



Australian Government

MEM48001 Test the mechanical properties of materials

Release: 1

MEM48001 Test the mechanical properties of materials

Modification History

Release 1. Supersedes and is equivalent to MSATCM301A Test the mechanical properties of materials.

Application

This unit of competency defines the skills and knowledge required to carry out mechanical destructive tests on materials and interpret the results.

It applies where a technician will be required to undertake a range of mechanical tests on samples of materials and to draw some conclusions from those tests with regard to the mechanical properties of the material.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Pre-requisite Unit

Nil.

Competency Field

Metallurgy

Elements and Performance Criteria

Elements	Performance Criteria
<i>Elements describe the essential outcomes.</i>	<i>Performance criteria describe the performance needed to demonstrate achievement of the element.</i>
1. Determine job requirements	1.1 Follow standard operating procedures (SOPs) 1.2 Comply with work health and safety (WHS) requirements at all times 1.3 Use appropriate personal protective equipment (PPE) in accordance with SOPs 1.4 Identify job requirements from work information
2. Select testing procedures and/or standards	2.1 Identify the relevant testing standard and specifications 2.2 Determine the need for testing using certified equipment 2.3 Select appropriate procedures and/or standards for the requirements of the test

Elements	Performance Criteria
<i>Elements describe the essential outcomes.</i>	<i>Performance criteria describe the performance needed to demonstrate achievement of the element.</i>
	2.4 Prepare sample according to procedures 2.5 Arrange for external testing to meet job requirements
3. Conduct tensile testing	3.1 Undertake tensile test to specifications, noting relevant data 3.2 Calculate tensile and/or compressive properties 3.3 Draw relevant conclusions from the tensile test
4. Conduct hardness testing	4.1 Identify appropriate method of hardness testing 4.2 Undertake hardness test to specifications, noting relevant data 4.3 Calculate hardness properties 4.4 Draw relevant conclusions from the hardness test
5. Conduct impact testing	5.1 Undertake impact test to specifications, noting relevant data 5.2 Determine impact properties 5.3 Draw relevant conclusions from the impact test
6. Conduct fatigue and/or flexing testing	6.1 Undertake fatigue and/or flexing testing to specifications noting relevant data 6.2 Interpret fatigue and/or flexing data 6.3 Draw relevant conclusions from the fatigue and/or flexing test
7. Conduct creep testing	7.1 Undertake creep testing to specifications, noting relevant data 7.2 Interpret creep data 7.3 Draw relevant conclusions from the creep test
8. Undertake strain measurements	8.1 Identify appropriate method of strain measurement 8.2 Undertake strain measurement and note relevant data 8.3 Interpret strain measurement results 8.4 Draw relevant conclusions from strain measurements
9. Conduct static shear and bend test	9.1 Identify appropriate method of static shear and bend test 9.2 Undertake static shear and bend tests to specifications, noting relevant data 9.3 Interpret static shear and bend test data 9.4 Draw relevant conclusions from static shear and bend tests

Elements	Performance Criteria
<i>Elements describe the essential outcomes.</i>	<i>Performance criteria describe the performance needed to demonstrate achievement of the element.</i>
10. Report result of tests	10.1 Identify reporting requirements 10.2 Prepare report to meet requirements 10.3 Circulate and file report to procedures

Foundation Skills

This section describes those language, literacy, numeracy and employment skills that are essential to performance.

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.

Mechanical tests include:	- tensile - impact - hardness - fatigue and flexing - creep.
Materials include one or more of the following:	- metals - polymer-based materials - other solid materials on which mechanical testing is relevant.
Testing standards include one or more of the following:	- Australian/New Zealand Standards (ASNZ) - International Organization for Standardization (ISO) - ASTM International - Deutsches Institut für Normung (DIN).
Tensile and/or compressive properties include:	- tensile strength - compressive strength - elongation - reduction of area - yield stress - yield point - proof stress

	• Young's modulus • elastic and plastic region and deformation or viscoelastic deformation.
Impact test includes:	• Izod • Charpy • drop-weight tear • non-destructive tests (NDT).
Impact properties include:	• impact tensile test (ITT) • notch sensitivity.
Hardness test includes:	• Vickers • Brinell • Rockwell • durometer tests.
Strain measurements include:	• foil method • extensometer • destructive tests.

Unit Mapping Information

Release 1. Supersedes and is equivalent to MSATCM301A Test the mechanical properties of materials.

Links

Companion Volume implementation guides are found in VETNet -

<https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2>

Assessment Requirements for MEM48001 Test the mechanical properties of materials

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Performance Evidence

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

- following work instructions, standard operating procedures (SOPs) and safe work practices
- selecting and setting up appropriate tests on at least two occasions
- performing the full range of tests and noting relevant data in accordance with the appropriate procedures and standards
- calculating and determining properties of materials in accordance with requirements
- interpreting results and drawing relevant conclusions on at least two occasions
- identifying and preparing reports to meet requirements
- circulating and filing completed report in accordance with procedures.

Note: Where a volume and/or frequency is not specified, demonstration must be provided at least once.

Knowledge Evidence

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

- safe work practices and procedures and use of personal protective equipment (PPE)
- standards including:
 - needs for standards
 - standards organisations
 - structure and operations of Standards Australia (SA)
- role of National Association of Testing Authorities (NATA) including in relation to:
 - tensile testing
 - methods for tensile testing
 - determination of tensile properties
- types of materials
- mechanical properties of materials
- general impact testing including:
 - factors affecting impact properties of materials
 - impact testing (AS 1544) or equivalent international standard

- drop-weight tear test (AS 1330) or equivalent international standard
- hardness testing including:
 - Vickers hardness testing (AS 1817) Part 1 or equivalent international standard
 - Brinell hardness testing (AS 1816) Part 1 or equivalent international standard
 - Rockwell hardness testing (AS 1815) Part 1 or equivalent international standard
- fatigue and flex testing including:
 - factors affecting the fatigue and flex properties of materials
 - fatigue testing procedures
 - presentation of fatigue properties
- creep testing including:
 - factors affecting creep behaviour of materials
 - creep testing procedures
 - stress-rupture testing
 - presentation of creep properties.

Assessment Conditions

- Assessors must:
 - have vocational competency in testing the mechanical properties of materials at least to the level being assessed with relevant industry knowledge and experience
 - satisfy the assessor requirements in the *Standards for Registered Training Organisations 2015* or its replacement and comply with the *National Vocational Education and Training Regulator Act 2011*, its replacement or equivalent legislation covering VET regulation in a non-referring state/territory as the case requires.
- Where possible, assessment must occur in operational workplace situations. Where this is not possible or where personal safety or environmental damage are limiting factors, assessment must occur in a sufficiently rigorous simulated environment that reflects realistic operational workplace conditions that cover all aspects of workplace performance, including environment, task skills, task management skills, contingency management skills and job role environment skills.
- Conditions for assessment must include access to all tools, equipment, materials and documentation required including relevant workplace procedures, product and manufacturing specifications.
- Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

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