



Australian Government

MEM48020 Recommend ferrous and nonferrous metals or alloys for an application

Release: 1

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Modification History

Release 1. Supersedes and is equivalent to MSATCM509A Recommend ferrous and non ferrous metals or alloys for an application.

Application

This unit of competency defines the knowledge and skills required to recommend ferrous and nonferrous metal or alloys for an application based upon knowledge of their metallurgical properties.

It requires application and knowledge of metallurgical properties as a member of a design and development team or similar in support of the design and development of manufacturing applications where the final product or components are made from pure metal or alloys.

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

Pre-requisite Unit

MEM48004 Interpret basic binary phase diagrams

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 the design requirements for the material from specifications or in consultation with others
2. Select metal or alloy for the application	2.1 Select the material based upon the requirement and consideration of principal properties and further processing

Elements	Performance Criteria
<i>Elements describe the essential outcomes.</i>	<i>Performance criteria describe the performance needed to demonstrate achievement of the element.</i>
	2.2 Consider economic and technical implications of different metals 2.3 Compare possible alternative materials with or without further processing using formula and engineering calculations 2.4 Recommend most economical solution 2.5 Review final recommendation with relevant personnel

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.

Further processing includes one or more of the following:	• addition of alloys and heat treatment • hardening • tempering • annealing.
Materials covers both elemental metals and alloys and includes:	• unalloyed steels • alloy steels • stainless steels • grey cast irons • white cast irons • malleable cast irons • nodular (ductile) cast irons • alloy cast irons • copper alloys • aluminium alloys • zinc • tin • nickel

	• cobalt • magnesium • titanium.
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Unit Mapping Information

Release 1. Supersedes and is equivalent to MSATCM509A Recommend ferrous and non ferrous metals or alloys for an application.

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 MEM48020 Recommend ferrous and nonferrous metals or alloys for an application

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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
- identifying and interpreting engineering requirements for the application from specifications, safety procedures and other reference material
- selecting appropriate metals to suit specific applications on at least two occasions
- applying basic metallurgical principles in preparing recommendations on at least two occasions
- applying and manipulating appropriate formulas for applications involving engineering calculations
- applying appropriate calculations to engineering and metallurgical situations
- preparing basic costs and estimates
- communicating within the workplace
- writing reports.

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)
- further processing
- unalloyed steels including:
 - iron-iron carbide phase diagram
 - phases in iron carbon alloys
 - slow cooling of steel and critical temperature lines
 - basis aspects of common heat treatment processes including full annealing, spheroidising stress relief annealing, process annealing, normalising, hardening and tempering
- alloy steels including:
 - effect of alloying elements

- structural changes resulting from alloy additions including:
 - phase diagrams - Fe-C-Cr
 - effect of alloy additions on heat treatment, austenitising temperature, time and rate of transformation, hardening and tempering
- manganese steel
- stainless steels including:
 - classification
 - compositions, heat treatment, structure, properties and applications of stainless steels
 - austenitic
 - ferritic
 - duplex and super duplex ferritic-austenitic
 - martensitic
 - precipitation hardening
 - heat treatment problems including sensitisation and embrittlement
- cast irons including:
 - classification including structure, carbon distribution and form
 - factors affecting structure and properties including effect of carbon, silicon and cooling rate
- typical cast irons including compositions, method of manufacture, structures, properties and applications of:
 - grey cast irons
 - white cast irons
 - malleable cast irons
 - nodular (ductile) cast irons
 - alloy cast irons
 - austempered cast irons
 - compacted graphite irons
- copper alloys including:
 - commercial alloys from the following systems:
 - Cu-O, Cu-Be, Cu-Ni, Cu-Sn and Cu-Al
 - effects of casting, deformation, recrystallisation and ageing treatments on the structure and properties of the above alloys
- aluminium alloys including:
 - commercial alloys from the following systems:
 - Al-Si, Al-Cu, Al-Mg and Al-Mg-Si
 - relationship between structure and properties of the above alloys
- other alloys including:
 - zinc alloys
 - tin alloys
 - nickel alloys

- cobalt alloys
- magnesium alloys
- titanium alloys.
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Assessment Conditions

- Assessors must:
 - have vocational competency in recommending ferrous and nonferrous metals or alloys for an application 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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