
FCT08 Store and handle fibre composite materials
FCT09 Determine materials and techniques for a composite component or product
FCT11 Select and use fibre composite process or systems appropriate for product
FCT13 Select and apply repair techniques
FCT14 Select and use joining techniques
   (This unit may need to be expanded to cover a range of assembly techniques)
FCT15 Prepare composite/substrate surfaces
FCT21 Finish a fibre composite product
FCT22 Identify and interpret required standards for composites

The group identified the following additional units as being required by Boeing:
MEM09002B Interpret technical drawing
The group considered that the above list of units would meet Boeing training requirements as well as the current packaging rules for the draft 'Certificate III in Fibre Composite Trade – MEM31111' qualification. However, advice was provided that the packaging rules for this qualification may change before it is endorsed.

The outcomes of the discussions were summarised in the job profile for Aircraft Structure-Manufacturing tradespersons provided in Diagram 1.

5. **Recommendations for the draft Certificate III in Fibre Composite Trade-MEM3111**

In reviewing the draft units the group noted the following:

- It would be beneficial to split unit ‘FCT01 - Layup fibre composites using open moulding techniques’ into two units, one dealing with “Chopper gun” techniques and the other dealing with other moulding techniques, as Boeing do not use “chopper guns”.

- Unit ‘FCT14 – Select and use joining techniques’ may need to be expanded to include other assembly techniques, or a new unit may need to be written.

- The “Required Skills” listed in some units is very scant and may need to be expanded.

- Several typos were encountered within the units, which need to be corrected.

6. **Future action**

The following actions were agreed to by the group:

- Sam and Ian will collaborate to produce a draft report of the outcomes of this meeting, which will be provided to Brian to assist him in his actions below.

- Peter will check the timelines and status for the endorsement of the Certificate III in Fibre Composite Trade –MEM3111 qualification and its approval as an apprenticeship program.

- Brian will check with his training colleagues whether the structure developed at this meeting does in fact meet Boeing’s training requirements and if there are any gaps, what they might be.

- In addition Brain will check the “Required skills and knowledge” listed within the selected draft units to identify any additional information that may be required to meet Boeing’s needs.

- Brian will provide George with the information to enable the draft report to be updated for presentation and consideration at the next meeting.

- The next meeting will involve the key stakeholders and will be held at Box Hill Institute on **Friday 26 August at 10:00 am**. This meeting will aim to confirm the way forward.
## Appendix 1 – Job Profile for Aircraft Structures-Manufacturing Tradespersons

<table>
<thead>
<tr>
<th>Duties</th>
<th>Tasks</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A. Fabricate detailed parts using composite materials</strong></td>
<td>A1. Use computers to access relevant work instruction&lt;br&gt;A2. Select correct tools and equipment&lt;br&gt;A3. Verify receipt of relevant materials for the job&lt;br&gt;A4. Clean, polish and coat the relevant tool&lt;br&gt;A5. Contribute to cutting the plies&lt;br&gt;A6. Assemble the plies in the lay-up mandril or tool&lt;br&gt;A7. Conduct the curing cycle&lt;br&gt;A8. Trim component to required shape&lt;br&gt;A9. Clean up tool in accordance with established procedures</td>
</tr>
<tr>
<td><strong>B. Assemble composite structures</strong></td>
<td>B1. Use computers to access relevant work instruction&lt;br&gt;B2. Select appropriate tools, equipment and jigs&lt;br&gt;B3. Verify receipt of all detailed parts, as per work instruction&lt;br&gt;B4. Assemble the component using relevant tools, jogs and detailed parts&lt;br&gt;B5. Conduct non-destructive inspection&lt;br&gt;B6. Forward component to next stage in the process</td>
</tr>
<tr>
<td><strong>C. Repair fabricated components</strong></td>
<td>C1. Inspect component requiring repair&lt;br&gt;C2. Determine the requirements of the repair&lt;br&gt;C3. Select most appropriate repair technique for the job&lt;br&gt;C4. Undertake repair of the component&lt;br&gt;C5. Conduct non-destructive inspection of repaired component</td>
</tr>
</tbody>
</table>
Appendix 2 – Minutes of Project Steering Committee meetings

Minutes of the 1st Steering Committee meeting for the Certificate III in Fibre Composite Aircraft Structures

Meeting held at Box Hill Institute of TAFE on Monday 3rd October 2011

Present:
Brian Scholes Boeing Aerostructures Australia
Peter Canavan Australian Industry Group
George Adda Box Hill Institute of TAFE

Apologies:
Paul Kennett Manufacturing & Engineering Skills Advisory Board (MESAB)
Russell Gambling Kangan Institute of TAFE
Representative Australian Manufacturing Workers Union (AMWU)

In attendance:
Sam McCurdy Dewhurst Consultancy Pty Ltd

1. Background:

George Adda summarised the proceedings of the Working Party to date. Two meetings had been held on 8th and 26th August. These had identified a course structure to meet the training needs of Boeing staff, which incorporated draft units from the proposed qualification MEM31111 – Certificate III in Fibre Composites - Trade. Several changes to some of the draft units had been suggested and these had been conveyed to the writer, Kevin Hummell, who had indicated his approval of the changes.

George advised that he had discussions with Paul Kennett (MESAB) and Bob Paton (Manufacturing Industry Skills Council) and gained support for the project.

It was reported that there may be some opposition to the proposal to include the fibre composite units within the MEM30505 - Certificate III in Engineering - Fabrication Trade qualification, as it was perceived that this might erode the roles of traditional boilermakers and pattern makers for which the qualification was designed. A separate qualification for fibre composite trade may be the preferred option. However, this could take some time to be endorsed. The solution will have to be decided at Board level.

As an interim measure to meet Boeing’s immediate needs, a Victorian accredited course should be developed and in place by the start of 2012, using the draft fibre composite units.
This course could then be retired once the units are available within the MEM05- Metals and Engineering Training Package.

2. Preparation of a draft accreditation submission

The committee decided that it would prudent to proceed to develop a draft accreditation submission for a Certificate III course using the draft fibre composite units proposed for the Training Package.

It was suggested that Brian check with Russell Gambling on the status of the training for the eight current Boeing apprentices, who should complete the core trade units with Kangan Institute by the end of the year. If so, they could then commence training in the fibre composite units from the accredited course from the beginning of 2012.

A question was raised about the copyright of the draft “Fibre composite” units of competency and their use in a Victorian accredited course. It was agreed that this point needs to be clarified between Skills Victoria and MSA.

Action: George Adda

3. Feedback on proposed course structure and units of competency – Brian Scholes

Brian advised that he had presented the proposal to an Operations Forum at Boeing, which consisted of management and union representatives. The concept had been enthusiastically received, as the units were seen to be tailored to the needs of Boeing, but also provided broadening skills and knowledge that would facilitate career pathways to other organisations.

Boeing currently has eight 1st year apprentices, including 3 mature age apprentices and it is anticipated that this level of training demand will apply for the next five years. Brian confirmed that the proposed fibre composite units and course structure would meet the training needs of the Boeing apprentices.

4. Review of a draft accreditation document

A draft accreditation submission was then reviewed by the committee and several changes were identified. In particular, the following changes were noted:

- The title should be amended to “Certificate III in Fibre Composite Aircraft Structures”
- Section B2 should indicate the vocational competencies that graduates of the course will have
- In Section B3.1, a statement should be added indicating the catalyst for the development of the course was the fact that Boeing traditionally employed people trained in the fabrication trade, but the advent of fibre composites in aircraft manufacturing had necessitated a change in the focus of the training.
- Initially the nominal hours for the draft fibre composite units should be based on the provisional points allocated to the draft trade course, using a 10:1 ratio.
5. **Future action**
   
   It was agreed that Sam should produce a draft accreditation submission incorporating all of the changes discussed at this meeting and the amended fibre composite units, which have been given copyright clearance. This should be circulated to all Steering Committee members for review, prior to the next meeting.

   **Action:** Sam McCurdy

6. **Arrangements for the next meeting**
   
   The next meeting will be held at Box Hill Institute of TAFE on **Friday 4 November at 10:00 am**.

   The meeting closed at 11:50 am.
Minutes of the 2nd Steering Committee meeting for the Course in Fibre Composites Aircraft Structures

Meeting held at Box Hill Institute of TAFE on Monday 4th November 2011

Present:
Paul Kennett (Chair) Manufacturing & Engineering Skills Advisory Board (MESAB)
Brian Scholes Boeing Aerostructures Australia
Peter Canavan Australian Industry Group
Russell Gambling Kangan Institute of TAFE
Greg Warren Australian Manufacturing Workers Union (AMWU)
George Adda Box Hill Institute of TAFE

Apologies:
None

In attendance:
Sam McCurdy Dewhurst Consultancy Pty Ltd

1. Welcome:
George Adda welcomed the members to the 2nd meeting of the Steering Committee and provided a brief summary of the project to date. He then handed the meeting over to the Chairperson Paul Kennett.

2. Minutes of the previous meeting:
The minutes were accepted as an accurate record of the meeting.

3. Business arising from the previous meeting:
George Adda explained that since the last meeting, he had been advised by Skills Victoria that the title of the course should be changed to a "Course in Fibre Composites Aircraft Structures, as this would maximise access to Government funding and enable the units within the course to be imported into existing Training Package qualifications, until such time as an appropriate qualification was incorporated into relevant Training Package(s).

4. Course title change:
George confirmed the advantages of changing the course title from a “Certificate III in” to a “Course in ...” and indicated that it would provide considerable flexibility in the training arena. He also confirmed that the accredited course would be retired as soon as a suitable Training Package qualification was endorsed.
Brian Scholes indicated that while he supported the change in title as an interim measure, ultimately Boeing want a suitable Certificate III trade qualification and that is what he had promised the company. He was advised that this is the ultimate goal, but the creation of a “Fibre composite” trade qualification is probably a long term proposition and is unlikely to occur until the middle of 2012 at the earliest. The final product may be a “stand-alone” Certificate III ‘fibre composites’ trade qualification, or a ‘fibre composites’ stream within the existing Certificate III in Engineering - Fabrication Trade qualification. This will be determined at a national level.

The members confirmed their support for the change in course title to the “Course in Fibre Composites Aircraft Structures”.

Greg Warren flagged a potential issue with the inclusion of the unit MEM24008B - Perform ultra sonic testing in the course. This could lead to demarcation problems with the Non-destructive Testing (NDT) industry sector. Brian explained that Boeing require their apprentices to have a working knowledge of non-destructive testing, hence the inclusion of the unit in the course. It was agreed that the final document should flag this as a potential demarcation problem at a national level.

5. General Business

5.1 Working Group activity

George outlined the outcomes of two Working Group meetings that had led to the creation of the proposed course structure. The draft national units of competency for fibre composites had been reviewed and relevant ones selected. Some improvements had been made to the content of the selected units and these had been sent to Kevin Hummel (the original writer), who had welcomed the changes.

The amended draft national units had then been approved at the first Steering Committee meeting for re-formatting to meet VRQA requirements for accreditation.

5.2 Draft units of competency

Sam McCurdy advised that he had re-formatted the 15 selected national draft fibre composites units to comply with the VRQA unit template. This had entailed some minor tidying up of the wording in some sections. However, the unit titles and overall content had been retained, which would facilitate alignment to the national units once they have become endorsed.

The re-formatted units had then been incorporated into a draft accreditation submission for a “Course in Fibre Composites Aircraft Structures”, which had been distributed to the members for discussion at this meeting. It had been decided to use the three units that were pre-requisites for several of the other fibre composites units as a core with the other units being electives. To complete the ‘Course in Fibre Composites Aircraft Structures”, participants would be required to complete the three core and three elective units.

5.3 Draft accreditation submission

George summarised the course accreditation process and then led the members through the draft submission. The following changes were recommended by the members:

• The Australian Metal Workers Union (AMWU) should be included as representative of the industry in the 1st sentence of the paragraph in Section B, 3.1.
• Indicate that the “Representative” of the AMWU is Greg Warren, in the membership of the Project Steering Committee.
• The AMWU and Australian Industry Group (AIG) should be added to the list of required Letters of Support in Section B, 3.1.

• In section B, 6.2, change the National Quality Council to the National Skills Standards Council (NSSC)

• In section B, 8 amend the 2nd paragraph to read “Credit transfer is available for those participant who have already completed any of the two imported endorsed units of competency from the MEM05-Metals and Engineering Training Package

• Amend the last sentence in section B, 8 to read “Additionally, this course may be used as a pathway into a range of fibre composites occupations.”

It was explained that, on advice provided by the CMM-Engineering Industries, nominal hours had been allocated to each of the fibre composites units based on the provisional points allocated to the draft national fibre composites units of competence

6 Course Contents Endorsement forms

George explained the purpose of the Course Contents Endorsement forms and requested each of the members to complete and sign a form, if they supported the course proceeding to accreditation with the amendments listed above.

7 Future action

George advised that the amended course accreditation submission will be forwarded to two independent Accreditation Advisers (AAs), who will review it against the AQTF Standards for accrediting courses and provide a written report.

Any recommendations for change made by the AAs will be incorporated into a final document which will then be considered at an Accreditation Panel made up of the two AAs and a representative from the Steering Committee (Usually the Chairperson). If acceptable, the submission will then be forwarded to the VRQA with all supporting documents for accreditation.

It is estimated that the AAs would receive the submission next week and provide a report by mid-November, allowing the Accreditation Panel to meet in late November. The complete submission could then be forwarded to VRQA by the end of the month.

It was agreed that a copy of the final draft of the accreditation submission to be forwarded to the AAs should also be sent to each of the Steering Committee members.

8 Other business

None

9 Conclusion

The Chairperson thanked the members and closed the meeting at 11:20 am.
Course Contents Endorsement forms
Appendix 4 - Letters of Support

Letters of Support