



Australian Government

MEM21021 Restore clockwork mechanisms

Release: 1

MEM21021 Restore clockwork mechanisms

Modification History

Release 1. Supersedes and is equivalent to MEM21021A Restore clockwork mechanisms

Application

This unit of competency defines the skills and knowledge required to restore and repair clock components by manufacturing parts using hand skills and machine tools and also covers servicing power equalisation systems.

Application includes restoration and repair work to antique clocks where parts are no longer available.

Where machine manufacture of clock components is required unit MEM21022 Manufacture watch and clock components should also be selected.

No licensing, legislative or certification requirements apply to this unit at the time of publication.

Band: B

Unit weight: 6

Pre-requisite Unit

MEM06007	Perform basic incidental heat/quenching, tempering and annealing
MEM09002	Interpret technical drawing
MEM11011	Undertake manual handling
MEM13015	Work safely and effectively in manufacturing and engineering
MEM16006	Organise and communicate information
MEM18001	Use hand tools
MEM21017	Service and repair clock timepieces
MEM21019	Service and repair clock striking mechanisms
MEM21020	Service and repair clock chiming mechanisms

Competency Field

Horology

Elements and Performance Criteria

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	Select and use appropriate personal protective equipment (PPE) in accordance with SOPs
		1.4	Identify job requirements from specifications, drawings, job sheets or work instructions
2	Identify clock restoration requirements	2.1	Identify missing, damaged or worn parts
		2.2	Identify prior modifications and repairs, including non-standard or non-original components
		2.3	Plan repairs in consideration of original clock design and manufacture
		2.4	Record and document repair
3	Service and repair power equalisation devices	3.1	Identify fusee and stopwork device
		3.2	Release mainspring power
		3.3	Diagnose system faults
		3.4	Replace fusee chains or cables
		3.5	Set up fusee and stopwork systems
4	Produce clock parts by hand	4.1	Prepare working drawings and templates of replacement parts
		4.2	Plan suitable method and sequence of production
		4.3	Select materials suitable for manufacturing
		4.4	Transfer designs and mark out templates and work pieces

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Performance criteria describe the performance needed to demonstrate achievement of the element.

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| | | 4.5 | Select appropriate hand tools to undertake process |
| | | 4.6 | Produce components by hand to required specifications |
| | | 4.7 | Conduct finishing, heat treatment and polishing of components |
| | | 4.8 | Verify function of manufactured components |
| 5 | Refinish and polish clock components | 5.1 | Select appropriate refinishing process to repair worn or corroded clock components |
| | | 5.2 | Refinish parts to replicate original finish |
| | | 5.3 | Adjust refinished components for correct function |
| 6 | Repair gears, wheels and arbors | 6.1 | Identify worn or damaged teeth |
| | | 6.2 | Fit, file and shape replacement teeth |
| | | 6.3 | Re-pivot arbors |
| | | 6.4 | Secure replacement part using appropriate fixing method |
| | | 6.5 | Test-run with matched component |

Foundation Skills

This section describes those required skills (reading, writing, oral communication and numeracy) that are essential to workplace performance in this unit of competency.

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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Clock design and manufacture includes one (1) or more of the following:

- remaining faithful to original design and finish
- accounting for value and provenance
- maintaining originality of parts

Record and document repair includes one (1) or more of the following:

- date and extent of repair
- cost of replacement part
- time spent on procedure

Working drawings and templates include one (1) or more of the following:

- sketch or illustration by hand
- photocopy original component then adhere to stock

Appropriate tools and equipment include one (1) or more of the following:

- files
- burnishers
- oil stones
- jewellers saw
- finishing papers
- needle files
- marking out equipment
- lathe/drilling tailstock

Produce components by hand includes the use of one (1) or more of the following:

- pallets
- striking and chiming levers
- ratchet wheels
- clickwork
- taper pins

Heat treatment includes one (1) or more of the following:

- annealing
- hardening
- tempering (bluing)

Refinishing process includes one (1) or more of the following:

- filing
- honing
- graining
- polishing

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Clock components include one (1) or more of the following:

- arbors and pinions
- clicks
- pallets
- screws
- taper pins

Fixing method includes one (1) or more of the following:

- Loctite
- low melting solder
- electronic soldering iron
- spirit lamp

Unit Mapping Information

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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>

Assessment Requirements for MEM21021 Restore clockwork mechanisms

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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 on at least two (2) occasions and include:

- following work instructions, standard operating procedures (SOPs) and safe work practices
- identifying missing damaged or worn parts
- liaising with customer, identifying restoration costs and planning and conducting repairs to maintain originality of timepiece
- servicing and repairing power equalisation devices, including dismantling, assembling and setting up fusee systems
- using appropriate tools and equipment for restoration work
- preparing and using working drawings and templates to manufacture components by hand
- applying appropriate heat treatment process and refinish manufacture process to achieve desired result and verifying correct function of manufactured components
- repairing gears, wheels and arbors and test run with matched component
- recording and documenting repairs.

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 and use of personal protective equipment (PPE)
- clock design and manufacture
- design and drawing of replacement parts
- techniques for manufacturing replacement parts
- gear forms (cycloidal and involute)
- gear terminology (pitch and root diameter)
- types and uses of files, including shapes and cuts
- jeweller saws and blades
- metal types and applications to clock components
- power equalisation devices and their function
- finishing and polishing techniques and media.

Assessment Conditions

- Assessors must:
 - have vocational competency in restoring clockwork mechanisms 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. This must 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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