



Australian Government

MEM48002 Monitor ferrous melting and casting processes

Release: 1

MEM48002 Monitor ferrous melting and casting processes

Modification History

Release 1. Supersedes and is equivalent to MSATCM302A Monitor ferrous melting and casting processes.

Application

This unit of competency defines the skills and knowledge required to monitor the melting and casting of the alloys of iron and steel.

It applies where a technician will be required to monitor a ferrous melting and casting operation, ensuring that correct quantities and temperatures are used, and correct procedures followed.

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 Use appropriate personal protective equipment (PPE) in accordance with SOPs 1.4 Identify job requirements from work information
2. Identify specifications for required casting	2.1 Identify required material specification 2.2 Identify mould requirements 2.3 Identify any special appropriate requirements

Elements	Performance Criteria
<i>Elements describe the essential outcomes.</i>	<i>Performance criteria describe the performance needed to demonstrate achievement of the element.</i>
3. Verify metal changes to melting	3.1 Select required components to give the required metal specification 3.2 Calculate required charge of each component 3.3 Recommend changes or additions to the charge 3.4 Monitor the preparation of the charge including checking for contaminants
4. Monitor furnace operation	4.1 Check that the furnace is in good operational condition and that appropriate lining is present 4.2 Identify need for maintenance and/or repairs and organise accordingly 4.3 Monitor a melt to ensure the product meets specification
5. Monitor pouring of molten metal	5.1 Check that the ladle is in good operational condition and that appropriate lining is present 5.2 Check pouring is to procedures 5.3 Take required samples for analysis
6. Control hazards	6.1 Identify hazards in the metal melting and pouring process 6.2 Assess the risks arising from those hazards 6.3 Implement procedures to control those hazards in line with procedures and duty of care

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.

Material specification	ferrous metals
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includes one or more of the following:	• ferrous alloys.
Contaminants include one or more of the following:	• non-specified metal • rubber • grease • water • paint and non-metallics • closed containers or pipes • pressure containers including aerosols.

Unit Mapping Information

Release 1. Supersedes and is equivalent to MSATCM302A Monitor ferrous melting and casting processes.

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 MEM48002 Monitor ferrous melting and casting processes

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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 and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying and interpreting specifications, safety procedures, codes of practice and/or standards for the required melting and casting processes
- calculating charges
- checking for contaminants when verifying metal changes to melting criteria on at least two occasions and recommending changes or additions to the charge
- performing visual checking of furnaces criteria on at least two occasions for operational condition and safety risks
- taking samples on at least two occasions for analysis in accordance with work health and safety (WHS) and quality procedures.

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)
- charge calculations including importance of composition control, methods used to calculate for additions and types of alloy additions
- steel including induction furnace melting (principles and refractories), arc furnace melting, acid, basic, single slag, double slag, deoxidisation and hydrogen control and ladle refining
- cast iron including types of cast iron, influence of carbon and silicon contents, carbon equivalent, effect of cooling rate, microstructure and classification of graphite, carbide stabilisers and graphite, inoculation and types of inoculants, spheroidal graphite formation and treatment methods and casting characteristics of grey, SG (ductile) and malleable cast irons

- ferrous alloys including definitions of iron and steel and their physical properties including density, tensile, hardness, melting points, shrinking percentage, casting temperature, SG (ductile) iron, carbon steel, grey and white irons, alloy cast irons, alloy steels, chilled and malleable iron
- selection including customer and manufacturer's requirements, metal analysis and Australian Standards
- types of furnaces and maintenance including blast furnace, cupola, induction, direct arc, indirect arc, open hearth, reverberatory and rotary
- refractories including dolomite, silica brick, chrome brick, ganister, fireclay, firebrick, magnesite, kyanite and fused alumina
- linings including monolithic, castable, rammable, bricks, basic, acid and neutral
- ladles including types (lip, tea pot and bottom pour), maintenance and safe working practices
- safety including housekeeping, PPE, dry area, pre-heating of ladles and overhead cranes
- furnace operation procedures including PPE, dry charging equipment, pre-heating, scrap selection, housekeeping, melting and alloying program, calculations including percentages and ratio, charge calculations and maintenance
- types of control equipment including carbon equivalent, wedge test, fluidity spiral test, chemical analysis, wet chemical analysis, spectrograph, sample spoons, sample moulds, deoxidising, degassing and temperature measurement
- quality control including accurate weighing, correct chemical analysis, temperature control, slag control (including chemistry and interaction with molten bath), alloying procedure, thermal analysis, degassing and deoxidising
- types of defects including contamination, gas absorption, metal analysis, temperature control and oxidation
- alloy production including charge analysis, charge calculation, charge preparation, melt control, tapping and pouring.

Assessment Conditions

- Assessors must:
 - have vocational competency in monitoring ferrous melting and casting processes 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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