



Australian Government

AURTTM009 Fit sleeves and bore and hone engine cylinders

Release: 1

AURTTM009 Fit sleeves and bore and hone engine cylinders

Modification History

Release	Comment
Release 1	New unit of competency.

Application

This unit describes the performance outcomes required to fit sleeves to restore engine cylinder blocks and to bore and hone the sleeves to specific tolerances. It involves preparing for the task, assessing damage and determining required repair action, boring, sleeving and honing engine cylinders, and completing workplace processes and documentation.

It applies to those working in the automotive service and repair industry. The engines 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 bore engine cylinder	1.1 Job requirements are determined from workplace instructions 1.2 Engine block, boring and sleeving information is sourced and interpreted 1.3 Tools and measuring equipment for boring are selected and checked for serviceability

Elements Elements describe the essential outcomes.	Performance Criteria 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.
	1.4 Hazards associated with the work are identified and risks are managed 1.5 Engine cylinder is measured and <i>calibration requirements</i> for boring are determined 1.6 Engine cylinder block is prepared for boring, and reboring machine is prepared to accept engine cylinder block according to manufacturer specifications and workplace procedures 1.7 Engine cylinder block is correctly positioned and clamped, and limit stop is set according to manufacturer specifications and workplace procedures
2. Bore engine cylinder	2.1 Cutting tools are mounted and positioned, and worn and damaged cutting tools are identified and replaced or sharpened 2.2 Boring operations are carried out at correct speeds and feed rates according to workplace procedures and <i>safety and environmental requirements</i> , and following machinery safe operating procedures 2.3 Engine cylinder is measured to ensure compliance with specifications 2.4 Boring operations are completed to required specifications and honing allowances according to workplace procedures and safety requirements, and following machinery safe operating procedures
3. Prepare to sleeve engine cylinder	3.1 Tools and equipment for sleeving are selected, checked and prepared for operation according to manufacturer specifications and workplace procedures 3.2 Measuring and calibration requirements for sleeving are determined and required sleeve is selected 3.3 Engine cylinder block or barrel is prepared for sleeving according to manufacturer specifications and workplace procedures
4. Sleeve engine cylinder	4.1 Sleeving operations are carried out according to workplace procedures and safety requirements, and following machinery safe operating procedures 4.2 Sleeves are measured to ensure compliance with specifications, including sleeve protrusion 4.3 Sleeves are bored as required to required specifications and honing allowances according to workplace procedures and safety requirements, and following machinery safe operating procedures
5. Prepare to hone engine cylinder	5.1 Bored engine block is cleaned of residue and swarf according to manufacturer specifications and workplace procedures

Elements Elements describe the essential outcomes.	Performance Criteria 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.
	5.2 Tools and equipment for honing are selected, checked and prepared for operation according to manufacturer specifications and workplace procedures 5.3 Clearances are measured and honing requirements are determined 5.4 Honing machine is prepared to accept engine cylinder block according to manufacturer specifications and workplace procedures 5.5 Engine cylinder block is positioned and securely clamped, and required hone stroke is set according to manufacturer specifications and workplace procedures 5.6 Hone stones are selected and speed is set to achieve required finish and cross hatch
6. Hone engine cylinder	6.1 Engine cylinder is honed at correct speed and rate to required finish according to workplace procedures and safety requirements and following machinery safe operating procedures 6.2 Engine cylinder is measured to ensure compliance with specifications 6.3 Honing operations are completed to required piston to bore clearance according to workplace procedures and safety requirements and following machinery safe operating procedures 6.4 Engine cylinder block is thoroughly cleaned of residual honing oil according to workplace procedures
7. Complete sleeving, boring and honing processes	7.1 Final inspection is made to ensure finished work complies with workplace requirements 7.2 Bright surfaces are treated with rust prevention solution and engine cylinder block is prepared for further process or storage according to workplace procedures 7.3 Work area is cleaned, waste and non-recyclable materials are disposed of, and recyclable material is collected 7.4 Workplace documentation is processed according to workplace procedures

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.

Skills	Description
Learning skills to:	locate appropriate sources of information efficiently.
Reading skills to:	- identify and interpret engine component specifications from workshop literature - interpret safe operating procedures for engine component rebuild machinery from operating manuals and signs.
Writing skills to:	legibly and accurately fill out workplace documentation when making recommendations.
Numeracy skills to:	- interpret numerical information in manufacturer specifications, workshop literature, and machinery dials, gauges and computer readouts - use basic mathematical operations, including addition and subtraction, to: - convert metric dimensions to imperial, and imperial dimensions to metric - calculate tolerances and clearances.
Planning and organising skills to:	select best tooling option for the work and sequence components to reduce time and material wastage.
Technology skills to:	use metric and imperial precision measuring equipment.

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.

<i>Calibration requirements</i> must include:	- determining: - piston to bore clearance - sizes of cut - required honing allowance.
<i>Safety and environmental requirements</i> must include:	- work health and safety (WHS) and occupational health and safety (OHS) requirements, including: - procedures for selecting and using personal protective equipment (PPE) for: - handling engine cylinder blocks - using boring and honing machines - using chemical cleaning and lubricating agents - safe operating procedures for boring and honing machinery,

	including: • electrical safety of boring and honing machinery • boring and honing machinery movement and operation • environmental requirements, including procedures for trapping, storing and disposing of cleaning and lubricating fluids released during the machining process.
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Unit Mapping Information

Equivalent to AURTTM3009 Fit sleeves and bore and hone engine cylinders

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 AURTTM009 Fit sleeves and bore and hone engine cylinders

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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:

- work on three different engine blocks as follows:
 - bore one engine block to accept parallel liners with correct interference fit
 - bore one engine block to accept flanged liners with correct interference fit
 - bore and hone the cylinders of a different multi-cylinder engine block to achieve correct piston to bore clearance.

Knowledge Evidence

Individuals must be able to demonstrate knowledge of:

- work health and safety (WHS) and occupational health and safety (OHS) requirements relating to fitting sleeves and boring and honing engine cylinders, including:
 - procedures for selecting and using personal protective equipment (PPE) for:
 - handling engine cylinder blocks
 - using boring and honing machines
 - using chemical cleaning and lubricating agents
 - safe operating procedures for boring and honing machinery, including:
 - electrical safety of boring and honing machinery
 - boring and honing machinery movement and operation
- environmental requirements, including procedures for trapping, storing and disposing of cleaning and lubricating fluids released during the machining process
- types and application of sleeves, including:
 - dry sleeves, including:
 - interference fit parallel sleeve

- interference fit flanged sleeves
- chrome type finished-to-size dry flanged sleeves
- wet sleeves, including:
 - flanged
 - stepped
- sleeve fitting procedures, including:
 - interference sleeves, including fitting parallel sleeves to step in parent bore
 - wet sleeves
 - checking sleeve height
- types, characteristics and limitations of honing and boring machines, including:
 - types and grades of boring tools
 - types and grades of honing stones
 - hand-held and machine-operated hones
- tool sharpening methods, including:
 - maintaining sharpness of tool throughout boring operations
 - compensation methods for tool wear throughout boring operations
- boring methods and procedures, including:
 - determining required size of bore, including honing allowance
 - preparing engine cylinder block for boring, and setting engine cylinder block into boring machine, including jigs, rails and clamps
 - setting boring tool to correct diameter, locking boring tool, and setting limit stop
 - reasons for taking a test cut
 - speed and feed rates of boring tool for differing materials, including alloysil or nicolsil, and for bore diameters
 - methods for setting speed and feed rate of boring tools
- honing methods and procedures, including:
 - cleaning engine cylinder block before and after honing
 - preparing portable and stationary honing machines, setting engine cylinder block into honing machine, and setting hone stroke
 - setting honing speeds and feed rates to achieve required finish
 - methods of measuring bores for taper, ovality and barrelling
- types and application of cleaning, lubricating and protective agents, including:
 - material suitability
 - application of lubricating agents for different speeds and feed rates of boring machines and honing machines
 - hazards associated with chemical cleaning and lubricating agents
- 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 rust 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 cylinders that they have worked on, 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 multi-cylinder engine blocks as specified in the performance evidence
- engine boring and honing machines
- precision measuring equipment, including:
 - dial bore gauges
 - dial indicator gauges
 - inside and outside metric and imperial micrometers.

Links

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