Australian Government

AURETR2035 Demonstrate knowledge of petrol and diesel engine operation

Release 1

INDUSTRY SKILLS COUNCILS
Creating Australia's Future

AURETR2035 Demonstrate knowledge of petrol and diesel engine operation

Modification History

Release	Comment
Release 1	New unit of competency

Unit Descriptor

Unit descriptor	This unit describes the performance outcomes required to demonstrate knowledge of petrol and diesel engine components and systems, as well as of principles of engine operation and performance that enables an automotive electrician to understand engine operation when diagnosing faults in motor vehicles. The unit involves carrying out basic structured problem-solving techniques relating to electrical components and systems. No licensing, legislative, regulatory or certification requirements apply to this unit at the time of publication.

Application of the Unit

Application of the unit	Work applies to light and heavy vehicle, mining, construction, agricultural, motorcycle, outdoor power equipment and marine environments. Electrical components and systems are integral parts of petrol and diesel engines.

Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Not applicable.

Employability Skills Information

Employability skills	This unit contains employability skills.

Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the required performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge and/or the range statement. Assessment of performance is to be consistent with the evidence guide.

Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Identify resources	1.1. ***Sources of information*** are located to assist with understanding petrol and diesel engine system operation and performance 1.2. Relevance of information to engine type, and system operation and performance is confirmed
2. Apply knowledge of engine operation	2.1. Understanding of the operating principles of ***petrol and diesel engine operation*** is developed 2.2. Knowledge of ***engine components***, their function and operation in a petrol and diesel engine is applied 2.3. Knowledge of the ***relationship*** that a four-stroke cycle petrol and diesel engine has with the vehicle's ignition, starting, air and fuel delivery and cooling system is applied
3. Apply fault identification to engine performance	3.1. Components of petrol and diesel engines are identified 3.2. Engine principles are applied to vehicle inspection and service activities 3.3. Basic fault-finding procedures are performed on petrol and diesel engines

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

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

Required skills

- communication skills to:
  - communicate ideas and information relating to petrol and diesel engine terminology and procedures (verbal and written)
  - clarify workplace instructions and determine job requirements
  - apply questioning and active listening skills to obtain factual information from sources
- initiative and enterprise skills to recognise a workplace problem or potential problem and take action
- learning skills to identify sources of information, assistance and expert knowledge to expand skills, knowledge and understanding
- literacy skills to:
  - understand technical information relating to engine operation
  - read and follow information in written instructions, specifications and other reference documents
- problem-solving skills to:
  - refer problems outside area of responsibility to appropriate person
  - use and communicate basic mathematical ideas and techniques that relate to automotive systems and components
- self-management skills to:
  - recognise limitations and seek timely advice
  - follow workplace documentation, such as workplace safe operating procedures
- technical skills to:
  - collect, organise and understand technical information relating to:
    - recognising and reporting unsafe situations
    - petrol and diesel engine component and system identification, location and function
  - collect, organise and apply knowledge of information and concepts relating to petrol and diesel engine operation
- technology skills to use information technology equipment to assist with research

Required knowledge

- classifications of engines, including:
  - internal combustion
  - reciprocating and rotary engines
  - spark ignition and compression ignition engines
  - engine cylinder arrangements
- engine configurations, including:

REQUIRED SKILLS AND KNOWLEDGE

- inline engines, vee-type engines and slant cylinder engines
- opposed cylinder engines
- camshaft and valve locations, including:
  - overhead cam (OHC)
  - overhead valve (OHV)
- engine operating principles, including:
  - two-stroke cycles
  - four-stroke cycles
- combustion, including:
  - air-fuel ratios and flame propagation
  - direct and indirect fuel injection
  - detonation and pre-ignition
- engine measurement and performance, including:
  - bore and stroke
  - swept volume and engine volume
  - compression ratio
  - engine efficiency
- torque and horsepower, including brake horsepower
- operation of petrol engines, including:
  - engine components, including cylinder blocks, cylinders, pistons, cylinder heads, combustion chambers, inlet and exhaust manifolds, spark plugs, connecting rods, crankshafts, piston rings, gudgeon pins, camshafts, cams and flywheels
- operation of diesel engines, including:
  - direct and indirect injection
  - swirl chambers
  - pre-combustion chambers

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, the 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 apply and demonstrate knowledge of: • location of relevant sources of information on petrol and diesel engine components, systems and principles of operation • operating principles of petrol and diesel engine systems and components • various engine types and layouts in petrol and diesel powered vehicles • relationship that a four-stroke cycle petrol and diesel engine has with the vehicle's ignition, starting, air and fuel delivery and cooling systems.
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. 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 assessment of this unit: • technical reference library with various information resources • a range of engine components, systems and assemblies • a range of petrol and diesel engine types and configurations mounted on an engine stand for ease of viewing • functioning light vehicle or vehicles

EVIDENCE GUIDE	
	• automotive tools and test equipment • personal protective equipment and workplace safety equipment.
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 the 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 correct interpretation and application. 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 the needs of diverse clients. Assessment processes and techniques must be culturally sensitive and appropriate to the language, literacy and numeracy 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.	
Sources of information may include:	• workplace service information • automotive engine mechanical texts • vehicle workshop manuals • service bulletins • magazine technical articles.

Petrol and diesel engine operation may include:	• engine construction
	• engine types and configuration
	• two-stroke and four-stroke
	• cycles of engine operation, including:
	  • intake stroke
	  • compression stroke
	  • power stroke
	  • exhaust stroke
	• firing order
	• ignition types, including:
	  • spark
	  • compression
	• engine mounting location, including:
	  • front longitudinal
	  • front transverse
	  • mid transverse
	• measurement and performance, including:
	  • bore and stroke
	  • displacement
	  • compression ratio
	  • engine efficiency
	  • torque versus horsepower.

Engine components may include:	• top of engine, including:
	  • timing belt or chain
	  • camshaft timing pulley
	  • camshaft single and dual
	  • rocker arms and shafts

RANGE STATEMENT	
	• intake valves and springs • exhaust valves and springs • cylinder head • front of engine, including: • crankshaft • crankshaft timing pulley • crankshaft pulley and balancer • rear of engine, including: • flywheel • starter ring gear • bottom of engine, including: • engine block • crankshaft • crankshaft balance weights • crankshaft main bearing journals • pistons • connecting rods.
Relationships may include:	• ignition system: • ignition timing • top dead centre (TDC) • electrical sensors • spark plugs • glow plugs • fuel injectors • knock sensors • starter motor system • charging system • coolant temperature sensor • air intake • fuel delivery • exhaust emission • engine oil lubrication system.

Unit Sector(s)

Competency field	Electrical
Unit sector	Technical – Electrical and Electronic

Custom Content Section

Not applicable.