



Australian Government

Department of Education, Employment and Workplace Relations

PMBPROD347B Produce composites using hand lamination

Revision Number: 1

PMBPROD347B Produce composites using hand lamination

Modification History

Not applicable.

Unit Descriptor

Unit descriptor

This competency covers the production of complex composite products using hand lamination of composite materials and the solving of problems.

Application of the Unit

Application of this unit

This competency is typically performed by operators applying knowledge of materials, product purpose and processes of hand lamination to produce products conforming to requirements. It also requires using a range of well developed skills requiring some discretion and judgement to recognise and resolve a range of problems.

The operator will:

- identify and plan own work requirements from production requests
- set up equipment, moulds and forms
- monitor materials and equipment operation
- make appropriate adjustments to correct materials, equipment or process variations
- solve equipment and process problems, seeking guidance where necessary or appropriate.
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Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisites

This unit has the prerequisite of *PMBPROD247C Hand lay up composites*.

Employability Skills Information

Employability Skills

The required outcomes described in this unit contain applicable Employability Skills. The Employability Skills Summary of the qualification(s) in which this unit is packaged will assist in identifying Employability Skill requirements.

Elements and Performance Criteria Pre-Content

| ELEMENT | PERFORMANCE CRITERIA |
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| Elements describe the essential outcomes of a unit of competency | 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. |
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| 1. Plan own work requirements. | 1.1 Identify most appropriate equipment and materials to be used for required product and upstream and downstream operations from production plan or request. 1.2 Identify materials required, including additives. 1.3 Implement measures to control identified hazards in accordance with procedures and duty of care. 1.4 Identify requirements for materials, quality, production and equipment checks. |
| 2. Set up mould and materials to procedures. | 2.1 Check materials, resins and fibres are correct and prepared to specifications. 2.2 Inspect and prepare mould as required. 2.3 Prepare jigs, fixtures and tools as required. 2.4 Take appropriate action for non-conforming items. 2.5 Set up date, batch and materials markings to specifications, as required. 2.6 Complete other checks. |
| 3. Hand lay up composites to procedures. | 3.1 Apply materials to the mould to specification. 3.2 Monitor product/process quality. 3.3 Make adjustments to remedy faults and non-conformity as required. 3.4 Adjust work to minimise scrap and waste. |
| 4. Anticipate and solve problems. | 4.1 Recognise a problem or a potential problem. 4.2 Determine problems needing priority action. 4.3 Refer problems outside area of responsibility to appropriate person, with possible causes. 4.4 Seek information and assistance as required to solve problems. 4.5 Solve problems within area of responsibility. 4.6 Follow through items initiated until final 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 the materials, equipment and process sufficient to recognise out of specification products, process problems and materials faults. For example, outside temperatures can affect the setting and curing time of resin mixtures. Therefore ratios of resins mixtures need to be strictly monitored to ensure an appropriate curing time for production output.

Knowledge of organisation procedures, quality requirements at each production stage, and the ability to implement them within appropriate time constraints and work standards.

Skill to identify the range of possible causes of product faults.

Application of the knowledge of managing risks using the hierarchy of controls applied to the hand lay up 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 solving processing and material problems including:

- characteristics and properties of materials required to form a composite structure of the required strength and surface finish, including fibres and pot life of the resins used
- impact of resin mixtures, laying of materials, and temperatures on product quality and production output
- changes to materials at various stages of production
- waste management and importance of non-conforming materials
- impact of variations in raw materials and application in relation to final product
- setting up moulds
- selection and preparation of resins, including mixing as required
- selection and preparation of fibre reinforcement, including cutting and trimming
- use of composites materials including gel coats, resins and fibres
- use and application of cores, fillers and surface finishes
- application of composite materials to the mould by hand lay up
- material properties and their interactions with process conditions
- relationships between material properties and process conditions
- changes to material properties to better suit process requirements
- product problems related to material properties
- product problems related to process conditions
- adjustments to process conditions to meet material and product requirements.

Competence also includes the ability to:

- plan own work, including predicting consequences and identifying improvements
- make measurements when required and identify product out of specification
- identify and describe own role and role of others involved directly in the process
- identify factors which may affect product quality or production output and appropriate remedies
- identify when assistance is required to solve problems.

Language, literacy and numeracy requirements

This unit requires the ability to read and interpret typical product specifications, job sheets, procedures, material labels and safety information as provided to operators.

Writing is required to the level of completing workplace forms.

Numeracy is required to the level of reading tables of figures and graphs (and applying the resultant information), using formula percentages/ratios to determine the required mass of an additive (catalyst, pigment etc.) for a given amount of resin, and similar manipulations and interpretation.

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.

Where the assessee does not currently possess evidence of competency in *PMBPROD247C Hand lay up composites*, it may be co-assessed with this unit.

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

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 hand lamination process characteristics in relation to the process requirements and the end product
- make adjustments to the process as required
- identify and take appropriate action on problems and potential problems.

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

- products are consistently produced which meet specification
- all safety procedures are always followed.

Assessment method and context

Assessment will occur during the hand lay up process for complex composites and will be undertaken in a work-like environment.

Competence in this unit may be assessed:

- through use of industrial hand lay up composite manufacture, using jobs of appropriate complexity
- 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 unit includes the use of equipment and materials to form complex composite products using hand lamination processes. It includes the operation of all relevant additional equipment where that equipment is integral to the hand lay up process. Composites may be regarded as 'complex' due to their shape (eg acute angle corners), technical specification (eg high strength/rigidity/low weight) or the conditions under which the work must be undertaken (eg poor access, hot/cold environment)

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:

- open moulds for composite products
- hand mixing equipment and stirrers
- knives and cutters
- hand application tools, rollers, brushes, etc
- relevant personal protective equipment.

Hazards

Typical hazards include:

- hazardous materials and vapours
- manual handling hazards
- fire hazards due to flammable nature of resins used
- knife hazards
- slip hazards.

Problems

'Anticipate and solve problems' means resolve a wide range of routine and non-routine problems, using product and process knowledge to develop solutions to problems which do not have a known solution /a solution recorded in the procedures.

Typical routine faults include:

- incorrect resin ratios
- fibre wet out
- shifting of fibres during lay up
- lay up sequence.

Non-routine faults, which may have multiple causes include:

- mould release problems,
- warping or cracking after moulding
- voids due to resin drainage.

Typical process and product problems may include:

- cracks, dents or imperfections of the mould
- use of incorrect materials
- variations in materials, colour, consistency or mix
- contamination of materials.

Appropriate action for problems outside of area of responsibility may be reporting to an appropriate person.

Appropriate action for solving problems within area of responsibility includes asking questions and seeking assistance from appropriate persons/sources.

Variables

Key variables to be monitored include:

- temperature of environment/resin
- time since mixing vs pot life of resin
- air flow/ventilation
- viscosity of resin
- differing fibres and fabrics
- compacting density of application.
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Unit Sector(s)

Not applicable.