



**Australian Government**

# **AURTTM010 Heat treat, straighten and reclaim engine components**

**Release: 1**

# AURTTM010 Heat treat, straighten and reclaim engine components

## Modification History

| Release   | Comment                 |
|-----------|-------------------------|
| Release 1 | New unit of competency. |

## Application

This unit describes the performance outcomes required to apply heat treatment and straightening techniques to repair damaged or under sized engine components, and perform the necessary machining to reclaim engine components in an engine reconditioning process. It involves preparing for the task, heat treating, straightening and reclaiming engine components, and completing workplace processes and documentation.

It applies to those working in the automotive service and repair industry. The engine components include those in vehicles from all sectors of the industry.

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

## Competency Field

Mechanical Miscellaneous

## Unit Sector

Technical - Manufacture

## Elements and Performance Criteria

| Elements                                          | Performance Criteria                                                                                                                                                                                        |
|---------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Elements describe the essential outcomes.         | Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold and italicised text is used, further information is detailed in the range of conditions section. |
| 1. Prepare to undertake heat treatment procedures | 1.1 Job requirements are determined from workplace instructions<br>1.2 Engine component reclamation procedures are sourced and interpreted, and most appropriate method is selected                         |

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|--------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                              | 1.3 Tools and measuring equipment are selected and checked for serviceability<br>1.4 Hazards associated with the work are identified and risks are managed<br>1.5 Engine component is prepared for heat treatment method according to <b><i>safety and environmental requirements</i></b>                                                                                                                                                                                                                                                                                                                                                                                                            |
| 2. Heat treat engine component for reclamation               | 2.1 Heat treatment method is used to repair engine component according to workplace procedures and safety requirements, and following machinery safe operating procedures<br>2.2 Engine component is measured to ensure compliance with specifications<br>2.3 Heat treatment method is completed in readiness for further repair according to workplace procedures and safety requirements, and following machinery safe operating procedures                                                                                                                                                                                                                                                        |
| 3. Straighten engine component for reclamation               | 3.1 Engine component is prepared for straightening method according to workplace procedures, and safety and environmental requirements<br>3.2 Component is mounted and clamped in straightening equipment according to manufacturer specifications and workplace procedures<br>3.3 Engine component is straightened according to workplace procedures and safety requirements, and following machinery safe operating procedures<br>3.4 Engine component is measured to ensure compliance with specifications<br>3.5 Straightening process is completed in readiness for further repair according to workplace procedures and safety requirements, and following machinery safe operating procedures |
| 4. Perform machining to reclaim component                    | 4.1 Machining is carried out according to workplace procedures and safety and environmental requirements, and following machinery safe operating procedures<br>4.2 Component is measured to ensure compliance with manufacturer specifications<br>4.3 Machining operations are completed according to manufacturer specifications, workplace procedures, and safety and environmental requirements, and following machinery safe operating procedures                                                                                                                                                                                                                                                |
| 5. Complete repair                                           | 5.1 Final inspection is made to ensure finished work complies with                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

| <b>Elements</b>                           | <b>Performance Criteria</b>                                                                                                                                                                                                                                                            |
|-------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
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| processes                                 | <p>workplace requirements</p> <p>5.2 Bright surfaces are treated with rust prevention solution and engine component is prepared for further process or storage according to workplace procedures</p> <p>5.3 Workplace documentation is processed according to workplace procedures</p> |

## Foundation Skills

This section describes those language, literacy, numeracy and employment skills that are essential to performance and are not explicit in the performance criteria.

| <b>Skills</b>                      | <b>Description</b>                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Learning skills to:                | <ul style="list-style-type: none"> <li>locate appropriate sources of information efficiently.</li> </ul>                                                                                                                                                                                                                                                                                                                                               |
| Reading skills to:                 | <ul style="list-style-type: none"> <li>interpret safe operating procedures for engine component rebuild machinery from workshop literature and signs.</li> </ul>                                                                                                                                                                                                                                                                                       |
| Writing skills to:                 | <ul style="list-style-type: none"> <li>legibly and accurately fill out workplace documentation to record measurements.</li> </ul>                                                                                                                                                                                                                                                                                                                      |
| Numeracy skills to:                | <ul style="list-style-type: none"> <li>interpret numerical information in manufacturer specifications, workshop literature, and machinery dials, gauges and computer readouts</li> <li>use basic mathematical operations, including addition and subtraction, to: <ul style="list-style-type: none"> <li>convert metric dimensions to imperial, and imperial dimensions to metric</li> <li>calculate tolerances and clearances.</li> </ul> </li> </ul> |
| Planning and organising skills to: | <ul style="list-style-type: none"> <li>select best heating, straightening and reclamation options for the work and sequence procedure to reduce time and material wastage.</li> </ul>                                                                                                                                                                                                                                                                  |
| Technology skills to:              | <ul style="list-style-type: none"> <li>use precision metric and imperial measuring equipment.</li> </ul>                                                                                                                                                                                                                                                                                                                                               |

## Range of Conditions

This section specifies 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. Bold italicised wording, if used in the performance criteria, is detailed below.

|                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b><i>Safety and environmental requirements</i></b> must include: | <ul style="list-style-type: none"><li>• work health and safety (WHS) and occupational health and safety (OHS) requirements, including procedures for:<ul style="list-style-type: none"><li>• selecting and using personal protective equipment (PPE)</li><li>• using heating torches, ovens, presses and straightening tools</li></ul></li><li>• environmental requirements, including procedures for trapping, storing and disposing of cooling and lubricating fluids released during the machining process.</li></ul> |
|-------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## Unit Mapping Information

Equivalent to AURTTM3010 Heat treat, straighten and reclaim engine components

## Links

Companion Volume implementation guides are found in VETNet -

<https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=b4278d82-d487-4070-a8c4-78045ec695b1>

# Assessment Requirements for AURTTM010 Heat treat, straighten and reclaim engine components

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## Performance Evidence

Before competency can be determined, individuals must demonstrate they can perform the following according to the standards defined in this unit's elements, performance criteria, range of conditions and foundation skills:

- heat treat, straighten and machine three different engine components, including one engine cylinder head.

## Knowledge Evidence

Individuals must be able to demonstrate knowledge of:

- work health and safety (WHS) and occupational health and safety (OHS) requirements relating to heat treating, straightening and reclaiming engine components, including procedures for:
  - selecting and using personal protective equipment (PPE)
  - using heating torches, ovens, presses and straightening tools
- environmental requirements, including procedures for trapping, storing and disposing of cooling and lubricating fluids released during the machining process
- types, characteristics, uses and limitations of reclamation techniques, including:
  - heat treatment techniques, including:
    - effects of heat on different metals and heating procedures
    - hardening and tempering techniques, including thermal stress relieving to stabilise crankshafts and applying Tufftride and nitride
  - straightening techniques, including:
    - cylinder head straightening
    - crankshaft, camshaft and connecting rod straightening
  - machining surfaces to achieve tolerances and required finish
- requirements of Australian standards relevant to engine reconditioning, including:

- AS 4182 Automotive repairs – Code of practice for reconditioning reciprocating spark ignition engines
- AS 4427 Automotive repairs – Code of practice for reconditioning reciprocating compression ignition engines
- post-repair procedures, including component surface oxidation protection.

## Assessment Conditions

Assessors must satisfy NVR/AQTF assessor requirements.

Competency is to be assessed in the workplace or a simulated environment that accurately reflects performance in a real workplace setting.

Assessment must include direct observation of tasks.

Where assessment of competency includes third-party evidence, individuals must provide evidence that links them to the engine components that they have heat treated, straightened and reclaimed, e.g. repair orders.

Assessors must verify performance evidence through questioning on skills and knowledge to ensure correct interpretation and application.

The following resources must be made available:

- automotive repair workplace or simulated workplace
- workplace instructions
- manufacturer engine specifications
- AS 4182 Automotive repairs – Code of practice for reconditioning reciprocating spark ignition engines
- AS 4427 Automotive repairs – Code of practice for reconditioning reciprocating compression ignition engines
- three different engine components, including one engine cylinder head
- heating equipment and tools for heat treating, straightening and reclaiming engine components.

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