



Australian Government

Department of Education, Employment and Workplace Relations

MEM21021A Restore clockwork mechanisms

Release: 1

MEM21021A Restore clockwork mechanisms

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit of competency covers restoring and repairing clock components by manufacturing parts using hand skills and machine tools. It also covers servicing power equalisation systems.
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Application of the Unit

Application of the unit	<p>This unit of competency applies to restoration and repair work on clock escapements and servicing of power equalisation systems undertaken in clock service and repair workshops. This work would normally be undertaken by specialist clock repairers. The unit includes restoration and repair work to antique clocks where parts are no longer available.</p> <p>For machine manufacture of clock components, <i>MEM21022A Manufacture watch and clock components</i>, should also be selected.</p> <p>Band: B</p> <p>Unit weight: 6 points</p>
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Licensing/Regulatory Information

Not Applicable

Pre-Requisites

Prerequisite units		
	MEM21020A	Service and repair clock chiming mechanisms
	MEM21019A	Service and repair clock striking mechanisms
	MEM21017A	Service and repair clock timepieces
	MEM18001C	Use hand tools
	MEM09002B	Interpret technical drawing
	MEM06007B	Perform basic incidental heat/quenching, tempering and annealing

Employability Skills Information

Employability skills	This unit contains employability skills.
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Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.
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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Identify clock restoration requirements	1.1. Identify missing, damaged or worn parts 1.2. Identify prior modifications and repairs, including non-standard or non-original components 1.3. Plan repairs in consideration of original clock design and manufacture 1.4. Record and document repair
2. Service and repair power equalisation devices	2.1. Identify fusee and stopwork device 2.2. Release mainspring power 2.3. Diagnose system faults 2.4. Replace fusee chains or cables 2.5. Set up fusee and stopwork systems
3. Produce clock parts by hand	3.1. Prepare working drawings and templates of replacement parts 3.2. Plan suitable method and sequence of production 3.3. Select materials suitable for manufacturing 3.4. Transfer designs and mark out templates and work pieces 3.5. Select appropriate hand tools to undertake process 3.6. Produce components by hand to required specifications 3.7. Conduct finishing, heat treatment, polishing of components 3.8. Verify function of manufactured components
4. Refinish and polish clock components	4.1. Select appropriate refinishing process to repair worn or corroded clock components 4.2. Refinish parts to replicate original finish 4.3. Adjust refinished components for correct function
5. Repair gears, wheels and arbors	5.1. Identify worn or damaged teeth 5.2. Fit, file and shape replacement teeth 5.3. Re-pivot arbors 5.4. Secure replacement part using appropriate fixing method 5.5. Test run with matched component

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

Required skills include:

- saw piercing
- transferring designs
- precision filing
- component fitting
- dismantling, reassembling and setting up power equalisation devices
- measuring components
- re-pivoting arbors

Required knowledge

Required knowledge includes:

- clock design and manufacture
- gear forms (e.g. cycloidal and involute)
- gear terminology (e.g. pitch and root diameter)
- types and uses of files, including shapes and cuts
- jewellers saws and blades
- metal types and applications to clock components
- power equalisation devices and their function
- finishing and polishing techniques and media
- occupational health and safety (OHS) regulations and procedures

Evidence Guide

EVIDENCE GUIDE	
<p>The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.</p>	
<p>Overview of assessment</p>	<p>A person who demonstrates competency in this unit must be able to restore clockwork mechanisms to industry standards, manufacturer specifications and in accordance with safety regulations and procedures.</p>
<p>Critical aspects for assessment and evidence required to demonstrate competency in this unit</p>	<p>Assessors must be satisfied that the candidate can competently and consistently:</p> <ul style="list-style-type: none"> • manufacture by hand and fit replacement parts to specification • plan and conduct repairs to maintain originality of timepiece • dismantle, assemble and set up fusee systems.
<p>Context of and specific resources for assessment</p>	<ul style="list-style-type: none"> • Assessment may occur on the job or in an appropriately simulated environment. Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and information on workplace practices and OHS practices. • Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. • Access must be provided to appropriate learning and/or assessment support when required. Where applicable, physical resources should include equipment modified for people with disabilities.
<p>Method of assessment</p>	<ul style="list-style-type: none"> • Assessment must satisfy the endorsed Assessment Guidelines of the MEM05 Metal and Engineering Training Package. • Assessment methods must confirm consistency and accuracy of performance (over time and in a range of workplace relevant contexts) together with application of underpinning knowledge. • Assessment methods must be by direct observation of tasks and include questioning on underpinning knowledge to ensure its correct interpretation and application. • Assessment may be applied under project-related

EVIDENCE GUIDE	
	<p>conditions (real or simulated) and require evidence of process.</p> <ul style="list-style-type: none"> • Assessment must confirm a reasonable inference that competency is not only able to be satisfied under the particular circumstance, but is able to be transferred to other circumstances. • Assessment may be in conjunction with assessment of other units of competency where required.
Guidance information for assessment	Assessment processes and techniques must be culturally appropriate and appropriate to the language and literacy capacity of the candidate and the work being performed.

Range Statement

RANGE STATEMENT	
<p>The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.</p>	
Clock design and manufacture	<p>Clock design and manufacture may include:</p> <ul style="list-style-type: none"> • remaining faithful to original design and finish • accounting for value and provenance • maintaining originality of parts
Record and document repair	<p>Record and document repair may include:</p> <ul style="list-style-type: none"> • date and extent of repair • cost of replacement part • time spent on procedure
Working drawings and templates	<p>Working drawings and templates may include:</p> <ul style="list-style-type: none"> • sketch or illustration by hand • photocopy original component then adhere to stock
Appropriate tools and equipment	<p>Appropriate tools and equipment may include:</p> <ul style="list-style-type: none"> • files

RANGE STATEMENT	
	<ul style="list-style-type: none"> • burnishers • oil stones • jewellers saw • finishing papers • needle files • marking out equipment • lathe/drilling tailstock
Produce components by hand	Produce components by hand may include: <ul style="list-style-type: none"> • hands • pallets • striking and chiming levers • ratchet wheels • clickwork • taper pins
Heat treatment	Heat treatment may include: <ul style="list-style-type: none"> • annealing • hardening • tempering (bluing)
Refinishing process	Refinishing process may include: <ul style="list-style-type: none"> • filing • honing • graining and polishing
Clock components	Clock components may include: <ul style="list-style-type: none"> • arbors and pinions • clicks • pallets • screws • taper pins
Fixing method	Fixing method may include: <ul style="list-style-type: none"> • loctite • low melting solder • electronic soldering iron • spirit lamp

Unit Sector(s)

Unit sector	Horology
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Co-requisite units

Co-requisite units		

Competency field

Competency field	
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