National Unit Specification: General Information

UNIT Automotive: Steering Systems (Intermediate 2)

NUMBER 2210278

COURSE

SUMMARY

This unit is designed to develop a knowledge of steering 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 the main components of a steering system.
2 Explain the operation of the components in relation to the steering system.
3 Indicate the components that are subject to wear and/or failure.
4 Demonstrate the procedure for removing and fitting a steering component and adjusting the alignment.

RECOMMENDED ENTRY

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

CREDIT VALUE

O.5 Credit at Intermediate 2.

CORE SKILLS

Information on the automatic certification of the 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: Steering 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 the main components of a steering system.

Performance Criteria
a) The main components of the steering and operating mechanism are correctly identified.
b) The main components of the steering gearbox and rack and pinion are correctly identified.
c) The main components of a track rod end are correctly identified.
d) The main components of a front hub are correctly identified.

Evidence Requirements
Written and/or oral evidence of the candidate's ability to identify from diagrams or actual units the main components of a steering system.

Satisfactory achievement will be evidenced by the candidate producing for:

PC (a) correct identification of 6 steering and operating mechanism components.
PC (b) correct identification of 6 steering box and 6 rack and pinion components.
PC (c) correct identification of 4 track rod end components.
PC (d) correct identification of 5 front hub components.

OUTCOME 2
Explain the operation of the components in relation to the steering system.

Performance Criteria
a) The explanation of the Ackermann principle of steering is correct.
b) The explanation of the operation of the steering gearbox and rack and pinion is correct.
c) The explanation of caster angle is correct.
d) The explanation of camber angle is correct.
e) The explanation of swivel axis (king pin) inclination is correct.

National unit specification: statement of standards (cont)

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Evidence Requirements
Written and/or oral evidence of the candidate's ability to explain, from diagrams or actual units, the operation of the components in relation to the steering system.

Satisfactory achievement will be evidenced by the candidate producing for:

PC (a) correct explanation of Ackermann operation.
PC (b) correct explanation of 1 steering box and 1 rack and pinion operation.
PC (c) correct explanation of caster angle.
PC (d) correct explanation of camber angle.
PC (e) correct explanation of swivel axis inclination.

OUTCOME 3
Indicate the components that are subject to wear and/or failure.

Performance Criteria
a) The components subject to wear and/or failure in the steering gearbox and rack and pinion are correctly indicated.
b) The components subject to wear and/or failure in the operating mechanisms are correctly indicated.
c) The components subject to wear and/or failure in the front hubs are correctly indicated.

Evidence Requirements
Written and/or oral evidence of the candidate's ability to correctly identify from diagrams or actual units, components subject to wear and/or failure.

Satisfactory achievement will be evidenced by the candidate producing for:

PC (a) correct indication of 4 steering box and 4 rack and pinion components subject to wear and/or failure.
PC (b) correct indication of 4 operating mechanism components subject to wear and/or failure.
PC (c) correct indication of 2 hub components subject to wear and/or failure.

National unit specification: statement of standards (cont)

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OUTCOME 4
Demonstrate the procedure for removing and fitting a steering component and adjusting the alignment.

Performance Criteria
a) Tools/equipment are used in accordance with manufacturers' or companies' set procedures.
b) The removal and fitting task is carried out correctly.
c) Torque setting, to the set specifications for the given task is carried out correctly.
d) The alignment of components/mechanism is correct.
e) The relevant/set safety requirements are correctly adhered to for the given task

Evidence Requirements
Evidence of actual performance for performance criteria (a) to (e), 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: Steering 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, Unit Replacement, building the knowledge necessary in building the underpinning theory which will assist in the attainment of the SVQ, PDA Certificate in Motor Vehicle Systems and Intermediate Level 2 of the Higher Still programme or as a freestanding unit.

The identification main steering components fitted to a vehicle, how they operate, the areas of potential failure or wear, the need for settings, adjustment and torque settings and the removal replacement and adjustment techniques.

The method used to identify steering types and their settings for end float, pre loads, articulation and alignment. The equipment used to check steering and the mechanisms could be demonstrated in a practical situation/location with video and other demonstration aids used as reinforcement to the practical demonstration. Torque setting, alignment and the need for correct settings should be reinforced.

Explanation of the need for steering box/rack clearance settings and adjustment, hub bearing end float, alignment of the steering assembly and the effects on the tyre wear and vehicle handling if the alignment is not correct, torque settings of bolts/studs/nuts fitted to the steering box, rack and hubs and the effect if incorrect torque or no settings are used.

Demonstration of the methods used to check steering units and mechanisms, identify areas of potential failure or wear, the problems caused or produced and the implication to the vehicle or unit if not fitted or aligned correctly, areas of potential failure or wear, adjustment of steering mechanisms, toe out/toe in, caster, camber KPI, toe out on turns.

Identification of problems within the steering and mechanism or the associated components, units which will have a life span dependent on the use of if incorrectly fitted the life span could be dramatically reduced or affected. Identification of the need for lubrication of the steering box, rack and pinion, track ends and hubs.

Practical exercise which could be on bench mounted assembly or a vehicle where the candidate can, from a given task relating to the various steering units and mechanisms, carry out a removal and fitting task to set specifications/procedures.

National unit specification: support notes (cont)

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GUIDANCE ON TEACHING AND LEARNING APPROACHES

Outcome 1

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

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

> Drop arm, worm, rocker shaft, transfer tube, guide track, guide roller, ball race, bearing, ball, nut, rack, pinion, ball joint, support yoke, roller bearing, stub axle, king pin, top ball joint, bottom ball joint, track rod, track rod end, recirculating balls, wish bone, column, flexible joint, idler, drop arm and tie rod, air bag.

Outcome 2

The main components of the steering should be identified and how the components operate.

The principle of Ackermann for a front and rear track rod arrangement, the operation of the various types of steering boxes and rack and pinion, the methods of coupling the steering shaft to the box or the rack with consideration to safety of the driver in the event of an accident. The use of supplementary restraint systems (SRS-air bag) and the dangers associated when they are fitted to a vehicle.

Outcome 3

Demonstration of the methods used to determine wear on the steering components and the effect of that wear on the operation/alignment of the steering.

The following sample of components could be used for identification of components that are subject to wear, and the assessment of the outcome:

> worm, rocker shaft, transfer tube, guide track, guide roller, ball race, bearing, ball, nut, rack, pinion, ball joint, support yoke, roller bearing, stub axle, king pin, top ball joint, bottom ball joint, track rod end, recirculating balls, wish bone, flexible joint, idler, drop arm, hub and tie rod.

Candidates could be given the opportunity to examine, in a practical location, steering systems, to identify the main components which could be subject to problems, and could lead to mis-alignment and steering problems.

National unit specification: support notes (cont)

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Reference to the effects on the steering of various faults could be explored during this part of the unit.

The methods of lubricating the steering box, rack and pinion, track ends and hubs could be explored as part of the unit as prevention of wear and requirements of a service routine.

Outcome 4

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.

Demonstrations of the methods used to check/set adjustments, such as wheel alignment pre loads, end float and the importance of correct/accurate adjustment.

Articulation (movement) of the inner ball joint on the rack should be stressed.

Practical exercise could be on bench mounted assembly or a vehicle where the candidate can, from a given task relating to the various steering systems carry out a removal and refitting task. The ability of the candidate to follow instruction, select the correct information, select the correct tools and or equipment, check that the tools are in a safe condition to use or report that the tools are suspect, calibrate if required the tools before use to achieve a correct reading or setting, connect the equipment and or tools in accordance to laid down/set out instructions/procedures, 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 approved manner in the store or stored area, and the work area is cleaned and left safe to meet health and safety at work regulations.

Reference to 'equipment/tools' within the performance criteria means that in some tasks specialist tools or equipment or both may be used.

Note:

The criteria or the critical points, (what the candidate must do for each PC, to achieve that PC when doing the task – the instruments or specifications for the task), relating to performance criteria (a) to (e), against which the candidate is measured in order to achieve the outcome should be clearly set out and recorded on a checklist.

National unit specification: support notes (cont)

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GUIDANCE ON APPROACHES TO ASSESSMENT
All assessment packs should contain the following:

- Clear indication that the assessment and the Marking schedule have undergone internal verification.

- Main assessment (or first assessment) – A clear statement of what the candidate must do to achieve a pass.

- Marking schedule for the Main assessment, of all the required and acceptable responses against which the assessor will mark the candidate.

- Reassessment (or second, third etc assessment depending on centre policy), indicating clearly that it is re-assessment, again, with a clear statement of what the candidate must do to achieve a pass.

- Marking schedule of all the required and acceptable responses against which the assessor will mark the candidate.

Outcome 1

Written and/or oral evidence which may be in the form of multi-choice type questions, a matching exercise, from diagrams, slides, video or actual units/vehicles, which allows the candidate to identify the main components of a steering system.

Outcome 2

Written and/or oral evidence which may be in the form of multi-choice type questions, short answer or gapped responses could be used which allows the candidate to explain the critical points of the steering system.

Outcome 3

Written and/or oral evidence which may be in the form of multi-choice type questions, a matching exercise, from diagrams, slides, video or actual units/vehicles, which allows the candidate to indicate the main components of a steering system that are subject to wear and/or failure.

National unit specification: support notes (cont)

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Outcome 4

A practical exercise either in the candidate's normal place of work, when being assessed during his/her SVQ, or in the centre on actual units or vehicles, with access to all the relevant tools, equipment, data and clean/safe work area.