Australian Government

PMBPROD355B Make pattern/plug for composites moulds

Revision Number: 1

INDUSTRY SKILLS COUNCILS
Creating Australia's Future

PMBPROD355B Make pattern/plug for composites moulds

Modification History

Not applicable.

Unit Descriptor

Unit descriptor
This competency covers planning, preparation and operations for making a plug/pattern, suitable for a full range of moulds for composite products. The competency includes the making of plugs and patterns used for the manufacture of composites moulds and the solving of routine problems.

Application of the Unit

Application of this unit
This competency is typically performed by advanced operators demonstrating some relevant theoretical knowledge and using a range of well developed skills requiring some discretion and judgement. 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:

- convert the specification or design into a plan for the tooling and mould
- check settings and adjustments of equipment
- monitor equipment operation
- make appropriate adjustments to correct materials, equipment or process variations
- solve equipment, material 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:

- *PMBPROD247B Hand lay up composites*
- *MEM9.2B Interpret technical drawing*.
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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
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.
1. Plan own work requirements.	1.1 Identify equipment and processes to be used for production process and upstream and downstream operations from production plan or request. 1.2 Identify and check materials required including additives and regrind and their amounts or percentages. 1.3 Implement measures to control identified hazards in line with procedures and duty of care. 1.4 Identify requirements for materials, quality, and production and equipment checks.
2. Plan and set up plug/pattern construction to procedures.	2.1 Produce a plan for the plug/pattern according to requirements. 2.2 Plan all steps of the plug/pattern construction. 2.3 Identify check points for measurements and tests. 2.4 Identify and locate a work area, tools, materials and equipment for construction. 2.5 Complete pre-start checks.
3. Construct the plug/pattern to procedures.	3.1 Start plug/pattern construction process, noting key variables. 3.2 Take samples as required and identify product out-of-specification 3.3 Monitor plug/pattern conformity to requirements. 3.4 Make adjustments to remedy faults and non-conformity as required. 3.5 Complete construction process. 3.6 Treat, prepare and repair the surface of the plug/pattern as necessary. 3.7 Adjust process to minimise scrap and trim. 3.8 Clean and adjust equipment as required
4. Respond to 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

ELEMENT	PERFORMANCE CRITERIA
ELEMENT	Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.
	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 material and equipment conditions which may lead to out of specification production. For example, if using styrofoam or polyurethane to construct the plug, it must be coated with an epoxy resin rather than a polyester resin because the styrofoam will dissolve. Therefore, careful attention to the combinations of the materials used needs to be made.
Knowledge of organization procedures, quality requirements at each production stage, and relevant regulatory requirements along with the ability to implement them within appropriate time constraints and work standards.
Application of the knowledge of managing risks using the hierarchy of controls applied to the pattern/plug making 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 of materials and behaviour in relation to heat, pressure, flow rate and time
- function and processing principles of equipment, including the cost, construction, dimensional and production principles, which effect the pattern/plug making operation
- impact of equipment and process speed, temperatures, and time during cycles on product quality and production output
- phases of the moulding cycle and the effect of the key variables on product quality, in order to make appropriate adjustments to equipment settings. For example, the plug can be constructed of almost any material, but the finishing phase is the most important phase that will impact the moulded products made with the plug.
- processing behaviour of those polymers which are moulded at the workplace
- waste management and importance of non-conforming materials
- changes to materials at various stages of production
- impact of variations in raw materials and equipment operation in relation to final product.

Competence includes the ability for the practical completion of the job to:

- plan own work, including predicting consequences and identifying improvements
- maintain output and product quality using appropriate instruments, controls, and test information
- identify and describe own role and role of others involved directly in making pattern/plugs for composite moulds
- identify factors which may affect product quality or production output and appropriate remedies
- identify when the 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 and material labels as provided to operators.
Writing is required to the level of completing workplace forms and production reports.
Numeracy is required to the level of determining required weights/volumes of materials in a resin mix for different circumstances (say using a data sheet), number of layers of impregnated matrix required to yield the required product laminate thickness, and similar activities.

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 inPMBPROD247B *Hand lay up composites* and *MEM9.2B Interpret technical drawing*, 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 pattern/plug production process variables 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:

- the process runs consistently and smoothly, with the minimum need for human intervention
- all safety procedures are always followed.

Assessment method and context

Assessment will occur on industrial pattern/plug production equipment and will be undertaken in a work-like environment.

Competence in this unit may be assessed:

- using appropriate, industrial pattern/plug production equipment
- 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 construct plugs/patterns from which composite moulds will be made. It includes the operation of all relevant additional equipment where that equipment is integral to the plug making process.
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:

- hand tools and power tools for use with composite and other materials (eg sheet metal and timber)
- hand mixing equipment and stirrers
- hand application tools (eg rollers, trowels, brushes, filleting tools)
- finishing materials (eg gelcoat and acrylic finishes, paints)
- construction materials (eg timber, styrofoam, and fibreglass)
- relevant personal protective equipment.

Hazards
Typical hazards include:

- spills
- slip and fall
- hand and power tools
- temperature
- toxic fumes/vapours (such as styrene in resins)
- hazardous materials (such flammable materials)
- manual handling hazards

- equipment operations.

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 may include:

- gel coat sag
- slow curing rates
- blistering
- wrinkles
- pinholes
- brush marks
- poor surface finish.

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

- release agents failure
- mould release failure
- warping or cracking after moulding.

Typical process and product problems may include:

- structural strength, rigidity and stability of the tooling
- dimensional accuracy of the tooling
- allowances in the design for shrinkage, deformations and alterations in the process from tooling to mould to finished composite product
- placement of flanges, closures, fitments, supports, struts and stiffeners
- variations in materials and/or 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:

- differences between actual and set temperatures
- colour and uniformity
- surface finish/appearance
- times (including curing rates)
- product weight and output rate
- product integrity and general conformance to specification and quality sample.
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Unit Sector(s)

Not applicable.