Australian Government

Department of Education, Employment and Workplace Relations

PMBTECH507B Develop fibre composite products using cored-laminate techniques

Revision Number: 1

PMBTECH507B Develop fibre composite products using cored-laminate techniques

Modification History

Not applicable.

Unit Descriptor

Unit descriptor
This competency covers the development of designs for 'sandwich type' fibre-composite laminates and the solving of technical problems.

Application of the Unit

Application of this unit
This competency is typically performed by technicians applying knowledge of materials, product purpose and processes to the design of 'sandwich' composites that meet specific performance requirements in terms of strength, stiffness and/or weight. It also requires transferring and applying theoretical concepts and skills to analyse and plan approaches to technical problems.
The technician will:

- determine appropriate materials and processes to meet design objectives
- determine appropriate equipment and process settings and adjustments
- develop drawings of new product
- solve technical problems associated with the design and manufacturing procedures.
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Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisites
This unit has the prerequisite of *MEM9.3B Prepare basic engineering drawing*.

Employability Skills Information

Employability Skills
This unit contains employability skills.

Elements and Performance Criteria Pre-Content

ELEMENT Elements describe the essential outcomes of a unit of competency	**PERFORMANCE CRITERIA** Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT ELEMENT	**PERFORMANCE CRITERIA** Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.
1. Confirm product specification.	1.1 Confirm physical/structural properties required of product. 1.2 Confirm other requirements of product. 1.3 Identify relevant regulations/standards/codes of practice which may be applicable. 1.4 Draw/use hand sketch to confirm product size and shape.
2. Identify technical requirements.	2.1 Determine the laminate properties appropriate for the job. 2.2 Select the appropriate core material(s). 2.3 Select the appropriate resin, matrix and other materials. 2.4 Determine joints, attachment points and other special features required. 2.5 Determine lay-up technique to be used.
3. Develop specification for manufacturing product.	3.1 Develop technical/engineering drawing of new product to company required standards. 3.2 Develop material list/specification for new product. 3.3 Develop manufacturing procedures/specifications for new product. 3.4 Complete required documentation.
4. Make trial samples, as required.	4.1 Liaise with production and other relevant people to ensure specifications/procedures are clear, adequate and understood. 4.2 Provide technical expertise to the production process as required to facilitate manufacture. 4.3 Test samples for function and quality. 4.4 Modify designs, where necessary to meet manufacturing and other requirements.
5. Anticipate and solve problems.	5.1 Recognise a problem or a potential problem. 5.2 Determine possible cause. 5.3 Refer problems outside area of responsibility to appropriate person, with possible cause. 5.4 Seek information and assistance as required, to solve problems 5.5 Solve problems within area of responsibility. 5.6 Follow through items initiated until final

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	resolution has occurred.

Required Skills and Knowledge

This describes the essential skills and knowledge and their level required for this unit.
Application of knowledge of materials, equipment and process sufficient to recognise material and equipment conditions which may lead to out of specification production. For example, poor adhesion can result in delamination under stress, impact and load conditions
Knowledge and ability to implement organization procedures, quality requirements at each production stage and relevant regulatory requirements, within appropriate time constraints and work standards.
Application of the knowledge of managing risks using the hierarchy of controls applied to the production process. Application of approved hazard control and safety procedures and the use of PPE in relation to handling materials, equipment operation and cleanup
Knowledge as a basis for developing designs that meet new product requirements:

- principal construction techniques and the technical advantages of various types
- material properties and their suitability for use as core (eg PVC rigid foams, PU foams, SAN foams, linear PVC foams, plywood, balsa, and various honeycomb materials)
- layered or laminate structural behaviour
- hand lay-up and vacuum-bagging techniques
- failure modes
- function and operating principles of composites forming equipment, machine components and ancillary equipment
- impact of temperature, pressure, time, on product quality and production output
- correct selection and use of equipment, materials, processes and procedures
- impact of variations in raw materials and equipment operation in relation to final product
- factors which may affect product quality or production output and appropriate remedies.

Competence also includes the ability to:

- plan own work, including predicting consequences and identifying improvements
- identify and describe own role and role of others involved directly in the design and manufacturing process
- identify when assistance is required to solve problems.

Language, **literacy and numeracy requirements**
This unit requires the ability to write and interpret technical specifications and reports. Advanced numeracy allowing the calculation and interpretation of statistics, product formulae and process conditions is also required.

Evidence Guide

The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, the range statement and the assessment guidelines for this training package.
Overview of assessment
A holistic approach should be taken to the assessment.
Assessors must be satisfied that the person can consistently perform the unit as a whole, as defined by the Elements, Performance Criteria and skills and knowledge.

Critical aspects for assessment and evidence required to demonstrate competency in this unit

It is essential that competence is demonstrated in the ability to select the appropriate moulded laminate structure to meet the cost and performance specification for the particular job.
It is essential that competence is demonstrated in the knowledge and skills defined in this unit. These may include the ability to:

- identify critical materials properties and structural considerations in relation to the design objectives and the end product
- make design modifications , as required
- identify and develop solutions to technical problems

Consistent performance should be demonstrated. For example, look to see that:

- design objectives are consistently met
- manufacturing codes of practice are observed

Assessment method and context

Assessment will occur on a sandwich-type composite design process and will be undertaken in a work-like environment.
Competence in this unit may be assessed:

- over a range of actual design projects which are implemented in the workplace
- in a situation allowing for the generation of evidence of the ability to recognise, anticipate and respond to problems
- by using a suitable simulation and/or a range of case studies/scenarios
- through a combination of these techniques.

In all cases it is expected that practical assessment will be combined with targeted questioning to assess the underpinning knowledge and theoretical assessment will be combined with appropriate practical/simulation or similar assessment. Assessors need to be aware of any cultural issues that may affect responses to questions.
Assessment processes and techniques must be culturally appropriate and appropriate to the oracy, language and literacy capacity of the assessee and the work being performed.

Specific resources for assessment

This section should be read in conjunction with the Range Statement for this unit of competency. Resources required include suitable access to an operating plant or equipment that allows for appropriate and realistic simulation. A bank of case studies/scenarios and questions will also be required to the extent that they form part of the assessment method. Questioning may take place either in the workplace, or in an adjacent, quiet facility such as an office or lunchroom. No other special resources are required.
Access must be provided to appropriate learning and/or assessment support when required. Where applicable, physical resources should include equipment modified for people with disabilities.

Range Statement

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. Add any 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. Where reference is made to industry codes of practice and/or Australian/international standards, the latest version must be used.

Context

This competency applies to the design of composite products using sandwich construction within the plastics and rubber industries. It covers the design of new sandwich products within the scope of normal sandwich product manufacture for the enterprise, ie using the range of materials and techniques which are standard within the enterprise.

For design outside this range, see *PMBTECH601A Develop a new product.*

Procedures

All operations are performed in accordance with procedures.

Procedures include all relevant workplace procedures, work instructions, temporary instructions and relevant industry and government codes and standards.

Tools and equipment

This competency includes use of equipment and tools such as:

- drawing tools (including computer aided drawing)
- measuring tools.

Typical hazards include:

- hazardous vapours and materials
- fibres, airborne and handled.

Problems

'Anticipate and solve problems' means develop solutions to a wide range of problems associated with the design and manufacture of a new product.

Typical design and product problems may include:

- structural optimisation
- strength problems
- core shearing
- bending
- cost.

Variables

Key design variables include:

- size
- weight
- thickness
- loading modes
- strength
- stiffness
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Unit Sector(s)

Not applicable.