



Australian Government

MEM24033 Undertake thermography tests

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Modification History

Release	Comments
1	This unit of competency was first released in MEM Manufacturing and Engineering Release 5.0.

Application

This unit of competency has been developed for training of non-destructive testing (NDT) technicians in performing thermography (infra-red) non-destructive tests, including quantitative and qualitative thermography testing.

The unit defines the skill and knowledge for passive and active testing of materials, the processing of infra-red images, interpretation of results, report preparation and storage for later comparative analysis.

Where interpretation of technical drawings is required, unit MEM09229 Read and interpret technical drawings should also be selected. Where the selection and use of engineering measurement is required, unit MEM12023 Perform engineering measurements should also be selected.

Where the selection and use of hand tools are required unit MEM18001 Use hand tools should also be selected.

Where the selection and use of power tools are required, unit MEM18002 Use power tools/hand held operations should also be selected.

Band: B

Unit Weight: 4

Licensing/Regulatory Information

Assessment as competent against MEM24033 Undertake thermography tests may contribute to certification against relevant Australian NDT standards where assessment of this unit of competency is carried out in conjunction with an examining authority as described in AS ISO 18436.7 Condition monitoring and diagnostics of machines - Requirements for qualification and assessment of personnel, Part 7: Thermography.

Pre-requisite unit(s)

MEM13015 Work safely and effectively in manufacturing and engineering

MEM16006 Organise and communicate information

MEM24039 Apply materials technology principles to non-destructive testing

MEM30007 Select common engineering materials

Competency field(s)

Non-destructive testing

Unit sector(s)

N/A

Elements and Performance Criteria

Elements	Performance criteria
Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
1. Establish job requirements	1.1 Comply with relevant WHS and regulatory requirements, standards, codes of practice and standard operating procedures (SOPs) for thermography testing 1.2 Identify job requirements from customer specifications, job sheets or work instructions
2. Prepare for thermographic testing	2.1 Liaise with client to explain testing requirements and schedule tests 2.2 Use established safe work practices and personal protective equipment (PPE) in accordance with SOPs 2.3 Identify test material inspection area determine if special access requirements appropriate for the NDT test need to be communicated to the client 2.4 Clean and prepare inspection areas for testing using appropriate procedures 2.5 Check and prepare all test equipment in accordance with manufacturer's specifications and job specification
3. Perform thermographic testing	3.1 Select the most appropriate thermographic test for the material and/or application 3.2. Set up test equipment in accordance with relevant standards and job specifications 3.3 Carry out thermographic test in accordance with relevant standards and specifications 3.4 Check thermographic testing equipment for defects, and maintain and store in accordance with procedures and manufacturer instructions

4. Interpret and report the results of thermographic tests	4.1 Review conduct of the test and confirm test procedures were applied correctly 4.2 Process thermographic images in accordance with standards and codes and job specifications 4.3 Determine material condition and defects according to standards and codes and job specification acceptance criteria 4.4 Report test results in accordance with enterprise procedures, accepted industry practices and job specifications 4.5 Store and catalogue thermal images for later comparative analysis
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Foundation Skills

This section describes those language, literacy, numeracy and employment skills that are essential to performance.

Other 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.	
Test material include one (1) or more of the following:	• ferrous and nonferrous metal: ○ castings ○ plate ○ pipe ○ welds ○ tanks ○ manufactured components ○ other ferrous and nonferrous items • glass • cement and concrete • polymers and elastomers • composites • textiles.

Environment conditions include:	• direct sunlight • precipitation • fog, mist and ice • wind and draught.
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Unit Mapping Information

Current Code and Title	Previous Code and Title	Comments	Equivalence
MEM24033 Undertake thermography tests	MEM24014 Perform thermography tests	Superseded	Equivalent

Assessment Requirements for MEM24033 Undertake thermography tests

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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.

Evidence required includes the ability to:

- follow work instructions, standard operating procedures (SOPs) and safe work practices
- identify and interpret specifications, relevant testing standards, codes and other reference documentation for performing thermographic testing.
- prepare work areas and materials for thermographic testing
- adjust thermographic testing settings and techniques for environment conditions and ambient temperature
- select appropriate thermography techniques for at least three different materials and test specifications
- undertake numerical operations and calculations associated with performing thermographic testing
- perform the following thermographic tests on different materials and prepare a report for each test according to non-destructive standard and code requirements:
 - lock-in thermographic test (periodic excitation method)
 - pulse thermographic test
 - transient thermographic test
 - continual excitation thermographic test.

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 standards and codes relevant to non-destructive testing

- applications and limitations of thermographic non-destructive testing for:
 - detection of defects in materials including cracks, cavities, voids, and inhomogeneities
 - inspection of welded joints
 - determination of material internal structure
 - detection of contaminants
 - condition monitoring
- electromagnetic spectrum and wavelength ranges for infra-red, visible light, ultra-violet, X-ray and gamma ray
- principles of heat and heat transfer including:
 - heat as energy
 - temperature scales
 - phases
 - heat transfer – conduction, convection and radiation including:
 - Fourier's law
 - Newton's law of cooling
 - evaporation fundamentals
- principles of infra-red radiation including:
 - natural and artificial sources of infra-red radiation
 - principles related to emission, reflection, transmission and absorption of infra-red radiation
 - black body, grey body and selective radiators
 - Plank's law
 - Wien's law
 - Stefan-Boltzmann law
 - Kirchoff's radiation law
 - cavity radiation effect
- thermal property of materials including:
 - emissivity
 - reflectance
 - transmittance
 - effects of surface structure and coating
- methods of temperature measurement
- qualitative thermography including:

- definition
 - advantages and disadvantages
 - typical applications in manufacturing and engineering
 - equipment and test techniques
- quantitative thermography including:
 - definition
 - effects of temperature and the environment
 - advantages and disadvantages
 - typical applications in manufacturing and engineering
 - equipment and test techniques
- difference between passive and active thermography
- principles of excitation including:
 - sources
 - type of excitation – pulse, periodic or continuous
- thermographic image capture including:
 - infra-red cameras including high-speed cooled infra-red cameras, lenses and other accessories
 - bolometers and other sensors
 - equipment factors affecting thermographic image capture including:
 - sensitivity
 - imager field of view
 - imager smallest identifiable object
 - imager smallest measurable object
 - emissivity of test material
 - focus
 - duration
 - temperature range setting
 - environment and temperature of test area
 - speed of response
 - frame repetition rate
- thermographic image analysis techniques including:
 - lock-in
 - motion compensation
 - background and other subtractions

- data selection criteria according to job type and standards, codes and procedures
 - use of image analysis software
- thermographic image post-processing techniques.

Assessment Conditions

- Assessors must:
 - have vocational competency in undertaking thermographic testing at least to the level being assessed with relevant industry knowledge and experience
 - satisfy the assessor requirements in the current vocational education and training legislation, frameworks and/or standards.
- 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.
- There must be access to all tools, equipment, materials and documentation required, including relevant workplace procedures, product and manufacturing specifications.

Link

Companion volumes, including implementation guides, are found on the national training register - <https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=45a7f1d5-61a5-447a-9688-7abbd7e1a5c7>.