



Australian Government

Department of Education, Employment and Workplace Relations

PMBPROD356C Construct moulds for composite products

Revision Number: 1

PMBPROD356C Construct moulds for composite products

Modification History

Not applicable.

Unit Descriptor

Unit descriptor

This competency covers planning, preparation and operations for making of moulds, suitable for a full range of composite products. The mould will be made on a suitable plug/pattern.

Application of the Unit

Application of this unit

This competency is typically performed by advanced operators applying knowledge of materials, product purpose and processes to make moulds for composite 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:

- convert specification or design into a plan for the mould
- plan the process required to make the mould
- assemble and prepare materials for the moulds
- apply materials as required
- check that finished mould meets specifications.
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Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisites

This unit has the prerequisite of:

- *PMBPROD247C Hand lay up composites*
- *PMBPREP201B Prepare moulds for composites production.*
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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. 1.3 Implement measures to control identified hazards in line with procedures and duty of care. 1.4 Identify requirements for materials, quality, production and equipment checks. 1.5 Identify materials, waste management and housekeeping needs.
2. Plan mould construction.	2.1 Produce a plan for the mould construction to specification. 2.2 Have design approved as necessary according to enterprise specifications. 2.3 Plan all steps of the mould production. 2.4 Check points are examined for measurements and tests according to specifications.
3. Set up equipment, tools and materials.	3.1 Clear and set up work area. 3.2 Identify and locate materials and equipment for the mould construction according to job specification.
4. Construct mould.	4.1 Apply mould materials as per specification. 4.2 Check dimensions, structural reinforcements, supports and flanges to the specifications or design. 4.3 Cure mould and release as per procedures. 4.4 Recheck dimensions of the finished mould. 4.5 Check fit with other matching mould parts and adjust where necessary.
5. Anticipate and solve problems.	5.1 Recognise a problem or a potential problem. 5.2 Determine problems needing priority action. 5.3 Refer problems outside area of responsibility to appropriate person, with possible causes. 5.4 Solve problems within area of responsibility. 5.5 Seek information and assistance as required to

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	solve problems. 5.6 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, excess resin will only add weight and weaken the finished product. Therefore care needs to be taken to ensure the correct resin to fibre ratio is used.

Knowledge of organization procedures, quality requirements at each stage, relevant regulatory requirements and 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 construction of composite moulds. Application of approved hazard control and safety procedures and the use of PPE in relation to handling materials, equipment operation and cleanup.

Skill to identify the range of possible product faults.

Knowledge about appropriate resins includes:

- polyester resin materials knowledge: basic ingredients and their functions; types and uses; grades; fillers; shelf life; storage and safety; cure process; exotherm graph; factors affecting the cure process; post curing
- epoxy resin materials knowledge: uses; cure reaction; exotherm graph; effects of temperature; effects of hardener; advantages and disadvantages; safety precautions
- vinylester resin materials knowledge: uses; cure reaction; catalyst/promoter systems, types and effects; advantages and disadvantages compared with other resins; safety precautions
- dicyclopentadiene (DCPD) - filled resin system
- catalysts and promoters materials knowledge: terminology;
- types; grades; uses; storage and safety.

Knowledge about appropriate reinforcement materials includes:

- basic characteristics and property differences of E Glass, S2 Glass, Carbon, Aramid;
- formulations;
- manufacturing terminology;
- types of finish and binders;
- common weights available;
- resin to glass ratios;
- glass content and comparative strength of the basic forms;
- the effect of increasing fibre content on reducing thickness and flexural properties;
- basic effect of proportion and direction of fibre orientation.

Knowledge as a basis for solving processing and material problems including:

- characteristics of materials and behaviour in relation to heat, pressure, flow rates, resin to fibre ratios and outside air temperatures and conditions
- impact of variations in raw materials and equipment operation in relation to final product
- waste management and importance of non-conforming materials
- key requirements of the product which impact on the mould construction
- hazards of the materials and process and appropriate hazard control procedures.

Competence also includes the ability to:

- plan own work, including predicting consequences and identifying improvements
- maintain output and product quality using appropriate tools, controls and test information
- identify and describe own role and role of others involved directly in the process or constructing composite moulds
- 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 competency requires the ability to communicate with a wide range of personnel and to interpret product specifications and mould requirements.

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 in PMBPROD247B *Hand lay up composites* and PMBPREP201A *Prepare moulds for composites production*, 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 process variables in relation of 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:

- composites production standards are met consistently
- all safety procedures are always followed.

Assessment method and context

Assessment will occur using appropriate equipment to construct composite moulds and will be undertaken in a work-like environment.

Competence in this unit may be assessed:

- in an appropriate industrial mould-making situation, in a work-like environment

- in a situation allowing for the generation of evidence of the ability to recognise, anticipate and solve 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 moulds for composite products.

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. These may include:

- construction of moulds
- preparation of resins, including mixing as required
- preparation of fibre reinforcement, including cutting and trimming
- application of composite materials to the mould by hand lay up.
- use of composites materials including gel coats, resins and fibres.

Tools and equipment

This competency includes use of equipment and tools such as:

- plugs/patterns

- hand tools and power tools for use with composite and other materials such as metal and timber
- hand mixing equipment and stirrers
- hand application tools, rollers
- relevant personal protective equipment.

Hazards

Typical hazards include:

- hand and power tools
- temperature
- hazardous materials and vapours
- fire hazards due to flammable nature of resins used
- manual handling hazards
- knife 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 process and product problems may include:

- structural strength, rigidity and durability of the mould
- dimensional accuracy of the mould
- placement of flanges, closures and fitments
- attachment of substructures.
- wrong materials for the mould construction
- incorrect fibre-to-resin ratios.

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.

Unit Sector(s)

Not applicable.