



**Australian Government**

**Department of Education, Employment and Workplace Relations**

# **MEM30005A Calculate force systems within simple beam structures**

**Release: 1**

## MEM30005A Calculate force systems within simple beam structures

### Modification History

Not Applicable

### Unit Descriptor

<b>Unit descriptor</b>	This unit covers understanding and calculating force systems within simple beam structures.
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### Application of the Unit

<b>Application of the unit</b>	<p>This unit applies to solving simple engineering problems involving forces, moments and basic stress and strain calculations, and determining nominal sizes of simple beams subject to loading.</p> <p><b>Band: 0</b></p> <p><b>Unit Weight: 0</b></p>
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### Licensing/Regulatory Information

Not Applicable

### Pre-Requisites

<b>Prerequisite units</b>		
<b>Path 1</b>	MEM30012A	Apply mathematical techniques in a manufacturing engineering or related environment

## Employability Skills Information

<b>Employability skills</b>	This unit contains employability skills.
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## 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.
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## Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Determine the resultant and equilibrant of systems of coplanar forces	1.1. Calculate the magnitude and direction of the resultant and equilibrant of coplanar force systems. 1.2. Calculate the line of action of a resultant using the principle of Moment.
2. Determine nominal sizes for a simple horizontal beam subject to a combination of uniform and point loading	2.1. Support reactions for a simply supported horizontal beam using the equations of equilibrium and including the moment effect of a couple are calculated. 2.2. The possible types of failure that need to be considered are determined. 2.3. Shear force and bending moment diagrams are drawn. 2.4. Bending stress is determined. 2.5. Calculations are completed to determine the nominal size for the beam. 2.6. Factors of safety are applied to finalise nominal size of beam.

## Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
<b>Required skills</b>
Look for evidence that confirms skills in: <ul style="list-style-type: none"> <li>• calculating and using trigonometry, transposition, algebraic formula</li> <li>• drawing shear force and bending moment diagrams</li> </ul>
<b>Required knowledge</b>
Look for evidence that confirms knowledge of: <ul style="list-style-type: none"> <li>• force and gravity</li> <li>• the concept of force</li> <li>• characteristics of force</li> <li>• rectangular components of force</li> <li>• graphical addition of forces</li> </ul>

**REQUIRED SKILLS AND KNOWLEDGE**

- mathematical addition of forces
- weight as force
- moment and torque
- moment of force
- addition of moments
- equilibrium of moments
- torque
- equivalent force moment systems
- statics
- equilibrium of coplanar forces
- conditions of equilibrium
- calculation of beam reactions (simply supported, point load, uniformly distributed load (UDL), self-weight)
- simple beams
- shear force and bending moment diagrams
- bending stress
- deflection by formulae
- stress and strain
- shear stress and strain
- allowable stress
- factors of safety

## Evidence Guide

<b>EVIDENCE GUIDE</b>	
<p>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.</p>	
<p><b>Overview of assessment</b></p>	<p>A person who demonstrates competency in this unit must be able to calculate force systems within simple beam structures. Competency in this unit cannot be claimed until all prerequisites have been satisfied.</p>
<p><b>Critical aspects for assessment and evidence required to demonstrate competency in this unit</b></p>	<p>Assessors must be satisfied that the candidate can competently and consistently perform all elements of the unit as specified by the criteria, including required knowledge, and be capable of applying the competency in new and different situations and contexts.</p>
<p><b>Context of and specific resources for assessment</b></p>	<p>This unit may be assessed on the job, off the job or a combination of both on and off the job. Where assessment occurs off the job, that is the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations. The competencies covered by this unit would be demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.</p> <p>This unit could be assessed in conjunction with any other units addressing the safety, quality, communication, materials handling, recording and reporting associated with calculating force systems within simple structures, or other units requiring the exercise of the skills and knowledge covered by this unit.</p>
<p><b>Method of assessment</b></p>	<p>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.</p>

**EVIDENCE GUIDE**

<b>Guidance information for assessment</b>	
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**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. 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.


## Unit Sector(s)

<b>Unit sector</b>	
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## Co-requisite units

<b>Co-requisite units</b>		

## Competency field

<b>Competency field</b>	Engineering technician
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