



Australian Government

Department of Education, Employment and Workplace Relations

MSATCM302A Monitor ferrous melting and casting processes

Revision Number: 1

MSATCM302A Monitor ferrous melting and casting processes

Modification History

Not applicable.

Unit Descriptor

Unit Descriptor	This unit covers the knowledge and skills needed to monitor the melting and casting of the alloys of iron, steel
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Application of the Unit

Application of the unit	In a typical scenario, 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.
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Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Pre-requisite Units	

Employability Skills Information

Employability Skills	This unit contains employability skills.
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Elements and Performance Criteria Pre-Content

Not applicable.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Identify specifications for required casting	1.1. Identify required material specification 1.2. Identify mould requirements 1.3. Identify any special requirements for this job
2. Verify metal charges to melting	2.1. Select required components to give the required metal specification 2.2. Calculate required charge of each component 2.3. Recommend changes/additions to the charge 2.4. Monitor the preparation of the charge including checking for contaminants
3. Monitor furnace operation	3.1. Check that the furnace is in good operational condition and that appropriate lining is present 3.2. Organise for maintenance/repairs as required 3.3. Monitor a melt to ensure the product meets specification
4. Monitor pouring of molten metal	4.1. Check that the ladle is in good operational condition and that appropriate lining is present 4.2. Check pouring is to procedures 4.3. Take required samples for analysis
5. Control hazards	5.1. Identify hazards in the metal melting/pouring process 5.2. Assess the risks arising from those hazards 5.3. Implement procedures to control those hazards in line with procedures and duty of care.

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This describes the essential skills and knowledge and their level, required for this unit.

Required skills:

- take calculations needed for determining charges
- perform visual checking of furnaces for operational condition and safety risks
- take of samples
- follow safety and quality procedures

Required knowledge:

- Charge Calculations
 - importance of composition control.
 - methods of calculation used to correct for
 - additions.
 - types of alloy additions.
- Steel
 - induction furnace melting; principles; refractories.
 - arc furnace melting; acid, basic, single slag,
 - double slag, deoxidisation, hydrogen control.
 - ladle refining
- Cast iron
 - types of cast iron
 - influence of carbon and silicon contents
 - carbon equivalent. effect of cooling rate.
 - microstructure, classification of graphite.
 - carbide stabilisers and graphite.
 - inoculation, types of inoculant.
 - spheroidal graphite formation and treatment
 - methods.
 - casting characteristics of grey, S.G and malleable
 - cast irons.
- Ferrous alloys:
 - definitions:
 - iron
 - steel
 - physical properties:
 - density
 - tensile

REQUIRED SKILLS AND KNOWLEDGE

- hardness
- melting points
- shrinkage percent
- casting temperature
- S.G. iron
- ductile iron
- carbon steel
- grey and white irons
- alloy cast irons
- alloys steels
- chilled and malleable iron
- selection:
 - customer requirements
 - manufacturer's requirements
 - metal analysis
 - Australian standards
- Types of furnaces:
 - blast furnace
 - cupola
 - induction
 - direct arc
 - indirect arc
 - open hearth
 - reverberatory
 - rotary
 - maintenance
- Refractories:
 - dolomite
 - silica brick
 - chrome brick
 - ganister
 - fireclay
 - firebrick
 - magnesite
 - kyanite
 - fused alumina
- Linings:
 - monolithic

REQUIRED SKILLS AND KNOWLEDGE

- castable
- rammable
- bricks
- basic
- acid
- neutral
- Types of ladles:
 - lip
 - tea pot
 - bottom pour
 - safety with ladles
 - maintenance
- Safety:
 - house keeping
 - personal clothing/gear
 - dry area
 - pre-heat ladles
 - overhead cranes
- Furnace operation:
 - personal clothing/gear
 - dry charge/equipment
 - pre-heating
 - scrap selection
 - house keeping
 - melting program
 - alloying program
 - calculations
 - percentages, ratio
 - charge calculations
 - maintenance
- Types of control equipment:
 - carbon equivalent
 - wedge test
 - fluidity spiral test
 - chemical analysis
 - wet
 - spectrograph
 - sample spoons

REQUIRED SKILLS AND KNOWLEDGE

- sample moulds
- deoxidising
- degassing
- temperature measurement
- Quality control:
 - accurate weighing
 - correct analysis
 - temperature control
 - slag control (including chemistry and interaction with molten bath)
 - alloying procedure
 - thermal analysis
 - degassing
 - deoxidising
- Defects:
 - contamination
 - gas absorption
 - metal analysis
 - temperature control
 - oxidation
- Alloy production:
 - charge analysis
 - charge calculation
 - charge preparation
 - melt control
 - tapping/pouring

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 TrainingPackage.

Overview of assessment

A person who demonstrates competency in this unit must be able to monitor basic ferrous melting and casting processes. 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:

- Monitor the melting and casting of ferrous metal. Evidence should be provided from a number of castings using different alloys and or different moulds.
- Safely operate melting furnace
- Safely handle pouring equipment

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.

EVIDENCE GUIDE**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 organisation where ferrous casting is done. 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.

Contaminants

Contaminants include non specified metal, rubber, grease, water, paint and non-metallics, closed containers or pipes and pressure containers such as aerosols.

Material specification

Material specification includes ferrous metals and ferrous alloys as well as contaminants.

Unit Sector(s)

Unit Sector	Metallurgy
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Competency field

Competency Field	
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Co-requisite units

Co-requisite Units		