Australian Government

Department of Education, Employment and Workplace Relations

MSATCM509A Recommend ferrous and non ferrous metals or alloys for an application

Revision Number: 1

MSATCM509A Recommend ferrous and non ferrous metals or alloys for an application

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor	This unit describes the skills to recommend ferrous and non ferrous metal and alloys for an application based upon a knowledge of their metallurgical properties.

Application of the Unit

Application of the unit	This unit 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.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Pre-requisite Units	*MSATCM304A*	*Interpret basic binary phase diagrams*

Employability Skills Information

Employability Skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Identify the design requirements for the material	1.1. The engineering requirement for the application is determined from specification or in consultation with others
2. Select metal or alloy for the application	2.1. Material is selected based upon the requirement and consideration of principal properties and further processing 2.2.
3. Consider economic and technical implications of different metals	3.1. Compare possible alternative materials with or without further processing 3.2. Most economic solution is recommended
4. Review final recommendation	4.1. Final recommendation is reviewed with the design team and if required with customers

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE
This describes the essential skills and knowledge and their level, required for this unit.
Required skills:
• communicate personally and in writing • write reports • prepare basic costs and estimates • Select appropriate metals to suit specific applications • Apply basic metallurgical principles in preparing recommendations • Apply and manipulate appropriate formulas for applications involving engineering calculations • Apply appropriate calculations to engineering and metallurgical situations
Required knowledge:

Competency includes sufficient knowledge of:
• Unalloyed steels
  • iron-iron carbide phase diagram. Phases in iron carbon alloys. Slow cooling of steel, critical temperature lines. Introduction to the more common heat treatment processes including full annealing, spheroidising stress relief annealing, process annealing, normalising, hardening and tempering.
• Alloy steels
  • effect of alloying elements
  • structural changes resulting from alloy additions 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
  • 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 - sensitisation, embrittlement, etc.
• Cast irons - classifications
  • classification - structure, carbon distribution and form.
  • factors affecting structure and properties - effect of carbon, silicon, cooling rate, etc.
• Typical cast irons

REQUIRED SKILLS AND KNOWLEDGE

- 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
  - commercial alloys from the following systems:
  - Cu-O, Cu-Be, Cu-Ni, Cu-Sn and Cu-Al.
  - the effects of casting, deformation, recrystallisation and ageing treatments on the structure and properties of the above alloys.
- Aluminium alloys
  - commercial alloys from the following systems:
  - Al-Si, Al-Cu, Al-Mg and Al-Mg-Si
  - the relationship between structure and properties of the above alloys.
- Other
  - Zinc alloys
  - tin alloys
  - nickel alloys
  - cobalt alloys
  - magnesium alloys
  - Titanium alloys

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 recommend ferrous and non ferrous metals or alloys for an application. 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: • Understand the given application and designer's expectations, to recommend the appropriate metal alloy.
Relationship to 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.
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

RANGE STATEMENT	
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.	
Codes of practice/standards	Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used.
Design requirements	Includes reference to all relevant drawings, specifications, manuals and documentation in accordance with workplace procedures.
Further processing	Includes addition of alloys and heat treatment ; hardening, tempering, annealing
Materials	Covers both elemental metals and alloys including: • 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

Unit Sector(s)

Unit Sector	Metallurgy

Competency field

Competency Field	

Co-requisite units

Co-requisite Units		