



Australian Government

Department of Education, Employment and Workplace Relations

MEM30007A Select common engineering materials

Release: 1

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Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit covers recognising common materials used in engineering, assisting in the selection of a material for a specific application, and using test results to evaluate the properties of materials.
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Application of the Unit

Application of the unit	This unit applies to technician level activities in manufacturing and engineering environments. Work is carried out under supervision. Band: 0 Unit Weight: 0
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Licensing/Regulatory Information

Not Applicable

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	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. Identify common engineering materials by their principal properties	1.1. The principal properties of ferrous and non-ferrous metals are identified. 1.2. The principal properties of thermosetting and thermoplastic polymers are identified. 1.3. The principal properties of ceramics and composite materials are identified. 1.4. The effects of different types of bonding in materials are identified. 1.5. The effects of mechanical and thermal processes on the principal properties of materials are identified.
2. Select materials for specific applications	2.1. The engineering requirement for the specific application is determined in consultation with others. 2.2. Material is selected based on the requirement and consideration of principal properties and further processing. 2.3. Selection is confirmed according to standard operating procedures.
3. Verify selected material as fit for purpose	3.1. Appropriate tests for the required properties are identified. 3.2. Testing of materials is arranged with appropriate persons, if necessary. 3.3. Test results are analysed and material choices are confirmed or modified as appropriate.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This section describes the skills and knowledge required for this unit.
Required skills
Look for evidence that confirms skills in: • undertaking research • selecting/carrying out tests appropriate to the material • communicating • documenting • planning and sequencing operations

REQUIRED SKILLS AND KNOWLEDGE

- reading, interpreting and following information on written job instructions, specifications, standard operating procedures, charts, lists, drawings and other applicable reference documents

Required knowledge

Look for evidence that confirms knowledge of:

- classification of materials:
 - metals and non-metals
 - ferrous and non-ferrous metals
 - polymers (thermoplastics, thermosetting and elastomers)
 - ceramics
 - composite materials
- structure of materials
- physical properties of materials:
 - electrical conductivity/resistivity
 - specific gravity/density
 - thermal conductivity/expansion
 - specific heat
 - melting/boiling points
- magnetic properties
- optical properties
- mechanical properties:
 - strength - yield, tensile, compressive
 - stress/strain data
 - hardness
 - toughness (impact and slow strain)
 - elasticity
 - plasticity
 - ductility
 - malleability
 - fatigue
 - creep
- chemical properties:
 - corrosion of metals, corrosion processes, mechanisms
 - degradation of polymers
- materials testing methods - destructive testing and applications:
 - tensile
 - compressive

REQUIRED SKILLS AND KNOWLEDGE

- shear
- torsion
- hardness
- impact
- fatigue
- creep
- visual
- corrosion testing
- engineering materials
- engineering applications of ferrous metals:
 - cast irons
 - carbon and alloy steels
 - stainless steels
- engineering applications of non-ferrous metals:
 - aluminium and its alloys
 - copper, brass and bronze
 - nickel alloys, zinc, titanium
 - magnesium
 - refractory metals
- engineering applications of polymers:
 - thermosetting polymers
 - thermoplastic polymers
 - ceramics and glasses
- effects of mechanical and thermal processes on the properties of materials:
 - casting
 - forging, rolling and extrusion
 - cold forming
 - powder processes
 - heat treatment
 - joining - fasteners
 - soldering
 - brazing
 - welding
 - adhesives
 - finishing - coatings, metallic and non-metallic
- hazards and control measure associated with selecting common engineering materials, including housekeeping
- safe work practices and procedures

Evidence Guide

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 common engineering materials.
Critical aspects for assessment and evidence required to demonstrate competency in this unit	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.
Context of and specific resources for assessment	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. This unit could be assessed in conjunction with any other units addressing the safety, quality, communication, materials handling, recording and reporting associated with selecting common engineering materials, or other units requiring the exercise of the skills and knowledge covered by this unit.
Method of assessment	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 should not require language, literacy and numeracy skills beyond those required in this unit. The candidate must have access to all tools, equipment, materials and documentation required and must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.
Guidance information for assessment	

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.

Common engineering materials	Includes ferrous metals, cast irons, carbon and alloy steels, stainless steels, coated steels, non-ferrous metals, aluminium and its alloys, copper and its alloys, nickel alloys, zinc, titanium, magnesium, refractory metals, polymers, thermosetting polymers, thermoplastic polymers, ceramics and glasses
Appropriate tests	Tests which can be undertaken by a technician within the organisation as well as those required to be undertaken by external organisations, including simple tests
Required properties	Properties to be tested include tensile strength, compression, shear characteristics, torsion, hardness, impact resistance, fatigue resistance, creep resistance, visual appearance and colour, magnetic properties, corrosion resistance
Appropriate persons	Internal technicians and/or external organisations

Unit Sector(s)

Unit sector	
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Co-requisite units

Co-requisite units		

Competency field

Competency field	Engineering technician
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