



**Australian Government**

# **MEM04022 Examine appropriateness of methoding for mould design**

**Release: 2**

# MEM04022 Examine appropriateness of methoding for mould design

## Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM04022 Examine appropriateness of methoding for mould design (Release 1).

Release 1. Supersedes and is equivalent to MEM04022A Examine appropriateness of methoding for mould design.

## Application

This unit of competency defines the skills and knowledge required to examine the methoding (gating, running and feeding of castings) for mould designs using basic metallurgical techniques and skills. This work is under the overall direction of a metallurgist.

It applies to a foundry tradesperson who has to examine the appropriateness of own or others methoding for a mould design using basic metallurgical skills and techniques supported by normal empirical trade skills.

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

**Band: B**

**Unit Weight: 4**

## Pre-requisite Unit

|          |                                                              |
|----------|--------------------------------------------------------------|
| MEM04024 | Produce moulds and cores by hand                             |
| MEM04025 | Produce moulds and cores by hand (advanced)                  |
| MEM09002 | Interpret technical drawing                                  |
| MEM11011 | Undertake manual handling                                    |
| MEM12023 | Perform engineering measurements                             |
| MEM12024 | Perform computations                                         |
| MEM13015 | Work safely and effectively in manufacturing and engineering |
| MEM14006 | Plan work activities                                         |
| MEM16006 | Organise and communicate information                         |
| MEM18001 | Use hand tools                                               |

MSATCM304A Interpret basic binary phase diagrams

## Competency Field

Casting and moulding

## Elements and Performance Criteria

Elements describe the essential outcomes.

Performance criteria describe the performance needed to demonstrate achievement of the element.

- |   |                                                                  |                                                                                                                                                             |
|---|------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | <b>Determine job requirements</b>                                | 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 specifications, drawings, job sheets or work instructions                                                                |
|   |                                                                  |                                                                                                                                                             |
| 2 | <b>Evaluate proposed mould design for methoding requirements</b> | 2.1 Identify risk management strategies to minimise defect formation                                                                                        |
|   |                                                                  | 2.2 Identify desired solidification process and take into account casting design, metal composition, mould design and specifications                        |
|   |                                                                  | 2.3 Identify running, gating and feeding principles and techniques appropriate for the particular casting                                                   |
|   |                                                                  | 2.4 Identify methods to minimise shrinkage, porosity, segregation, hot tearing and shear                                                                    |
|   |                                                                  | 2.5 Examine suitability of methoding, including gating and the number, placement and sizing of feeders/risers                                               |
|   |                                                                  | 2.6 Enter data where required to facilitate the generation of a computer simulation of methoding and casting process for later comparison to actual casting |

Elements describe the essential outcomes.

Performance criteria describe the performance needed to demonstrate achievement of the element.

- |   |                       |     |                                                                                           |
|---|-----------------------|-----|-------------------------------------------------------------------------------------------|
| 3 | <b>Report results</b> | 3.1 | Compare casting results with computer simulated predictions                               |
|   |                       | 3.2 | Determine reporting requirements                                                          |
|   |                       | 3.3 | Prepare reports and circulate for feedback and file in accordance with SOPs               |
|   |                       | 3.4 | Communicate suggestions for improvements directly to other team members where appropriate |

## Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

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.

**Size and number of feeder heads and gating includes the following:**

- manual calculation and use of computer programs within defined design parameters

## Unit Mapping Information

Release 2. Supersedes and is equivalent to MEM04022 Examine appropriateness of methoding for mould design (Release 1).

Release 1. Supersedes and is equivalent to MEM04022A Examine appropriateness of methoding for mould design.

## 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 MEM04022 Examine appropriateness of methoding for mould design

## Modification History

Release 2. Quantum of hours of workplace practice removed. Supersedes and is equivalent to MEM04022 Examine appropriateness of methoding for mould design (Release 1).

Release 1. Supersedes and is equivalent to MEM04022A Examine appropriateness of methoding for mould design.

## Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy the requirements of the elements and performance criteria on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- calculating manually, and by use of computer programs, runner and feeding systems for casting designs within defined design parameters
- examining mould designs for suitability against job specifications
- understanding the interplay between moulds, cores, gating and feeding
- examining the resulting casting for success of gating and feeding, including calculation of the size and number of feeder heads and gating
- comparing casting results with computer simulated predictions
- preparing reports, circulating and communicating suggestions for improvements directly to other team members where appropriate and filing report in accordance with SOPs.

## 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)
- calculations related to methoding and feeding, including:
  - dimensions of runner systems
  - cross-sectional areas of sprue, runners and ingates
  - volumes and dimensions of feeders
- the effects on solidification of:
  - nucleation
  - growth mechanisms (crystal and interfacial)
  - dendrite coherency
  - constitutional undercooling
  - superheat - effects, control and minimisation of excess heat

- eutectic and peritectic solidification
- grain structure
- principles underpinning the effective operation of running, gating and feeding systems, including:
  - runner and gating principles (ratios)
  - determining type and placement of sprue, runners and ingates
  - inclusion control (slag and erosion)
  - calculations and effect of metal flow (lamellar and turbulent), velocity and temperature
  - calculation of feeder size
  - principles used in the determination of the location of feeders (end and feed zones, neighbourhood effect and feeding distances), including effect on solidification, exothermic and insulating feeding aids (sleeves and topping)
  - feeding mechanisms (liquid, mass, interdendritic, burst and solid)
  - use of computer packages (runner and feeder calculations and mould simulations) including benefits and limitations and yield calculations
- risk management strategies to minimise defect formation and the methods for minimising shrinkage, porosity, segregation, hot tearing and shear.

## Assessment Conditions

- Assessors must:
  - have vocational competency in examining appropriateness of methoding for mould design 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.
- Assessment must occur in a functioning workplace. Where assessment in the workplace would be unsafe, impractical or threatens the environment, assessment must occur in a sufficiently rigorous simulated environment that reflects the circumstances that would be experienced in a functioning workplace. Assessment must cover all aspects of workplace performance, including 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.

## Links

Companion Volume implementation guides are found in VETNet -

<https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2>

