



Australian Government

MEM48028 Determine corrosion prevention strategies for metal and alloys

Release: 1

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Modification History

Release 1. Supersedes and is equivalent to MSATCM517A Determine corrosion prevention strategies for metal and alloys.

Application

This unit of competency defines the skills and knowledge required to apply metallurgical principles to determine strategies for minimising or avoiding corrosion of metallic components and structures in manufacturing, engineering and structural situations.

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 Discuss corrosion prevention or minimisation need with clients, colleagues and other technical experts
2. Research and determine corrosion prevention or minimisation need	2.1 Identify product performance, cost, location and environmental factors 2.2 Research and report on the metallurgical techniques and principles relating to corrosion from appropriate sources of information and examination of corroded material 2.3 Identify the metallurgical techniques and associated technologies required to prevent or minimise corrosion in the application

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. Determine appropriate corrosion prevention or minimisation strategy and techniques for application	3.1 Select appropriate corrosion prevention or minimisation strategies for application 3.2 Document corrosion prevention or minimisation strategy and approvals obtained from relevant personnel 3.3 Prepare instructions for implementing corrosion prevention or minimisation strategy and communicate to appropriate personnel

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.

Metallurgical principles include:	• definition of corrosion • environments • corrosion damage • classification of corrosion • cost of erosion • social implications.
Corrosion principles include:	• electrochemical aspects including: • electrochemical reactions and chemical corrosion, galvanic cells, anode reactions, cathode reactions, concentration cells, polarisation, passivity, pourbaix diagrams (simplified Pourbaix diagrams for Al, Fe and Zn), the driving force of corrosion and the rate of corrosion • environmental effects including: • oxygen and oxidisers, velocity, temperature, corrosive concentration and corrosion environments (water, soil, atmosphere, dry gasses)

	- metallurgical aspects including: - metal structures (defects, grain boundaries, second phases, cold work, residual stress), galvanic series, immunity and passivity.
Corrosion, mechanism of oxide film growth, at elevated temperatures include:	- rate laws - oxide defect structures - Pilling-Bedworth rule - oxidation of alloys - catastrophic oxidations - de carburisation - high temperature resistant alloys.
Forms of corrosion include:	- uniform corrosion (general corrosion) - galvanic corrosion - crevice corrosion - pitting corrosion - fretting corrosion - selective attack (leaching) - intergranular corrosion - stray current corrosion (electrolysis) - erosion corrosion and cavitation damage - stress corrosion cracking - corrosion fatigue - hydrogen damage - microbial corrosion.
Basic principles of corrosion control include:	- material selection including: - metals and alloys, metal purification, non-metallics and stress relief - alteration of environment including: - changing media, temperature, velocity and oxygen concentration - corrosion protection including: - cathodic protection, anodic, protection and passivation, corrosion inhibitors, chemical conversion coatings, metal coatings, corrosion-preventing paints, coatings of plastic and rubber and temporary corrosion prevention - corrosion prevented by design including: - wall thickness and design rules (streamlining, stagnation, crevices and metallic contact).
Corrosion characteristics of common alloys include:	- steel and cast iron - stainless steel - aluminium and its alloys - copper and its alloys.
Methodology of corrosion investigations include:	- corrosions testing - corrosion monitoring

	• electrochemical investigations • physical methods.
Sources of information includes one or more of the following:	• reference texts • manufacturer catalogues and industrial magazines • websites • information gathered using communications technology.

Unit Mapping Information

Release 1. Supersedes and is equivalent to MSATCM517A Determine corrosion prevention strategies for metal and alloys.

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 MEM48028 Determine corrosion prevention strategies for metal and alloys

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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 reduce corrosion on at least two occasions
- applying metallurgical principles to manufacturing, engineering and structural situations
- referring solutions to the original aim of the application
- quoting solutions in appropriate units using appropriate significant figures
- quoting limitations of corrosion prevention or minimisation strategies.

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
- sources of information
- metallurgical principles and their limitations
- methodology of corrosion investigations
- corrosion principles and characteristics
- forms of corrosion
- corrosion (mechanism of oxide film growth) at elevated temperatures
- instruction procedures for implementing corrosion prevention or minimisation strategy.
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Assessment Conditions

- Assessors must:
 - have vocational competency in determining corrosion prevention strategies for metal and alloys 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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