



Australian Government

MEM24017 Perform visual testing to non-destructive testing standards

Release: 1

MEM24017 Perform visual testing to non-destructive testing standards

Modification History

Release 1. New unit.

Application

This unit of competency has been developed for training of non-destructive testing (NDT) technicians in visual testing, including inspection of surfaces and translucent sub-surfaces, fusion welds, and the interior of pipes, cylinders, and machine components.

The unit defines the skill and knowledge for both direct visual inspection and visual testing of inaccessible areas using camera and video equipment. The unit covers visual inspection undertaken for the purposes of detecting surface and translucent sub-surface anomalies and discontinuities and conformance to specification in tested materials.

Where interpretation of technical drawings is required, unit MEM09002 Interpret technical drawing should also be selected.

Where the selection and use of engineering measurement is required, unit MEM12023 Perform engineering measurements should also be selected.

Competence in this unit along with MEM24012 Apply metallurgical principles may satisfy the requirements of AS 17637: Non-destructive testing of welds — Visual testing of fusion-welded joints.

No licensing, legislative or requirements apply to this unit at the time of publication. Certification against Australian standards may be achieved where assessment in this unit of competency is carried out in conjunction with an examining authority as described in ISO 9712 Non-destructive testing — Qualification and certification of personnel.

Band: B

Unit Weight: 4

Pre-requisite Unit

MEM24012 Apply metallurgical principles

Competency Field

Non-destructive testing

Elements and Performance Criteria

Elements	Performance Criteria
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Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
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 Use appropriate personal protective equipment (PPE) in accordance with SOPs 1.4 Identify job requirements from customer specifications, job sheets or work instructions
2. Prepare for visual testing	2.1 Liaise with client to ensure safe and effective access to test area and test material 2.2 Identify test material inspection area 2.3 Review relevant standards and codes for requirements relevant to visual testing task 2.4 Clean and prepare test area and test material for testing using appropriate procedures and materials 2.5 Arrange illumination for visual inspection according to standards and job inspection requirements 2.6 Check and prepare all test equipment in accordance with manufacturers specifications and job specification.
3. Perform direct visual testing of accessible welds, other surfaces and sub-surfaces	3.1 Place eyes at required distance and angle for weld or surface to be inspected 3.2 Use required magnification devices 3.3 Detect and measure surface features and defects 3.4 Record result for later review and reporting
4. Perform remote visual testing using camera or video equipment	4.1 Determine best approach and instrument for remote visual inspection task 4.2 Set equipment controls for desired viewing angles and magnification 4.3 Detect and measure surface features and defects 4.4 Transfer images to suitable storage system
5. Interpret and report results of visual tests	5.1 Review tests for any obvious errors or problems and apply corrective actions or retest 5.2 Assess information gained from visual tests and classify defects in accordance with relevant standards and codes and customer specifications 5.3 Seek professional or technical assistance on test procedures and test

Elements	Performance Criteria
Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
	interpretation where required 5.4 Complete test reports according to requirements of relevant standards and customer specifications

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.

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|---|--|
| Standards and codes include Australian or international standards and codes and include one or more of the following: | <ul style="list-style-type: none"> • non-destructive testing of welds • non-destructive testing of materials • standards for materials used in manufacturing and engineering • standards for calibration and operation of test equipment. |
| Test material includes: | <ul style="list-style-type: none"> • prepared joints for welding • welds • ferrous and nonferrous metals <p>plus one or more of the following</p> <ul style="list-style-type: none"> • composites • plates • pipes • tanks. |
| Surfaces includes the surface and sub-surface of the following: | <ul style="list-style-type: none"> • plates • pipes • tanks • other manufactured or fabricated items. |

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.

Direct visual testing is direct viewing of the test area with the eyes only or with the aid of optical instruments. Optical instruments and aids include one or more of the following:

- straight edge or measuring tape with graduations of 1mm or finer
- vernier callipers
- feeler gauges
- radius gauge
- magnifying lens
- lamps
- profile measuring gauge
- impression material
- mirrors
- endoscope
- borescope.

Remote visual testing is indirect viewing of the test area through film or digital equipment. Equipment includes one or more of:

- cameras
- video equipment
- automated and computer-enhanced vision equipment
- drones.

Surface defects and discontinuities include one or more of:

- warps
- mismatches of size, shape, orientation, colour or join
- corrosion
- cracks
- surface irregularities
- excessive wear.

Unit Mapping Information

No equivalent unit

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 MEM24017 Perform visual testing to non-destructive testing standards

Modification History

Release 1. New unit.

Performance Evidence

There must be evidence the candidate has demonstrated the ability to:

- prepare the testing area for visual inspection
- comply with workplace procedures and WHS requirements at all times during visual testing
- correctly identify material part or area for visual inspection
- clean and prepare materials for visual inspection
- visually inspect welds and weld joints in ferrous and nonferrous metals including:
 - inspect weld joint preparation
 - conduct visual tests during multi-run welding
 - visually test finished welds
 - visually test welds after heat treatment
- correctly operate lenses and magnifiers
- correctly operate cameras and video equipment
- correctly identify defects and irregularities including:
 - defect type and position
 - defect size
 - defect shape.

Note: Where a volume and/or frequency is not specified, demonstration must be provided at least once.

Knowledge Evidence

There must be evidence the candidate has knowledge of:

- standards and codes relevant to non-destructive testing (NDT)
- applications and limitations of visual NDT
- electromagnetic spectrum and standard names for wavelength ranges
- the physical principles and physics of light including:
 - visible wavelengths
 - natural and artificial sources of light
 - advantages and disadvantages for visual testing of different sources of artificial light
- optical characteristics relevant to visual testing including:
 - light polarisation

- stroboscopic effects
- dispersion
- refraction and refraction index
- reflection
- absorption
- fluorescence
- range and limits of natural eye vision
- potential effects of environmental conditions on visual testing
- potential impact on visual testing of eye condition and disorders
- lighting techniques to aid accuracy of visual testing
- camera and photo sensor operation principles
- material attributes and conditions that may affect a visual test
- welding processes and positions
- weld joint preparation faults including:
 - incorrect joint shape, dimension and assembly
 - fusion faces and adjacent surfaces not clean
 - incorrect surface treatment
- weld faults detectable through visual testing including:
 - visible cracks and cavities
 - incorrect depth and shape of gouging
 - poor slag removal
 - arc strikes, tool impressions and other surface defects
 - incorrect weld profile and dimensions
 - weld root and surface defects
- NDT standards and codes test report requirements.

Assessment Conditions

- Assessors must:
 - have vocational competency in performing visual testing to NDT standards 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.
- 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.

- 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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