



**Australian Government**

# **AURTTM3011 Recondition engine cylinder heads**

**Release 2**

## AURTTM3011 Recondition engine cylinder heads

### Modification History

Release	Comment
Release 2	Replaces AURTTM3011 Recondition engine cylinder heads (Release 1) Reference to OHS legislation replaced with new WHS legislation

### Unit Descriptor

Unit descriptor	This unit describes the performance outcomes required to recondition engine cylinder heads according to workplace requirements. It involves determining engine cylinder head damage and required repair action, and preparing and using reconditioning machines.  No licensing, legislative, regulatory or certification requirements apply to this unit at time of endorsement.
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### Application of the Unit

Application of the unit	Work applies to reconditioning cylinder heads in an engine reconditioning setting. Engine cylinder heads to be reconditioned are to include overhead valve and overhead camshaft and may include those of light vehicles, heavy vehicles, agricultural and plant equipment, recreational vehicles and motorcycles.
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### Licensing/Regulatory Information

Refer to Unit Descriptor.

### Pre-Requisites

not applicable.

## Employability Skills Information

<b>Employability skills</b>	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. Prepare to undertake cylinder head reconditioning	1.1. <b>Workplace instructions</b> are used to determine job requirements, including method, process and equipment 1.2. <b>Information</b> is accessed, procedures and methods are analysed, and appropriate tooling options are selected for reconditioning engine <b>cylinder heads</b> 1.3. <b>Tools and measuring equipment</b> are checked and prepared for operation 1.4. Safe operating procedures and <b>workplace health and safety (WHS)</b> and <b>environmental requirements</b> are observed throughout the work 1.5. Cylinder head is cleaned
2. Dismantle cylinder head	2.1. Cylinder head component specifications are accessed and interpreted from manufacturer and component supplier information to determine correct dismantling procedure 2.2. Cylinder head is dismantled and laid out in a logical order using approved methods, tools and equipment without causing damage to components or systems 2.3. Component parts are cleaned using cleaning agents appropriate to the type of material and kept in a logical order in preparation for evaluation
3. Use methods to check/test cylinder head	3.1. Cylinder head is pressure and/or crack tested 3.2. Cylinder head and components are <b>inspected, measured and tested</b> against manufacturer and component supplier specifications 3.3. Inspection, measurement and testing are completed without causing damage to component or system
4. Recondition component parts	4.1. Components are <b>adjusted and/or machined</b> to meet manufacturer and component supplier specifications 4.2. Adjustments and/or machining of components are achieved without causing damage to components or system 4.3. Work is carried out according to established industry guidelines
5. Assemble cylinder head	5.1. Cylinder head is assembled without causing damage to components or system

<b>ELEMENT</b>	<b>PERFORMANCE CRITERIA</b>
	<p>5.2. Assembly is carried out to comply with manufacturer and component supplier specifications, established industry guidelines and Australian standards</p> <p>5.3. Assembly activities are carried out according to industry regulations and guidelines, OHS legislation, and workplace procedures and policies</p>
6. Carry out testing and adjustment procedures	<p>6.1. Testing and adjustment are carried out to comply with manufacturer and component supplier specifications, established industry guidelines and Australian standards</p> <p>6.2. Tests and adjustments are completed without causing damage to components or system</p> <p>6.3. Tests and adjustments are performed using industry-approved procedures and equipment</p>
7. Finalise cylinder head reconditioning	<p>7.1. Work performed is documented</p> <p>7.2. Final inspection is made to ensure surfaces are protected</p> <p>7.3. Engine cylinder head is prepared for storage according to workplace requirements</p> <p>7.4. Workplace documentation is processed according to workplace procedures</p>

## Required Skills and Knowledge

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

### Required skills

- technical skills to:
  - select correct replacement tip or sharpening tool for material to be machined
  - identify worn and damaged cutting tools, pilots and arbors
  - mount and position cutting tools
  - set machining parameters to achieve job requirements and maximise tool life
  - use appropriate and sufficient clamping or mounting of the work piece
  - check that valve seats conform to specifications and workplace requirements
  - set and measure adjustments to specified tolerances and dimensions
- communication skills to:
  - follow oral instructions
  - report deviations from specifications
  - interact with customers and team members
- literacy skills to:
  - read and interpret routine job instructions, specifications, drawings and standard operating procedures
  - identify and analyse technical information
  - understand quality procedures
- numeracy skills to use mathematical ideas and techniques to:
  - calculate time
  - assess tolerances
  - apply accurate measurements
  - calculate material requirements
  - establish quality checks
- problem-solving skills to:
  - locate, interpret and apply workplace policies and procedures, including manufacturer and component supplier procedures
  - identify and avoid planning and scheduling problems
  - prevent time and material wastage
  - organise work and plan processes
- self-management skills to:
  - select and use appropriate equipment, materials, processes and procedures
  - follow workplace documentation, such as codes of practice and operating procedures
- technology skills to use communication devices and computerised equipment to:
  - search and gather supporting material

- take, locate, download and view digital images

### Required knowledge

- WHS regulations and requirements, equipment, material and personal safety requirements, including personal protective equipment (PPE) for handling engine cylinder heads and using specialised equipment, such as:
  - facing machines
  - valve refacers
  - valve spring compressors
  - ovens and presses
- procedures for removing cylinder head from engine block
- dismantling methods and procedures
- cleaning methods and procedures
- procedures for measuring, testing and evaluating cylinder heads, including:
  - testing hardness of aluminium alloy cylinder heads and procedures for re-hardening aluminium alloy cylinder heads
  - visual inspections
  - cylinder head crack testing, including:
    - dye-penetrant testing
    - wet and dry magnetic particle testing
    - vacuum testing
    - pressure testing
  - inspecting valve guides and valve seats
- procedures for measuring, testing and evaluating associated parts, including inspecting camshafts, valves, valve springs, valve spring seats, valve spring retainers, collets and lash caps, rocker arms, rocker shafts and pushrods
- procedures for repairing cylinder heads and associated components, including:
  - heat treating aluminium alloy cylinder heads
  - straightening cylinder heads
  - repairing cracks in cylinder heads
  - welding aluminium alloy and cast iron cylinder heads
  - types of surface finishes for different cylinder head gaskets
  - surfacing cylinder heads, including manifold faces
  - repairing valve guides, valve seats, rocker arms and rocker shafts
  - refacing valves in valve refacer
  - fitting injector tubes and pre-combustion chambers
  - cleaning cylinder heads of residue and swarf
- procedures for assembling cylinder heads, including:
  - refitting welsh plugs and oil gallery plugs, valves, springs, spring seats, retainers, collets lash caps, camshafts, rocker gear, cam followers and associated components

- reasons for setting valve timing before fitting cylinder head to block
- evaluating and setting rocker arm geometry
- preparing cylinder block to accept cylinder head
- fitting head gaskets and cylinder heads to engine blocks
- tightening procedures of cylinder head bolts
- Australian standards relating to engine reconditioning



## Evidence Guide

<b>Evidence Guide</b>	
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.	
<b>Overview of assessment</b>	
<b>Critical aspects for assessment and evidence required to demonstrate competency in this unit</b>	<p>The evidence required to demonstrate competency in this unit must be relevant to workplace operations and satisfy all of the requirements of the performance criteria and required skills and knowledge.</p> <p>A person who demonstrates competency in this unit must be able to:</p> <ul style="list-style-type: none"> <li>• observe safety procedures and requirements</li> <li>• select reconditioning methods and techniques appropriate to the circumstances</li> <li>• complete preparatory activity in a systematic manner</li> <li>• conduct reconditioning of a range of cylinder heads according to workplace, manufacturer and component supplier requirements</li> <li>• complete reconditioning of cylinder heads within workplace timeframes</li> <li>• complete work without damage to tools and equipment or injury to persons.</li> </ul>
<b>Context of, and specific resources for assessment</b>	<p>Workplace environment that accurately reflects performance in a real workplace setting. Performance is demonstrated consistently over a period of time and in a suitable range of contexts.</p> <p>Assessment is to occur:</p> <ul style="list-style-type: none"> <li>• using standard workplace practices and procedures</li> <li>• following safety requirements</li> <li>• applying environmental constraints.</li> </ul> <p>Assessment is to comply with relevant:</p> <ul style="list-style-type: none"> <li>• regulatory requirements</li> <li>• Australian standards</li> <li>• industry codes of practice.</li> </ul> <p>The following resources must be made available for the assessment of this unit:</p> <ul style="list-style-type: none"> <li>• appropriate worksite</li> <li>• cylinder heads appropriate to the workplace,</li> </ul>

<b>Evidence Guide</b>	
	<p>including multi-valve, OHV and OHC cylinder heads</p> <ul style="list-style-type: none"> <li>• fixed and portable hand, air and power tools and equipment appropriate to reconditioning cylinder heads</li> <li>• specifications and work instructions.</li> </ul>
<b>Method of assessment</b>	<p>Assessment must satisfy the endorsed Assessment Guidelines of this Training Package.</p> <p>Assessment methods must confirm consistency and accuracy of performance (over time and in a range of workplace relevant contexts) together with application of required skills and knowledge.</p> <p>Assessment methods must be by direct observation of tasks and include questioning on required skills and knowledge to ensure its correct interpretation and application.</p> <p>Assessment must confirm that competency is able not only to be satisfied under the particular circumstance, but is able to be transferred to other circumstances.</p> <p>Competence in this unit may be assessed in conjunction with other units which together form part of a holistic work role.</p> <p>Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability.</p> <p>Assessment processes and techniques must be culturally sensitive and appropriate to the language and literacy capacity of the candidate and the work being performed.</p>

## Range Statement

<b>Range Statement</b>	
<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, 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>	
<p><b><i>Workplace instructions</i></b> may include:</p>	<ul style="list-style-type: none"> <li>• computer-generated instructions</li> <li>• verbal instructions</li> <li>• written instructions.</li> </ul>
<p><b><i>Information</i></b> may include:</p>	<ul style="list-style-type: none"> <li>• Australian standards</li> <li>• engineer's design specifications and instructions</li> <li>• instructions issued by authorised workplace or external persons</li> <li>• workplace specifications and requirements</li> <li>• regulatory and legislative requirements relating to the automotive industry, including Australian Design Rules</li> <li>• safe work procedures relating to the operation of machinery associated with reconditioning cylinder heads</li> <li>• verbal, written and graphical instructions, signage, work schedules, plans, specifications, work bulletins, memos, material safety data sheets (MSDS), diagrams or sketches.</li> </ul>
<p><b><i>Cylinder heads</i></b> may include:</p>	<ul style="list-style-type: none"> <li>• overhead cam (OHC)</li> <li>• overhead valve (OHV).</li> </ul>
<p><b><i>Tools and measuring equipment</i></b> may include:</p>	<ul style="list-style-type: none"> <li>• arbors</li> <li>• clamps</li> <li>• depth micrometer</li> <li>• dial bore gauge</li> <li>• dial indicator</li> <li>• inside and outside micrometer</li> <li>• inside calliper</li> <li>• shim grinder</li> <li>• snap gauge</li> <li>• surfacing machine</li> <li>• vacuum tester</li> <li>• valve refacing machine</li> <li>• valve spring tester.</li> </ul>

<b>Range Statement</b>	
<b>WHS requirements</b> may include:	<ul style="list-style-type: none"> <li>• operational risk assessment and treatments associated with:               <ul style="list-style-type: none"> <li>• electrical safety</li> <li>• machinery movement and operation</li> <li>• manual and mechanical lifting and shifting</li> <li>• toxic substances</li> <li>• working in proximity to others and site visitors</li> </ul> </li> <li>• PPE required by legislation, regulations, codes of practice and workplace policies and procedures.</li> </ul>
<b>Environmental requirements</b> are to include:	<ul style="list-style-type: none"> <li>• clean-up management</li> <li>• dust and noise minimisation</li> <li>• waste management.</li> </ul>
<b>Inspected, measured and tested</b> may include:	<ul style="list-style-type: none"> <li>• visual checking</li> <li>• pressure checking procedures</li> <li>• crack testing procedures</li> <li>• tolerance checking procedures.</li> </ul>
<b>Adjustments/machining</b> may include:	<ul style="list-style-type: none"> <li>• surface finishing</li> <li>• seat cutting and replacement</li> <li>• guide replacement</li> <li>• valve grinding</li> <li>• tensioning procedures.</li> </ul>

## Unit Sector(s)

<b>Competency field</b>	Mechanical Miscellaneous
<b>Sector</b>	Technical - Manufacture

## Custom Content Section

Not applicable.