



Australian Government

Department of Education, Employment and Workplace Relations

MEM26006A Mark and cut out sheets for composite use

Release: 1

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Modification History

Release 1 New unit

Unit Descriptor

This unit of competency covers the skills and knowledge required to orient, mark out, create templates/lay flats for reinforcing, including woven, non-woven, pre-preg, cores, filler material, and so on.

Application of the Unit

The marking out/cutting out of sheets used for composites can be significantly different to the marking out/cutting out of other materials, such as metals. Sheets used in composite fabrication often have significant directionality which must be considered. As a result of this 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 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 and samples, or to make repairs.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Not applicable.

Employability Skills Information

This unit contains employability skills.

Elements and Performance Criteria Pre-Content

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.

Elements and Performance Criteria

1	Interpret product requirements	1.1	Determine requirements of final products
		1.2	Determine requirements of sheet material to be used
		1.3	Identify process to be used to fabricate product
2	Develop geometric shape, as required	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 3-D shapes
3	Orient required shape to suit directional differences of sheet	3.1	Identify directional properties in sheet
		3.2	Identify sheet-related directional requirements of product
		3.3	Identify orientations and alignments 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	Cut sheet to meet requirements

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| 5 | Store templates/lay flats, 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 lay flats according to procedures |
| | | 5.5 | Complete logs and reports, as required |

Required Skills and Knowledge

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

Required skills

Required skills include:

- interpreting drawings and procedures
- using hand tools and power tools
- operating computer numeric controlled (CNC) machines
- measuring and marking out
- communicating with appropriate people
- performing basic computations

Required knowledge

Required knowledge includes:

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

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:
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	• marks and cut outs are correct for shape • 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 will require the marking and cutting out of a range of suitable sheets used in reinforced composite fabrication. Assessment will occur over a range of situations which will include disruptions to normal, smooth operation.
Method of assessment	A single assessment event is not appropriate. On-the-job assessment should be included as part of the assessment process wherever possible. Where assessment occurs off the job, judgement must consider evidence of the candidate's performance in a productive work environment that includes a sufficient range of appropriate tasks and materials to cover the scope of application for this unit. Assessors should gather a range of evidence that is valid, sufficient, current and authentic. Evidence can be gathered through a variety of ways, including direct observation, supervisor's reports, project work, samples and questioning. Questioning techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. The candidate must have access to all tools, equipment, materials and documentation required. The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.
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.

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.

Procedures	Procedures may be written, verbal, computer-based or in some other form, and may include: • all work instructions • standard operating procedures • formulas/recipes • batch sheets • temporary instructions • any similar instructions provided for the smooth running of the plant • good operating practice as may be defined by industry codes of practice (e.g. Responsible Care) and government regulations
Sheets	Sheets include: • reinforcing: • woven • non-woven • pre-preg • cores • timber, such as MDF and plywood • filler material
Requirements of final product	Requirements of final product may be determined from various sources, including: • drawings • product specifications • customer requests • descriptions of required use of product
Requirements of sheet material	Requirements of sheet material include: • strength • flexibility/rigidity • thickness • density • directionality • drape • operating temperature
Lay flats	Lay flats (templates) are the geometric development of 3-D shape into a 2-D template which will allow the 3-D shape into be fabricated from a 2-D sheet. The lay flat may not take into account the required directionality.

	Lay flats may be: • physical (e.g. board and sheet metal) • virtual (e.g. coordinates and laser beam)
Regular rectilinear shapes	Regular rectilinear shapes include: • rectangular prisms • cubes • portions of prisms and cubes • similar shapes
Regular curved shapes	Regular curved shapes include: • cylinders • spheres • segments of cylinders and spheres • similar shapes
Transition pieces	Transition pieces include: • cones • pyramids • portions of cones and pyramids • square to round • tee piece • lobster back • similar shapes
Complex 3-D shapes	Complex 3-D shapes include: • other 3-D shapes which may need to be fabricated and which may be composed of a number of components of the above shapes
Alignment	Alignment may make reference to: • warp • weft • selvedge • other features of the sheet Alignment also includes: • the nesting of lay flats to optimise the use of materials and minimise waste
Logs and reports	Logs and reports may be: • paper or electronic based • verbal reports • items found which require action

Appropriate action	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	Typical problems may include: • identifying directionality in sheet • identify a feature to provide alignment • products requiring multidirectional properties
Health, safety and environment (HSE)	All operations to which this unit applies are subject to stringent HSE requirements, which may be imposed through state/territory or federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between Performance Criteria and HSE requirements, the HSE requirements take precedence

Unit Sector(s)

Composites

Custom Content Section

Not applicable.