



**Australian Government**

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

# **MEM24012B Apply metallurgy principles**

**Release: 1**

## **MEM24012B Apply metallurgy principles**

### **Modification History**

This unit has dual status and is to be regarded as both a Specialisation band A unit and Specialisation band B unit for progression to C5 (AQF level V).

### **Unit Descriptor**

This unit covers applying basic metallurgy principles related to non-destructive testing techniques (NDT).

### **Application of the Unit**

This unit applies to knowledge of metallurgy principles, and the relationship between the various non-destructive testing methods and their capabilities and limitations when applied to the detection of specific discontinuities in metals.

Such variables as the type of discontinuity, manufacturing process and limitations will assist in determining the sequence of testing and the ultimate selection of one non-destructive test method in preference to another. Any testing that may be carried out must be completed with particular attention to personal and OH&S regulations.

Where materials and chemicals which are subject to codes and regulations are stored and used - for example, chemicals, explosives, solvents, dangerous materials, acids, or noxious waste products - safe work habits must be considered.

### **Licensing/Regulatory Information**

### **Pre-Requisites**

None

### **Employability Skills Information**

### **Elements and Performance Criteria Pre-Content**

Elements are the essential outcomes of the unit of competency.

Together, performance criteria specify the requirements for competent performance. Text in italics is explained in the range statement following.

# Elements and Performance Criteria

## Elements and Performance Criteria

Element	Performance Criteria
1 Interpret and apply the principles of solidification and crystal structures in metals	1.1 Principles of solidification and crystal structures in metals are interpreted and applied in relation to NDT techniques.
2 Interpret equilibrium diagrams for metals	2.1 Equilibrium diagrams are correctly interpreted.
3 Interpret and apply the principles of fusion welding of steel	3.1 <b>Principles and methods for fusion welding of steel</b> are applied to NDT testing. 3.2 <b>Defects in weldments</b> are identified and classified.
4 Interpret and apply the principles of the formation of castings	4.1 Principles and methods used to produce metal castings are applied to NDT testing. 4.2 <b>Defects in metal castings</b> are identified and classified.
5 Interpret and apply the principles of steel forging	5.1 <b>Principles and methods used to produce steel forgings</b> are applied to NDT testing. 5.2 Defects in steel castings are identified and classified.
6 Interpret and apply the principles of mechanical testing	6.1 <b>Principles of mechanical testing</b> are applied to NDT testing.

## Required Skills and Knowledge

### Evidence Guide

The evidence guide specifies the evidence required to demonstrate achievement in the unit of competency as a whole. It must be read in conjunction with the unit descriptor, performance criteria, range statement and the assessment guidelines for the Metal and Engineering Training Package

#### Overview of assessment requirements

A person who demonstrates competency in this unit must be able to apply metallurgy principles. Competency in this unit cannot be claimed until all prerequisites have been satisfied.

#### Context of 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.

#### Interdependent assessment

This unit could be assessed in conjunction with any other units addressing the safety, quality, communication, materials handling, recording and reporting associated with applying basic metallurgy principles as related to non-destructive testing techniques, 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 techniques should not require language, literacy and numeracy skills beyond those required in this unit of competency. The candidate must have access to all tools, equipment, materials and documentation required. The candidate must

be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

### **Consistency of performance**

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.

### **Required skills**

Look for evidence that confirms skills in:

research

understanding and applying metallurgy principles

### **Required knowledge**

Look for evidence that confirms knowledge of:

principles of solidification and crystal structures in metal:

classification of materials

structure of atoms

process of solidification

crystal structures

defects formed during solidification

modification of crystal structure

heat treatment processes

defects formed during heat treatment

meaning of equilibrium diagrams representative of a range of metals including aluminium and steel:

alloy systems

solid and liquid solubility

basic equilibrium diagrams

equilibrium diagrams for common alloys

principles of fusion welding in relation to NDT testing

defects in fusion welding:

processing defects

grinding cracks

pickling cracks

heat treatment cracks

service defects

fatigue cracks

corrosion and stress corrosion cracks

principles of the formation of castings

defects in castings

principles of steel forging

defects in steel forging

principles of mechanical testing:

mechanical testing

tensile testing

impact testing

hardness testing

fatigue testing

other tests

## Range Statement

The range statement provides information about the context in which the unit of competency is carried out. The variables and scope cater for different work requirements, work practices and knowledge between States, Territories and the Commonwealth, and between organisations and workplaces. The range statement relates to the unit as a whole and provides a focus for assessment. Text in italics in the performance criteria is explained here.

The following variables may be present and may include, but are not limited to, the examples listed under the scope. All work is undertaken to relevant legislative requirements, where applicable

<b>Variable</b>	<b>Scope</b>
<b>Principles and methods for fusion welding of steel</b>	MMAW SAW GMAW GTAW FCAW
<b>Defects in weldments</b>	Cracks, lack of fusion, cavities, imperfect shape, solid inclusions, miscellaneous
<b>Defects in metal castings</b>	Shrinkage cavities, hot tears, cold cracks, gas holes
<b>Principles and methods used to produce steel forgings</b>	Deformations, strengthening mechanisms, annealing
<b>Principles of mechanical testing</b>	Impact, tensile, hardness testing

## Unit Sector(s)

## Unit Weight

4

## Band

A

## **Competency field**

Non-destructive testing

## **Related units**

None