

National Unit Specification: General Information

UNIT Automotive: Cooling Systems (Intermediate 2)

NUMBER 2210208

COURSE

SUMMARY

A unit designed to develop a knowledge of the main cooling system components fitted to a vehicle, how they operate, the areas of potential failure or wear, the need for settings and adjustment including removal and replacement techniques.

OUTCOMES

- 1 Identify engine cooling system components.
- 2 Explain the operation of an engine cooling system and its components.
- 3 Demonstrate the procedure for testing, removal and fitting of main engine cooling system components.

RECOMMENDED ENTRY

Access to this unit is at the discretion of the centre, however no entry prerequisites are envisaged.

CREDIT VALUE

1 Credit at Intermediate 2.

CORE SKILLS

Information on the automatic certification of any core skills in this unit is published in *Automatic Certification of Core Skills in National Qualifications* (SQA, 1999)

Administrative Information

Superclass: XS

Publication date: Session 1998-99

Source: Scottish Qualifications Authority

Version: 1

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National unit specification: statement of standards

UNIT Automotive: Cooling Systems (Intermediate 2)

Acceptable performance in this unit will be the satisfactory achievement of the standards set out in this part of the unit specification. All sections of the statement of standards are mandatory and cannot be altered without reference to the Scottish Qualifications Authority.

OUTCOME 1

Identify engine cooling system components.

Performance Criteria

- a) The main cooling system components of an air cooled engine are correctly identified.
- b) The main cooling system components of a liquid cooled engine are correctly identified.

Evidence Requirements

Written and/or oral evidence of the candidate's ability to correctly identify, from diagrams or actual vehicles and units, air cooling and liquid cooling system components.

Satisfactory achievement will be demonstrated by the candidate achieving:

- PC (a) correct identification of 4 main air cooling system components.
- PC (b) correct identification of 7 main water cooling system components.

OUTCOME 2

Explain the operation of an engine cooling system and its components.

Performance Criteria

- a) The explanation of the necessity for using a cooling system on a heat engine is correct.
- b) The explanation of the operation of a radiator is correct.
- c) The explanation of the operation of a thermostat is correct.
- d) The explanation of the operation of a pressure cap is correct.
- e) The explanation of the operation of a water pump is correct.

Evidence Requirements

Written and/or oral evidence of the candidate's ability to explain the operation of an engine cooling systems and its components.

Satisfactory achievement will be demonstrated by the candidate achieving:

- PC (a) correct explanation of the use of a cooling system.
- PC (b) correct explanation of a radiator operation.
- PC (c) correct explanation of a thermostat operation.
- PC (d) correct explanation of a pressure cap operation.
- PC (e) correct explanation of a water pump operation.

National unit specification: statement of standards (cont)

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OUTCOME 3

Demonstrate the procedure for testing, removal and fitting of main engine cooling system components.

Performance Criteria

- a) The tools/equipment are used in accordance with manufacturer's or companies' set procedures.
- b) The removal and fitting task is carried out correctly.
- c) The tests used to establish cooling system component condition is correct.
- d) The torque setting to set specifications for the given task is carried out correctly.
- e) The alignment of components is correct.
- f) The relevant safety requirements are correctly adhered to for the given task.

Evidence Requirements

Evidence of actual performance of the candidate's ability to follow instructions (manufacturers or company set procedures), use tools, observe relevant/set safety requirements for the given task and meet set time scales within defined criteria.

National unit specification: support notes

UNIT Automotive: Cooling Systems (Intermediate 2)

This part of the unit specification is offered as guidance. None of the sections of the support notes is mandatory.

GUIDANCE ON CONTENT AND CONTEXT

This unit is designed to operate in conjunction with the SVQ level II 'Vehicle Mechanical: Unit Replacement', building the underpinning theory which will assist in the attainment of the SVQ, the PDA Certificate in Motor Vehicle Systems, Intermediate 2 of the Higher Still programme, or as a freestanding unit.

The following sample of components could be used for both identification and the assessment of the outcome:

Outcome 1

Air Cooling Components

Centrifugal fan
Air flow control flaps
Cowlings
Cooling fins
Heat exchangers
Vee belts

Liquid Cooling Components

Radiator
Cooling fan
Water pump
Thermostat
Hoses
Pressure cap
Interior heater
Water jackets
Vee belts
Temperature gauge and sender unit
Thermostatic fan switch
Bleed screws
Interior heater systems
Core plugs

Outcome 2

The need for the cooling system and the method used to take the excess heat from the engine and the form that this takes – convection, conduction and radiation. The need to maintain the engine temperature at a constant level and the effects of overcooling/under cooling should be investigated.

The operation of the system and the components within the system to maintain the engine cooling efficiency.

National unit specification: support notes (cont)

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Outcome 3

The candidate should be dressed as specified in the assessment standards (Specifications), and demonstrate a safe working practice before, during and at the end of the given task.

Recognition of the areas within the cooling system and components that may, give rise to wear or failure. Items such as the water pump seals and bearings, hoses, heater matrix, thermostat, radiator, electric cooling fan/temperature sensor and water pump drive belts. The methods and tests that are normally carried out to establish the condition of the system and its components. The constant use of anti corrosion inhibitors/anti freeze should also be stressed at this point.

The following tests could be carried out on a cooling system; pressure cap, radiator, thermostat.

Practical exercise could be on bench mounted assemblies or on a vehicle where the candidate can from the given task relating to the cooling system carry out a removal and reassembly procedure. The ability of the candidate to follow instructions, select the correct information, select the correct tools and or equipment, check that the tools are in a safe condition prior to use, calibrate if required, to achieve a correct reading, connect the tools/equipment according to the set out procedures/instructions and work in a manner that promotes safety to themselves, others and the vehicle.

At the end of the task, all tools and equipment cleaned and replaced in the appropriate manner in the store or stored area, and the work area cleaned and left in a manner that meets the health and safety at work regulations.

GUIDANCE ON TEACHING AND LEARNING APPROACHES

Candidates could be given the opportunity to examine, in a practical location, a cooling system, to identify the main components, layout, the principle of operation, components and the system in operation.

The principal operation could be demonstrated in a practical situation/location with video and other demonstration aids used as reinforcement to the practical demonstration.

Demonstration of the methods used to determine worn and/or failed items and unserviceable items within the cooling system and adjustment of drive belts is recommended.

System pressure test, pressure cap test, thermostat test, radiator temperature sensor test, audible testing for bearing.

National unit specification: support notes (cont)

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GUIDANCE ON APPROACHES TO ASSESSMENT

Tutors/trainers should select an Instrument of Assessment appropriate for each outcome. Examples of Instruments of Assessment which may be selected are as follows:

Outcome 1

Multi choice test/matching exercise with diagrams if required.

This could be from the following list:

Air Cooled

Centrifugal fan
Air flow control flaps
Cowling
Cooling fins
Heat exchanger
Vee belt

Liquid Cooled

Radiator
Cooling fan
Water pump
Thermostat
Hoses
Pressure cap
Interior heater matrix
Water jackets
Vee belt
Temperature gauges and sender units
Thermostatic fan switch
Core plugs

Outcome 2

Multi choice test/matching exercise with diagrams if required.

Outcome 3

Practical exercise testing, removing and fitting liquid cooling system components. Satisfactory achievement will be demonstrated by the candidate testing, removing and fitting liquid cooling system components, whilst complying with all the performance criteria.