



Australian Government

AURTTM004 Assemble engine blocks and sub-assemblies

Release: 1

AURTTM004 Assemble engine blocks and sub-assemblies

Modification History

Release	Comment
Release 1	New unit of competency.

Application

This unit describes the performance outcomes required to assemble a short engine block and sub-assemblies, and check clearances and tolerances in an engine reconditioning process. It involves preparing for the task, selecting the correct assembly procedure, carrying out the assembly and performing post-assembly testing, and completing workplace processes and documentation.

It applies to those working in the automotive service and repair industry. The engine blocks and sub-assemblies include those in vehicles from all sectors of the industry. This unit does not cover fitting semi-finished sleeves, or boring and honing cylinders.

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 assemble engine block and sub-assembly	1.1 Job requirements are determined from workplace instructions 1.2 Information is sourced, procedures and methods are analysed, and appropriate tools are selected for assembling engine block

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.
	and sub-assemblies 1.3 Tools and measuring equipment are prepared and checked for serviceability 1.4 Hazards associated with the work are identified and risks are managed 1.5 Pre-assembly cleaning of engine components is carried out according to safety and environmental requirements, and components are laid out in logical order 1.6 Replacement component parts are checked for size and suitability according to manufacturer specifications and job requirements
2. Check engine block and sub-assembly clearances and tolerances	2.1 Clearances and tolerances are measured to the tolerance required by manufacturer specifications 2.2 Clearances and tolerances are adjusted according to workplace procedures and to the tolerance required by manufacturer specifications
3. Assemble engine block and engine sub-assembly	3.1 Engine sub-assemblies are assembled in correct order and without damage, against manufacturer specifications and tolerances and according to workplace procedures and relevant Australian standards and safety requirements 3.2 Engine blocks are assembled in correct order against manufacturer specifications and tolerances and according to workplace procedures, relevant Australian standards, and safety requirements, and without causing damage to components or systems 3.3 Assembled components are measured according to manufacturer specifications and workplace procedures 3.4 Assembled component clearances and tolerances are adjusted according to workplace procedures and to the tolerance required by manufacturer specifications
4. Complete assembly process	4.1 Final inspection is made to ensure finished work complies with workplace requirements 4.2 Bright surfaces are treated with rust prevention solution and engine block and sub-assemblies are prepared for further process or storage according to workplace procedures 4.3 Work area is cleaned, waste and non-recyclable materials are disposed of, and recyclable material is collected 4.4 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 machinery safe operating procedures from operating manuals and signs.
Writing skills to:	legibly and accurately fill out workplace documentation when making recommendations and recording parts and material used.
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:	determine best tooling option for the work and sequence procedure 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>Tools</i> must include:	- fixed and portable hand, air and power tools - lifting equipment - torque wrench - material suitable for assembling engine block.
<i>Pre-assembly cleaning</i> must include:	- removing machining residue - ensuring gasket faces are clean, and oil and water passageways

	are clear using appropriate tools, such as a rifle brush.
<i>Safety and environmental requirements</i> must include:	• work health and safety (WHS) and occupational health and safety (OHS) requirements, including operational risk assessment and treatments associated with: • power tool electrical safety • manual and mechanical lifting and shifting equipment • toxic cleaning substances • environmental requirements, including procedures for trapping, storing and disposing of cleaning fluids released during the assembly process.
<i>Measuring clearances and tolerances</i> must include:	• back clearance and side clearance • bearing to journal clearance • end floats • piston ring end gap • piston to bore clearance.
<i>Adjusting clearances and tolerances</i> must include:	• adjusting gear backlash • machining semi-finished thrust bearings • machining piston protrusion and valve pockets • pin-boring connecting rod little ends.
<i>Assembled</i> must include:	• gaskets • seals.
<i>Australian standards</i> must include:	• 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.

Unit Mapping Information

Equivalent to AURTTM3004 Assemble engine blocks and sub-assemblies

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 AURTTM004 Assemble engine blocks and sub-assemblies

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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:

- assemble two different engine blocks, one of which must be a V configuration engine block, and the sub-assemblies of those engine blocks, in which the work must involve:
 - a multi-cylinder diesel engine
 - a multi-cylinder petrol engine.

Knowledge Evidence

Individuals must be able to demonstrate knowledge of:

- work health and safety (WHS) and occupational health and safety (OHS) requirements relating to assembling engine blocks and sub-assemblies, including procedures for:
 - selecting and using personal protective equipment (PPE) for handling engine blocks and sub-assemblies and using chemical cleaning agents
 - correctly operating specialised equipment, including heating torches, ovens and presses
 - handling freezing substances, including liquid nitrogen
 - manual handling techniques, including:
 - using machinery for lifting engine blocks and engine components
 - using slings, chains and other lifting equipment according to safe work practices
- environmental requirements, including procedures for trapping, storing and disposing of cleaning fluids released during the assembly process
- procedures for clearance testing and adjusting or machining components, including:
 - piston to connecting rod big end alignment
 - big end and main bearing crush with bearing blue

- piston ring end gap, back clearance and side clearance
- bearing to crankshaft clearances with plastigage and measuring and calculating clearances
- semi-flanged thrust bearings
- finished camshaft bearings and measuring clearances
- camshafts and cam followers
- camshaft end float
- crankshaft end float
- gear backlash
- oil pump sealing and pick-up oil piping
- component assembly procedures and processes, including:
 - pre-assembly wash procedures for components
 - welsh plugs and oil gallery plugs
 - piston and connecting rod assemblies
 - big end bearings
 - piston rings to pistons, including procedures for using ring compressors
 - main bearings and thrust washers
 - semi-flanged thrust bearings
 - crankshafts, including protection measures for crankshaft journals, bearings, rings and bores
 - finished camshaft bearings
 - camshafts and cam followers
 - timing gears
 - chains and tensioners
 - oil pumps, oil squirters and oil pump pick-ups
 - balance shafts
 - fitting ancillary components, including:
 - covers and seals
 - housings
 - diesel fuel injection pumps
 - oil coolers
 - crankshaft pulleys
 - flywheels
 - bell housings
- 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.

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 block and sub-assemblies that they have assembled, 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
- 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
- two different multi-cylinder engine blocks, including:
 - in-line engine blocks
 - V configuration engine blocks
- full gasket and seal set for the engine block
- fixed and portable hand, air and power tools, lifting equipment, torque wrench and material suitable for assembling engine block
- precision measuring equipment, including:
 - dial bore gauges
 - dial indicators
 - inside and outside metric and imperial micrometers.

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