



Australian Government

MEM23063A Select and test mechanical engineering materials

Release: 1

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Modification History

Release 1 - New unit. Replaces MEM23061A, but not equivalent.

Unit Descriptor

This unit of competency covers the skills needed to interpret design information for material and material test requirements, select appropriate tests and use results in the selection of appropriate materials for mechanical and manufacturing engineering-related applications.

Application of the Unit

This unit applies to the selection of materials and material tests, sourcing materials data, ensuring appropriate performance and physical standards for mechanical and manufacturing applications, documenting materials tests, and ensuring calibration standards. The unit applies to mechanical and manufacturing engineering applications in mass production, batch production, jobbing shop and prototyping.

Activities may be performed as a member of a design and development team.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

MEM23004A Apply technical mathematics

MEM23109A Apply engineering mechanic principles

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.

Elements and Performance Criteria

1	Distinguish classes of materials, based on properties and materials tests, relevant to mechanical and manufacturing engineering	1.1	Relate material properties to common mechanical and manufacturing engineering methods and processes
		1.2	Identify common characteristics, faults or flaws in materials, components and product
		1.3	Identify engineering-related test methods for materials and components or product properties
		1.4	Identify common industrial test standards/codes, calibration requirements, regulations and authorities relevant to selection of materials and products for mechanical and manufacturing engineering applications
2	Utilise sources of information on engineering materials, materials tests and test equipment	2.1	Review design information for material specifications and required material tests
		2.2	Identify and use appropriate sources of information on materials, material tests and test calibration
		2.3	Identify and use appropriate sources of information on methods of testing of properties of materials
		2.4	Investigate and report on relevant standards and codes
		2.5	Identify and use appropriate sources of information on materials safety data sheets (MSDS)
		2.6	Establish availability of technical and professional assistance

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| 3 | Test for or obtain the properties of engineering materials | 3.1 | Specify required materials tests and manage implementation of tests to ensure quality, safety and suitability for applications |
| | | 3.2 | Ensure traceability of measurement standard |
| | | 3.3 | Obtain test sheets/certificates for appropriate materials for applications in accordance with organisational procedures and/or codes and regulations |
| | | 3.4 | Obtain appropriate MSDS for applications in accordance with organisational procedures and/or codes and regulations |
| 4 | Select and implement materials for mechanical/manufacturing engineering applications | 4.1 | Select materials for use in given mechanical or manufacturing engineering applications based on relevant test information |
| | | 4.2 | Incorporate materials and components into mechanical and manufacturing processes in accordance with design functional requirements |
| 5 | Document materials design data and methods and results of materials tests | 5.1 | Report and record materials selections against design functional requirements in accordance with organisational procedures, codes and regulations |
| | | 5.2 | Undertake any required environmental impact and sustainability assessment |
| | | 5.3 | Report and record materials tests and test sheets or certificates in accordance with organisational procedures, codes and regulations, including appropriate calibration and traceability |
| | | 5.4 | Report and record appropriate MSDS for applications in accordance with organisational procedures, codes and regulations |

Required Skills and Knowledge

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

Required skills

Required skills include:

- selecting class of materials for an application based on comparison of properties for a significant range of materials classes
- selecting class of materials for an application suitable to mechanical and manufacturing engineering-related methods and processes
- identifying common characteristics, faults or flaws in materials
- identifying test methods for properties of, and faults and flaws in, materials and components
- identifying industrial test standards and regulations for materials and particular engineering applications
- selecting the most appropriate tests and test methods from a range of possible tests
- identifying and applying standards and regulations for materials and components
- sourcing and using materials test sheets and certificates
- sourcing and implementing MSDS
- implementing tests correctly for materials and component properties and faults
- interpreting design documentation for materials and materials testing requirements
- applying environmental and sustainability requirements to material selection
- reporting, recording and filing test reports and documentation
- implementing materials tests and test sheets/certificates, test calibration and traceability

Required knowledge

Required knowledge includes:

- properties of materials classes
- the effect of material properties, faults or flaws on mechanical and manufacturing engineering methods and processes
- test methods and procedures for materials and components, including specific industrial test standards, regulations and authorities related to particular engineering applications
- test methods for faults or flaws in materials and components or product
- sources and uses of information on materials and materials tests, including test certificates, regulations, standards, regulatory bodies and industrial authorities
- methods of accessing MSDS
- significance of test sheets/certificates to applications
- significance of MSDS and relevance of procedures
- materials selections in relation to design functional requirements

- environmental impact and sustainability assessment
- significance of test procedures, reports and documentation to applications, including the need for obtaining and filing test sheets and certificates
- significance of test calibration and traceability

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.

Overview of assessment	A person who demonstrates competency in this unit must be able to select and test mechanical engineering materials.
Critical aspects for assessment and evidence required to demonstrate competency in this unit	<p>Assessors must be satisfied that the candidate can competently and consistently:</p> <ul style="list-style-type: none"> • review design information for materials and materials test requirements • select classes of materials relevant to design for further research, testing and evaluation • identify standards, codes and regulatory requirements relevant to materials testing and application • specify appropriate tests and interpret test results for material selection • select materials consistent with test results and design and regulatory requirements • ensure traceability in material selection process • correctly document all results and tests.
Context of and specific resources for assessment	<ul style="list-style-type: none"> • 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, 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. • This unit could be assessed in conjunction with any other units addressing the safety, quality, communication, materials handling, recording and reporting associated with selecting and testing mechanical engineering materials or other units requiring the exercise of the skills and knowledge covered by this unit.
Method of assessment	<ul style="list-style-type: none"> • Assessment must satisfy the endorsed Assessment Guidelines of the MEM05 Metal and Engineering Training Package. • Assessment methods must confirm consistency and accuracy of performance (over time and in a range of workplace relevant contexts) together with

	<p>application of underpinning knowledge.</p> <ul style="list-style-type: none"> • Assessment methods must be by direct observation of tasks and include questioning on underpinning knowledge to ensure correct interpretation and application. • Assessment may be applied under project-related conditions (real or simulated) and require evidence of process. • Assessment must confirm a reasonable inference that competency is not only able to be satisfied under the particular circumstance, but is able to be transferred to other circumstances. • Assessment may be in conjunction with assessment of other units of competency where required.
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.

Classes of materials	<p>Classes of materials include:</p> <ul style="list-style-type: none"> • non-ferrous metals and alloys • ferrous metals • non-metals (e.g. timber, concrete, ceramics, polymers and fabrics, adhesives and lubricants) • thermal and electrical conductors and insulators
Properties and characteristics of materials	<p>Properties and characteristics of materials may include:</p> <ul style="list-style-type: none"> • physical properties (e.g. strength; elasticity; plasticity; malleability; hardness; toughness; brittleness; fatigue endurance; mouldability; weldability; machinability; formability; resistance to creep and stress relaxation; resistance to degradation, such as use of plastic fillers to enhance UV resistance; adhesion; electrical, magnetic, thermal, chemical and optical; material structure and effect on properties)

	<ul style="list-style-type: none"> • susceptibility to corrosion • conductivity and resistance – both thermal and electrical • the effect of manufacturing and construction processes on material properties
Mechanical engineering	Mechanical engineering is the engineering discipline concerned with the conceptual development, research, design, manufacture, implementation, installation, commissioning and maintenance of mechanical products, processes, systems or services for converting energy into power and motion, materials into product and components into machines and systems
Manufacturing engineering	Manufacturing engineering includes conceptual development, design, manufacture, construction, implementation, installation, optimisation, commissioning and maintenance of resources and processes employed for the manufacture of product and components, machines and systems
Sources of information	<p>Sources of information may include:</p> <ul style="list-style-type: none"> • standards and codes • MSDS • reference texts • manufacturer catalogues and other published information • regulatory bodies • technical, professional and industrial associations and societies
Standards and codes	Standards and codes refer to all relevant Australian and international standards and codes applicable to the mechanical engineering analysis task
Tests of materials	<p>Tests of materials include:</p> <ul style="list-style-type: none"> • destructive, including tensile, compression, impact, hardness, fatigue, corrosion, stress relaxation and creep, fatigue and peel resistance (adhesives) • non-destructive, including hardness, ultrasonics, X-ray, die penetrant, eddy current, surface friction, conductivity, heat expansion, photoelastic, heat capacity refractive index and magnetic hysteresis loop
Traceability	Test calibrations can be traced back to the relevant base unit in the relevant measurement system

Unit Sector(s)

Competency field

Unit sector Engineering science

Custom Content Section

Not applicable.