Australian Government

Assessment Requirements for MEM05061 Apply basic metallurgy principles to welding applications

Release: 1

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Modification History

Release 1. New unit.

Performance Evidence

Evidence required to demonstrate competency in this unit must be relevant to and satisfy the requirements of the elements and performance criteria and include the ability to:

- confirm the weldability of at least one grade each of carbon steel and stainless steel, aluminium or an aluminium alloy, and one other non-ferrous metal or alloy
- monitor and identify factors that could adversely affect heat input on deposited metal
- monitor and identify the factors associated with the heat affected zone that could adversely affect the welding of at least two of carbon and low alloy steels, stainless steels, aluminium, and nickel, copper and manganese metal and alloys.

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:

- parameters used for the grouping of base metals
- microstructures of common ferrous and non-ferrous metals and alloys
- iron-carbon diagram and its use in welding and related processes
- the classification of carbon, manganese and low alloy steels
- effects of common alloying elements on material properties and weldability
- mechanical properties of carbon and low alloy steels including hardness and ductility
- factors affecting base metal quality
- factors affecting the weldability of carbon and low alloy steels
- weld defects in carbon and low alloy steels including:
  - distortion
  - lack of fusion
  - penetration defects including incomplete root penetration, lack of root fusion, lack of inter-run fusion, lack of side wall fusion
  - inclusions
  - porosity
  - fatigue
  - intergranular and stress corrosion

- cracking including solidification cracking, hydrogen heat affected zone cracking, and reheat cracking
- factors affecting weldability of alloy, quenched and tempered steels including:
  - welding zones
  - microstructures of base and filler metals and implications for welding
  - carbon equivalence
  - hydrogen content and control
  - residual stress avoidance
  - weld preheat temperatures.
- cold cracking including test methods for susceptibility
- factors affecting the weldability of stainless steels
- factors affecting the weldability of aluminium and aluminium alloys
- weldability of non-ferrous metals and their alloys including copper, nickel, magnesium
- weldability of cast irons
- causes and control of distortion in welding including the relationship between a material's coefficient of thermal expansion per unit volume of heat and distortion
- types of electrodes used in welding and their classification
- effects of moisture on electrode performance
- potential sources of hydrogen and effects of hydrogen diffusement in welding
- hydrogen control techniques for welding processes
- methods of residual stress control including welding technique, peening, heat treatment,
- the basic metallurgical changes that occur in carbon steel during normalising
- heat treatment methods including normalising, annealing, quenching, stress relieving, tempering, pre-heating, and post weld heat treatment
- shielding gases and their application to welding processes
- sources for further metallurgical professional and technical advice
- welding terminology including codes and symbols.

Assessment Conditions

- Assessors must:
  - have vocational competency in applying basic metallurgy principles to welding applications at least to the level being assessed
  - 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.

- Reports required to be provided by the applicant can be either reports on actual welded fabrications or test pieces.
- Knowledge assessment may be either verbal or written but must adequately reflect the knowledge requirements of the unit in a functioning workplace.
- 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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Links

Companion Volume implementation guides are found in VETNet - https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b7050d37-5fd0-4740-8f7d-3b7a49c10bb2