



Australian Government

AURTTM3003 Apply metal to rebuild engine components

Release 2

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Modification History

Release	Comment
Release 2	Replaces AURTTM3003 Apply metal to rebuild engine components (Release 1) Reference to OHS legislation replaced with new WHS legislation

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes required to use industry-accepted methods to apply metal spray, hard chrome and weld materials to rebuild components. It involves determining repair requirements and rebuilding engine components 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 rebuilt, which may include those of 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 undertake metal building procedures	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 rebuilding engine components 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 component is prepared for metal application
2. Apply metal to engine components	2.1. Correct information is accessed and interpreted from manufacturer and component supplier specifications 2.2. Metal application process is used to rebuild damaged engine components 2.3. Rebuild method is completed in readiness for further repair without causing damage to components or system
3. Perform necessary machining to rebuild component	3.1. Machining is carried out according to workplace procedures and without causing damage to component or system 3.2. Component is checked and measured with instruments to ensure compliance with specifications 3.3. Machining operations are completed to specifications
4. Finalise rebuild process	4.1. Surfaces of component are finished to manufacturer and component supplier specifications and allowable tolerances 4.2. Finishing work is completed without causing damage to the component 4.3. Surfaces are protected with a rust prevention solution 4.4. Components are prepared for further process or storage 4.5. 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:
 - identify and rectify weld defects
 - identify worn and damaged cutting and grinding tools
 - mount and position cutting and grinding tools
 - set machining parameters to achieve job requirements and maximise tool life
 - measure to specified tolerances and dimensions
- communication skills to:
 - follow oral instructions
 - report deviations from specifications
 - interact with customers and team members with regard to workplace instructions
- 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 procedures
 - identify and avoid planning and scheduling problems
 - prevent time and material wastage
 - organise work and plan processes
- planning and organising skills to:
 - make good use of time and resources
 - set priorities
 - monitor own performance
- self-management skills to:
 - manage risks and hazards associated with machinery for applying metal, cutting and grinding
 - optimise workflow and productivity

Required knowledge

- WHS regulations and requirements, equipment, material and personal safety requirements, including:
 - personal protective equipment (PPE) for using welding equipment and machines to rebuild engine components
 - hazards associated with welding equipment
- procedures for identifying existing heat treatment processes, including nitriding, tufftriding, and induction hardening
- engine and engine component structures
- specific welding procedures, including:
 - manual metal arc welding (MMAW)
 - gas metal arc welding (GMAW)
 - gas tungsten arc welding (GTAW)
 - flux core
 - metal spraying
 - submerged arc
- procedures for hard chrome application
- repair operations for components, including:
 - crankshaft journals, camshaft journals and lobes, seal areas, crankshaft nose and keyway, and pulley retaining thread damage
 - crankshaft radius treatment, including:
 - shot peening
 - radius rolling
 - deep fillet radius rolling
- 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 applying metal appropriate to the circumstances • complete preparatory activity in a systematic manner • rebuild a range of engine components 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 should be made available for the assessment of this unit: • appropriate worksite • crankshafts, camshafts, engine cylinder head assemblies, and engine block assemblies

Evidence Guide	
	• material relevant to rebuilding engine components • equipment and hand and power tools appropriate to rebuilding engine components • 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 rebuilding engine components • 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 necessary to produce required finish • MMAW, GMAW, GTAW, flux core and metal spraying • types and grades of grinding stones • types of facing tools.
Tools and measuring equipment may include:	• clamps • dial indicators • hand and power tools • inside and outside micrometers • lifting equipment • welding equipment, such as: • roll welders • short arc welding equipment • gas metal arc welders

Range Statement	
	• gas tungsten arc welders • metal spraying equipment • hard chroming equipment.
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 • 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.
Preparing the engine component may include:	• cleaning the component using appropriate cleaning methods • fitting and clamping the component.
Engine components may include:	• alloy and cast iron cylinder heads • camshaft lobes and journals • crankshaft and camshaft bearing faces • crankshaft journals and thrust surfaces • piston and connecting rod assemblies.
Rebuild methods will include:	• building up lobes/journals by welding, metal spraying and hard chroming • repairing cast iron cylinder heads • repairing cracks in alloy cylinder heads.

Unit Sector(s)

Competency field	Mechanical Miscellaneous
Sector	Technical - Manufacture

Custom Content Section

Not applicable.