



Australian Government

MEA707 Select and test aeronautical engineering materials

Release: 1

MEA707 Select and test aeronautical engineering materials

Modification History

Release 1 - New unit of competency

Application

Applications of this unit of competency include selecting engineering materials and materials tests, sourcing materials data; ensuring appropriate performance and physical standards for aeronautical applications; documenting materials tests, ensured calibration standards; interpreting and documenting materials data sheets as appropriate for mass production, batch production, jobbing shop, and prototyping applications.

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

This unit is used in workplaces that operate under the airworthiness regulatory systems of the Australian Defence Force (ADF) and the Civil Aviation Safety Authority (CASA).

Pre-requisite Unit

Competency Field

Engineering science

Unit Sector

Elements and Performance Criteria

Elements describe the essential outcomes.

Performance criteria describe the performance needed to demonstrate achievement of the element.

1. Identify classes of materials, based on properties and materials tests relevant to aeronautical engineering	1.1	Identify classes of materials, based on properties, required for particular aeronautical engineering applications
	1.2	Relate material properties to common production and construction methods and processes
	1.3	Identify common characteristics, faults or flaws in materials and components or product in particular engineering applications
	1.4	Identify test methods for materials and components or

			product in particular engineering applications
		1.5	Identify specific industrial test standards/codes, calibration requirements, regulations and authorities related to selection of materials and products for particular engineering applications
		1.6	Investigate the role of Australia's national measurement system
2.	Identify and use sources of information on engineering materials, materials tests and test equipment	2.1	Identify and use appropriate sources of information on materials
		2.2	Identify and use appropriate sources of information on methods of testing of properties of materials to ensure suitability for a particular application
		2.3	Identify and use appropriate sources of information on materials, materials tests, test calibration, test certificates, regulations, standards, standards councils/societies/authorities/regulatory bodies
		2.4	Investigate and report on the use of standards and codes
		2.5	Identify and use appropriate sources of information on material safety data sheets (MSDS)
3.	Specify and implement materials for particular aeronautical engineering applications	3.1	Select materials for use in given aeronautical engineering applications based on relevant test information
		3.2	Incorporate materials and components into aeronautical processes in accordance with design functional requirements
4.	Specify and implement methods used to test or obtain the properties of engineering materials	4.1	Specify and implement tests of materials to ensure quality, safety or suitability for a range of applications
		4.2	Ensure traceability of measurement standard
		4.3	Obtain test sheets/certificates for appropriate materials for applications in accordance with organisational procedures and/or codes and regulations
		4.4	Obtain appropriate MSDS for applications in accordance with organisational procedures and/or codes and regulations

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| 5. | Report on and record 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, including environmental impact and sustainability assessment |
| | | 5.2 | Report and record materials tests and test sheets/certificates in accordance with organisational procedures, codes and regulations |
| | | 5.3 | Ensure appropriate calibration and traceability |
| | | 5.4 | Report and record appropriate MSDS for applications in accordance with organisational procedures, codes and regulations |

Foundation Skills

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

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| Classes of materials include: | <ul style="list-style-type: none"> • Non-ferrous metals and alloys - copper, aluminium, zinc, lead, tin, titanium and their alloys • Ferrous metals - carbon steels, alloy steels and cast irons • Non-metallic - composite materials, bearing materials, lubricants, ceramics, polymers and fabrics, adhesives • Electrical insulation materials, thermal conductors and insulators, electrical conductors, semiconductors and insulators |
| Properties of materials include: | <ul style="list-style-type: none"> • Strength, elasticity, plasticity, malleability, toughness, brittleness, fatigue endurance, mouldability, weldability, machinability, formability, resistance to creep and stress relaxation, resistance to degradation (e.g. use of plastic fillers to enhance UV resistance), adhesion; electrical, magnetic, thermal, chemical and optical; material structure and effect on properties, flammability of fabrics |

Other factors include:	• Corrosion and corrosion protection methods • Aging of metals and fatigue • The effect of manufacturing and construction processes on material properties (e.g. effect of heat treatment on corrosion resistance and fatigue properties, hydrogen embrittlement, shot peening of surfaces) • The effect of property enhancement on design (e.g. adhesives plus sintering replacing some forging and machining of gears on shafts) • Lay-up methods for composite structures • Costs, such as manufacture of material, source of material, and typical applications and possibilities
Aeronautical engineering refers to:	• The engineering discipline concerned with the conceptual development, research, design, manufacture, implementation, installation, commissioning and maintenance of aerospace mechanical, hydraulic, pneumatic, fuel and fire products, processes, systems or services for civil and military applications
Australia's national measurement system includes:	• National Measurement Institute (NMI) • National Association of Testing Authorities • Standards Australia • Joint Accreditation System of Australia and New Zealand
Sources of information include:	• Reference texts • Manufacturer's catalogues and industrial magazines • Websites • Use of phone, email and fax information gathering
Standards councils/societies/authorities/regulatory bodies include:	• Australian Standards (AS) • American Society of Testing and Materials (ASTM) • US Military Specification (MIL Spec.) • American Society of Manufacturing Engineers (ASME) • International Standards Organisation (ISO) • CASA • ADF • United States Federal Aviation Authority • European Aviation Safety Agency
Standards and codes include:	• Non-destructive testing (NDT) and mechanical test standards • Chemical test standards • Electrical test standards • Compliance test standards for components
Tests of materials include:	• Destructive, including tensile, compression, impact, hardness, fatigue, corrosion, stress relaxation and creep,

- and peel resistance (adhesives)
- Non-destructive, including hardness, ultrasonics, X-ray, magnetic particle, dye penetrant, eddy current, surface friction, conductivity, heat expansion, photoelastic, heat capacity refractive index and magnetic hysteresis loop
 - Test calibrations that can be traced back to the relevant base unit in the relevant measurement system
- Traceability includes:**

Unit Mapping Information

Release 1 – supersedes and is equivalent to MEA350A Select and test aeronautical engineering materials

Links

Companion Volume implementation guides are found in VETNet -

<https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=ce216c9c-04d5-4b3b-9bcf-4e81d0950371>

Assessment Requirements for MEA707 Select and test aeronautical engineering materials

Modification History

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Performance Evidence

Evidence required to demonstrate competency in this unit must be relevant to and satisfy all of the requirements of the elements and performance criteria under the specified conditions of assessment, and must 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 production and construction methods and processes
- identifying, overcoming or compensating for common characteristics, faults or flaws in materials or product
- identifying test methods for materials and components, specific industrial test standards and regulations for particular engineering applications
- identifying test methods for faults or flaws in materials and components or product
- selecting materials following an extensive search of appropriate sources of information, including manufacturer's catalogues and websites
- selecting appropriate tests from a range of possible tests, following an extensive search of appropriate sources of information, including manufacturer's catalogues and websites
- satisfying applicable standards and regulations for materials and components
- sourcing materials test certificates and using the material properties information from them
- sourcing, obtaining and implementing MSDS
- implementing tests correctly for materials and component faults and properties of materials
- selecting test methods appropriate to applications
- obtaining appropriate test sheets/certificates for applications
- completing reports, records and design documentation
- addressing environmental impact and sustainability issues
- reporting, recording and filing test reports and documentation
- implementing materials tests and test sheets/certificates, test calibration and traceability.

Knowledge Evidence

Evidence required to demonstrate competency in this unit must be relevant to and satisfy all of the requirements of the elements and performance criteria and include knowledge of:

- properties of materials classes

- the effect of material properties on production and construction methods and processes
- the effect of characteristics, faults or flaws in materials on product and processes
- test methods for materials and components, specific industrial test standards, regulations and authorities related to particular engineering applications
- test methods for faults or flaws in materials and components or product
- methods of accessing and using alternative information sources
- test procedures and typical applications for tests
- sources and uses of information on materials, materials tests, test certificates, regulations, standards, regulatory bodies and industrial authorities
- methods of accessing MSDS and their relevance to procedures
- identification of materials for an application based on comparison of properties of materials
- identification of test for an application based on an understanding of its ability to measure specific material or product properties
- significance of test sheets/certificates to applications
- the need for obtaining and filing test sheets/certificates
- materials selections in relation to design functional requirements
- environmental impact and sustainability assessment
- significance of test reports and documentation to applications
- significance of reporting and recording procedures
- significance of materials tests and test sheets/certificates, test calibration and traceability
- significance of reporting and recording procedures.

Assessment Conditions

- 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 a simulated working environment must be used that reflects realistic workplace situations and conditions.
- The competencies covered by this unit would be demonstrated by an individual working alone or as part of a team.
- Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability.
- Assessment methods must be by direct observation of tasks and include questioning on underpinning knowledge to ensure its 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 able not only to be satisfied under the particular circumstance, but is able to be transferred to other circumstances.
- Assessors must be satisfied that the candidate can competently and consistently:
 - identify classes of materials for specific aeronautical engineering situations and specify by material specification

- identify testing requirements for selected materials and applicable organisations for the conduct of tests
- identify and specify processes required to achieve required material properties
- obtain and apply relevant MSDS
- ensure that material manufacturing and test records meet regulatory requirements.
- Assessment may be in conjunction with assessment of other units of competency where required.
- Assessors must satisfy the requirements of the National Vocational Education and Training Regulator (Australian Skills Quality Authority, or its successors).

Links

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<https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=ce216c9c-04d5-4b3b-9bcf-4e81d0950371>