



Australian Government

AURTTM3002 Repair bearing tunnels and connecting rods in engines

Release 2

AURTTM3002 Repair bearing tunnels and connecting rods in engines

Modification History

Release	Comment
Release 2	Replaces AURTTM3002 Repair bearing tunnels and connecting rods in engines (Release 1) Reference to OHS legislation replaced with new WHS legislation

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes required to repair bearing tunnels and connecting rods in engines. It involves determining the machining process required, selecting the appropriate machine, and performing the machining to specifications and workplace requirements in an engine reconditioning process. 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 engine components to be machined, which may include those from light vehicles, heavy vehicles, agricultural and plant equipment, recreational vehicles and motorcycles. Work is carried out according to award provisions.
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Licensing/Regulatory Information

Refer to Unit Descriptor.

Pre-Requisites

Not applicable.

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. Prepare to line-bore an engine	1.1. Workplace instructions are used to determine job requirements, including method, process and equipment 1.2. Information is sourced, procedures and methods are analysed, and appropriate tooling options are selected for line boring an engine 1.3. Tools and measuring equipment are checked and prepared for operation 1.4. Safe operating procedures and workplace health and safety (WHS) and environmental requirements are observed throughout the work 1.5. Engine is measured and calibration requirements for line boring are determined 1.6. Engine block or cylinder head is prepared for line boring 1.7. Line-boring machine is prepared to accept cylinder engine block or cylinder head 1.8. Engine block or cylinder head is positioned and securely clamped
2. Line-bore tunnels	2.1. Tool is set and locked and a test cut is taken 2.2. Engine tunnels are line bored at correct speeds and feed rates without causing damage to components or system 2.3. Tunnels are checked/measured with instruments to ensure compliance with specifications 2.4. Line-boring operations are completed to required specifications and honing allowances
3. Prepare tunnels for honing operations	3.1. Line-bored engine block or cylinder head is cleaned of residue and swarf, and cleaned using appropriate cleaning materials 3.2. Honing machine is prepared to accept engine block or cylinder head 3.3. Engine block or cylinder head is positioned and securely clamped, and required hone stroke is set 3.4. Hone stones are selected and speed is set to achieve required finish
4. Hone engine tunnels	4.1. Tunnels are honed at correct speed and rate to required finish without causing damage to components or system 4.2. Components are checked/measured with

ELEMENT	PERFORMANCE CRITERIA
	instruments to ensure compliance with specifications 4.3.Honing operations are completed in line with required bore to journal clearance
5. Prepare connecting rods for repair operations	5.1.Connecting rods are checked for straightness and straightened as necessary 5.2.Connecting rod-boring machine is prepared to accept connecting rod 5.3.Connecting rod is positioned ready for honing, and securely clamped if machining
6. Repair connecting rod	6.1.Connecting rod little-ends are resized according to workplace requirements 6.2.Connecting rod big-ends are resized according to workplace requirements 6.3.Connecting rods are repaired without causing damage to components or system 6.4.Components are checked/measured with instruments to ensure compliance with specifications
7. Finalise repair process	7.1.Engine block or cylinder head is thoroughly cleaned of residue honing oil 7.2.Final inspection is made to ensure finished work complies with workplace requirements 7.3.Bright surfaces are treated with a protective coating to prevent rust if engine block or cylinder head is to be stored 7.4.Engine block or cylinder head is prepared for further processing or storage 7.5.Workplace documentation is processed according to workplace procedures

Required Skills and Knowledge

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

Required skills

- technical skills to:
 - sharpen and shape cutting tools
 - identify worn and damaged cutting tools
 - mount and position cutting tools
 - set machining parameters to achieve job requirements and maximise tool life
 - use appropriate and sufficient clamping/mounting of the work piece
 - use coolant and lubricant correctly
 - check for conformance to specifications
 - measure 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
 - 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:
 - 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:
 - correct personal protective equipment (PPE) for handling engine blocks, using line-boring and honing machines, and using chemical cleaning and lubricating agents
 - hazards associated with rotating line-boring and honing tools
- types, characteristics and limitations of line-boring and honing machines, including:
 - types and grades of boring tools
 - types and grades of honing stones
- tool sharpening and dressing methods, including:
 - maintaining sharpness of tools throughout boring operations
 - dressing procedures of stones
- line boring methods and procedures, including:
 - setting engine block or cylinder head into line boring machine and aligning to the centre line of the boring bar
 - setting the line boring tool to the correct diameter and locking the boring tool
 - welding and relocating main bearing caps
 - machining top and bottom of bearing caps
 - preparing line borer to accept engine block or cylinder head
 - machining parting faces of the cylinder head camshaft bearing
 - line boring cylinder head camshaft tunnels
 - line boring damaged tunnels to oversize to accept sleeving operation
 - machining parting faces of the cylinder block
 - line boring cylinder block tunnels to accept oversized back bearings
 - line boring tunnels to leave a honing allowance
 - line boring rear main bearing areas and thrust-bearing diameters to original size
 - machining and squaring thrust faces in engine blocks
 - line boring semi-finished camshaft bearings
- line-honing methods and procedures, including:
 - procedures for setting the diameter of the honing stone
 - rotational and oscillating speeds of honing bar
- connecting rod repair methods and procedures, including:
 - removing rod eye bush and measuring rod eye bore
 - checking alignment of connecting rod and straightening the connecting rod
 - boring rod eye for over-sized bush
 - removing cap bolts and nuts and machining parting faces on connecting rod and big-end cap
 - resizing big-end for standard and oversize back bearings
 - fitting new little-end bushes and pin boring little-ends

- types and application of cleaning and lubricating agents
- Australian standards relevant to engine reconditioning

Evidence Guide

Evidence Guide	
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.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	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. A person who demonstrates competency in this unit must be able to: • observe safety procedures and requirements • select methods and techniques for repairing bearing tunnels and connecting rods appropriate to the circumstances • complete preparatory activity in a systematic manner • line bore and hone a range of multi-cylinder engines according to workplace, manufacturer and component supplier requirements • repair a range of connecting rods according to workplace, manufacturer and component supplier requirements • complete work without damage to tools and equipment or injury to persons.
Context of, and specific resources for assessment	Competency is to be assessed in the workplace or a simulated 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. Assessment is to occur: • using standard workplace practices and procedures • following safety requirements • applying environmental constraints. Assessment is to comply with relevant: • regulatory requirements • Australian standards • industry codes of practice. The following resources must be made available for the

Evidence Guide

	assessment of this unit: • appropriate worksite • multi-cylinder engine blocks and cylinder heads appropriate to the workplace, including in-line multi-cylinder engine blocks, vee-configuration multi-cylinder engine blocks, and overhead camshaft cylinder heads • fixed and portable hand and power tools and equipment appropriate to line boring and honing engine blocks and cylinder heads • specifications and work instructions.
Method of assessment	Assessment must satisfy the endorsed Assessment Guidelines of this 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 required skills and knowledge. Assessment methods must be by direct observation of tasks and include questioning on required skills and knowledge to ensure its correct interpretation and application. 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. Competence in this unit may be assessed in conjunction with other units which together form part of a holistic work role. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Assessment processes and techniques must be culturally sensitive and appropriate to the language and literacy capacity of the candidate and the work being performed.

Range Statement

Range Statement	
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.	
Workplace instructions may include:	• computer-generated instructions • verbal instructions • written instructions.
Information may include:	• Australian standards • engineer's design specifications and instructions • instructions issued by authorised workplace or external persons • workplace specifications and requirements • regulatory and legislative requirements relating to the automotive industry, including Australian Design Rules • safe work procedures relating to the operation of machinery associated with repairing bearing tunnels and connecting rods • verbal, written and graphical instructions, signage, work schedules, plans, specifications, work bulletins, memos, material safety data sheets (MSDS), diagrams or sketches.
Appropriate tooling options may include:	• grades of tool tips • hand-held and machine-operated hones • types and grades of honing stones • types of boring tools.
Tooling and measuring equipment may include:	• arbors • clamps • dial bore gauges • dial indicators • inside and outside micrometers.
WHS requirements may include:	• individual state or territory regulatory requirements • operational risk assessment and treatments associated with: • electrical safety • machinery movement and operation • manual and mechanical lifting and shifting

Range Statement	
	• toxic substances • working in proximity to others and site visitors • PPE required by legislation, regulations, codes of practice and workplace policies and procedures.
Environmental requirements include:	• clean-up management • dust and noise minimisation • waste management.
Measured and calibration may include:	• determining sizes of cut and required honing allowances • determining tunnel to journal clearance.
Engine block or cylinder head is prepared may include:	• removing main bearings from engine block • machining bearing cap parting faces • fitting bearing caps to required tensions.
Line-boring machine is prepared must include:	• clamps • jigs • rails.
Set and locked will include:	• setting the tool to the required diameter • locking the tool according to manufacturer specifications.
Speeds and feed rates will include:	• those correct for tunnel material and diameter.
Honing allowances will include:	• those that are dependent on the speed and feed and nose radius of the boring tool.

Unit Sector(s)

Competency field	Mechanical Miscellaneous
Sector	Technical - Manufacture

Custom Content Section

Not applicable.