



Australian Government

MEM48023 Apply metallurgical principles and practice to optimise furnace operation

Release: 1

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Modification History

Release 1. Supersedes and is equivalent to MSATCM512A Apply metallurgy principles and practice to optimise furnace operation.

Application

This unit of competency defines the skills and knowledge required to optimise furnace operation as a member of a new furnace design and development team or as part of a team optimising the operation of an existing furnace.

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 Identify job requirements from work information
2. Select metallurgical principles and practices relevant to furnace operation	2.1 Select the relevant metallurgical techniques and principles and associated software and hardware technologies for a furnace design or furnace optimising situation 2.2 Analyse existing furnaces and production records to identify opportunities for optimising furnace operation
3. Apply the relevant metallurgical techniques and principles to achieve	3.1 Apply relevant scientific principles to obtain the best furnace operation solution considering metallurgical and commercial

Elements	Performance Criteria
<i>Elements describe the essential outcomes.</i>	<i>Performance criteria describe the performance needed to demonstrate achievement of the element.</i>
optimum furnace operation	requirements 3.2 Use appropriate calculations and coherent units in metallurgical and engineering calculations 3.3 Apply relevant techniques and associated technologies, software and hardware to obtain the required solutions 3.4 Make metallurgical assessments of metal and/or alloys to ensure furnace installation or optimisation is achieving desired outcomes

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.

Sources of information include one or more of the following:	• reference standards and texts • manufacturers catalogues and industrial magazines • websites • phone information gathering • email information gathering.
Furnace operation includes:	• classification of fuels • carbonisation of coal • properties of coke • gaseous fuels • electrical energy • heat balances • controlled atmospheres • temperature measurement • combustion calculations • refractories

	• types of furnaces and typical construction • typical burners and their use in furnaces • exhaust gas analysis for oil and gas fired furnaces.
Metallurgical techniques and principles include:	• prediction and analysis of the properties of metals and alloys undergoing: • smelting • refining • casting • heat treating or forging in a furnace to produce commercial metal products or to develop new alloys and processes • calculation of furnace capacity, temperature range and refractory specification to achieve melting • development of heat treatment or forging solutions for specified metals and alloys • commercial production forecasts.

Unit Mapping Information

Release 1. Supersedes and is equivalent to MSATCM512A Apply metallurgy principles and practice to optimise furnace operation.

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 MEM48023 Apply metallurgical principles and practice to optimise furnace operation

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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 appropriate metallurgical principles to suit specific furnace applications
- selecting appropriate techniques and associated technologies, software and hardware to optimise furnace operation to suit specific applications on at least two occasions
- applying and manipulating appropriate formulas for applications involving engineering and metallurgical calculations
- applying appropriate calculations to metallurgical situations
- referring solutions to the original aim of the metallurgical application
- reporting results in appropriate units using appropriate significant figures
- stating limitations of solutions due to assumptions, scientific principles and techniques used
- presenting and recommending solutions.

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
- information sources
- furnace operation
- metallurgical techniques and principles as specified in the Range of Conditions
- limitations of selected basic scientific principles
- basic metallurgical techniques and related software and hardware technologies
- limitations of basic techniques and associated software and hardware technologies.
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Assessment Conditions

- Assessors must:
 - have vocational competency in applying metallurgical principles and practice to optimise furnace operation 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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