



**Australian Government**

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

# **MSATCM301A Test the mechanical properties of materials**

**Revision Number: 1**

## MSATCM301A Test the mechanical properties of materials

### Modification History

Not applicable.

### Unit Descriptor

<b>Unit Descriptor</b>	This unit covers the knowledge and skills needed to carry out mechanical (destructive) tests on materials and interpret the results.
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### Application of the Unit

<b>Application of the unit</b>	In a typical scenario, 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.
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### Licensing/Regulatory Information

Not applicable.

### Pre-Requisites

<b>Pre-requisite Units</b>		
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### Employability Skills Information

<b>Employability Skills</b>	This unit contains employability skills
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## **Elements and Performance Criteria Pre-Content**

Not applicable.

## Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Select appropriate testing procedures/standards	1.1. Identify the relevant testing standard 1.2. Identify the need (or otherwise) for testing using a certified laboratory/test equipment 1.3. Select appropriate procedures/standards for the requirements of the test 1.4. Prepare sample according to appropriate procedures 1.5. Arrange for external testing if appropriate. 1.6.
2. Conduct tensile/compression testing	2.1. Undertake tensile test noting relevant data 2.2. Calculate tensile/compressive properties 2.3. Draw relevant conclusions from the tensile test. 2.4.
3. Conduct hardness testing.	3.1. Identify appropriate method of hardness testing 3.2. Undertake hardness test noting relevant data 3.3. Calculate hardness properties 3.4. Draw relevant conclusions from the hardness test 3.5.
4. Conduct impact testing	4.1. Undertake impact test noting relevant data 4.2. Determine impact properties 4.3. Draw relevant conclusions from the impact test 4.4.
5. Conduct fatigue/flexing testing	5.1. Undertake fatigue/flex testing noting relevant data 5.2. Interpret fatigue/flexing data 5.3. Draw relevant conclusions from the fatigue/flexing test 5.4.
6. Conduct creep testing	6.1. Undertake creep test noting relevant data 6.2. Interpret creep data 6.3. Draw relevant conclusions from the creep test 6.4.
7. Undertake strain measurements	7.1. Identify appropriate method of strain measurement 7.2. Undertake strain measurement and note relevant data 7.3. Interpret strain measurement results 7.4. Draw relevant conclusions from strain measurements 7.5.
8. Conduct static shear and bend	8.1. Identify appropriate method of static shear and bend test

<b>ELEMENT</b>	<b>PERFORMANCE CRITERIA</b>
test	8.2.Undertake static shear and bend tests noting relevant data 8.3.Interpret static shear and bend test data 8.4.Draw relevant conclusions from static shear and bend tests 8.5.
9. Report result of tests	9.1.Identify reporting requirements 9.2.Prepare report to meet requirements 9.3.Circulate and file report to procedures. 9.4.

## Required Skills and Knowledge

### REQUIRED SKILLS AND KNOWLEDGE

This describes the essential skills and knowledge and their level, required for this unit.

#### Required skills

- analyse
- select and set up appropriate tests
- problem-solve
- **perform tests**
- interpret results
- report results

#### Required knowledge

- standards
  - needs for standards
  - standards organisations
  - structure and operations of SAA
  - (Standards Association of Australia)
- role of NATA (National Association of Testing Australia)
  - tensile testing
  - methods for tensile testing e.g. AS1391 or equivalent international standard
  - determination of tensile properties
- general impact testing
  - factors affecting impact properties of materials
  - impact testing (AS 1544), or equivalent international standard
  - dropweight Tear Test (AS 1330 ) or equivalent international standard
- hardness testing
  - 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, Part1) or equivalent international standard
  - other Hardness Testing Methods (e.g. Equotip and other rebound methods)
- fatigue/flex testing
  - factors affecting the fatigue/flex properties materials
  - fatigue testing procedures
  - presentation of Fatigue properties
- creep testing
  - factors affecting creep behaviour of materials
  - creep testing procedures
  - stress-rupture testing

<b>REQUIRED SKILLS AND KNOWLEDGE</b>
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| <ul style="list-style-type: none"><li>• presentation of Creep properties</li></ul> |
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## 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, the 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 test the mechanical properties of materials.

Critical aspects for assessment and evidence are required to demonstrate competency in this unit.

#### Critical aspects for assessment and evidence required to demonstrate competency in this unit

It is essential that competence is demonstrated in the ability to:

- Conduct tests and interpret results. Evidence should be provided from a number of each type of mechanical test.

#### Relationship with other units

This unit may be assessed concurrently with other relevant units.

#### Assessment method and context

Assessors must be satisfied that the person can consistently perform the unit as a whole, as defined by the elements, performance criteria, skills and knowledge. A holistic approach should be taken to the assessment.

Assessors should gather sufficient, fair, valid, reliable, authentic and current evidence from a range of sources. Sources of evidence may include direct observation, reports from supervisors, peers and colleagues, project work, samples, organisation records and questioning. Assessment should not require language, literacy or numeracy skills beyond those required for the unit.

The assessee will have access to all techniques, procedures, information, resources and aids which would normally be available in the workplace.

The method of assessment should be discussed and agreed with the assessee prior to the commencement of assessment. Assessment will need to occur in a situation where mechanical testing is undertaken.



**EVIDENCE GUIDE****Resource implications**

This section should be read in conjunction with the range of variables for this unit of competency. Resources required include suitable access to an operating plant or equipment that allows for appropriate and realistic simulation. A bank of case studies/scenarios and questions will also be required to the extent that they form part of the assessment method. Questioning may take place either in the workplace, or in an adjacent, quiet facility such as an office or lunchroom. No other special resources are required.

## Range Statement

<b>RANGE STATEMENT</b>	
<p>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.</p>	
<b>Codes of practice/standards</b>	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used.
<b>Mechanical tests</b>	Mechanical tests include tensile, impact, hardness, fatigue/flexing and creep.
<b>Materials</b>	Materials includes metals, polymer based materials and other solid materials on which mechanical testing is relevant
<b>Testing standard</b>	Testing standard include ASNZ, ISO, ASTM, DIN or other relevant standard.
<b>Certified</b>	Certified equipment/laboratory refers to NATA certification or relevant equivalent.
<b>Tensile/compressive properties</b>	<p>Tensile properties include:</p> <ul style="list-style-type: none"> <li>• tensile strength,</li> <li>• compressive strength,</li> <li>• elongation,</li> <li>• reduction of area,</li> <li>• yield stress,</li> <li>• yield point,</li> <li>• proof stress,</li> <li>• Young's modulus</li> <li>• elastic/plastic region and deformation or viscoelastic deformation..</li> </ul>
<b>Impact test</b>	Impact testing includes Izod, Charpy, Dropweight Tear and NDT tests.
<b>Impact properties</b>	Impact properties include ITT, USE, Notch Sensitivity
<b>Hardness test</b>	Hardness testing includes Vickers, Brinell, Rockwell and Durometer tests.

**RANGE STATEMENT****Strain measurements**

Strain measurements include foil method, extensometer and destructive tests

**Unit Sector(s)****Unit Sector**

Metallurgy

**Competency field****Competency Field****Co-requisite units****Co-requisite Units**