



Australian Government

MEM24034 Undertake digital and computed radiography

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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 defines the skills and knowledge required by non-destructive testing (NDT) technicians to perform computer and digital radiographic testing to the level described in relevant Australian and international standards and codes. The unit applies to computer digital radiographic testing undertaken in a range of industrial applications, including metallic and non-metallic fabrications, structures and components. Digital radiography testing may be performed by NDT technicians in a wide range of industries and sectors, including mechanical or mechatronics engineering, manufacturing, aerospace, and associated industry sectors.

The unit covers calibration, set-up and use of computer and digital radiography equipment, including X-ray generators and sealed radioactive sources. Techniques covered include real-time digital radiography (DR), digital detector arrays (DDA) and computed radiography (CR). The unit requires attention to personal and work health and safety (WHS) and ionizing radiation equipment materials and chemicals codes and regulations. These employees work under the general supervision of personnel such as engineering associates, NDT technicians aligned to level 3 in technical standards; professional engineers and scientists; engineering technologists; and production, operations and maintenance managers.

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: 6

Licensing/Regulatory Information

Assessment as competent against MEM24034 Undertake digital and computed radiography may contribute to certification against Australian NDT standards where the assessment in this unit of competency is carried out in conjunction with an examining authority as described in AS ISO 9712 NDT – Qualification and certification of personnel, or subsequent Standards.

Individuals must adhere to the state and national safety regulation in relation to radiation use and licencing.

Pre-requisite unit(s)

MEM13015 Work safely and effectively in manufacturing and engineering

MEM13018 Work safely with ionizing radiation

MEM16006 Organise and communicate information

MEM24030 Undertake radiographic tests

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 digital and computed radiography testing 1.2 Identify job requirements from specifications, job sheets or work instructions
2. Prepare testing sites	2.1 Assess suitability of site for digital radiography 2.2 Use established safe work practices and personal protective equipment (PPE) in accordance with SOPs 2.3 Liaise with client to explain testing and safety requirements and schedule tests 2.4 Assemble all specified testing equipment, materials and containers and safety equipment 2.5 Determine test site boundary for test operations

3. Prepare test material and equipment	3.1 Identify inspection area and determine if special access requirements appropriate for the NDT test need to be communicated to the client 3.2 Clean and prepare inspection areas for testing using appropriate test procedures and materials in accordance with WHS and regulatory requirements 3.3 Assess inspection areas visually and identify obvious discontinuities 3.4 Select the most appropriate digital radiographic test technique for the material or application 3.5 Select appropriate testing and processing equipment and conduct pre-use checks in accordance with relevant standards and/or procedures 3.6 Calibrate computer and digital radiography equipment using radiography phantoms and reference images records
4. Perform computed radiographic testing	4.1 Optimise computed radiography equipment set-up for various geometries in accordance with standards and/or procedures 4.2 Conduct computed radiographic tests in accordance with relevant standards, codes and specifications 4.3 Use radiation control measures to minimise personal radiation exposure 4.4 Process image plate and assess radiograph for quality 4.5 Modify computed images to optimise defect detection
5. Perform digital radiographic testing	5.1 Optimise digital radiography equipment set-up for various geometries in accordance with standards and/or procedures 5.2 Conduct radiographic tests in accordance with relevant standards, codes and specifications 5.3 Use radiation control measures to minimise personal radiation exposure 5.4 Process digital radiograph and assess for quality 5.5 Modify digital images to optimise defect detection
6. Interpret and report radiographic test results	6.1 Review conduct of the test and confirm test procedures were applied correctly 6.2 Assess computed or digital radiograph indications and determine the type of discontinuity for each relevant indication 6.3 Classify defects in accordance with relevant national and international codes and standards

	6.4 Interpret results according to applicable standards, codes, specifications or procedures 6.5 Prepare report according to standards and specifications 6.6 Maintain statutory records of the use of radiation sources and/or instruments that emit ionising radiation
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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 includes one (1) or more of the following:	• ferrous and nonferrous metallic items: ○ castings ○ plate ○ pipe ○ welds ○ tanks ○ manufactured components ○ other ferrous and nonferrous metal items • glass • cement and concrete • polymers and elastomers • composites.
Personal radiation control measures include:	• minimising exposure time • maximising distance from radiation source • use of specified shielding.
Computed radiography includes:	• radiography using phosphor-imaging plates for later processing by special software.

Digital radiography includes:	• real-time radiography using a single digital scanner or a digital detector array.
Radiographic test techniques include:	• single wall, single image (plate) • double wall, single image (tube) • double wall, double image • double wall, double image, source superimposed.

Unit Mapping Information

Current Code and Title	Previous Code and Title	Comments	Equivalence
MEM24034 Undertake digital and computed radiography	MEM24015 Perform digital and computed radiography	Superseded	Equivalent

Assessment Requirements for MEM24034 Undertake digital and computed radiography

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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. Different specimens means different in character, i.e. in product form, material specification, shape, size, or discontinuity type and be representative of products typically tested in the industrial sector. The testing process for one specimen must result in at least 10 digital images for interpretation.

Evidence required includes the ability to:

- prepare two sites for digital radiography
- prepare two sites for computed radiography
- use measures to avoid or minimise radiation exposure to self and others for at least one test occasion, selecting a real time radiography reading station location for maximum safety and efficiency
- applying safe work practices and controls for minimising radiation exposure to self and others:
 - ensuring security of radiation sources during storage, transport and use
 - using signs, barriers, shielding to minimise radiation exposure of public
 - reducing personal exposure time
 - maintaining greatest feasible distance between radiation source and equipment operator
 - using maximum feasible shielding between radiation source and equipment operator
 - using a dosimeter to monitor personal radiation exposure
 - maintaining statutory records of the use of radiation sources and/or instruments that emit ionising radiation
- prepare area for digital radiographic testing on at least three occasions
- select the most appropriate digital radiographic test technique for the material or application

- optimise the quality of digital radiographic test set-up for different geometries and/or specialised applications
- use digital radiography to perform at least three of the following radiographic test techniques on one occasion each:
 - single wall, single image (plate)
 - double wall, single image (tube)
 - double wall, double image
 - double wall, double image, source superimposed
- process acquired digital radiographic images for viewing
- enhance or modify acquired digital image to optimise defect detection
- interpret and evaluate digital radiographs including checking and confirming indicators and identifying defects
- classify defects in accordance with job specifications and national and international codes and standards
- report test results and complete job records in accordance with SOPs and relevant Australian and international codes and standards
- calibrate digital radiography equipment on at least two occasions including using phantoms and reference images
- minimise environmental impact of digital radiographic tests.

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, codes and regulations relevant to handling and storing digital radiographic equipment and radiation sources
- advantages and disadvantages of film and digital radiography
- radiation safe work practices and controls including:
 - measures to ensure security of radiation sources during storage, transport and use
 - signs, barriers, and shielding used to minimise radiation exposure of public
 - measures to reduce personal exposure time
 - measures to maintain greatest feasible distance between radiation source and equipment operator
 - measures for maximum feasible shielding between radiation source and equipment operator

- use of a dosimeter to monitor personal radiation exposure
 - procedures for maintaining statutory records of the use of radiation sources and/or instruments that emit ionising radiation
- safety features of radioisotope cameras and X-ray equipment
- principles and stages of digital radiography including:
 - set up and optimisation
 - image capture
 - mapping
 - image reading (CR)
 - image processing
 - image manipulation and magnification
 - image analysis
 - reporting
- applications and differences between digital radiography techniques including direct radiography (DR), digital detector arrays (DDA), and computed radiography (CR)
- procedures for carrying out each type of radiographic test and for specialised radiographic applications
- principal types of X-ray generators and radioisotopes and their effect on radiographic sensitivity
- cleaning and preparation processes for a range of test surfaces
- types of discontinuities and their consequences/effect on the material
- equipment calibration checks including:
 - laser beam jitter and flare
 - beam alignment
 - spatial resolution
 - line pair resolution
 - unsharpness
 - shading correction
 - image plate or cassette positioning
 - linearity
 - contrast sensitivity
- measuring tool calibration
- absorption of ionizing radiation by matter and the biological effects on living tissue
- X-ray equipment

- gamma ray sources
- shielding thickness calculation methods
- exposure calculations and techniques
- reciprocity law.

Assessment Conditions

- Assessors must:
 - have vocational competency in undertaking digital and computed radiography 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>.