IMICA01

Contribute to Housekeeping in Motor Vehicle Environments

Overview

This NOS is about the routine maintenance of the workplace, carrying out basic, non-specialist checks of relevant workplace equipment, cleaning the work area and using resources as directed.

Performance criteria

You must be able to:

1. select and use suitable personal protective equipment throughout all housekeeping and equipment maintenance activities
2. select and use cleaning equipment which is of the right type and suitable for the task
3. use resources as directed and for their intended purpose only following workplace procedures
4. follow workplace policies, schedules and manufacturers' instructions when cleaning and maintaining equipment
5. ensure your equipment maintenance activities keep your equipment fit for purpose
6. clean the work area(s), for which you are responsible, at the specified time and frequency
7. store your equipment in a safe manner which permits ease of access and identification for use
8. carry out housekeeping activities safely and in a way which minimises inconvenience to customers and staff
9. ensure your housekeeping activities keep your work area clean and free from debris and waste materials
10. dispose of used cleaning agents, materials and debris to comply with relevant legal, environmental and workplace requirements
11. report any faulty or damaged equipment to the relevant person(s) clearly and promptly
12. report any anticipated delays in completion to the relevant person(s) promptly

Knowledge and understanding

You need to know and understand:

1. the scope of your job responsibilities for the use and maintenance of equipment and your work area
2. workplace policies, schedules and legislation for housekeeping activities and equipment maintenance
3. the manufacturer's requirements for the cleaning and general, non-specialist maintenance of the equipment for which you are responsible
4. the regulations and information sources applicable to workshop cleaning and maintenance activities for which you are responsible
5. the importance of reporting faults quickly to the relevant person
6. the importance of reporting anticipated delays to the relevant person(s) promptly
7. how to select and use equipment appropriate to the task
8. how to store equipment safely and accessibly
9. how to report faulty or damaged equipment
10. how to work safely when cleaning and maintaining equipment
11. how to select and use work area cleaning equipment, materials and agents
12. how to clean and maintain the equipment and work areas for which you are responsible
13. how to dispose of unused cleaning agents, materials and debris to comply with relevant legal, environmental and workplace requirements
14. the properties and hazards associated with the use of cleaning agents and materials
15. the importance of wearing personal protective equipment
16. the importance of using resources as directed and for their intended purpose only

Scope/range

1. Equipment maintenance covers:

a. routine checks on equipment
b. cleaning equipment
c. visual inspection of electrical equipment

2. Housekeeping activities cover:

a. day to day work area cleaning
b. clearing away
c. dealing with spillages
d. disposal of waste, used materials and debris taking into account relevant environmental factors

3. Motor Vehicle could include:

a. Light Vehicles
b. Heavy Vehicles/Commercial Vehicles
c. Motorcycles
d. Lift Trucks
e. Heavy Vehicle Trailers
f. Caravan and Motorhomes

Developed by	IMI
Version Number	2
Date Approved	October 2014
Indicative Review Date	October 2017
Validity	Current
Status	Original
Originating Organisation	IMI
Original URN	IMIARBG1
Relevant Occupations	Accident Repair Technicians; Automotive Aftermarket Electrical Enhancement Technician (Automotive); Auto-electrical Technician (Automotive); Auto and Mobile Installation Technicians; Automotive Paint Supervisor; Automotive Paint Technician; Body Builder (Automotive); Body Builder Workshop Controller (Automotive); Body Repair and Alignment Technician (Automotive); Body Repair Technician (Automotive); Caravan and Motorhome Diagnostic Technician (Automotive); Caravan and Motorhome Service Technician (Automotive); Caravans and Motorhomes Diagnostic Technician (Automotive); Caravans and Motorhomes Service Technician (Automotive); Cosmetic Refinishing Technician (Automotive); Cosmetic Senior Refinishing Technician (Automotive); Heavy Vehicle Diagnostic Technician (Automotive); Heavy Vehicle Fleet/Service Manager (Automotive); Heavy Vehicle Master Technician (Automotive); Heavy Vehicle Service Technician (Automotive); Heavy Vehicle Trailer Diagnostic Technician (Automotive); Heavy Vehicle Trailer Fleet/Service Manager (Automotive); Heavy Vehicle Trailer Master Technician (Automotive); Heavy Vehicle Trailer Service Technician (Automotive); Lift Truck Service Technician (Automotive); Lift Truck Trailer Diagnostic Technician (Automotive);

	Lift Truck Trailer Master Technician (Automotive); Lift Truck Workshop Controller ; Light Vehicle Diagnostic Technician (Automotive); Light Vehicle Fleet/Service Manager (Automotive); Light Vehicle Master Technician (Automotive); Light Vehicle Service Technician (Automotive); Maintenance and Repair Technicians; Maintenance Team Technician; Maintenance Fitter; Mechanical Fitter; Mechanical Maintenance Technician; Mechanical Supervisor; Mechanical, Electrical and Trim Assistant Technician (Automotive); Mechanical, Electrical and Trim Technician (Automotive); Motor Repair and Rewind Electrician; Motor Vehicle Valeting (Automotive); Motorcycle Diagnostic Technician; Motorcycle Fleet/Service Manager (Automotive); Motorcycle Master Technician (Automotive); Motorcycle Service Technician; Motorsport Technician; PDR Senior Technician (Automotive); PDR Technician (Automotive); Rental and Leasing Customer Service Advisor (Automotive); Rental and Leasing Maintenance Advisors (Automotive); Rental and Leasing Technical Service Advisor (Automotive); Roadside Assistance Manager; Roadside Assistance Operator; Roadside Assistance Operators; Roadside Assistance Senior Operator; Roadside Assistance Senior Technician; Roadside Assistance Technician; Sales Executive (Automotive); Sales Controller (Automotive); Tyre Fitting Operations (Automotive); Tyre exhaust and windscreen fitters ; Vehicle Damage Assessment Operators; Vehicle Damage Assessor (Automotive); Vehicle Fitters; Vehicle Fitting Operations (Automotive); Vehicle Parts Operative; Vehicle Parts Operators; Vehicle Parts Supervisor; Vehicle Recovery Operator; Vehicle Recovery Operators; Vehicle Recovery Technical Operator; Vehicle Sales Operators; Vehicle Trades; Vehicle Valeter (Automotive)
Suite	Accident Repair - Body; Accident Repair - Joining; Accident Repair - Paint; Accident Repair - SMART - Cosmetic; Accident Repair - SMART - PDR; Accident Repair - Mechanical, Electrical and Trim; Body Building; Maintenance and Repair - Caravans and Motorhomes; Maintenance and Repair - Heavy Vehicle; Maintenance and Repair - Heavy Vehicle Trailer; Maintenance and Repair - Lift Truck; Maintenance and Repair - Light Vehicle; Maintenance and Repair - Motorcycle; Auto Electrical and Mobile Electrical Installation; Roadside Assistance; Vehicle Damage Assessment Operations; Vehicle Fitting; Vehicle Parts Operations; Vehicle Recovery; Vehicle Sales v3
Keywords	Contribute, Housekeeping, Motor Vehicle Environments

IMICA02

Reduce Risk(s) to Health and Safety in the Motor Vehicle Environment

Overview

This NOS covers the basic, legally required health and safety duties of everyone in the workplace. This NOS does **not** require a full Risk Assessment to be undertaken. This NOS is about identifying hazards and evaluating risk(s) in the workplace as well as reducing the risk(s) to health and safety in the workplace. This NOS is about having an appreciation of identifiable risk(s) in the workplace and knowing how to identify them and deal with them.

It describes the competence required to ensure that:

- actions or lack of action do not create any health and safety risk(s)
- identifiable risk(s) in the workplace are not ignored
- sensible action is taken to put things right, including reporting situations which pose an identifiable risk(s) to people in the workplace, and seeking advice from others

Performance criteria

You must be able to:

1. carry out your working practices in accordance with relevant legislative requirements
2. identify the correct personal and vehicle protective equipment required to correctly carry out your workplace practices
3. carry out your workplace practices and workplace policies using the correct personal protective equipment
4. rectify health and safety risk(s) that are within your capability and scope of your job responsibilities
5. pass on any suggestions for reducing risk(s) to health and safety within your job role to the responsible persons
6. ensure your personal conduct in the workplace does not endanger the health and safety of yourself or other persons
7. follow the workplace policies and suppliers' or manufacturers' instructions for the safe use of equipment, materials and products and report any differences identified
8. ensure your personal presentation at work ensures the health and safety of yourself and others, meets any relevant legislative duties and is in accordance with workplace policies

Knowledge and understanding

You need to know and understand:

1. the current health and safety legislation, regulations and workplace policies that govern your working practices
2. your duties and responsibilities for current health and safety as defined by any specific legislation covering your job role and where to access the information
3. agreed workplace policies relating to controlling risk(s) to health and safety the responsible person(s) to whom you report health and safety concerns
4. what hazards may exist in your workplace
5. health and safety risk(s) which may be present in your own job role and the precautions you must take
6. the importance of remaining alert to the presence of hazards in the whole workplace
7. how to deal with and report risk(s)
8. the requirements and guidance on the precautions
9. the specific workplace policies including safe working practices covering your job role
10. suppliers' and manufacturers' instructions for the safe use of equipment, materials and products
11. the importance of personal presentation in maintaining health and safety in the workplace
12. the importance of personal conduct in maintaining the health and safety of yourself and others
13. the importance of personal protective equipment, when and where it should be used and the importance of maintaining it correctly
14. your scope and responsibility for rectifying risk(s)

Scope/range

1. Risk(s) resulting from:

a. use of tools and equipment relevant to the task
b. the use of materials or substances
c. working practices which do not conform to laid down policies
d. unsafe behaviour
e. accidental breakages and spillages
f. environmental factors
g. working at height
h. lifting operations and manual handling
i. incorrect use of personal protective equipment

2. Workplace policies covering:

a. the use of safe working methods and equipment
b. the safe use of hazardous substances
c. smoking, eating, drinking and drugs
d. what to do in the event of an emergency
e. personal presentation
f. personal protective equipment
g. lifting operations and manual handling
h. working at height
i. mobile phones and personal stereo equipment

3. Motor Vehicle could include:

a. Light Vehicles
b. Heavy Vehicles/Commercial Vehicles
c. Motorcycles
d. Lift Trucks
e. Heavy Vehicle Trailers
f. Caravan and Motorhomes

IMICA02

Reduce Risk(s) to Health and Safety in the Motor Vehicle Environment

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Status	Original
Originating Organisation	IMI
Original URN	IMIARB2
Relevant Occupations	Auto-electrical Technician (Automotive); Auto and Mobile Installation Technicians; Automotive Aftermarket Electrical Enhancement Technician (Automotive); Automotive Paint Supervisor; Automotive Paint Technician; Body Builder (Automotive); Body Builder Workshop Controller (Automotive); Body Repair and Alignment Technician (Automotive); Body Repair Technician (Automotive); Caravan and Motorhome Diagnostic Technician (Automotive); Caravan and Motorhome Service Technician (Automotive); Caravans and Motorhomes Diagnostic Technician (Automotive); Caravans and Motorhomes Service Technician (Automotive); Heavy Vehicle Diagnostic Technician (Automotive); Heavy Vehicle Fleet/Service Manager (Automotive); Heavy Vehicle Master Technician (Automotive); Heavy Vehicle Service Technician (Automotive); Heavy Vehicle Trailer Diagnostic Technician (Automotive); Heavy Vehicle Trailer Fleet/Service Manager (Automotive); Heavy Vehicle Trailer Master Technician (Automotive); Heavy Vehicle Trailer Service Technician (Automotive); Lift Truck Service Technician (Automotive); Lift Truck Trailer Diagnostic Technician (Automotive); Lift Truck Trailer Master Technician (Automotive); Lift Truck Workshop Controller ; Light Vehicle Diagnostic

	Technician (Automotive); Light Vehicle Fleet/Service Manager (Automotive); Light Vehicle Master Technician (Automotive); Light Vehicle Service Technician (Automotive); Maintenance and Repair Technicians; Maintenance Fitter; Maintenance Team Technician; Mechanical, Electrical and Trim Technician (Automotive); Mechanical, Electrical and Trim Assistant Technician (Automotive); Motorcycle Diagnostic Technician; Motor Vehicle Valeting (Automotive); Motorcycle Fleet/Service Manager (Automotive); Motorcycle Master Technician (Automotive); Motorcycle Service Technician; Motorsport Technician; PDR Senior Technician (Automotive); PDR Technician (Automotive); Rental and Leasing Customer Service Advisor (Automotive); Rental and Leasing Maintenance Advisors (Automotive); Rental and Leasing Technical Service Advisor (Automotive); Roadside Assistance Manager; Roadside Assistance Operator; Roadside Assistance Operators; Roadside Assistance Senior Operator; Roadside Assistance Senior Technician; Roadside Assistance Technician; Sales Controller (Automotive); Sales Executive (Automotive); Senior Automotive Paint Technician; Tyre Fitting Operations (Automotive); Tyre exhaust and windscreen fitters ; Vehicle Damage Assessment Operators; Vehicle Damage Assessor (Automotive); Vehicle Fitters; Vehicle Fitting Operations (Automotive); Vehicle Parts Operative; Vehicle Parts Operators; Vehicle Parts Supervisor; Vehicle Recovery Operator; Vehicle Recovery Operators; Vehicle Recovery Technical Operator; Vehicle Sales Operators; Vehicle Trades; Vehicle Valeter (Automotive)
Suite	Accident Repair - Body; Accident Repair - Joining; Accident Repair - Mechanical, Electrical and Trim; Accident Repair - Paint; Accident Repair - SMART - Cosmetic; Accident Repair - SMART - PDR; Auto Electrical and Mobile Electrical Installation; Body Building; Maintenance and Repair - Caravans and Motorhomes; Maintenance and Repair - Heavy Vehicle; Maintenance and Repair - Heavy Vehicle Trailer; Maintenance and Repair - Lift Truck; Maintenance and Repair - Light Vehicle; Maintenance and Repair - Motorcycle; Vehicle Damage Assessment Operations; Vehicle Fitting; Vehicle Parts Operations; Vehicle Recovery; Vehicle Sales v3
Keywords	Identify, Agree, Motor Vehicle, Customer Needs

IMICA03

Maintain Working Relationships in the Motor Vehicle Environment

Overview

This NOS is about maintaining good working relationships with all colleagues in the working environment by using effective communication and support skills.

Performance criteria

You must be able to:

1. contribute to team working by initiating ideas and co-operating with colleagues
2. respond promptly and willingly to requests for assistance from colleagues which fall within the limits of your own job responsibilities and capabilities
3. refer colleagues to the relevant person(s) where requests fall outside your responsibility and capability
4. give colleagues sufficient, accurate information and support to meet their work needs
5. make requests for assistance to colleagues clearly and courteously
6. use methods of communication which meet the needs of colleagues
7. treat colleagues in a way which shows respect for their views and opinions and promotes goodwill
8. make and keep achievable commitments to colleagues
9. inform colleagues promptly of any problems or information likely to affect their own work

Knowledge and understanding

You need to know and understand:

1. your own and your colleague's job role and limits of responsibility for giving advice and support
2. the operational constraints which may affect interaction with colleagues
3. lines of communication within your workplace
4. how to use suitable and effective communication skills when responding to and interacting with others
5. how to adapt communication methods to satisfy the needs of colleagues
6. how to report problems using appropriate methods of communication
7. the importance of developing positive working relationships with colleagues – the effect on morale, productivity, and company image
8. the importance of acknowledging other peoples' views and opinions
9. the importance of making and honouring realistic commitments to colleagues
10. the implications of inappropriate communication

Scope/range

1. Colleagues are:

a. immediate work colleagues
b. supervisors and managers

2. Requests for assistance covering:

a. technical assistance
b. personal assistance

3. Motor Vehicle could include:

a. Light Vehicles
b. Heavy Vehicles/Commercial Vehicles
c. Motorcycles
d. Lift Trucks
e. Heavy Vehicle Trailers
f. Caravan and Motorhomes

Developed by	IMI
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Status	Original
Originating Organisation	IMI
Original URN	IMIARB3
Relevant Occupations	Accident Repair Technicians; Automotive Aftermarket Electrical Enhancement Technician (Automotive); Auto and Mobile Installation Technicians; Auto-electrical Technician (Automotive); Automotive Paint Supervisor; Automotive Paint Technician; Body Builder (Automotive); Body Builder Workshop Controller (Automotive); Body Repair and Alignment Technician (Automotive); Body Repair Technician (Automotive); Caravan and Motorhome Diagnostic Technician (Automotive); Caravan and Motorhome Service Technician (Automotive); Caravans and Motorhomes Diagnostic Technician (Automotive); Caravans and Motorhomes Service Technician (Automotive); Cosmetic Senior Refinishing Technician (Automotive); Cosmetic Refinishing Technician (Automotive); Heavy Vehicle Diagnostic Technician (Automotive); Heavy Vehicle Fleet/Service Manager (Automotive); Heavy Vehicle Master Technician (Automotive); Heavy Vehicle Service Technician (Automotive); Heavy Vehicle Trailer Diagnostic Technician (Automotive); Heavy Vehicle Trailer Fleet/Service Manager (Automotive); Heavy Vehicle Trailer Master Technician (Automotive); Heavy Vehicle Trailer Service Technician (Automotive); Lift Truck Service Technician (Automotive); Lift Truck Trailer Diagnostic Technician (Automotive);

	Lift Truck Trailer Master Technician (Automotive); Lift Truck Workshop Controller ; Light Vehicle Diagnostic Technician (Automotive); Light Vehicle Fleet/Service Manager (Automotive); Light Vehicle Master Technician (Automotive); Light Vehicle Service Technician (Automotive); Maintenance and Repair Technicians; Mechanical, Electrical and Trim Technician (Automotive); Mechanical, Electrical and Trim Assistant Technician (Automotive); Motor Repair and Rewind Electrician; Motor Vehicle Valeting (Automotive); Motorcycle Diagnostic Technician; Motorcycle Fleet/Service Manager (Automotive); Motorcycle Master Technician (Automotive); Motorcycle Service Technician; Motorsport Technician; PDR Senior Technician (Automotive); PDR Technician (Automotive); Rental and Leasing Customer Service Advisor (Automotive); Rental and Leasing Maintenance Advisors (Automotive); Rental and Leasing Technical Service Advisor (Automotive); Roadside Assistance Manager; Roadside Assistance Operator; Roadside Assistance Operators; Roadside Assistance Senior Operator; Roadside Assistance Senior Technician; Roadside Assistance Technician; Sales Executive (Automotive); Sales Controller (Automotive); Tyre exhaust and windscreen fitters ; Tyre Fitting Operations (Automotive); Vehicle Damage Assessment Operators; Vehicle Damage Assessor (Automotive); Vehicle Fitters; Vehicle Fitting Operations (Automotive); Vehicle Parts Operative; Vehicle Parts Operators; Vehicle Parts Supervisor; Vehicle Recovery Operators; Vehicle Recovery Operator; Vehicle Recovery Technical Operator; Vehicle Valeter (Automotive)
Suite	2010 Incremental change to the NOS in Interpreting; Accident Repair - Body; Accident Repair - Joining; Accident Repair - Mechanical, Electrical and Trim; Accident Repair - Paint; Accident Repair - SMART - Cosmetic; Accident Repair - SMART - PDR; Auto Electrical and Mobile Electrical Installation; Automotive Glazing; Maintenance and Repair - Caravans and Motorhomes; Maintenance and Repair - Heavy Vehicle; Maintenance and Repair - Heavy Vehicle Trailer; Maintenance and Repair - Lift Truck; Maintenance and Repair - Light Vehicle; Maintenance and Repair - Motorcycle; Roadside Assistance; Vehicle Damage Assessment Operations; Vehicle Fitting; Vehicle Sales v3; Vehicle Recovery; Vehicle Parts Operations
Keywords	Maintain Working Relationships, Motor Vehicle Environment

IMICA04

Use of tools and equipment in Motor Vehicle Environments

Overview

This NOS is about the basic use of tools, materials and fabrications relevant to the Automotive Sector. This NOS is also about interpreting information, adopting safe and healthy working practices and selecting tools, materials and equipment. This NOS is for those working in technical support roles and is also appropriate for workshop planners.

Performance criteria

You must be able to:

1. select and use suitable personal protective equipment appropriate to the task
2. interpret the information supplied relating to the task
3. carry out pre-start preparation inspections on tools and equipment in accordance with approved procedures
4. carry out operations using tools and equipment in accordance with safe working practices to achieve the work outcome
5. highlight and identify problems associated with tools and equipment to the relevant person
6. demonstrate work skills to manufacture and repair components using measure, mark out, file, fit, tap, thread, cut, drill, finish, position and secure
7. use and maintain the relevant tools and equipment
8. dispose of waste in accordance with relevant legislation including environmental to maintain a clean work space
9. carry out checks in accordance with manufacturer's/operator's guidance, schedules, relevant legislation and official guidance and relevant organisational requirements.
10. demonstrate correct selection of materials for manufacture or repair
11. inspect, clean and store tools and equipment after use

Knowledge and understanding

You need to know and understand:

1. the relevant organisational procedures developed to report and rectify inappropriate information and unsuitable resources, and how they are implemented
2. the types of information, their source and how they are interpreted
3. the relevant organisational procedures to solve problems with the information and why it is important they are followed
4. the relevant legislation and official guidance and how it is applied
5. what the accident reporting procedures are and who is responsible for making the reports
6. why and when personal protective equipment (PPE) should be used
7. the relevant requirements for the disposal of waste, used materials and debris taking into account relevant environmental factors
8. material properties relevant to the task and their appropriate applications
9. the appropriate use of materials for fabrication and repair
10. how to file, fit, tap, thread, cut and drill mterials you are working on
11. how to select and use gaskets, sealants, seals, fittings and fasteners

Scope/range

1. Tools and equipment are:

a. hand tools
b. electrical
c. mechanical
d. pneumatic
e. hydraulic

2. Motor Vehicle could include:

a. Light Vehicles
b. Heavy Vehicles/Commercial Vehicles
c. Motorcycles
d. Lift Trucks
e. Heavy Vehicle Trailers
f. Caravan and Motorhomes

IMICA04

Use of tools and equipment in Motor Vehicle Environments

Developed by	IMI
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Date Approved	October 2014
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Validity	Current
Status	Original
Originating Organisation	IMIARB4
Original URN	IMIARB4
Relevant Occupations	Automotive Aftermarket Electrical Enhancement Technician (Automotive); Auto-electrical Technician (Automotive); Body Builder (Automotive); Body Builder Workshop Controller (Automotive); Body Repair and Alignment Technician (Automotive); Body Repair Technician (Automotive); Caravan and Motorhome Diagnostic Technician (Automotive); Caravan and Motorhome Service Technician (Automotive); Caravans and Motorhomes Diagnostic Technician (Automotive); Caravans and Motorhomes Service Technician (Automotive); Cosmetic Refinishing Technician (Automotive); Cosmetic Senior Refinishing Technician (Automotive); Heavy Vehicle Diagnostic Technician (Automotive); Heavy Vehicle Fleet/Service Manager (Automotive); Heavy Vehicle Master Technician (Automotive); Heavy Vehicle Service Technician (Automotive); Heavy Vehicle Trailer Diagnostic Technician (Automotive); Heavy Vehicle Trailer Fleet/Service Manager (Automotive); Heavy Vehicle Trailer Master Technician (Automotive); Heavy Vehicle Trailer Service Technician (Automotive); Lift Truck Service Technician (Automotive); Lift Truck Trailer Diagnostic Technician (Automotive); Lift Truck Trailer Master Technician (Automotive); Lift Truck Workshop Controller ; Light Vehicle Diagnostic

	Technician (Automotive); Light Vehicle Fleet/Service Manager (Automotive); Light Vehicle Master Technician (Automotive); Light Vehicle Service Technician (Automotive); Maintenance and Repair Technicians; Maintenance Electrician; Mechanical, Electrical and Trim Assistant Technician (Automotive); Mechanical, Electrical and Trim Technician (Automotive); Motor Repair and Rewind Electrician; Motorcycle Diagnostic Technician; Motorcycle Master Technician (Automotive); Motorcycle Service Technician; PDR Technician (Automotive); PDR Senior Technician (Automotive); Roadside Assistance Operator; Roadside Assistance Operators; Roadside Assistance Senior Operator; Roadside Assistance Senior Technician; Roadside Assistance Technician; Tyre Fitting Operations (Automotive); Tyre exhaust and windscreen fitters ; Vehicle Fitters; Vehicle Fitting Operations (Automotive); Vehicle Recovery Operator; Vehicle Recovery Operators; Vehicle Recovery Technical Operator
Suite	Accident Repair - Body; Accident Repair - Joining; Accident Repair - Mechanical, Electrical and Trim; Accident Repair - SMART - Cosmetic; Accident Repair - SMART - PDR; Auto Electrical and Mobile Electrical Installation; Body Building; Maintenance and Repair - Heavy Vehicle; Maintenance and Repair - Heavy Vehicle Trailer; Maintenance and Repair - Lift Truck; Maintenance and Repair - Light Vehicle; Maintenance and Repair - Motorcycle; Maintenance and Repair - Caravans and Motorhomes; Maintenance and Repair - Motorcycle; Vehicle Recovery; Vehicle Fitting
Keywords	Tools, Equipment, Motor Vehicle Engineering

IMIARBG6
Enable learning through demonstration and instruction

Overview

This NOS is about demonstrating skills and methods to learners and instructing learners in procedures and processes.

These include; demonstrating how equipment is used, showing a learner how to do something, giving learners instructions on what to do or how to carry out a particular activity, deciding when you should use demonstration or instruction to encourage learning, reviewing the potential use of technology- based learning, checking on the progress of learners and giving feedback to learners.

IMIARBG6

Enable learning through demonstration and instruction

Performance criteria

You must be able to:

Demonstrate skills and methods to learners

P1 base the demonstration on an analysis of the skills needed and the order they must be learned in

P2 ensure that the demonstration is accurate and realistic

P3 structure the demonstration so the learner can get the most out of it

P4 encourage learners to ask questions and get explanation at appropriate stages in the demonstration

P5 give learners the opportunities to practise the skill being demonstrated and give them positive feedback

P6 give extra demonstrations of the skills being taught to reinforce learning

P7 ensure that demonstrations take place in a safe environment and allow learners to see the demonstration clearly

P8 respond to the needs of learners during the demonstration

P9 reduce distractions and disruptions as much as possible

You must be able to:

Instruct learners

P10 match instruction to the needs of the learners

P11 identify which learning outcomes will be achieved through instruction

P12 ensure that the manner, level and speed of the instruction encourages learners to take part

P13 regularly check that learners understand and adapt instruction as appropriate

P14 give learners positive feedback on the learning experience and the outcomes achieved

P15 identify anything that prevents learning and review this with the learners

IMIARBG6

Enable learning through demonstration and instruction

Knowledge and understanding

You need to know and understand:

The nature and role of demonstrations and instruction

K1 the separate areas of demonstrations which encourage learning
K2 which types of learning are best achieved and supported through demonstrations
K3 how to identify and use different learning opportunities
K4 how to structure demonstrations and instruction sessions
K5 how to choose from a range of demonstration techniques

You need to know and understand:

Principles and concepts

K6 how to put learners at their ease and encourage them to take part
K7 how to choose between demonstration and instruction as learning methods
K8 how to identify individual learning needs
K9 which factors are likely to prevent learning and how to overcome them
K10 how to check learners' understanding and progress
K11 how to put information in order and decide whether the language you will be using is appropriate
K12 how to choose and prepare appropriate materials, including technology based materials
K13 the separate areas of instructional techniques which encourage learning
K14 which types of learning are best achieved and supported through instruction

You need to know and understand:

External factors influencing human resource development

K15 how to make sure everybody acts in line with health, safety and environmental protection l legislation and best practice
K16 how to analyse and use developments in learning and new ways of delivery, including technology-based learning

IMIARBG6

Enable learning through demonstration and instruction

Developed by	IMI Ltd
Version number	1
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Indicative review date	January 2012
Validity	Current
Status	Original
Originating organisation	IMI Ltd
Original URN	G6
Relevant occupations	Maintenance and Repair Technicians; Accident Repair Technicians; Auto and Mobile Installation Technicians; Roadside Assistance Operators; Vehicle Recovery Operators; Vehicle Damage Assessment Operators; Vehicle Parts Operators; Vehicle Sales Operators
Suite	Maintenance and Repair – Light Vehicle; Heavy Vehicle, Heavy Vehicle Trailer; Motorcycle; Lift Truck; Caravans and Motorhomes; Accident Repair – Body; Paint; Joining; Mechanical, Electrical & Trim (MET); SMART Cosmetic; SMART Paintless Dent Removal (PDR); Auto electrical and Mobile Electrical Installation; Body Building; Roadside Assistance; Vehicle Recovery; Vehicle Damage Assessors; Vehicle Fitting; Vehicle Parts; Vehicle Sales
Key words	[KEYWORDS]

IMICA08

Identify and Agree the Motor Vehicle Customer Needs

Overview

This NOS is about gaining information from customers on their perceived needs; giving advice and information and agreeing a course of action; contracting for the agreed work and completing all necessary records and instructions.

Performance criteria

You must be able to:

1. obtain the relevant information from the customer to make an assessment of their own and perceived vehicle needs
2. provide customers with accurate, current and relevant advice and information on suitable vehicle inspection, repair and/or service procedures, potential courses of action, the implications of courses of action and the estimated costs
3. provide advice and information clearly and in a form and manner which the customer will understand
4. actively encourage customers to ask questions and seek clarification during your conversation.
5. support the accurate identification and clarification of customer and vehicle needs, by referring to vehicle data and operating procedures
6. agree with the customer before accepting the vehicle and record the extent and nature of the work to be undertaken, the terms and conditions of acceptance, the cost and the timescale
7. confirm your customer's understanding of the agreement you have made
8. ensure your recording systems are complete, accurate, in the format required and signed by the customer where necessary
9. pass all completed records to the next person in the process promptly
10. gain further customer approval where the contracted agreement is likely to be exceeded

Knowledge and understanding

You need to know and understand:

1. the relevant legal requirements of consumer legislation and the consequences of your own actions in respect of these
2. the different types of company and product warranties that you deal with within your organisation
3. the limits of your own responsibility for accepting and returning vehicles
4. the importance of keeping customers informed and managing their expectations
5. your workplace requirements for the completion of records and documentation
6. how to communicate effectively with, and listen to, customers
7. how to adapt your language when explaining technical matters to non-technical customers
8. how to extract the relevant information to identify and agree the motor vehicle customer needs
9. how to care for customers and achieve customer satisfaction
10. the range of options available to meet customer needs
11. the range and type of services offered by your organisation
12. the effect of non-availability of resource upon the receipt of customer vehicles and for the completion of the work
13. where and how to access costing and work completion time information

Scope/range

1. Motor Vehicle could include:

a. Light Vehicles
b. Heavy Vehicles/Commercial Vehicles
c. Motorcycles
d. Lift Trucks
e. Heavy Vehicle Trailers
f. Caravan and Motorhomes

IMICA08

Identify and Agree the Motor Vehicle Customer Needs

Developed by	IMI
Version Number	2
Date Approved	October 2014
Indicative Review Date	October 2017
Validity	Current
Status	Original
Originating Organisation	IMI
Original URN	IMIARB8
Relevant Occupations	Body Builder (Automotive); Body Builder Workshop Controller (Automotive); Body Repair and Alignment Technician (Automotive); Body Repair Technician (Automotive); Caravan and Motorhome Diagnostic Technician (Automotive); Caravan and Motorhome Service Technician (Automotive); Caravans and Motorhomes Diagnostic Technician (Automotive); Caravans and Motorhomes Service Technician (Automotive); Cosmetic Senior Refinishing Technician (Automotive); Cosmetic Refinishing Technician (Automotive); Heavy Vehicle Diagnostic Technician (Automotive); Heavy Vehicle Fleet/Service Manager (Automotive); Heavy Vehicle Master Technician (Automotive); Heavy Vehicle Service Technician (Automotive); Heavy Vehicle Trailer Diagnostic Technician (Automotive); Heavy Vehicle Trailer Fleet/Service Manager (Automotive); Heavy Vehicle Trailer Master Technician (Automotive); Heavy Vehicle Trailer Service Technician (Automotive); Lift Truck Service Technician (Automotive); Lift Truck Trailer Diagnostic Technician (Automotive); Lift Truck Trailer Master Technician (Automotive); Lift Truck Workshop Controller ; Light Vehicle Diagnostic Technician (Automotive); Light Vehicle Fleet/Service Manager (Automotive); Light Vehicle Master Technician (Automotive); Light Vehicle

	Service Technician (Automotive); Maintenance and Repair Technicians; Mechanical, Electrical and Trim Assistant Technician (Automotive); Mechanical, Electrical and Trim Technician (Automotive); Motorcycle Diagnostic Technician; Motorcycle Fleet/Service Manager (Automotive); Motorcycle Master Technician (Automotive); Motorcycle Service Technician; PDR Senior Technician (Automotive); PDR Technician (Automotive); Roadside Assistance Manager; Roadside Assistance Operator; Roadside Assistance Operators; Roadside Assistance Senior Operator; Roadside Assistance Senior Technician; Roadside Assistance Technician
Suite	Accident Repair - Body; Accident Repair - Joining; Accident Repair - Mechanical, Electrical and Trim; Accident Repair - SMART - Cosmetic; Accident Repair - SMART - PDR; Auto Electrical and Mobile Electrical Installation; Body Building; Maintenance and Repair - Caravans and Motorhomes; Maintenance and Repair - Heavy Vehicle; Maintenance and Repair - Heavy Vehicle Trailer; Maintenance and Repair - Lift Truck; Maintenance and Repair - Light Vehicle; Maintenance and Repair - Motorcycle; Roadside Assistance; Vehicle Fitting; Vehicle Recovery
Keywords	Reduce Risk(s), Health and Safety, Motor Vehicle Environment

IMIARBG11
Supervisory skills

Overview

This NOS is about ensuring that the work required in your area of responsibility is effectively planned and fairly allocated to individuals and/or teams. It also involves monitoring the progress and quality of the work of individuals and/or teams to ensure that the required level or standard of performance is being met and reviewing and updating plans of work in the light of developments.

The ‘area of responsibility’ may be, for example, a branch or department or functional area or an operating site within an organisation.

The NOS is recommended for first line managers and middle managers.

IMIARBG11
Supervisory skills

Performance criteria

You must be able to:

P1 confirm the work required in your area of responsibility with your manager and seek clarification, where necessary, on any outstanding points and issues

P2 plan how the work will be undertaken, seeking views from people in your area of responsibility, identifying any priorities or critical activities and making best use of the available resources

P3 ensure that work is allocated to individuals and/or teams on a fair basis taking account of skills, knowledge and understanding, experience and workloads and the opportunities for development

P4 ensure that individuals and/or teams are briefed on allocated work, showing how it fits with the vision and objectives for the area and the overall organisation, and the standard or level of expected performance

P5 recognise and seek to find out about differences in expectations and working methods of any team members from a different country or culture and promote ways of working that take account of their expectations and maximise productivity

P6 encourage individuals and/or team members to ask questions, make suggestions and seek clarification in relation to allocated work

P7 monitor the progress and quality of the work of individuals and/or teams on a regular and fair basis against the standard or level of expected performance and provide prompt and constructive feedback

P8 support individuals and/or teams in identifying and dealing with problems and unforeseen events

P9 motivate individual and/or teams to complete the work they have been allocated and provide, where requested and where possible, any additional support and/or resources to help completion

P10 monitor your area for conflict, identifying the cause(s) when it occurs and dealing with it promptly and effectively

P11 identify unacceptable or poor performance, discuss the cause(s) and agree ways of improving performance with individuals and/or teams

P12 recognise successful completion of significant pieces of work or work activities by individuals and/or teams

P13 use information collected on the performance of individuals and/or teams in any formal appraisals of performance

P14 review and update plans of work for your area, clearly communicating any changes to those affected

IMIARBG11
Supervisory skills

Knowledge and understanding

You need to know and understand:

K1 how to select and successfully apply different methods for communicating with people across an area of responsibility

K2 the importance of confirming/clarifying the work required in your area of responsibility with your manager and how to do this effectively

K3 how to identify and take due account of health and safety issues in the planning, allocation and monitoring of work

K4 how to produce a plan of work for your area of responsibility, including how to identify any priorities or critical activities and the available resources

K5 how to identify sustainable resources and ensure their effective use when planning the work for your area of responsibility

K6 the importance of seeking views from people working in your area and how to take account of their views in producing the plan of work

K7 the values, ethics, beliefs, faith, cultural conventions, perceptions and expectations of any team members from a different country or culture and how your own values, ethics, beliefs, faith, cultural conventions, perceptions, expectations, use of language, tone of voice and body language may appear to them

K8 why it is important to allocate work to individuals and/or teams on a fair basis and how to do so effectively

K9 why it is important that individuals and/or teams are briefed on allocated work and the standard or level of expected performance and how to do so effectively

K10 the importance of showing individuals and/or teams how their work fits with the vision and objectives of the area and those of the organisation

K11 ways of encouraging individuals and/or teams to ask questions and/or seek clarification in relation to the work which they have been allocated

K12 effective ways of regularly and fairly monitoring the progress and quality of work of individuals and/or teams against the standards or level of expected performance

K13 how to provide prompt and constructive feedback to individuals and/or teams

K14 why it is important to monitor your area for conflict and how to identify the cause(s) of conflict when it occurs and deal with it promptly and effectively how to take account of diversity and inclusion issues when supporting and encouraging individuals and/or teams to complete the work they have been allocated

K15 why it is important to identify unacceptable or poor performance by individuals and/or teams and how to discuss the cause(s) and agree ways of improving performance with them

K16 the type of problems and unforeseen events that may occur and how to

support individuals and/or teams in dealing with them

K17 the additional support and/or resources which individuals and/or teams might require to help them complete their work and how to assist in providing this

K18 how to select and successfully apply different methods for encouraging, motivating and supporting individuals and/or teams to complete the work they have been allocated, improve their performance and for recognising their achievements

K19 how to log information on the ongoing performance of individuals and/or teams and use this information for formal performance appraisal purposes

Industry/sector specific knowledge and understanding

K20 industry/sector requirements for the development or maintenance of knowledge, understanding and skills

K21 industry/sector specific legislation, regulations, guidelines, codes of practice relating to carrying out work

IMIARBG11
Supervisory skills

Additional Information

Skills

Listed below are the main generic ‘skills’ which need to be applied in allocating and monitoring the progress and quality of work in your area of responsibility. These skills are explicit/implicit in the detailed content of the NOS and are listed here as additional information.

1. Communicating
2. Consulting
3. Decision making
4. Delegating
5. Information management
6. Leadership
7. Managing conflict
8. Monitoring
9. Motivating
10. Planning
11. Problem solving
12. Providing feedback
13. Prioritising
14. Reviewing
15. Setting objectives
16. Stress management
17. Valuing and supporting others.

IMIARBG11
Supervisory skills

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Status	Tailored
Originating organisation	IMI Ltd
Original URN	(MSC D6)
Relevant occupations	Engineering; Vehicle Trades
Suite	Accident Repair - Body
Key words	supervisory skills

IMIARBG12
Developing staff

Overview

This NOS is about helping members of your team address problems affecting their performance. These may be work-related problems or problems arising from their personal circumstances.

The NOS involves identifying problems affecting people's performance and discussing these in a timely way with the team members concerned to help them find a suitable solution to their problem. Sometimes you may need to refer the team member to specialist support services.

The NOS is recommended particularly for first line managers and middle managers.

IMIARBG12
Developing staff

Performance criteria

You must be able to:

- P1 give team members opportunities to approach you with problems affecting their performance
- P2 identify performance issues and bring these promptly to the attention of the team members concerned
- P3 discuss problems with team members at a time and place appropriate to the type, seriousness and complexity of the problem
- P4 gather and check information to accurately identify the problem and its cause
- P5 discuss the range of alternative courses of action and agree with the team member a timely and effective way of dealing with the problem
- P6 refer the team member to support services or specialists, where necessary
- P7 keep a confidential record of your discussions with team members about problems affecting their performance
- P8 ensure your actions are in line with your organisation's policies for managing people

IMIARBG12
Developing staff

Knowledge and understanding

You need to know and understand:

K1 the importance in giving team members opportunities to approach you with problems affecting their performance
K2 how to encourage team members to approach you with problems affecting their performance
K3 the importance of identifying performance issues and bringing these promptly to the attention of the team members concerned
K4 the importance of discussing problems with team members at a time and place appropriate to the type, seriousness and complexity of the problem
K5 how to gather and check the information you need to identify the problem and its cause
K6 the importance of identifying the problem accurately
K7 the range of alternative courses of action to deal with the problem
K8 the importance of discussing and agreeing with the team member a timely and effective way of dealing with the problem
K9 when to refer the team member to support services or specialists
K10 the importance of keeping a confidential record of your discussions with team members about problems affecting their performance, and how to do so
K11 the importance of ensuring your actions are in line with your organisation's policies for managing people and their performance

Industry/sector specific knowledge and understanding

K12 industry/sector requirements for helping team members address problems affecting their performance

Context specific knowledge and understanding

K13 the types of problems that your team members may encounter which can affect their performance
K14 your role, responsibilities and limits of authority when dealing with team members' problems
K15 the range of support services or specialists that exist inside and outside your organisation
K16 your organisation's policies for managing people and their performance

IMIARBG12
Developing staff

Additional Information

Skills

Listed below are the main generic ‘skills’ which need to be applied in helping team members address problems affecting their performance. These skills are explicit/implicit in the detailed content of the NOS and are listed here as additional information.

1. Acting assertively
2. Communicating
3. Consulting
4. Decision-making
5. Empathising
6. Information management
7. Managing conflict
8. Monitoring
9. Problem solving
10. Providing feedback
11. Reviewing
12. Setting objectives
13. Team building
14. Valuing and supporting others.

IMIARBG12
Developing staff

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Status	Original
Originating organisation	IMI Ltd
Original URN	(MSC D8)
Relevant occupations	Engineering; Vehicle Trades
Suite	Accident Repair - Body
Key words	developing staff

IMIARBG13
Business Management

Overview

This NOS is about managing business processes to make sure the organisation delivers outputs that meet customers' needs and stakeholders' needs, and organisational and legal requirements.

The NOS is recommended for middle managers.

IMIARBG13
Business Management

Performance criteria

You must be able to:

- P1 design processes that deliver outcomes based on organisational goals and aims
- P2 ensure processes and resources are sustainable and effective in their use
- P3 identify and provide the resources you need
- P4 take account of influences that may affect and shape how processes work
- P5 link processes so that they interact across the organisation to form a complete system
- P6 provide information and support for staff and other stakeholders involved.
- P7 define process responsibilities
- P8 develop process measures that are affordable and provide enough information for people to decide how to manage the process
- P9 establish and use effective methods to review and improve the process

IMIARBG13
Business Management

Knowledge and understanding

You need to know and understand:

K1 principles and models of effective process management
K2 how to define business processes
K3 types of business process measures and how to assess their suitability
K4 how to ensure processes and resources are sustainable and effective in their use, and the importance of doing so
K5 the difference between process outputs and outcomes
K6 how to assess process changes for risk and reward against their potential investment cost
K7 how to carry out cost and benefit analysis
K8 types of analytical and problem-solving tools that you can use when developing business processes
K9 how to measure the effect of changes in the business process

You need to know and understand:

Industry/sector specific knowledge and understanding

K10 the sector and market in which your organisation works
K11 relevant sector trends, developments and competitor performance that affect your business processes

You need to know and understand:

Context specific knowledge and understanding

K12 your organisation's aims and goals
K13 your organisation's structure, values and culture
K14 how your organisation adds value through delivering its products, services and processes
K15 the needs of your actual and potential customers and other key stakeholders
K16 your organisation's products, services and processes and the interdependencies between them
K17 measures of process performance that are relevant to your organisation

IMIARBG13
Business Management

Additional Information

Skills

Listed below are the main generic ‘skills’ which need to be applied in managing business processes. These skills are explicit/implicit in the detailed content of the NOS and are listed here as additional information.
™

1. Communicating
2. Information management
3. Analysing
4. Assessing
5. Presenting information
6. Influencing
7. Persuading
8. Negotiating
9. Problem solving
10. Prioritising
11. Thinking systematically
12. Thinking creatively
13. Reviewing

IMIARBG13
Business Management

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Originating organisation	IMI Ltd
Original URN	(MSC F3)
Relevant occupations	Engineering; Vehicle Trades; Communications Officer
Suite	Accident Repair – Body; Local Government Skills
Key words	business, management, strategy, planning

IMILV01
Carry out routine light vehicle maintenance

Overview

This NOS is about conducting routine maintenance, adjustment and replacement activities as part of the periodic servicing of light vehicles.

Performance criteria

You must be able to:

P1 use suitable personal protective equipment and vehicle coverings throughout all vehicle maintenance activities

P2 prepare the vehicle systems and work area for safe working procedures (where appropriate)

P3 use suitable **sources of technical information** to support all your vehicle maintenance activities

P4 adhere to the correct specifications and tolerances for the vehicle when making **assessments** of system and component performance

P5 record details accurately and use this adapted specification as the basis for your examination and assessment where the customer's vehicle falls outside the manufacturer's original specification

P6 examine the vehicle's systems and components following:

- P6.1 the manufacturer's approved **examination methods**
- P6.2 recognised repair methods
- P6.3 your workplace procedures
- P6.4 health and safety requirements

P7 ensure your **examination methods** identify accurately any vehicle system and component problems falling outside the maintenance schedule specified

P8 carry out adjustments, replacement of vehicle components and replenishment of consumable materials following the manufacturer's current specification for:

- P8.1 the particular maintenance interval
- P8.2 working methods and procedures
- P8.3 use of equipment
- P8.4 the tolerances for the vehicle

P9 record the details accurately and take action which complies with the customer's instructions where system adjustments cannot be made within the manufacturer's specification

P10 work in a way which minimises the risk of damage to the vehicle and its systems and the surrounding area

P11 use suitable testing methods to evaluate the performance of all replaced and adjusted components and systems accurately, prior to returning the vehicle to

the customer

P12 report any problems or issues relating to the vehicle's condition or conformity to the relevant person(s) promptly

P13 ensure your maintenance records are accurate, complete and passed to the relevant person(s) promptly in the format required

P14 complete all vehicle maintenance activities within the agreed timescale

P15 report any anticipated delays in completion to the relevant person(s) promptly

Knowledge and understanding

Legislative and organisational requirements and procedures

You need to know and understand:

K1 the manufacturer's and warranty requirements relating to routine maintenance activities for vehicle systems and components

K2 the legal requirements relating to the vehicle maintenance activities for vehicle systems and components

K3 the legislation and workplace procedures relevant to:

- K3.1 health and safety
- K3.2 the environment (including waste disposal)
- K3.3 appropriate personal and vehicle protection

K4 your workplace procedures for:

- K4.1 recording vehicle maintenance work and any variations from the original vehicle specification
- K4.2 the referral of problems
- K4.3 reporting delays to the completion of work

K5 the importance of documenting vehicle maintenance information

K6 the importance of working to agreed timescales and keeping others informed of progress

K7 the relationship between time and costs

K8 the importance of reporting anticipated delays to the relevant person(s) promptly

Use of technical information

You need to know and understand:

K9 how to find, interpret and use **sources of technical information** for scheduled maintenance activities, including on-board diagnostic displays

K10 the importance of using the correct **sources of technical information**

K11 the purpose of and how to use identification codes

Vehicle system operation

You need to know and understand:

K12 how engines, cooling systems, air supply and exhaust systems, fuel systems and ignition systems operate for the type(s) of vehicle on which you are

working (including hybrid vehicles and alternative fuel vehicles)

K13 how clutch assemblies, clutch operating systems, manual gear boxes, automatic gear boxes, drivelines and hubs (if appropriate) and final drive assemblies operate for the type of vehicle on which you are working (including hybrid / alternative fuel and electric vehicles)

K14 how suspension systems, steering systems, braking systems, non-electrical body systems, wheels and tyres operate for the type of vehicle on which you are working (including regenerative braking systems and other energy recuperation systems used on hybrid / electric and alternative fuel vehicles)

K15 the purpose, operating principles and location of power storage systems (including batteries), power generating systems,(including vehicle charging systems), starting systems, lighting systems and ancillary equipment for the type of vehicle on which you are working (including hybrid / alternative fuel and electric vehicles)

K16 the operating specifications and tolerances for the type(s) of vehicles on which you are working (including hybrid / alternative fuel and electric vehicles)

K17 the hazards associated with high energy electrical vehicle components

Routine maintenance requirements

You need to know and understand:

K18 how to conduct scheduled, routine light vehicle maintenance activities using prescribed **examination methods** and **assessments** against vehicle specifications to identify damage, corrosion, inadequate fluid levels, leaks, wear, security problems and general condition and serviceability

K19 how to check and make adjustments to clearances, gaps, settings, alignment, pressures, tension, speeds and levels relevant to the engine area, transmission area, chassis area, electrical area and body (including to valves, ignition, fuel and emissions, brakes, transmission, lights, tyres, steering and body fittings)

K20 how to replenish and replace routine service components and materials, including filters, drive, belts, wiper blades, brake linings and pads, lubricants and fluids

K21 how to recognise and report cosmetic damage to vehicle components and units outside normal service items

K22 how to identify codes and grades of lubricants

K23 how to work safely avoiding damage to the vehicle and its systems (including special precautions that may be required when working on hybrid / alternative fuel and electric vehicles)

K24 the consequence of using incorrect lubricants, fluids and components

Additional information

Scope/range

1. Sources of technical information are:

1.1. vehicle technical data
1.2. schedules of inspection
1.3. regulations

2. Examination methods are:

2.1. aural
2.2. visual
2.3. functional
2.4. measurements

3. Assessments are for:

3.1. malfunction
3.2. damage
3.3. fluid levels
3.4. leaks
3.5. wear
3.6. security
3.7. condition and serviceability
3.8. conformity
3.9. necessity for adjustment(s)

Glossary

Agreed timescales:

Examples include: manufacturer's recommended work times, job times set by your company or a job time agreed with a specific customer.

Adjustments:

Examples include: adjustments to clearances, gaps, settings, alignment pressures, tensions, speeds and levels, and adjustments to valves, ignition, fuel and emissions, brakes, transmission, lights, tyres, steering and body fittings.

Components:

Examples include: filters, drive belts, wiper blades, brake linings and pads, lubricants and fluids.

Conformity:

Examples include conformity to manufacturer's specifications, UK and European legal requirements where applicable.

Systems testing equipment:

Examples include: test instruments, emission test equipment, wheel alignment equipment, tyre tread depth gauges.

Maintenance records:

Examples include: records of vehicle inspection, manufacturers', fleet, company or customer job cards.

Major service:

As defined by manufacturers' specifications appropriate to the vehicle being

working upon.

Vehicles:

These can be any of the following – light vehicles. Additionally these vehicles may be SI, CI, Hybrid, Electric or Alternative fuel vehicles.

Alternative Fuel:

This is defined as any type of fuel that may be used to power an internal combustion engine, examples would include LPG, bio ethanol etc.

Routine vehicle maintenance:

Examples include: conducting scheduled maintenance, adjustments, replacements and replenishment of, or to, components and systems in accordance with manufacturer's instructions for the period and/or mileage interval.

Vehicle technical data:

Examples include: hard copy manuals, data on computer and data obtained from on- board diagnostic displays.

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Original URN	LV01
Relevant occupations	Engineering; Vehicle Trades; Light Vehicle Service Technician (Automotive)
Suite	Maintenance & Repair - Light Vehicle; Vehicle Fitting
Key words	Vehicle; maintenance; light; servicing; routine; periodic; schedule

IMILV02
Remove and replace light vehicle engine units and components

Overview

This NOS is about removing and replacing units and components where dismantling and re-assembly of engine systems is required. It is also about evaluating the performance of replaced units and components. The units and components concerned are those outside those replaced as part of normal routine, vehicle maintenance (servicing) activities.

Performance criteria

You must be able to:

- P1 wear suitable personal protective equipment and use vehicle coverings throughout all removal and replacement activities
- P2 support your removal and replacement activities by reviewing
  - P2.1 vehicle technical data
  - P2.2 removal and replacement procedures
  - P2.3 legal requirements
- P3 prepare the vehicle systems and work area for safe working procedures (where appropriate)
- P4 prepare, test and use all the **equipment** required following manufacturers' instructions
- P5 carry out all removal and replacement activities following;
  - P5.1 manufacturers' instructions
  - P5.2 recognised repair methods
  - P5.3 health and safety requirements
  - P5.4 your workplace procedures
- P6 work in a way which minimises the risk of:
  - P6.1 damage to other vehicle systems
  - P6.2 damage to other vehicle components and units
  - P6.3 contact with leakage
  - P6.4 contact with hazardous substances
  - P6.5 damage to your working environment
- P7 ensure replaced engine components and units conform to the vehicle operating specification and any legal requirements
- P8 record and report any additional faults you notice during the course of your work promptly
- P9 use suitable **testing methods** to evaluate the performance of the reassembled system accurately
- P10 ensure the reassembled system performs to the vehicle operating specification and meets any legal requirements prior to return to the customer
- P11 ensure your records are accurate, complete and passed to the relevant person(s) promptly in the format required

P12 complete all removal and replacement activities within the agreed timescale

P13 report any expected delays in completion to the relevant person(s) promptly

Knowledge and understanding

Legislative and organisational requirements and procedures

You need to know and understand:

K1 the legal requirements relating to the vehicle

K2 the legislation and workplace procedures relevant to:

- K2.1 health and safety
- K2.2 the environment (including waste disposal)
- K2.3 appropriate personal and vehicle protective equipment

K3 the importance of documenting removal and replacement information

K4 the importance of working to agreed timescales and keeping others informed progress

K5 the relationship between time and costs

K6 the importance of reporting anticipated delays to the relevant person(s) promptly

Use of technical information

You need to know and understand:

K7 how to find, interpret and use sources of information applicable to units and component removal and replacement within **engine systems**

K8 the importance of using the correct sources of technical information

K9 the purpose of and how to use identification codes

Electrical principles

You need to know and understand:

K10 vehicle earthing principles and earthing methods

K11 principles associated with vehicle **engine systems**, including types of sensors, actuators, their application and operation

K12 types of circuit protection and why these are necessary

K13 electrical safety procedures

K14 how warning, charging and starter circuits work

K15 electric symbols, units and terms

K16 battery charging

K17 electrical/electronic control system principles

K18 the hazards associated with high energy electrical vehicle components

Engine system operation and construction

You need to know and understand:

K19 how **engine systems** and their related **units and components** are constructed, dismantled and reassembled for the classification of vehicle worked upon

K20 how **engine systems** and their related **units and components** operate for the classification of vehicle worked upon

Equipment

You need to know and understand:

K21 how to prepare, test and use all the removal and replacement **equipment** required

Engine unit and component removal and replacement

You need to know and understand:

K22 how to remove and replace engine system mechanical and electrical units components for the classification of vehicle worked upon

K23 how to file, fit, tap, thread, cut and drill plastics and metals

K24 how to select and fit gaskets, sealants, fittings and fasteners

K25 how to test and evaluate the performance of replacement engine **units and components** and the reassembled system against the vehicle operating specifications and any legal requirements

K26 the relationship between **testing methods** and the engine **units and components** replaced – the use of appropriate test methods

K27 the properties of jointing materials and when and where they should be used

K28 the manufacturer's specification for the type and quality of engine **units and components** to be used

K29 how to work safely avoiding damage to other vehicle systems, components units and contact with leakage and hazardous substances

Additional information

Scope/range

1. **Equipment** is
   - 1.1. hand tools
   - 1.2. special workshop tools
   - 1.3. general workshop equipment
   - 1.4. electrical testing equipment

2. **Testing methods** are:
   - 2.1. visual
   - 2.2. aural
   - 2.3. functional
   - 2.4. measurement

3. **Units and components** are
   - 3.1. mechanical
   - 3.2. electrical

4. **Engine systems** are
   - 4.1. engine mechanical systems
   - 4.2. cooling, heating and ventilation systems
   - 4.3. air supply and exhaust systems
   - 4.4. fuel and ignition systems
   - 4.5. engine electrical systems
   - 4.6. lubrication systems

Glossary

Agreed timescales:

Examples include: manufacturer's recommended work times, job times set by your company or a job time agreed with a specific customer.

Units and components:

Any units or component from the engine system as defined in the Scoping Statement above.

Vehicles:

These can be any of the following – light vehicles, commercial vehicles, motorcycles, mopeds and scooters. Additionally these vehicles may be SI, CI, Hybrid or Alternative fuel vehicles.

Alternative Fuel:

This is defined as any type of fuel that may be used to power an internal combustion engine, examples would include LPG, bio ethanol etc.

IMILV02
Remove and replace light vehicle engine units and components

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Original URN	LV02
Relevant occupations	Engineering; Vehicle Trades; Light Vehicle Service Technician (Automotive)
Suite	Maintenance & Repair - Light Vehicle
Key words	Engine; units; components; light; remove; replace; oil; mechanical; electrical; cooling; lubrication

IMILV03
Remove and replace light vehicle electrical units and components

Overview

This NOS is about removing and replacing units and components previously identified as faulty or damaged or where the customer has requested replacements. It is also about evaluating the performance of replaced units and components.

The units and components concerned are those outside those replaced as part of normal routine vehicle maintenance.

Performance criteria

You must be able to:

- P1 wear suitable personal protective equipment and use vehicle coverings throughout all removal and replacement activities
- P2 support your removal and replacement activities by reviewing:
  - P2.1 vehicle technical data
  - P2.2 removal and replacement procedures
  - P2.3 legal requirements
- P3 prepare, test and use all the **equipment** required following manufacturers' instructions
- P4 prepare the vehicle systems and work area for safe working procedures (where appropriate)
- P5 carry out all removal and replacement activities following;
  - P5.1 manufacturers' instructions
  - P5.2 your workplace procedures
  - P5.3 health and safety requirements
- P6 work in a way which minimises the risk of:
  - P6.1 damage to other vehicle systems
  - P6.2 damage to other vehicle components and units
  - P6.3 contact with leakage
  - P6.4 contact with hazardous substances
- P7 ensure replaced electrical auxiliary units and components conform to the vehicle operating specification and any legal requirements
- P8 record and report any additional faults you notice during the course of your work promptly
- P9 use suitable **testing methods** to evaluate the performance of the reassembled system accurately
- P10 ensure the reassembled system performs to the vehicle operating specification and meets any legal requirements prior to return to the customer
- P11 ensure your records are accurate, complete and passed to the relevant person(s) promptly in the format required
- P12 complete all removal and replacement activities within the agreed timescale
- P13 report any expected delays in completion to the relevant person(s) promptly

Knowledge and understanding

Legislative and organisational requirements and procedures

You need to know and understand:

K1 the legal requirements relating to the vehicle (including road safety and refrigerant handling, fuel storage or other requirements)

K2 the legislation and workplace procedures relevant to

- K2.1 health and safety
- K2.2 the environment (including waste disposal)
- K2.3 appropriate personal and vehicle protective equipment

K3 the importance of documenting removal and replacement information

K4 the importance of working to agreed timescales and keeping others informed of progress

K5 the relationship between time and costs

K6 the importance of reporting anticipated delays to the relevant person(s) promptly

Use of technical information

You need to know and understand:

K7 how to find, interpret and use sources of information applicable to electrical units and component removal and replacement

K8 the importance of using the correct sources of technical information

K9 the purpose of and how to use identification codes

Electrical auxiliary system operation and construction

You need to know and understand:

K10 how **electrical units and components** are constructed, removed and replaced for the classification of vehicle worked upon

K11 how **electrical units and components** operate for the classification of vehicle worked upon

Equipment

You need to know and understand:

K12 how to prepare, test and use all the removal and replacement **equipment** required

Electrical and electronic principles

You need to know and understand:

K13 vehicle earthing principles and earthing methods
K14 electrical and electronic principles associated with electrical systems, including types of sensors and actuators, their application and operation
K15 types of circuit protection and why these are necessary
K16 electrical safety procedures
K17 how lighting, warning, charging and starter circuits work
K18 electric symbols, units and terms
K19 electrical/electronic control system principles
K20 the hazards associated with high energy electrical vehicle components

Electrical units and component removal and replacement

You need to know and understand:

K21 how to remove and replace **electrical units and components** for the classification of vehicle worked upon
K22 how to test and evaluate the performance of replacement **electrical units and components** and the reassembled system against the vehicle operating specifications and any legal requirements
K23 the relationship between **testing methods** and the **electrical units and components** replaced – the use of appropriate test methods
K24 the manufacturer's specification for the type and quality of **electrical units and components** to be used
K25 how to work safely avoiding damage to other vehicle systems, components and units and contact with leakage and hazardous substances

Additional information

Scope/range

1. **Equipment** is
   - 1.1. hand tools
   - 1.2. special workshop tools
   - 1.3. general workshop equipment
   - 1.4. electrical meters

2. **Testing methods** are:
   - 2.1. visual
   - 2.2. aural
   - 2.3. functional
   - 2.4. measurement

3. **Electrical units and components** are
   - 3.1. lighting systems
   - 3.2. wiper systems
   - 3.3. security and alarm systems
   - 3.4. comfort and convenience systems
   - 3.5. infotainment systems
   - 3.6. communication systems
   - 3.7. electric window systems
   - 3.8. monitoring and instrumentation systems

Glossary

Agreed timescales:

Examples include: manufacturer's recommended work times, job times set by your company or a job time agreed with a customer.

Comfort and convenience systems:

Examples are heated seats, electrically adjusted seats, heated screens, electric mirrors, heating, climate control and air conditioning.

Units and components:

Any unit or component from the electrical systems defined in the Scoping Statement above.

Vehicles:

These can be any of the following – light vehicles, commercial vehicles, motorcycles, mopeds and scooters. Additionally these vehicles may be SI, CI, Hybrid or Alternative fuel vehicles.

Alternative Fuel:

This is defined as any type of fuel that may be used to power an internal combustion engine, examples would include LPG, bio ethanol etc.

IMILV03
Remove and replace light vehicle electrical units and components

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Originating organisation	IMI Ltd
Original URN	LV03
Relevant occupations	Engineering; Vehicle Trades; Light Vehicle Service Technician (Automotive)
Suite	Maintenance & Repair - Light Vehicle
Key words	Electrical; units; components; remove; replace; light; lighting; alarms; wipers; electrics

IMILV04
Remove and replace light vehicle chassis units and components

Overview

This NOS is about removing and replacing units and components where dismantling and re-assembly of chassis systems is required. It is also about evaluating the performance of replaced units and components. The units and components concerned are those outside those replaced as part of normal routine, vehicle maintenance (servicing) activities.

Performance criteria

You must be able to:

P1 wear suitable personal protective equipment and use vehicle coverings throughout all removal and replacement activities

P2 support your removal and replacement activities by reviewing:

- P2.1 vehicle technical data
- P2.2 removal and replacement procedures
- P2.3 legal requirements

P3 prepare, set up, test and use all the **equipment** required following manufacturers' instructions

P4 prepare the vehicle systems and work area for safe working procedures (where appropriate)

P5 carry out all removal and replacement activities following;

- P5.1 manufacturers' instructions
- P5.2 recognised repair methods
- P5.3 your workplace procedures
- P5.4 health and safety requirements

P6 work in a way which minimises the risk of:

- P6.1 damage to other vehicle systems
- P6.2 damage to other vehicle components and units
- P6.3 contact with leakage
- P6.4 contact with hazardous substances
- P6.5 damage to your working environment

P7 ensure replaced chassis **units and components** conform to the vehicle operating specification and any legal requirements

P8 record and report any additional faults you notice during the course of your work promptly

P9 use suitable **testing methods** to evaluate the performance of the reassembled system accurately

P10 ensure the reassembled chassis system performs to the vehicle operating specification and meets any legal requirements prior to returning it to the customer

P11 ensure your records are accurate, complete and passed to the relevant

person(s) promptly in the format required

P12 complete all removal and replacement activities within the agreed timescale

P13 report any expected delays in completion to the relevant person(s) promptly

Knowledge and understanding

Legislative and organisational requirements and procedures

You need to know and understand:

K1 the legislation and workplace procedures relevant to:
- K1.1 health and safety
- K1.2 the environment (including waste disposal)
- K1.3 personal and vehicle protective equipment

K2 the importance of documenting removal and replacement information

K3 the importance of working to agreed timescales and keeping others informed of progress

K4 the relationship between time and costs

K5 the importance of reporting anticipated delays to the relevant person(s) promptly

Use of technical information

You need to know and understand:

K6 how to find, interpret and use technical information applicable to unit and component removal and replacement within **chassis systems**

K7 the importance of using the correct sources of technical information

K8 the purpose of and how to use identification codes

Electrical and electronic principles

You need to know and understand:

K9 vehicle earthing principles and earthing methods

K10 electrical and electronic principles associated with **chassis systems**, including types of sensors and actuators, their application and operation

K11 types of circuit protection and why these are necessary

K12 electrical safety procedures

K13 electric symbols, units and terms

K14 electrical and electronic control system principles

K15 the hazards associated with high energy electrical vehicle components

Chassis system operation and construction

You need to know and understand:	K16	how **chassis systems** and their related **units and components** are constructed, removed and replaced for the classification of vehicle worked upon
	K17	how **chassis systems** and their related **units and components** operate for classification of vehicle worked upon
		Equipment
You need to know and understand:	K18	how to prepare, test and use all the removal and replacement **equipment** required
		Chassis system unit and component removal and replacement
You need to know and understand:	K19	how to remove and replace chassis system mechanical, electrical and hydraulic **units and components** for the classification of vehicle worked upon
	K20	how to file, fit, tap, thread, cut and drill plastics and metals
	K21	how to select and use gaskets, sealants, seals, fittings and fasteners
	K22	how to test and evaluate the performance of replacement chassis system **units and components** and the reassembled system against the vehicle operating specifications and any legal requirements
	K23	the relationship between **testing methods** and the chassis system **units and components** replaced – the use of appropriate test methods
	K24	when replacement **units and components** must meet the original **equipment** specification (OES) for warranty or other requirements
	K25	how to work safely avoiding damage to other vehicle systems, components and units and contact with leakage and hazardous substances (any special arrangements or precautions when working with alternative fuel or hybrid vehicles must be covered)

Additional information

Scope/range

1. **Equipment** is
   - 1.1. hand tools
   - 1.2. special workshop tools
   - 1.3. general workshop equipment
   - 1.4. electrical testing equipment

2. **Testing methods** are:
   - 2.1. visual
   - 2.2. aural
   - 2.3. functional
   - 2.4. measurement

3. **Units and components** are:
   - 3.1. mechanical
   - 3.2. electrical
   - 3.3. hydraulic

4. **Chassis systems** are
   - 4.1. steering
   - 4.2. suspension
   - 4.3. braking

Glossary

Agreed timescales:

Examples include: manufacturer's recommended work times, job times set by your company or a job time agreed with a specific customer.

Units and components:

Any unit or component from the chassis systems defined in the Scoping Statement above.

Functional testing:

Examples include: use of brake roller tester, chassis dynamometer, suspension activation, security activator.

Steering and suspension system:

For the purposes of this NOS, this will also include wheels and tyres.

Vehicles:

These can be any of the following – light vehicles. Additionally these vehicles may be SI, CI, Hybrid or Alternative fuel vehicles.

Alternative Fuel:

This is defined as any type of fuel that may be used to power an internal combustion engine, examples would include LPG, bio ethanol etc.

IMILV04
Remove and replace light vehicle chassis units and components

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Relevant occupations	Engineering; Vehicle Trades; Light Vehicle Service Technician (Automotive)
Suite	Maintenance & Repair - Light Vehicle
Key words	Chassis; steering; suspension; brakes; remove; replace; light; vehicle; units; components

IMILV05
Inspect light vehicles using prescribed inspection methods

Overview

This NOS is about carrying out a range of inspections on light vehicles using a variety of prescribed testing and inspection methods.

Performance criteria

You must be able to:

- P1 use suitable personal and vehicle protective equipment throughout all vehicle inspection activities
- P2 use suitable sources of technical information to support your **vehicle inspection** activities
- P3 prepare the vehicle systems and work area for safe working procedures (where appropriate)
- P4 carry out systematic **vehicle inspections** following:
  - P4.1 manufacturer's approved procedures
  - P4.2 recognised repair methods
  - P4.3 health and safety requirements
  - P4.4 prescribed documentation
- P5 confirm all systems and components inspected function correctly following the manufacturer's specifications
- P6 ensure your comparison of the vehicle against specification accurately identifies any:
  - P6.1 differences from the vehicle specification
  - P6.2 vehicle appearance and condition faults
- P7 work in a way which minimises the risk of damage to the vehicle and its systems, other people and their property
- P8 make suitable recommendations for future action based upon the results of your **tests** and inspections
- P9 ensure your records are accurate, complete and passed to the relevant person(s) promptly in the format required (this includes all vehicle related paperwork)
- P10 complete all inspection activities within the agreed timescale and to specification
- P11 report any anticipated delays in completion to the relevant person(s) promptly

Knowledge and understanding

Legislative and organisational requirements and procedures

You need to know and understand:

K1 the legislation and workplace procedures relevant to:
- K1.1 health and safety
- K1.2 the environment (including waste disposal)
- K1.3 appropriate personal and vehicle protective equipment

K2 the legislation relevant to the **vehicle inspections** described in the Scoping Statement for this NOS

K3 the importance of making accurate records of the results of your **tests** and inspections and interpreting them correctly

K4 the importance of working to agreed timescales and keeping others informed progress

K5 the relationship between time and costs

K6 the importance of reporting anticipated delays to the relevant person(s) promptly

Sources of information

You need to know and understand:

K7 how to find, interpret and use technical information

K8 the importance of using technical information to inform your inspection and testing of vehicles

Testing methods and the conduct of Inspections

You need to know and understand:

K9 the hazards associated with high energy electrical vehicle components

K10 how vehicle systems operate (including the engine area, transmission area, chassis / frame area and electrical area) and the operational tolerances for the vehicle(s) on which you are working

K11 how to follow procedures to carry out the systematic inspections described in the scoping statement above

K12 how to confirm the correct operation of vehicle systems and vehicle condition

K13 how to compare **test** and inspection results against vehicle specifications and legal requirements

K14 how to record **test** and inspection results in the format required

K15 how to make recommendations based upon the results of your inspections

K16 the implications of failing to carry out inspections activities correctly

K17 the implications of signing workplace documentation and vehicle records

Additional information

Scope/range

1. **Vehicle inspections** are:

1.1. pre-work

1.2. post work

1.3. pre-delivery

1.4. maintenance Inspection

Examples of maintenance inspection at this level include:

1.5. Brake inspections, Seasonal Inspections, Tyre inspections etc.

2. **Test** methods are:

2.1. visual

2.2. aural

2.3. functional

2.4. measurement

3. Examples of Equipment Includes:

Appropriate test equipment to correctly confirm the functionality of the system that you are inspecting; this may include measuring equipment, specialist diagnostic equipment or any type of tool required.

Glossary

Agreed timescales:

Examples include: manufacturer's recommended work times, job times set by your company or a job time agreed with a specific customer.

Vehicles:

These can be any of the following – light vehicles Additionally these vehicles may be SI, CI, Hybrid or Alternative fuel vehicles.

Alternative Fuel:

This is defined as any type of fuel that may be used to power an internal combustion engine, examples would include LPG, bio ethanol etc.

Sources of technical information:

Examples include pre-determined / pre-printed inspection schedules, manufacturers' manuals and Trade Association check lists, workplace procedures.

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Relevant occupations	Engineering; Vehicle Trades; Light Vehicle Service Technician (Automotive)
Suite	Maintenance & Repair - Light Vehicle; Accident Repair – Joining
Key words	Inspect; motor; vehicles; prescribed; inspection; methods; light; pre-work; post-work

IMILV06
Inspect light vehicles

Overview

This NOS is about carrying out a range of inspections on light vehicles using a variety of testing methods and equipment.

Performance criteria

You must be able to:

- P1 use suitable personal and vehicle protective equipment throughout all vehicle inspection activities
- P2 use suitable sources of technical information to support your vehicle inspection activities
- P3 prepare the vehicle systems and work area for safe working procedures (where appropriate)
- P4 confirm that **equipment** has been calibrated to meet manufacturers' and legal requirements where necessary
- P5 conduct all **vehicle inspections** and **testing** following:
  - P5.1 the manufacturer's approved examination methods
  - P5.2 recognised methods
  - P5.3 your workplace procedures
  - P5.4 health and safety requirements
- P6 ensure your inspection and **testing** of the vehicle against specification accurately identifies:
  - P6.1 differences from the vehicle specification
  - P6.2 vehicle appearance and condition faults
  - P6.3 non-compliance with statutory requirements
- P7 work in a way which minimises the risk of damage to the vehicle and its systems, other people and their property and your working environment
- P8 make suitable recommendations for future action based upon the results of your **tests** and inspections
- P9 explain the reasons for your recommendations to the relevant person(s)
- P10 offer alternative options from your recommendations if the customer does not agree to your plan for future action
- P11 ensure your records are accurate, complete and passed to the relevant person(s) promptly in the format required
- P12 complete all inspection activities within the agreed timescale
- P13 report any anticipated delays in completion to the relevant person(s) promptly

Knowledge and understanding

Legislative and organisational requirements and procedures

You need to know and understand:

K1 the legislation and workplace procedures relevant to
- K1.1 health and safety
- K1.2 the environment (including waste disposal)
- K1.3 appropriate personal and vehicle protective equipment

K2 the legislation relevant to the types of **vehicle inspections** described in the Scoping Statement for this NOS

K3 your workplace procedures for the referral of problems:

K4 the importance of making accurate records of the results of your **tests** and inspections and interpreting them correctly

K5 the importance of working to agreed timescales and keeping others informed of progress

K6 the relationship between time, costs and profitability

K7 the importance of reporting anticipated delays to the relevant person(s) promptly

Sources of information

You need to know and understand:

K8 how to find, interpret and use technical information

K9 the importance of using technical information to inform your inspection and **testing** of vehicles

Testing methods and the conduct of Inspections

You need to know and understand:

K10 the hazards associated with high energy electrical vehicle components

K11 how vehicle systems operate (including the engine area, transmission area, chassis or frame area and electrical area) and the operational tolerances for vehicle(s) on which you are working

K12 how to follow procedures and processes to enable a logical and systematic inspection of vehicles to take place

K13 how to **test** the operation and tolerances of vehicle systems and how to assess vehicle condition; including workshop based and road **tests**

K14 how to compare **test** and inspection results against vehicle specifications and legal requirements

K15 how to record **test** and inspection results in the format required

K16 how to make recommendations based upon the results of your inspections

K17 the full implications of failing to carry out an inspection correctly

K18 the implications of signing workplace documentation and vehicle records

Additional information

Scope/range

1. **Vehicle inspections** are:
   - 1.1. pre-purchase
   - 1.2. pre-MOT test
   - 1.3. safety
   - 1.4. post-accident, pre-repair
   - 1.5. post accident, post-repair

2. **Test methods** are:
   - 2.1. visual
   - 2.2. aural
   - 2.3. functional
   - 2.4. measurement

3. Examples of **Equipment** include:
   - 3.1. emissions testing
   - 3.2. brake testing
   - 3.3. headlamp alignment
   - 3.4. wheel alignment
   - 3.5. torque setting
   - 3.6. specialist diagnostic equipment
   - 3.7. measuring equipment (e.g. vernier calipers, micrometer, feeler blades, DTI's etc.)

Glossary

Agreed timescales:

Examples include: manufacturer's recommended work times, job times set by your company or a job time agreed with a specific customer.

Vehicles:

These can be any of the following – light vehicles. Additionally these vehicles may be SI, CI, Hybrid or Alternative fuel vehicles.

Alternative Fuel:

This is defined as any type of fuel that may be used to power an internal combustion engine, examples would include LPG, bio ethanol etc.

Sources of technical information:

Examples include inspection schedules, MOT inspection manuals and guides, manufacturers' manuals, Trade Association check lists and workplace procedures.

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Original URN	LV06
Relevant occupations	Engineering; Vehicle Trades; Light Vehicle Service Technician (Automotive); Light Vehicle Diagnostic Technician (Automotive)
Suite	Maintenance & Repair - Light Vehicle; Accident Repair – Joining
Key words	Inspect; motor; vehicles; light; post; accident; pre-work; post-work

IMILV07
Diagnose and rectify light vehicle engine and component faults

Overview

This NOS is about diagnosing and rectifying faults occurring in the vehicle engine's mechanical, electrical, hydraulic and fluid systems.

Performance criteria

You must be able to:

P1 wear suitable personal protective equipment and use vehicle coverings when using **diagnostic methods** and carrying out **rectification activities**

P2 support the identification of **faults**, by reviewing vehicle:

- P2.1 technical data
- P2.2 diagnostic test procedures

P3 prepare the vehicle systems and work area for safe working procedures (where appropriate)

P4 prepare, inspect, test and use all the required **equipment** following manufacturers' instructions

P5 use **diagnostic methods** which are relevant to the symptoms presented

P6 collect sufficient diagnostic information in a systematic way to enable an accurate diagnosis of engine system **faults**

P7 identify and record any system deviation from acceptable limits accurately

P8 accurately ensure your assessment of dismantled sub-assemblies, components and units identifies their condition and suitability for repair or replacement

P9 inform the relevant person(s) promptly where repairs are uneconomic or unsatisfactory to perform

P10 carry out all diagnostic and **rectification activities** following:

- P10.1 manufacturers' instructions
- P10.2 recognised repair methods
- P10.3 your workplace procedures
- P10.4 health and safety requirements

P11 work in a way which minimises the risk of :

- P11.1 damage to other vehicle systems
- P11.2 damage to other components and units
- P11.3 contact with leakages
- P11.4 contact with hazardous substances

P12 ensure all repaired and replaced components and units conform to the vehicle operating specification and any legal requirements

P13 adjust components and units, when necessary, correctly to ensure that they

operate to meet system requirements

P14 record and report any additional **faults** you notice during the course of work promptly

P15 use testing methods which are suitable for assessing the performance of the system rectified

P16 ensure the engine system rectified performs to the vehicle operating specification and any legal requirements prior to return to the customer

P17 ensure your records are accurate, complete and passed to the relevant person(s) promptly in the format required

P18 complete all system diagnostic activities within the agreed timescale

P19 report any anticipated delays in completion to the relevant person(s) promptly

Knowledge and understanding

Legislative and organisational requirements and procedures

You need to know and understand:

K1 the legislation and workplace procedures relevant to
- K1.1 health and safety
- K1.2 the environment (including waste disposal)
- K1.3 appropriate personal and vehicle protective equipment

K2 legal requirements relating to the vehicle (including road safety requirements)

K3 your workplace procedures for:
- K3.1 recording fault location and correction activities
- K3.2 reporting the results of tests
- K3.3 the referral of problems
- K3.4 reporting delays to the completion of work

K4 the importance of working to recognised diagnostic and rectification procedures and processes and obtaining the correct information for diagnostic and **rectification activities** to proceed

K5 the importance of, documenting diagnostic and rectification information

K6 the importance of working to agreed timescales and keeping others informed of progress

K7 the relationship between time, costs and profitability

K8 the importance of reporting anticipated delays to the relevant person(s) promptly

Electrical and electronic principles

You need to know and understand:

K9 electrical and electronic principles associated with engine systems, including types of sensors and actuators, their application and operation

K10 how electrical and electronic engine systems operate, including electrical component function, electrical inputs, outputs, voltages and oscilloscope patterns, digital and fibre optics principles

K11 the interaction between electrical, electronic and mechanical components within vehicle engine systems

K12 how engine electrical systems interlink and interact, including multiplexing

K13 electrical symbols, unit and terms

K14 electrical safety procedures

K15 the hazards associated with high energy electrical vehicle components

Use of diagnostic and rectification equipment

You need to know and understand:

K16 how to prepare and test the accuracy of **diagnostic testing equipment**

K17 how to use diagnostic and rectification **equipment** for engine mechanical, electrical, electronic, hydraulic and fluid systems; specialist engine repair tools and general workshop **equipment**

Engine electrical faults, their diagnosis and correction

You need to know and understand:

K18 how engine mechanical, electrical, electronic, hydraulic and fluid systems are constructed and operate

K19 how engine mechanical, electrical, electronic, hydraulic and fluid systems are dismantled, reassembled and adjusted to manufacturers' specifications

K20 the types and causes of engine mechanical, electrical, electronic, hydraulic and fluid system, component and unit **faults** and failures

K21 engine mechanical, electrical, electronic, hydraulic and fluid component unit and replacement procedures, the circumstances which will necessitate replacement and other possible courses of action

K22 how to find, interpret and use sources of information on engine electrical and electronic operating specifications, diagnostic test procedures, repair procedures and legal requirements

K23 vehicle operating specifications for limits, fits and tolerances relating to engine mechanical, electrical, electronic, hydraulic and fluid systems for the vehicle(s) on which you work

K24 how to select the most appropriate **diagnostic testing** method for the symptoms presented

K25 how to carry out systematic **diagnostic testing** of engine mechanical, electrical, electronic, hydraulic and fluid systems using prescribed processes or formats

K26 how to assess the condition of mechanical, electrical, electronic, hydraulic and fluid components and units

K27 how to interpret test results and vehicle data in order to identify the location and cause of engine system **faults**

K28 how to carry out the **rectification activities** in order to correct **faults** in the engine mechanical, electrical, electronic, hydraulic and fluid systems

K29 the relationship between test methodology and the **faults** repaired – the use of appropriate testing methods

K30 how to make cost effective recommendations for rectification

Additional information

Scope/range

1. **Faults** occur within
   - 1.1. the engine mechanical system
   - 1.2. the engine electrical and electronic systems
   - 1.3. the engine hydraulic and fluid systems

2. **Diagnostic methods** are
   - 2.1. measurement
   - 2.2. functional testing
   - 2.3. electrical and electronic systems testing

3. **Diagnostic Testing** is defined as**:**
   - 3.1. Verify the fault
   - 3.2. Collect further information
   - 3.3. Evaluate the evidence
   - 3.4. Carry out further tests in a logical sequence
   - 3.5. Rectify the problem
   - 3.6. Check all systems

4. **Equipment** is
   - 4.1. diagnostic and rectification equipment for engine mechanical systems
   - 4.2. diagnostic and rectification equipment for engine electrical systems
   - 4.3. diagnostic and rectification equipment for engine hydraulic and fluid systems
   - 4.4. specialist repair tools
   - 4.5. general workshop equipment

5. **Rectification activities** are defined as:
   A suitable repair, replacement, re-coding or re-programming that rectifies the fault(s) identified form the diagnostic activities carried out.

Glossary

Agreed timescales:

Examples include: manufacturer's recommended work times, job times set by your company or a job time agreed with a specific customer.

Diagnostic information:

This relates to mechanical condition, including wear, run out, pressures and compressions, flow, leakage and electrical measurements such as voltage and pulse displays, electronic systems data, including fault codes, sensor measurements and control unit outputs and/or signals.

Engine Area:

Engine mechanical, cooling systems, electronic ignition, petrol fuel injection, diesel fuel injection, lubrication, engine management systems, exhaust gas re-circulation and starting/charging.

Engine and component faults:

These are faults that require a multi stage inspection and a series of test results to identify the cause.

Functional testing:

Examples include: engine balance, power balance, performance testing and road testing where relevant.

Hydraulic and fluid systems:

These are fuels, oil, lubrication, cooling, air conditioning etc.

Recommendations:

Examples include: servicing, dismantling for further inspection and test, repair and replacement.

Vehicles:

These can be any of the following – light vehicles. Additionally these vehicles may be SI, CI, Hybrid or Alternative fuel vehicles.

Alternative Fuel:

This is defined as any type of fuel that may be used to power an internal combustion engine, examples would include LPG, bio ethanol etc.

IMILV07
Diagnose and rectify light vehicle engine and component faults

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Relevant occupations	Engineering; Vehicle Trades; Light Vehicle Diagnostic Technician (Automotive)
Suite	Maintenance & Repair - Light Vehicle
Key words	Diagnose; rectify; motor; vehicle; engine; components; faults; light; electronic; electrical; hydraulic; mechanical

IMILV08
Diagnose and rectify light vehicle chassis system faults

Overview

This NOS is about diagnosing and rectifying faults occurring within vehicle steering, suspension and braking systems.

Performance criteria

You must be able to:

P1 wear suitable personal protective equipment and use vehicle coverings when using **diagnostic methods** and carrying out **rectification activities**

P2 support the identification of **faults**, by reviewing vehicle:

- P2.1 technical data
- P2.2 diagnostic test procedures

P3 prepare the vehicle systems and work area for safe working procedures (where appropriate)

P4 prepare, inspect, test and use all the required **equipment** following manufacturers' instructions

P5 use **diagnostic methods** which are relevant to the symptoms presented

P6 collect diagnostic information in a systematic way relevant to the **diagnostic methods** used

P7 collect sufficient diagnostic information to enable an accurate diagnosis of chassis system **faults**

P8 identify and record any system deviation from acceptable limits accurately

P9 accurately ensure your assessment of dismantled sub-assemblies, components and units identifies their condition and suitability for repair or replacement

P10 inform the relevant person(s) promptly where repairs are uneconomic or unsatisfactory to perform

P11 carry out all **rectification activities** following:

- P11.1 manufacturers' instructions
- P11.2 your workplace procedures
- P11.3 health and safety requirements

P12 work in a way which minimises the risk of :

- P12.1 damage to other vehicle systems
- P12.2 damage to other components and units
- P12.3 contact with leakages
- P12.4 contact with hazardous substances

P13 ensure all repaired and replaced components and units conform to the vehicle operating specification and any legal requirements

P14 adjust components and units correctly to ensure that they operate to meet system requirements, when necessary

P15 record and report any additional **faults** you notice during the course of work promptly

P16 use testing methods which are suitable for assessing the performance of the system rectified

P17 ensure the chassis system rectified performs to the vehicle operating specification and any legal requirements prior to return to the customer

P18 ensure your records are accurate, complete and passed to the relevant person(s) promptly in the format required

P19 complete all system diagnostic activities within the agreed timescale

P20 report any anticipated delays in completion to the relevant person(s) promptly

Knowledge and understanding

Legislative and organisational requirements and procedures

You need to know and understand:

K1 the legislation and workplace procedures relevant to
- K1.1 health and safety
- K1.2 the environment (including waste disposal)
- K1.3 appropriate personal and vehicle protective equipment

K2 legal requirements relating to the vehicle (including road safety requirements)

K3 your workplace procedures for:
- K3.1 recording fault location and correction activities
- K3.2 reporting the results of tests
- K3.3 the referral of problems
- K3.4 reporting delays to the completion of work

K4 the importance of working to recognised diagnostic and rectification procedures and processes and obtaining the correct information for diagnostic and **rectification activities** to proceed

K5 the importance of, documenting diagnostic and rectification information

K6 the importance of working to agreed timescales and keeping others informed of progress

K7 the relationship between time, costs and profitability

K8 the importance of reporting anticipated delays to the relevant person(s) promptly

Electrical and electronic principles

You need to know and understand:

K9 electrical and electronic principles associated with **chassis systems**, including types of sensors and actuators, their application and operation

K10 how electrical and electronic **chassis systems** operate, including electrical component function, electrical inputs, outputs, voltages and oscilloscope patterns, digital and fibre optics principles

K11 the interaction between electrical, electronic and mechanical components within vehicle **chassis systems**

K12 how chassis electrical systems interlink and interact, including multiplexing

K13 electrical symbols, units and terms

K14 electrical safety procedures

K15 the hazards associated with high energy electrical vehicle components

Use of diagnostic and rectification equipment

You need to know and understand:

K16 how to prepare and test the accuracy of **diagnostic testing equipment**

K17 how to use diagnostic and rectification **equipment** for chassis mechanical, electrical, hydraulic and fluid systems, specialist repair tools and general workshop equipment

Chassis faults, their diagnosis and correction

You need to know and understand:

K18 how **chassis** mechanical, electrical, electronic, hydraulic and fluid systems are constructed and operate

K19 how **chassis** mechanical, electrical, electronic, hydraulic and fluid systems are dismantled, reassembled and adjusted to manufacturers specifications

K20 the types and causes of **chassis** mechanical, electrical, electronic, hydraulic and fluid system, component and unit faults and failures

K21 **chassis** mechanical, electrical, hydraulic and fluid component and unit replacement procedures, the circumstances which will necessitate replacement and other possible courses of action

K22 how to find, interpret and use sources of information on **chassis** electrical operating specifications, diagnostic test procedures, repair procedures and legal requirements

K23 vehicle operating specifications for limits, fits and tolerances relating to **chassis** mechanical, electrical, electronic, hydraulic and fluid systems for the vehicle(s) on which you work

K24 how to select the most appropriate **diagnostic testing** method for the symptoms presented

K25 how to carry out systematic **diagnostic testing** of **chassis** mechanical, electrical, electronic, hydraulic and fluid systems using a prescribed process or format

K26 how to assess the condition evident within **chassis** mechanical, electrical, electronic, hydraulic and fluid components and units

K27 how to interpret test results and vehicle data in order to identify the location and cause of vehicle system faults

K28 how to carry out the **rectification activities** in order to correct faults in the **chassis** mechanical, electrical, electronic, hydraulic and fluid systems

K29 the relationship between test methodology and the faults repaired – the use of appropriate testing methods

K30 how to make cost effective recommendations for rectification

Additional information

Scope/range

1. **Chassis systems** are:
   - 1.1. steering
   - 1.2. suspension
   - 1.3. braking

2. **Diagnostic methods** are:
   - 2.1. measurement
   - 2.2. functional testing
   - 2.3. electrical and electronic systems testing

3. **Diagnostic Testing** is defined as:
   - 3.1. Verify the fault
   - 3.2. Collect further information
   - 3.3. Evaluate the evidence
   - 3.4. Carry out further tests in a logical sequence
   - 3.5. Rectify the problem
   - 3.6. Check all systems

4. **Equipment** is:
   - 4.1. diagnostic and rectification equipment for chassis mechanical systems
   - 4.2. diagnostic and rectification equipment for chassis electrical systems
   - 4.3. diagnostic and rectification equipment for chassis hydraulic and fluid systems
   - 4.4. specialist repair tools
   - 4.5. general workshop equipment

5. **Faults** are:
   - 5.1. mechanical
   - 5.2. electrical and electronic
   - 5.3. hydraulic and fluid

6. **Rectification activities** are defined as:

A suitable repair or replacement that rectifies the fault(s) identified form the diagnostic activities carried out.

Glossary

Agreed timescales:

Examples include: manufacturer's recommended work times, job times set by your company or a job time agreed with a specific customer.

Chassis or Frame Area:

Suspension systems, assisted steering systems, non-assisted steering systems, braking systems, ABS/traction control, wheels and tyres.

Chassis system faults:

These are faults that require a multi stage inspection and a series of test results to identify the cause.

Diagnostic information:

This relates to mechanical condition, including wear, run out, pressures, flow, leakage and electrical measurements such as voltage and pulse displays, electronic systems data, including fault codes, sensor measurements and control unit outputs and/or signals.

Functional testing:

Examples include: suspension and steering alignment, performance testing and road testing where relevant.

Hydraulic and fluid systems:

Examples are: hydraulic braking systems, hydro-pneumatic suspension systems, power steering.

Recommendations:

Examples include: servicing, dismantling for further inspection and test, repair and replacement.

Vehicles:

These can be any of the following – light vehicles. Additionally these vehicles may be SI, CI, Hybrid, Electric or Alternative fuel vehicles.

Alternative Fuel:

This is defined as any type of fuel that may be used to power an internal combustion engine, examples would include LPG, bio ethanol etc.

IMILV08
Diagnose and rectify light vehicle chassis system faults

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Originating organisation	IMI Ltd
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Relevant occupations	Engineering; Vehicle Trades; Light Vehicle Diagnostic Technician (Automotive)
Suite	Maintenance & Repair - Light Vehicle
Key words	Diagnose; rectify; motor; vehicle; chassis; systems; faults; light; vehicle; brakes; chassis; ABS; traction; control; EBS; EBD; steering; PAS

IMILV11

Overhaul light vehicle mechanical units

Overview

This NOS is about the overhaul of light vehicle mechanical units, involving dismantling, assessment, repair, replacement or adjustment of internal components together with re-assembly and testing.

Performance criteria

You must be able to:

- P1 wear suitable personal protective equipment throughout all **overhauling activities**
- P2 use suitable sources of technical information to support your **overhauling activities**
- P3 prepare the vehicle mechanical unit and work area for safe working procedures (where appropriate)
- P4 assess and prepare all the equipment required, following manufacturers' instructions, prior to use
- P5 use the tools and equipment required correctly and safely throughout all **overhauling activities**
- P6 carry out all **overhauling activities** following:
  - P6.1 manufacturers' instructions
  - P6.2 recognised repair methods
  - P6.3 your workplace procedures
  - P6.4 health and safety requirements
- P7 work in a way which minimises the risk of:
  - P7.1 damage to other components
  - P7.2 leakages
  - P7.3 contact with hazardous substances
- P8 ensure your assessment of the dismantled units identifies accurately the condition and suitability for overhaul
- P9 inform the relevant person(s) promptly where an overhaul is uneconomic or unsatisfactory to perform
- P10 use testing methods which comply with the manufacturer's requirements
- P11 adjust the units components correctly, when necessary, to ensure that they operate to meet the vehicle operating requirements
- P12 ensure the overhauled units and assemblies conform to the vehicle operating specification and any legal requirements
- P13 ensure your overhaul records are accurate, complete and passed to the relevant person(s) promptly in the format required
- P14 complete all **overhauling activities** within the agreed timescale

P15 report any anticipated delays in completion to the relevant person(s) promptly

Knowledge and understanding

Legislative and organisational requirements and procedures

You need to know and understand:

K1 the legal requirements applicable to the units and assemblies overhauled (including road safety requirements)

K2 the legislation and workplace procedures relevant to

- K2.1 health and safety
- K2.2 the environment (including waste disposal)
- K2.3 personal and vehicle protective equipment

K3 your workplace procedures for:

- K3.1 recording **overhaul activities**
- K3.2 reporting the results of tests
- K3.3 the referral of problems
- K3.4 reporting delays to the completion of work

K4 the importance of working to recognised overhauling and repair procedures and processes and obtaining the correct information for overhauling and repair activities to proceed

K5 the importance of, documenting repair information

K6 the importance of working to agreed timescales and keeping others informed of progress

K7 the importance of reporting any anticipated delays to the relevant person(s) promptly

Equipment

You need to know and understand:

K8 how to prepare, and assess the accuracy and operation of all the overhauling and testing equipment required

K9 how to use all the overhauling and testing equipment required

Mechanical units overhauling activities

You need to know and understand:

K10 how to find, interpret and use sources of information on overhauling procedures and statutory requirements

K11 how vehicle mechanical units and assemblies operate

K12 how mechanical units and assemblies are constructed, dismantled and reassembled

K13 the possible causes of faults in mechanical units and assemblies

K14 vehicle operating specification for limits, fits and tolerances and where this information can be sourced

K15 how to assess the condition evident within units, sub-assemblies and components

K16 the cost-benefit / relationship between the reconditioning, repair and replacement of components

K17 how to carry out **overhauling activities** for the type(s) of units worked upon

K18 the relationship between test methodology and the faults repaired – the use of appropriate testing methods

K19 how to test and evaluate the performance of overhauled units against the operating specification

K20 how to interpret test results

K21 how to identify the types and causes of mechanical units and assembly failure

K22 how to make suitable adjustments to components and units

K23 how to work safely avoiding personal injury, damage to components leakage and hazardous substances

K24 how to make cost effective recommendations based upon the cost-benefit relationship between the reconditioning, repair and replacement of components

Additional information

Scope/range

1. Overhaul activities are:

1.1. dismantling
1.2. assessment
1.3. repair
1.4. replacement
1.5. adjustment of internal components
1.6. re-assembly
1.7. functional testing

Glossary

Vehicles:

These can be any of the following – light vehicles. Additionally these vehicles may be SI, CI, Hybrid, Electric or Alternative fuel vehicles.

Alternative Fuel:

This is defined as any type of fuel that may be used to power an internal combustion engine, examples would include LPG, bio ethanol etc.

Adjustments:

Examples include, adjustments made to clearances, gaps, settings, pressures, tensions, pre-load and speeds.

Agreed timescales:

Examples include manufacturer's recommended work times, job times set by your company or a job time agreed with a specific customer.

Assessments:

Examples include those for wear, damage, alignment, corrosion, leakage, distortion and balance.

Equipment:

Examples include hand tools, pullers and presses, measuring instruments, refurbishment tools, general workshop equipment and special service tools.

Functional testing:

This refers to any applicable functional tests carried out after overhaul.

Mechanical Units:

Examples are: engines, gear boxes, final drive assemblies, steering units and components, suspension units and components.

Testing methods:

As prescribed by the appropriate technical literature.

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Suite	Maintenance & Repair - Light Vehicle
Key words	Overhaul; motor; mechanical; units; light; vehicle; repair; rebuild; engine

IMILV12
Remove and replace light vehicle transmission and driveline units and components

Overview

This NOS is about removing and replacing units and components where dismantling and re-assembly of transmission and driveline systems is required. It is also about evaluating the performance of replaced units and components. The units and components concerned are those outside those replaced as part of normal routine, vehicle maintenance (servicing) activities.

Performance criteria

You must be able to:

P1 wear suitable personal protective equipment and use vehicle coverings throughout all removal and replacement activities

P2 support your removal and replacement activities by reviewing:

- P2.1 vehicle technical data
- P2.2 removal and replacement procedures
- P2.3 legal requirements

P3 prepare the vehicle systems and work area for safe working procedures (where appropriate)

P4 prepare, inspect, set up, test and use all the **equipment** required following manufacturers' instructions

P5 carry out all removal and replacement activities following;

- P5.1 manufacturers' instructions
- P5.2 recognised repair methods
- P5.3 health and safety requirements
- P5.4 your workplace procedures

P6 work in a way which minimises the risk of:

- P6.1 damage to other vehicle systems
- P6.2 damage to other vehicle components and units
- P6.3 contact with leakage
- P6.4 contact with hazardous substances
- P6.5 damage to your working environment

P7 ensure replaced transmission or driveline **units and components** conform to the vehicle operating specification and any legal requirements

P8 record and report any additional faults you notice during the course of your work promptly

P9 use suitable **testing methods** to evaluate the performance of the reassembled system accurately

P10 ensure the reassembled transmission or driveline system performs to the vehicle operating specification and meets any legal requirements prior to return to the customer

P11 ensure your records are accurate, complete and passed to the relevant

person(s) promptly in the format required

P12 complete all removal and replacement activities within the agreed timescale

P13 report any expected delays in completion to the relevant person(s) promptly

Knowledge and understanding

Legislative and organisational requirements and procedures

You need to know and understand:

K1 the legal requirements relating to the vehicle

K2 the legislation and workplace procedures relevant to

- K2.1 health and safety
- K2.2 the environment (including waste disposal)
- K2.3 personal and vehicle protective equipment

K3 your workplace procedures for:

- K3.1 recording removal and replacement information
- K3.2 the referral of problems
- K3.3 reporting delays to the completion of work

K4 the importance of documenting removal and replacement information

K5 the importance of working to agreed timescales and keeping others informed progress

K6 the relationship between time and costs

K7 the importance of reporting anticipated delays to the relevant person(s) promptly

Use of technical information

You need to know and understand:

K8 how to find, interpret and use sources of information applicable to units and component removal and replacement within **transmission and driveline systems**

K9 the importance of using the correct sources of technical information

K10 the purpose of and how to use identification codes

Electrical and electronic principles

You need to know and understand:

K11 vehicle earthing principles and earthing methods

K12 electrical and electronic principles associated with **transmission and driveline systems**, including types of sensors and actuators, their application and operation

K13 types of circuit protection and why these are necessary

K14 electrical safety procedures electric symbols, units and terms
K15 electrical and electronic control system principles
K16 the hazards associated with high energy electrical vehicle components

Transmission and driveline system operation and construction

You need to know and understand:

K17 how **transmission and driveline systems** and their related **units and components** are constructed, removed and replaced for the classification of vehicle worked upon
K18 how **transmission and driveline systems** and their related **units and components** operate for the classification of vehicle worked upon

Equipment

You need to know and understand:

K19 how to prepare, inspect, test and use all the removal and replacement **equipment** required

Transmission and driveline system units and components removal and replacement

You need to know and understand:

K20 how to remove and replace **transmission and driveline system** mechanical, electrical and hydraulic **units and components** for the classification of vehicle worked upon
K21 how to file, fit, tap, thread, cut and drill plastics and metals
K22 how to select and use gaskets, sealants, seals, fittings and fasteners
K23 how to test and evaluate the performance of replacement **transmission and driveline system units and components** and the reassembled system against the vehicle operating specifications and any legal requirements
K24 the relationship between **testing methods** and the **transmission and driveline system units and components** replaced – the use of appropriate test methods
K25 when replacement **units and components** must meet the original **equipment** specification (OES) for warranty or other requirements
K26 how to work safely avoiding damage to other vehicle systems, **units and**

components and contact with leakage and hazardous substances

Additional information

Scope/range

1. Equipment is:

1.1. hand tools
1.2. special workshop tools
1.3. general workshop equipment
1.4. electrical testing equipment

2. Testing methods are:

2.1. visual
2.2. aural
2.3. functional
2.4. measurement

3. Units and components are**:**

3.1. mechanical
3.2. electrical
3.3. hydraulic

4. Transmission and driveline systems are:

4.1. gearbox
4.2. hubs and bearings
4.3. final drive assembly
4.4. driveline components (including propeller shafts and drive shafts)
4.5. clutch

Glossary

Agreed timescales:

Examples include: manufacturer's recommended work times, job times set by your company or a job time agreed with a specific customer.

Units and components:

Any unit or component from the transmission and driveline systems defined in the Scoping Statement above.

Functional testing:

Examples include: use of brake roller tester, chassis dynamometer, transmission stall test.

Vehicles:

These can be any of the following – light vehicles. Additionally these vehicles may be SI, CI, Hybrid, Electric or Alternative fuel vehicles.

Alternative Fuel:

This is defined as any type of fuel that may be used to power an internal combustion engine, examples would include LPG, bio ethanol etc.

IMILV12
Remove and replace light vehicle transmission and driveline units and components

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Original URN	LV12
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Suite	Maintenance & Repair - Light Vehicle
Key words	Components; light; vehicle; transmission; gearbox; driveshaft; clutch; differential; driveline; remove; replace

IMILV13
Diagnose and rectify light vehicle transmission and driveline system faults

Overview

This NOS is about diagnosing and rectifying faults occurring within light vehicle gearboxes, hubs and bearings, driveline shafts, clutches, differentials and final drive units.

Performance criteria

You must be able to:

P1 wear suitable personal protective equipment and use vehicle coverings when using **diagnostic methods** and carrying out **rectification activities**

P2 support the identification of **faults**, by reviewing vehicle:

- P2.1 technical data
- P2.2 diagnostic test procedures

P3 prepare the vehicle systems and work area for safe working procedures (where appropriate)

P4 prepare, inspect, test and use all the required **equipment** following manufacturers' instructions

P5 use **diagnostic methods** which are relevant to the symptoms presented

P6 collect diagnostic information in a systematic way relevant to the **diagnostic methods** used

P7 collect sufficient diagnostic information to enable an accurate diagnosis of transmission and driveline system **faults**

P8 identify and record any system deviation from acceptable limits accurately

P9 accurately ensure your assessment of dismantled sub-assemblies, components and units identifies their condition and suitability for repair or replacement inform the relevant person(s) promptly where repairs are uneconomic or unsatisfactory to perform

P10 carry out all diagnostic and **rectification activities** following:

- P10.1 manufacturers' instructions
- P10.2 recognised repair methods
- P10.3 your workplace procedures
- P10.4 health and safety requirements

P11 work in a way which minimises the risk of :

- P11.1 damage to other vehicle systems
- P11.2 damage to other components and units
- P11.3 contact with leakages
- P11.4 contact with hazardous substances

P12 ensure all repaired and replaced components and units conform to the vehicle operating specification and any legal requirements

P13 adjust components and units correctly, when necessary, to ensure that they operate to meet system requirements

P14 record and report any additional **faults** you notice during the course of work promptly

P15 use testing methods which are suitable for assessing the performance of the system rectified

P16 ensure the **transmission and driveline system** rectified performs to the vehicle operating specification and any legal requirements prior to return to the customer

P17 ensure your records are accurate, complete and passed to the relevant person(s) promptly in the format required

P18 complete all system diagnostic activities within the agreed timescale

P19 report any anticipated delays in completion to the relevant person(s) promptly

Knowledge and understanding

Legislative and organisational requirements and procedures

You need to know and understand:

K1 the legislation and workplace procedures relevant to
- K1.1 health and safety
- K1.2 the environment (including waste disposal)
- K1.3 appropriate personal and vehicle protective equipment

K2 legal requirements relating to the vehicle (including road safety requirements)

K3 your workplace procedures for:
- K3.1 recording fault location and correction activities
- K3.2 reporting the results of tests
- K3.3 the referral of problems
- K3.4 reporting delays to the completion of work

K4 the importance of working to recognised diagnostic procedures and processes and obtaining the correct information for diagnostic activities to proceed

K5 the importance of, documenting diagnostic and rectification information

K6 the importance of working to agreed timescales and keeping others informed of progress

K7 the relationship between time, costs and profitability

K8 the importance of reporting anticipated delays to the relevant person(s) promptly

Electrical and electronic principles

You need to know and understand:

K9 electrical and electronic principles associated with **transmission and driveline systems**, including types of sensors and actuators, their application and operation

K10 how electrical and electronic **transmission and driveline systems** operate, including electrical component function, electrical inputs, outputs, voltages and oscilloscope patterns, digital and fibre optics principles

K11 the interaction between electrical, electronic and mechanical components within vehicle **transmission and driveline systems**

K12 how transmission and driveline electrical systems interlink and interact, including multiplexing

K13 electrical symbols, units and terms
K14 electrical safety procedures
K15 the hazards associated with high energy electrical vehicle components

Use of diagnostic and rectification equipment

You need to know and understand:

K16 how to prepare and test the accuracy of **diagnostic testing equipment**
K17 how to use diagnostic and rectification **equipment** for transmission and driveline mechanical, electrical, hydraulic and fluid systems, specialist repair tools and general workshop **equipment**

Vehicle system faults, their diagnosis and correction

You need to know and understand:

K18 how transmission and driveline mechanical, electrical, electronic, hydraulic and fluid systems are constructed and operate
K19 how transmission and driveline mechanical, electrical, electronic, hydraulic and fluid systems are dismantled, reassembled and adjusted to manufacturers' specification
K20 the types and causes of transmission and driveline mechanical, electrical, electronic, hydraulic and fluid system, component and unit **faults** and failures
K21 transmission and driveline mechanical, electrical, hydraulic and fluid component and unit replacement procedures, the circumstances which will necessitate replacement and other possible courses of action
K22 how to find, interpret and use sources of information on transmission and driveline electrical operating specifications, diagnostic test procedures, repair procedures and legal requirements
K23 vehicle operating specifications for limits, fits and tolerances relating to transmission and driveline mechanical, electrical, electronic, hydraulic and fluid systems for the vehicle(s) on which you work
K24 how to select the most appropriate **diagnostic testing** method for the symptoms presented
K25 how to carry out systematic **diagnostic testing** of transmission and driveline mechanical, electrical, electronic, hydraulic and fluid systems using a prescribed process or format

K26 how to assess the condition evident within transmission and driveline mechanical, electrical, electronic, hydraulic and fluid components and units

K27 how to interpret test results and vehicle data in order to identify the location and cause of vehicle system **faults**

K28 how to carry out the **rectification activities** in order to correct **faults** in the transmission and driveline mechanical, electrical, electronic, hydraulic and fluid systems

K29 the relationship between test methodology and the **faults** repaired – the use of appropriate testing methods

K30 how to make cost effective recommendations for rectification

Additional information

Scope/range

1. **Transmission and driveline systems** are:
   - 1.1. gearbox
   - 1.2. hubs and bearings
   - 1.3. final drive assembly
   - 1.4. driveline components
   - 1.5. clutch

2. **Diagnostic methods** are:
   - 2.1. measurement
   - 2.2. functional testing
   - 2.3. electrical and electronic systems testing

3. **Diagnostic Testing** is defined as:
   - 3.1. verify the fault
   - 3.2. collect further information
   - 3.3. evaluate the evidence
   - 3.4. carry out further tests in a logical sequence
   - 3.5. rectify the problem
   - 3.6. check all systems

4. **Equipment** is:
   - 4.1. diagnostic and rectification equipment for transmission mechanical systems
   - 4.2. diagnostic and rectification equipment for transmission electrical systems
   - 4.3. diagnostic and rectification equipment for transmission hydraulic and fluid systems
   - 4.4. specialist repair tools
   - 4.5. general workshop equipment

5. **Faults** are:
   - 5.1. mechanical

5.2. electrical and electronic

5.3. hydraulic and fluid

6. **Rectification activities** are defined as:
A suitable repair of replacement that rectifies the fault(s) identified form the diagnostic activities carried out.

Glossary

Agreed timescales:

Examples include: manufacturers' recommended work times, job times set by your company or a job time agreed with a specific customer.

Transmission and driveline system fault:

These are faults that require a multi stage inspection and a series of test results to identify the cause.

Diagnostic information:

This relates to mechanical condition, including wear, run out, pressures, flow, leakage and electrical measurements such as voltage and pulse displays, electronic systems data, including fault codes, sensor measurements and control unit outputs and/or signals.

Functional testing:

Examples include performance testing and road testing where relevant.

Hydraulic and fluid systems:

Examples include oil coolers, oil pumps and torque converters.

Transmission Area:

Clutch assemblies, clutch operating systems, manual and automatic gear boxes (including electronic control), drivelines, hubs and final drive assemblies.

Recommendations:

Examples include: servicing, dismantling for further inspection and test, repair and replacement.

Vehicles:

These can be any of the following – light vehicles. Additionally these vehicles may be SI, CI, Hybrid, Electric or Alternative fuel vehicles.

Alternative Fuel:

This is defined as any type of fuel that may be used to power an internal combustion engine, examples would include LPG, bio ethanol etc.

IMILV13
Diagnose and rectify light vehicle transmission and driveline system faults

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Original URN	LV13
Relevant occupations	Engineering; Vehicle Trades; Light Vehicle Diagnostic Technician (Automotive)
Suite	Maintenance & Repair - Light Vehicle
Key words	Diagnose; rectify; motor; vehicle; transmission; driveline; faults; clutch; gearbox; hubs; driveshaft

IMILV14
Diagnose faults where no prescribed process or format is available in light vehicle environments

Overview

This NOS is about devising and implementing strategies to diagnose faults when the application of standard manufacturer diagnostic procedures has failed to reveal the source and cause of problems. You are also required to identify the best course of action to be taken to correct problems.

Performance criteria

You must be able to:

P1 wear suitable personal protective equipment and use vehicle coverings throughout all diagnostic related activities in the workshop

P2 confirm with the relevant people that all standard diagnostic procedures and techniques have been systematically and correctly applied to the vehicle prior to undertaking further work

P3 prepare the vehicle systems and work area for safe working procedures (where appropriate)

P4 analyse all previous system fault information, diagnostic test methods and results correctly to verify the inconclusive results prior to undertaking further work

P5 liaise with the relevant manufacturer's representative to obtain up to date information, advice and guidance relevant to the identified fault, when necessary

P6 use **diagnostic methods** which are relevant to the symptoms presented

P7 collect diagnostic information in a systematic and structured way which progressively eliminates all possible **causes of the fault**

P8 apply the checks and tests that are most likely to be effective in revealing the **cause of the fault**

P9 carry out all diagnostic activities following:

- P9.1 your workplace procedures
- P9.2 health and safety requirements
- P9.3 environmental requirements

P10 work in a way which minimises the risk of:

- P10.1 damage to other vehicle systems
- P10.2 damage to other components and units
- P10.3 contact with leakages
- P10.4 contact with hazardous substances

P11 use any **equipment** required, correctly and safely throughout all diagnostic and **rectification activities**

P12 collect sufficient diagnostic information to enable an accurate diagnosis of the fault

P13 correctly identify the **cause(s) of the fault**

P14 identify and record any system deviation from acceptable limits accurately

P15 accurately ensure your assessment of dismantled sub-assemblies, components and units identifies their condition and suitability for repair or replacement

P16 make clear recommendations for a suitable course of action to rectify the fault

P17 inform the relevant person(s) promptly where repairs are uneconomic or unsatisfactory to perform

P18 complete all system checks and tests in the most cost and time effective way for the fault presented

P19 complete all system diagnostic activities within the agreed timescale

P20 ensure your records are accurate, complete and passed to the relevant person(s) promptly in the format required

P21 report any anticipated delays in completion to the relevant person(s) promptly

Knowledge and understanding

Legislative and organisational requirements and procedures

You need to know and understand:

K1 the legislation and workplace procedures relevant to
- K1.1 health and safety
- K1.2 the environment (including waste disposal)
- K1.3 appropriate personal and vehicle protective equipment

K2 legal requirements relating to the vehicle (including road safety requirements)

K3 your workplace procedures for:
- K3.1 recording fault location and correction activities
- K3.2 reporting the results of tests
- K3.3 the referral of problems
- K3.4 reporting delays to the completion of work

K4 how to formulate and construct your own diagnostic procedures and processes in order for diagnostic activities to proceed

K5 the importance of documenting diagnostic and rectification information

K6 the importance of working to agreed timescales and keeping others informed progress

K7 the relationship between time, costs and profitability

K8 the importance of reporting anticipated delays to the relevant person(s) promptly

Electrical and electronic principles

You need to know and understand:

K9 electrical and electronic principles including types of sensors and actuators, their application and operation

K10 how electrical and electronic vehicle systems operate, including electrical component function, electrical inputs, outputs, voltages and oscilloscope patterns, digital and fibre optics principles

K11 the interaction between electrical, electronic, mechanical and hydraulic components and systems within a vehicle, including multiplexing

K12 electrical symbols, units and terms

K13 electrical safety procedures

K14 the hazards associated with high energy electrical vehicle components

Use of diagnostic and rectification equipment

You need to know and understand:

K15 how to prepare and test the accuracy of **diagnostic testing equipment**

K16 how to use diagnostic and rectification **equipment** for mechanical, electrical, hydraulic and fluid systems, specialist repair tools and general workshop **equipment**

Vehicle system faults, their diagnosis and correction

You need to know and understand:

K17 how vehicle mechanical, electrical, electronic, hydraulic and fluid systems are constructed and operate

K18 how vehicle mechanical, electrical, electronic, hydraulic and fluid systems are dismantled, reassembled and adjusted to manufacturers' specification

K19 the types and **causes** of vehicle mechanical, electrical, electronic, hydraulic and fluid system, component and units **faults** and failures

K20 vehicle mechanical, electrical, electronic, hydraulic and fluid component and units replacement procedures, the circumstances which will necessitate replacement and other possible courses of action

K21 how to find, interpret and use sources of information on vehicle mechanical, electrical, electronic, hydraulic and fluid system **operating specifications**, diagnostic test procedures, repair procedures and legal requirements

K22 how to select the most appropriate **diagnostic testing** method for the symptoms presented

K23 how to carry out systematic **diagnostic testing** of vehicle mechanical, electrical, electronic, hydraulic and fluid systems

K24 how to interpret, evaluate and analyse test results and vehicle data in order to identify the location and **cause** of vehicle system **faults**

K25 how to carry out the **rectification activities** in order to correct **faults** in vehicle mechanical, electrical, electronic, hydraulic and fluid systems

K26 your workplace procedure, policy and procedure for:

K26.1 work carried out under warranty

K26.2 liaising with manufacturers and outside agencies

K27 the relationship between test methodology and the **faults** repaired – the use of

appropriate testing methods

K28 how to make cost effective recommendations for rectification

Additional information

Scope/range

1. **Causes of faults** are:
   - 1.1. mechanical
   - 1.2. electrical
   - 1.3. electronic
   - 1.4. hydraulic

2. **Faults** cover the:
   - 2.1. vehicle engine area
   - 2.2. transmission and driveline area
   - 2.3. chassis system area
   - 2.4. electrical and electronic units and components area

3. **Diagnostic methods** are:
   - 3.1. measurement
   - 3.2. functional testing
   - 3.3. electrical and electronic systems testing

4. **Diagnostic Testing** is defined as:
   - 4.1. verify the fault
   - 4.2. collect further information
   - 4.3. evaluate the evidence
   - 4.4. carry out further tests in a logical sequence
   - 4.5. rectify the problem
   - 4.6. check all systems

5. **Equipment** is:
   - 5.1. diagnostic and rectification equipment for mechanical systems
   - 5.2. diagnostic and rectification equipment for electrical and electronic systems
   - 5.3. diagnostic and rectification equipment for hydraulic and fluid systems
   - 5.4. specialist repair tools
   - 5.5. general workshop equipment

6. **Rectification activities** are defined as:
   A suitable repair, replacement, re-coding or re-programming that rectifies the fault(s) identified from the diagnostic activities carried out.

7. **Operating specifications** include**:**
   7.1. limits
   7.2. fits
   7.3. tolerances

Glossary

Diagnostic Equipment:

Examples include electronic testing equipment, brake testing equipment, steering geometry equipment, wheel balancing equipment, emission test equipment, measuring instruments, special service tools, charging service stations, noise and vibration detection equipment.

Recommendations:

Examples include: dismantling, return to manufacturer, repair or replacement.

Vehicles:

These can be any of the following – light vehicles. Additionally these vehicles may be SI, CI, Hybrid, Electric or Alternative fuel vehicles.

Alternative Fuel:

This is defined as any type of fuel that may be used to power an internal combustion engine, examples would include LPG, bio ethanol etc.

VEHICLE AREAS COVERED BY THIS NOS:

Vehicle Engine Area:

Engines, cooling systems, electronic ignition, petrol fuel injection, diesel fuel injection, engine management systems

Transmission and Driveline Area:

Clutch assemblies, clutch operating systems, manual gear boxes, automatic gear boxes (including electronic control), drivelines and hubs and final drive assemblies.

Chassis or Frame Area:

Suspension systems, assisted steering systems, non-assisted steering systems, braking systems, ABS/traction control, wheels and tyres, stability systems, bodywork and related areas.

Electrical and Electronic Area:

Starting systems, charging system, body electrical systems (including wiring harnesses, lighting systems, auxiliaries, CANBUS systems, fibre optics, vehicle condition and monitoring, comfort and convenience, alarm systems), supplementary restraint systems (SRS), heating and air conditioning systems, climate control, communication equipment, navigation systems and entertainment equipment.

IMILV14
Diagnose faults where no prescribed process or format is available in light vehicle environments

Developed by	IMI
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Date approved	December 2013
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Validity	Current
Status	Original
Originating organisation	IMI Ltd
Original URN	LV14
Relevant occupations	Engineering; Vehicle Trades; Light Vehicle Diagnostic Technician (Automotive); Light Vehicle Master Technician (Automotive); Light Vehicle Fleet/Service Manager (Automotive)
Suite	Maintenance & Repair - Light Vehicle
Key words	Diagnose; faults; prescribed; process; format; motor; vehicle; guided; diagnosis

IMILV15
Provide technical support and advice to colleagues in light vehicle environments

Overview

This NOS is about providing a range of technical support to other workshop colleagues. It includes ensuring technical information is up to date and giving technical advice, instruction and briefings to colleagues.

Performance criteria

You must be able to:

P1 check vehicle technical **information** is up to date and accessible to workshop staff

P2 check staff have the correct technical resources to carry out their work

P3 identify any additional resources required correctly and promptly

P4 report any problems affecting the operation of the workshop to your manager promptly

P5 respond to requests for technical help and **advice** promptly and positively

P6 provide colleagues with clear instruction on:

- P6.1 product updates
- P6.2 technical tasks
- P6.3 what the results should be
- P6.4 how they should perform tasks
- P6.5 the standard that must be achieved

P7 deliver technical instruction and demonstrations in a manner and at a speed that is appropriate to the individual(s) concerned

P8 give on-going technical support and **advice** to colleagues

P9 ensure your support and **advice** is technically accurate and in line with manufacturers' instructions and your organisation's requirements

P10 choose the most effective situation for giving support and **advice** to colleagues

P11 give colleagues time to consider your response and give further explanation when appropriate, checking they have fully understood

P12 identify and correct mistakes in a way that supports your colleagues' self confidence and praise them when they perform tasks correctly

P13 check the work of colleagues at regular intervals and take prompt action to resolve problems

P14 suggest possible methods for improving the work of colleagues to your manager, when necessary

P15 carry out your checks in a cost effective and efficient manner that is not detrimental to the smooth running of the workshop

Knowledge and understanding

Legislative and organisational requirements and procedures

You need to know and understand:

K1 the legislation and workplace procedures relevant to:
- K1.1 health and safety
- K1.2 the environment (including waste disposal)
- K1.3 appropriate personal and vehicle protective equipment

K2 legal requirements relating to the vehicle (including road safety requirements)

K3 your workplace procedures for:
- K3.1 recording fault location and correction activities
- K3.2 reporting the results of tests
- K3.3 the referral of problems
- K3.4 reporting delays to the completion of work
- K3.5 gaining up to date technical **information** and repair methods

K4 the importance of working to recognised diagnostic procedures and processes and obtaining the correct **information** for diagnostic activities to proceed and how to formulate and construct your own diagnostic procedures and processes in order for diagnostic activities to proceed

K5 the importance of documenting diagnostic and rectification **information**

K6 the importance of working to agreed timescales and keeping others informed

K7 the relationship between time, costs and profitability

K8 the importance of reporting anticipated delays to the relevant person(s) promptly

Electrical and electronic principles

You need to know and understand:

K9 electrical and electronic principles including types of sensors and actuators, their application and operation

K10 how electrical and electronic vehicle systems operate, including electrical component function, electrical inputs, outputs, voltages and oscilloscope patterns, digital and fibre optics principles

K11 the interaction between electrical, electronic, mechanical and hydraulic components and systems within a vehicle, including multiplexing

K12 electrical symbols, units and terms

K13 electrical safety procedures

K14 the hazards associated with high energy electrical vehicle components

Use of diagnostic and rectification equipment

You need to know and understand:

K15 how to prepare and test the accuracy of diagnostic testing equipment

K16 how to use diagnostic and rectification equipment for mechanical, electrical, hydraulic and fluid systems, specialist repair tools and general workshop equipment

Vehicle system faults, their diagnosis and correction

You need to know and understand:

K17 how vehicle mechanical, electrical, electronic, hydraulic and fluid systems are constructed and operate

K18 how vehicle mechanical, electrical, electronic, hydraulic and fluid systems are dismantled, reassembled and adjusted to manufacturers' specifications

K19 the types and causes of vehicle mechanical, electrical, electronic, hydraulic and fluid system, component and unit faults and failures

K20 vehicle mechanical, electrical, electronic, hydraulic and fluid component and unit replacement procedures, the circumstances which will necessitate replacement and other possible courses of action

K21 how to find, interpret and use sources of **information** on vehicle mechanical, electrical, electronic, hydraulic and fluid system **operating specifications**, diagnostic test procedures, repair procedures and legal requirements

K22 how to select the most appropriate diagnostic testing method for the symptoms presented

K23 how to carry out systematic diagnostic testing of vehicle mechanical, electrical, electronic, hydraulic and fluid systems

K24 how to interpret, evaluate and analyse test results and vehicle data in order to identify the location and cause of vehicle system faults

K25 how to carry out the rectification activities in order to correct faults in the vehicle mechanical, electrical, electronic, hydraulic and fluid systems

K26 your workplace policy and procedure for:

K26.1 work carried out under warranty

K26.2 liaising with manufacturers and outside agencies

K27 the relationship between test methodology and the faults repaired – the use of appropriate testing methods

K28 how to make cost effective recommendations for rectification

Personal Skills

You need to know and understand:

K29 how to give straightforward presentations on technical matters

K30 how to file and store technical **information**

K31 how to instruct colleagues and demonstrate tasks clearly and correctly

K32 how to conduct effective checks of your colleague's work

K33 how to choose the best action to take when work is not in line with requirements

K34 how to discuss colleagues' work with them in a way that will encourage them to be positive and not lead to conflict

K35 how to give **advice** and **guidance** in a way that is appropriate to the colleague you are supporting

K36 how to recognise a training need

K37 what might happen if you undermine colleagues' self confidence when correcting mistakes

K38 the importance of liaising with your manager when evaluating others' work and giving feedback

K39 the importance of continuous development and learning

Additional information

Scope/range

1. **Information, Advice** and **Guidance** may be about any of the following:
   - 1.1. mechanical fault finding
   - 1.2. electrical fault finding
   - 1.3. electronic fault finding
   - 1.4. hydraulic fault finding
   - 1.5. customer handling
   - 1.6. road testing
   - 1.7. time
   - 1.8. tools
   - 1.9. equipment
   - 1.10. materials
   - 1.11. technical information

2. **Operating specifications** include**:**
   - 2.1. limits
   - 2.2. fits
   - 2.3. tolerances

Glossary

Manufacturers:

Examples include vehicle and original equipment manufacturers.

Methods for improving the work of colleagues:

Examples include further training, on-the-job coaching, giving people more appropriate responsibilities.

Problems:

Examples include equipment, tool and material shortfalls and faults; requirements for new resources; lack of technical information; staffing or workload problems; training needs etc.

Situation for giving support and advice:

Examples include one-to-one during a work activity, one-to-one away from a work activity, to the whole team.

Support and advice:

Examples include demonstrations, instruction and briefings

Technical information:

This could be hard copy, electronic information or verbal advice.

VEHICLE AREAS COVERED BY THIS NOS:

Vehicles:

These can be any of the following – light vehicles. Additionally these vehicles may be SI, CI, Hybrid, Electric or Alternative fuel vehicles.

Alternative Fuel:

This is defined as any type of fuel that may be used to power an internal combustion engine, examples would include LPG, bio ethanol etc.

Vehicle Engine Area:

Engines, cooling systems, electronic ignition, petrol fuel injection, diesel fuel injection, engine management systems

Transmission and Driveline Area:

Clutch assemblies, clutch operating systems, manual gear boxes, automatic gear boxes (including electronic control), drivelines and hubs and final drive assemblies.

Chassis or Frame Area:

Suspension systems, assisted steering systems, non-assisted steering systems, braking systems, ABS/traction control, wheels and tyres, stability systems, bodywork and related areas.

Electrical Area:

Starting systems, charging system, body electrical systems (including wiring harnesses, lighting systems, auxiliaries, CANBUS systems, fibre optics, vehicle condition and monitoring, comfort and convenience, alarm systems), supplementary restraint systems (SRS), heating and air conditioning systems, climate control, communication equipment, navigation systems and entertainment equipment.

IMILV15
Provide technical support and advice to colleagues in light vehicle environments

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Original URN	LV15
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Suite	Maintenance & Repair - Light Vehicle
Key words	Technical; support; advice; colleagues; motor; vehicle; light

IMILV16
Liaise with light vehicle and product manufacturers on technical matters

Overview

This NOS covers obtaining and providing information to and from light vehicle manufacturers and suppliers for diagnostic activities, warranty activities, repairs and to support product development.

Performance criteria

You must be able to:

P1 be aware of current technical developments and **information** for the vehicles you handle

P2 seek assistance from manufacturers only when the prescribed diagnostic processes have failed

P3 provide **information** at the level of detail necessary and in a form and manner which the recipient will understand and accept

P4 report technical problems and quality issues promptly in line with manufacturer's requirements

P5 collect sufficient, detailed **information** on the vehicle, the problem and action taken prior to contacting the manufacturer

P6 ensure requests for **information** to manufacturers are made clearly and promptly

P7 respond to requests for **information** from manufacturers within the specified timescale

P8 ensure all **information** received from manufacturers is passed on to the relevant person(s) promptly

P9 report any anticipated delays in obtaining or providing **information** to the relevant person(s) promptly

P10 ensure your reports and technical **information** are complete, accurate and in the format required

P11 suggest possible methods for improving the reporting process to your manager, when necessary

P12 carry out your reporting in an effective and efficient manner that is not detrimental to the smooth running of the workshop

Knowledge and understanding

Legislative and organisational requirements and procedures

You need to know and understand:

K1 the legislation and workplace procedures relevant to:
- K1.1 health and safety
- K1.2 the environment (including waste disposal)
- K1.3 appropriate personal and vehicle protective equipment

K2 legal requirements relating to the vehicle (including road safety requirements)

K3 your workplace procedures for:
- K3.1 recording fault location and correction activities
- K3.2 reporting the results of tests
- K3.3 the referral of problems
- K3.4 reporting delays to the completion of work
- K3.5 gaining up to date technical **information** and repair methods
- K3.6 recording contact with suppliers, manufacturers and suppliers

K4 the importance of working to recognised diagnostic procedures and processes and obtaining the correct **information** for diagnostic activities to proceed and how to formulate and construct your own diagnostic procedures and processes in order for diagnostic activities to proceed

K5 the importance of documenting diagnostic and rectification **information**

K6 the importance of working to agreed timescales and keeping others informed of progress and delays

K7 the relationship between time, costs and profitability

Electrical and electronic principles

You need to know and understand:

K8 the hazards associated with high energy electrical vehicle components

K9 electrical and electronic principles including types of sensors and actuators, their application and operation

K10 how electrical and electronic vehicle systems operate, including electrical component function, electrical inputs, outputs, voltages and oscilloscope patterns, digital and fibre optics principles

K11 the interaction between electrical, electronic, mechanical and hydraulic components and systems within a vehicle, including multiplexing

K12 electrical symbols, units and terms

K13 electrical safety procedures

Use of diagnostic and rectification equipment

You need to know and understand:

K14 how to prepare and test the accuracy of diagnostic testing equipment

K15 how to use diagnostic and rectification equipment for mechanical, electrical, electronic, hydraulic and fluid systems, specialist repair tools and general workshop equipment

Vehicle faults, their diagnosis and correction

You need to know and understand:

K16 how vehicle mechanical, electrical, electronic, hydraulic and fluid systems are constructed, dismantled, reassembled and operate

K17 the types and causes of vehicle mechanical, electrical, electronic, hydraulic and fluid system, component and unit faults and failures

K18 vehicle mechanical, electrical, electronic, hydraulic and fluid component and unit replacement procedures, the circumstances which will necessitate replacement and other possible courses of action

K19 how to find, interpret and use sources of **information** on vehicle mechanical, electrical, electronic, hydraulic and fluid system specifications, diagnostic test procedures, repair procedures and legal requirements

K20 how to select the most appropriate diagnostic testing method for the symptoms presented

K21 how to carry out systematic diagnostic testing of vehicle mechanical, electrical, electronic, hydraulic and fluid systems

K22 how to interpret, evaluate and analyse test results and vehicle data in order to identify the location and cause of vehicle system faults

K23 how to carry out the rectification activities in order to correct faults in the vehicle mechanical, electrical, electronic, hydraulic and fluid systems

K24 your workplace procedure and policy for:

K24.1 work carried out under warranty

K24.2 liaising with manufacturers and outside agencies

K25 the relationship between test methodology and the faults repaired – the use of

appropriate testing methods

K26 how to make cost effective recommendations for rectification

Personal Skills

You need to know and understand:

K27 how to communicate effectively with manufacturers, managers, colleagues and customers

K28 how to access the reporting system

K29 how to process **information** and compile reports

K30 when it is appropriate to contact the manufacturer and or supplier

K31 the limits of your authority and that of the designated personnel when liaising with the manufacturer or supplier

Additional information

Scope/range

1. **Information** may be about any of the following:

1.1. mechanical fault finding
1.2. electrical fault finding
1.3. electronic fault finding
1.4. hydraulic fault finding
1.5. customer handling
1.6. road testing
1.7. time
1.8. tools
1.9. equipment
1.10. materials
1.11. technical information

IMILV16
Liaise with light vehicle and product manufacturers on technical matters

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Original URN	LV16
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Suite	Maintenance and Repair - Light Vehicle
Key words	Liaise; light; vehicles; product; manufacturers; technical; warranty

IMILV17
Provide diagnostic equipment and technical information system support in light vehicle environments

Overview

This NOS covers the updating of technical information systems and diagnostic equipment. It also includes testing for, and rectifying, equipment and system problems.

Performance criteria

You must be able to:

- P1 use safe working practices when dealing with diagnostic equipment and technical information systems
- P2 ensure installation of updates is carried out promptly following delivery
- P3 load software correctly following the manufacturer's instructions
- P4 set the configuration options according to:
  - P4.1 manufacturers specification
  - P4.2 your workplace procedures
  - P4.3 your workplace preferences
- P5 take prompt and effective corrective actions to **resolve any errors** occurring during the loading of the software within the limits of your workplace responsibilities
- P6 complete any specified product registration procedures promptly and accurately, when necessary
- P7 inform all relevant persons of the completion of the software installation promptly
- P8 advise the relevant people of any new features and changes to existing functionality promptly
- P9 effectively test the diagnostic equipment and technical information system using the specified self test function(s) to identify the **cause** and solution in the event of a **fault**
- P10 take prompt and effective actions to resolve any identified problems in diagnostic equipment and technical information systems using the self test instructions
- P11 contact external support services only when the self test function fails to identify the **cause** of and solution to problems
- P12 promptly and clearly inform the relevant person(s) of any unresolved loading **errors** and equipment problems
- P13 source alternative diagnostic equipment if equipment has to be sent away for repair and inform the relevant person (s) promptly
- P14 inform the relevant person(s) promptly if equipment has to be sent away for repair

Knowledge and understanding

Legislative and organisational requirements and procedures

You need to know and understand:

K1 the legislation and workplace procedures relevant to:
- K1.1 health and safety
- K1.2 the environment (including waste disposal)
- K1.3 appropriate diagnostic equipment, personal and vehicle protective equipment

K2 your workplace procedures for:
- K2.1 obtaining diagnostic software updates
- K2.2 loading technical information system and diagnostic software to specified destinations
- K2.3 ordering and fitting diagnostic equipment and technical system equipment replacement and spare parts
- K2.4 informing others that a technical / software update has taken place

K3 the importance of recording the version number / issue date of the software and updates used

K4 how to effectively **solve minor errors** in the loading of technical information system and diagnostic software

K5 how to accurately complete product registration procedures

K6 how to set the configuration options

K7 how to identify and resolve equipment and technical information system problems using the self test function(s) and external support services

K8 how to access system support services

K9 diagnostic equipment and technical information system software loading instructions

K10 the common types and **causes** of errors that can arise during loading of diagnostic equipment and technical information systems software

K11 the need for correct configuration settings

K12 the procedures for reporting problems

K13 the legal requirements governing the use of software

K14 why the prompt installation of software is important

K15 when to apply self test function(s)

K16 the importance of advising people of changes to diagnostic equipment

functionality promptly

K17 the importance of reporting equipment / software **faults** and failures to the relevant person(s) promptly

Additional information

Scope/range

1. **Causes of faults** are:
   - 1.1. mechanical
   - 1.2. electrical
   - 1.3. electronic

2. **Faults** cover:
   - 2.1. software
   - 2.2. hardware

3. **Solving minor errors** are defined as:
   A suitable repair, replacement, re-coding or re-programming that rectifies the fault(s) identified

Glossary

Problems:

Examples include damaged leads, damaged ports, corrupt software, faulty equipment, lack of connectivity between vehicle and diagnostic test equipment, lack of connectivity between diagnostic test equipment and the workshop information system.

IMILV17
Provide diagnostic equipment and technical information system support in light vehicle environments

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Suite	Maintenance & Repair - Light Vehicle
Key words	Diagnostic; equipment; technical; information; system; support; motor; vehicle

IMILV18
Conduct diagnostic consultations with customers in light vehicle environments

Overview

This NOS is about carrying out diagnostic consultations with customers to investigate their concerns relating to their vehicle. It includes making recommendations to ensure that the customer's concerns are addressed and explaining the results of diagnostic activities to enable customers to fully understand the problem(s) with their vehicle.

Performance criteria

You must be able to:

- P1 respond to customer's concerns in a positive and friendly manner
- P2 give a positive impression of yourself and your organisation when dealing with customers
- P3 obtain sufficient, detailed **information** using suitably structured questions
- P4 carry out a suitable road test to obtain further detailed **information** on, or clarification of, customer's concerns, when appropriate
- P5 provide customers with accurate, current and relevant **advice and information** on any further investigation(s) needed
- P6 explain the implications of any investigation(s) that may be needed clearly
- P7 give technical **advice and information** accurately, clearly and in a form and manner which the customer will understand
- P8 make clear and relevant recommendations for the next course of action
- P9 liaise with the customer or other relevant person(s) to agree the next course of action
- P10 explain to customers the action that has been taken regarding their vehicle clearly and in a manner the customer will understand, when appropriate
- P11 ensure your records are complete, accurate, in the format required and signed by the customer, when necessary
- P12 suggest possible methods for improving the customer care process to your manager, when necessary

Knowledge and understanding

Legislative and organisational requirements and procedures

You need to know and understand:

K1 the legislation and workplace procedures relevant to:
- K1.1 health and safety
- K1.2 the environment (including waste disposal)
- K1.3 appropriate personal and vehicle protective equipment

K2 legal requirements relating to the vehicle (including road safety requirements)

K3 your workplace procedures for:
- K3.1 recording fault location and correction activities
- K3.2 reporting the results of tests
- K3.3 the referral of problems
- K3.4 gaining up to date technical **information** and repair methods

K4 the importance of working to recognised diagnostic procedures and processes and obtaining the correct **information** for diagnostic activities to proceed and how to formulate and construct your own diagnostic procedures and processes in order for diagnostic activities to proceed

K5 the importance of documenting diagnostic and rectification **information**

K6 the relationship between time, costs and profitability

Electrical and electronic principles

You need to know and understand:

K7 the hazards associated with high energy electrical vehicle components

K8 electrical and electronic principles including types of sensors and actuators, their application and operation

K9 how electrical and electronic vehicle systems operate, including electrical component function, electrical inputs, outputs, voltages and oscilloscope patterns, digital and fibre optics principles

K10 the interaction between electrical, electronic, mechanical and hydraulic components and systems within a vehicle, including multiplexing

K11 electrical symbols, units and terms

K12 electrical safety procedures

Use of diagnostic and rectification equipment

You need to know and understand:

K13 how to prepare and test the accuracy of diagnostic testing equipment

K14 how to use diagnostic and rectification equipment for mechanical, electrical, electronic, hydraulic and fluid systems, specialist repair tools and general workshop equipment

Vehicle system faults, their diagnosis and correction

You need to know and understand:

K15 how vehicle mechanical, electrical, electronic, hydraulic and fluid systems are constructed and operate

K16 the types and causes of vehicle mechanical, electrical, electronic, hydraulic and fluid system, component and unit faults and failures

K17 vehicle mechanical, electrical, electronic, hydraulic and fluid component and unit replacement procedures, the circumstances which will necessitate replacement and other possible courses of action

K18 how to find, interpret and use sources of **information** on vehicle mechanical, electrical, electronic, hydraulic and fluid system **operating specifications**, diagnostic test procedures, repair procedures and legal requirements

K19 how to select the most appropriate diagnostic testing method for the symptoms presented

K20 how to carry out systematic diagnostic testing of vehicle mechanical, electrical, electronic, hydraulic and fluid systems

K21 how to interpret, evaluate and analyse test results and vehicle data in order to identify the location and cause of vehicle system faults

K22 how to carry out the rectification activities in order to correct faults in the vehicle mechanical, electrical, electronic, hydraulic and fluid systems

K23 your workplace policy and procedure for:

K23.1 work carried out under warranty

K23.2 liaising with manufacturers and outside agencies

K24 the relationship between test methodology and the faults repaired – the use of appropriate testing methods

K25 how to make cost effective recommendations for rectification

Personal Skills

You need to know and understand:	K26	how to give straightforward presentations on technical matters
	K27	how to communicate effectively with and listen to customers
	K28	how to recognise and handle different customer reactions
	K29	how to adapt your language when explaining technical matters to customers
	K30	how to use effective questioning techniques
	K31	how to care for customers and achieve customer satisfaction
	K32	your organisation's requirements for personal appearance and conduct when dealing with customers
	K33	how successful resolution of customer concerns and problems contributes to customer loyalty and improves relationships

Additional information

Scope/range

1. **Information, Advice** and **Guidance** may be about any of the following:

1.1. mechanical fault finding
1.2. electrical fault finding
1.3. electronic fault finding
1.4. hydraulic fault finding
1.5. customer handling
1.6. road testing
1.7. time
1.8. tools
1.9. equipment
1.10. materials
1.11. technical information

2. **Operating specifications** include**:**

2.1. limits
2.2. fits
2.3. tolerances

Glossary

Courses of action:

Examples include servicing, repair, replacement and customising vehicle features, no action, explanation of the correct operation of the vehicle and its systems.

Customer Reactions:

Examples include anger, confusion and frustration.

Diagnostic consultation:

Examples include face to face and telephone questioning, road tests (very often these will take place with customers to identify and resolve their concerns). It also includes giving technical advice and product information and clarification of technical issues after diagnostic work has been completed.

Relevant person(s):

Examples include managers, vehicle manufacturer and original equipment manufacturers.

VEHICLE AREAS COVERED BY THIS NOS:

Vehicles:

These can be any of the following – light vehicles. Additionally these vehicles may be SI, CI, Hybrid, Electric or Alternative fuel vehicles.

Alternative Fuel:

This is defined as any type of fuel that may be used to power an internal combustion engine, examples would include LPG, bio ethanol etc.

Vehicle Engine Area:

Engines, cooling systems, electronic ignition, petrol fuel injection, diesel fuel injection, engine management systems, hybrid systems and alternative fuels

Transmission and Driveline Area:

Clutch assemblies, clutch operating systems, manual gear boxes, automatic gear boxes (including electronic control), drivelines and hubs and final drive assemblies.

Chassis or Frame Area:

Suspension systems, assisted steering systems, non-assisted steering systems, braking systems, ABS/traction control, wheels and tyres, stability systems, bodywork and related areas.

Electrical Area:

Starting systems, charging system, body electrical systems (including wiring harnesses, lighting systems, auxiliaries, CANBUS systems, fibre optics, vehicle condition and monitoring, comfort and convenience, alarm systems), supplementary restraint systems (SRS), heating and air conditioning systems, climate control, communication equipment, navigation systems and entertainment equipment.

IMILV18
Conduct diagnostic consultations with customers in light vehicle environments

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Suite	Maintenance & Repair - Light Vehicle
Key words	Diagnostic; consultations; customers; motor; vehicle; light

IMILVBP18

remove and fit basic motor Mechanical, Electrical and Trim (MET) components and non permanently fixed vehicle body panels

Overview

This NOS is about the straightforward removal and fitting of basic mechanical, electrical and trim (MET) components to vehicles. It is also about checking the operation of the components fitted.

IMILVBP18

Remove and fit basic motor Mechanical, Electrical and Trim (MET) components and non permanently fixed vehicle body panels

Performance criteria

You must be able to:

P1 use the appropriate personal protective equipment when removing and fitting **basic MET components and non welded non-structural body panels**

P2 protect the vehicle and its contents effectively when removing and fitting **basic MET components and non welded non-structural body panels**

P3 select and use the correct **tools and equipment** for the panels or components you are going to remove or fit

P4 ensure that the **tools and equipment** you require are in a safe working condition

P5 remove and fit **basic MET components and non welded non-structural body panels** following:

- P5.1 removal and fitting procedures
- P5.2 manufacturers' instructions
- P5.3 your workplace procedures
- P5.4 health, safety and legal requirements

P6 avoid damaging other components, units and panels on the vehicle

P7 store all removed panels and components safely in the correct location

P8 realign the panels and components you have fitted correctly in a way which regains their original manufactured gaps

P9 check that the components you have fitted operate correctly following the manufacturer's specification

P10 report any additional faults you find during the course of your work to the relevant person(s) promptly

P11 report any delays in completing your work to the relevant person(s) promptly

P12 remove and fit **basic MET components or non welded non-structural body panels** within the agreed timescale

P13 complete work records accurately, in the format required and pass them to the relevant person(s) promptly

IMILVBP18

Remove and fit basic motor Mechanical, Electrical and Trim (MET) components and non permanently fixed vehicle body panels

Knowledge and understanding

You need to know and understand:

Legislative and organisational requirements and procedures

K1 the health, safety and legal requirements relating to the removal and fitting of **basic MET components and non welded non-structural body panels**

K2 your workplace procedures for:

- K2.1 the referral of problems
- K2.2 reporting of delays to the completion of work
- K2.3 completion of work records

K3 the work that needs to be done and the standard required

K4 the requirements for protecting the vehicle and contents from damage before, during and after removing and fitting activities

K5 the importance of selecting, using and maintaining the appropriate personal protective equipment when removing and fitting **basic MET components and non welded non-structural body panels**

Removing and fitting basic MET components

K6 how to find, interpret and use sources of information applicable to the removal and fitting of **basic MET components and non welded non-structural body** panels

K7 how to select, check and use all the tools and equipment required to remove and fit **basic MET components and non welded non-structural body** panels

K8 the correct procedures for removing and fitting basic MET components and **non welded non-structural body panels**

K9 the correct procedures for working with supplementary safety systems when fitting and removing **basic MET components and non welded non- structural body panels**

K10 the correct procedures for working with Gas Discharge headlight systems and when fitting and removing **basic MET components and non welded non- structural body panels**

K11 the methods of storing removed panels and components and the importance of storing them correctly

K12 the different types of fastenings and fixings and the reasons for their use

K13 the need for correct alignment of panels and components and the correct methods used to achieve this

K14 the types of quality checks that can be used to ensure correct alignment and operation of components to manufacturer's specification and their purpose

IMILVBP18

Remove and fit basic motor Mechanical, Electrical and Trim (MET) components and non permanently fixed vehicle body panels

Additional Information

Scope/range related to performance criteria

1. **Basic MET components includes:**
   - 1.1. bumpers
   - 1.2. headlamp units
   - 1.3. road wheels
   - 1.4. batteries
   - 1.5. bonnet and boot lid trim
   - 1.6. interior trim components
   - 1.7. exterior trim components

2. **Non permanently attached body panels** are
   - 2.1. wings
   - 2.2. doors
   - 2.3. bonnets
   - 2.4. boot lids and tailgates
   - 2.5. bumper bars, covers and components

3. **Tools and equipment** are
   - 3.1. spanners
   - 3.2. socket set
   - 3.3. screwdrivers
   - 3.4. manufacturer's specified specialist tools
   - 3.5. pliers and self locking grips
   - 3.6. power drill and drill bits
   - 3.7. trolley jack
   - 3.8. axle stands
   - 3.9. vehicle lifts
   - 3.10. torque wrench

IMILVBP18

Remove and fit basic motor Mechanical, Electrical and Trim (MET) components and non permanently fixed vehicle body panels

Glossary

Agreed timescales:
Examples include: job times set by your company or agreed with a specific customer

Commercial Vehicles:
These are medium and large goods vehicles of 3500kgs gross vehicle mass (GVM) and above.

Components fitted:
These can be either replacement or refitted components

MET:
Mechanical, electrical and trim

Non Permanently Fixed panels:
Any cosmetic panel within a vehicle that is fitted by mechanical fastening devices and will be undamaged when removed

Vehicles:
These can be any of the following: light vehicles, commercial vehicles, motorcycles, mopeds and scooters

IMILVBP18

Remove and fit basic motor Mechanical, Electrical and Trim (MET) components and non permanently fixed vehicle body panels

Developed by	IMI Ltd
Version number	1
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Indicative review date	January 2012
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Status	Original
Originating organisation	IMI Ltd
Original URN	8
Relevant occupations	Engineering; Vehicle Trades
Suite	Maintenance and Repair – Light Vehicle; Accident Repair - SMART – Cosmetic; Accident Repair - SMART – PDR; Accident Repair – Joining; Auto Electrical and Mobile Electrical Installation
Key words	Basic Motor Mechanical Electrical Trim MET Components Non Permanently Fixed Vehicle Body Panels

IMIAEMEI06

Diagnose and rectify motor vehicle electrical unit and component faults

Overview

This standard is about identifying and rectifying electrical faults occurring within a variety of electrical systems

Performance criteria

You must be able to:

1. select and wear appropriate personal protective equipment and use vehicle coverings when using electrical testing techniques and carrying out **rectification activities**
2. support the identification of electrical faults, by reviewing vehicle:
2.1 technical data
2.2 diagnostic test procedures
3. prepare, connect and test all the required electrical and electronic testing equipment following manufacturers' instructions prior to use
4. use electrical and electronic testing techniques which are relevant to the symptoms presented
5. collect sufficient diagnostic information in a systematic way to enable an accurate diagnosis of electrical system faults
6. identify and record any system deviation from acceptable limits
7. make cost effective, accurate recommendations for rectification based upon your analysis of the diagnostic information gained
8. use all tools and equipment required for your diagnostic and rectification activities, correctly and safely throughout
9. carry out all diagnostic & rectification activities following:
9.1 manufacturers' instructions
9.2 recognised researched repair methods
9.3 health and safety requirements
10. work in a way that minimises the risk of:
10.1 damage to other vehicle systems
10.2 damage to other components and units
10.3 contact with leakages
10.4 contact with hazardous substances
10.5 injury to yourself and others
11. ensure all repaired and replaced electrical components and units conform to the vehicle operating specification and any legal requirements
12. adjust components and units correctly to ensure that they operate to meet system requirement, wehn necessary
13. ensure the rectified electrical system performs to the vehicle operating specification and
any legal requirements prior to handover to the customer
14. ensure your records are accurate, complete and passed to the relevant person(s)promptly in the format required
15. complete all diagnostic and rectification activities within the agreed timescale
16. report any anticipated delays in completion to the relevant person(s)

promptly

Knowledge and understanding

You need to know and understand:

1. the current health and safety legislation and workplace procedures relevant to workshop practices and personal and vehicle protection when diagnosing and rectifying complex electrical faults
2. legal requirements relating to the vehicle electrics (including road safety and refrigerant handling requirements)
3. your workplace procedures for:
3.1 recording fault location and correction activities
3.2 reporting the results of tests
3.3 the referral of problems
3.4 reporting delays to the completion of work
4. the importance of working to recognised diagnostic procedures and processes and obtaining the correct information for diagnostic activities to proceed
5. the importance of documenting diagnostic and rectification information
6. the importance of working to agreed timescales and keeping others informed of progress
7. the relationship between time, costs and profitability
8. the importance of reporting anticipated delays to the relevant person(s) promptly
9. electrical and electronic principles, including Ohms Law, voltage, power, current (AC/DC) resistance, magnetism, electromagnetism and electromagnetic induction, digital and fibre optics principles
10. electrical symbols, units and terms
11. electrical safety procedures
12. how electrical and electronic units and components are constructed, dismantled and reassembled
13. how electrical and electronic units and components operate, including electrical component function, electrical inputs, outputs, voltage/current variation and patterns
14. the interaction between electrical, electronic and mechanical components within the systems defined
15. how electrical systems interlink and interact, including multiplexing
16. the operation of the electrical and electronic systems for electric, hybrid and alternative fuel vehicles (including regenerative braking systems)
17. how to prepare and test the accuracy of diagnostic testing equipment
18. how to use electrical and electronic testing equipment to correctly and safely diagnose electrical faults
19. the types and causes of electrical system, component and unit faults and

failures
20. electrical component and unit replacement procedures, the circumstances which will necessitate replacement and other possible courses of action
21. how to find, interpret and use sources of information on electrical operating specifications, diagnostic test procedures, repair procedures and legal requirements
22. how to carry out systematic diagnostic testing of electrical and electronic systems using electrical testing techniques
23. how to select the most appropriate diagnostic testing method for the symptoms presented
24. how to interpret test results and vehicle data in order to identify the location and cause of vehicle system faults
25. how to rectify electrical and electronic faults
26. how to make suitable adjustments to components and units
27. how to make cost effective recommendations for rectification

Scope/range

1. Electrical faults can occur within the following systems:
a. Infotainment
b. Comfort and Convenience
c. Supplementary Restraint Systems (SRS)
d. Networking Systems
e. Body Electric Systems

2. Electrical and electronic testing equipment includes:
a. volt meters,
b. ammeters,
c. ohmmeters
d. multimeters
e. battery testing equipment
f. dedicated and computer based diagnostic equipment
g. oscilloscopes

3. Tools and equipment include:
a. hand tools
b. special purpose tools
c. general workshop equipment

4. Diagnostic Testing is defined as:
a. verify the fault
b. vollect further information
c. evaluate the evidence
d. carry out further tests in a logical sequence
e. rectify the problem
f. check all systems

5. Electrical and electronic testing techniques include:
a. voltage, resistance and current measuring
b. frequency measuring
c. visual
d. dedicated and computer based testing

Glossary

Rectification activities are defined as:
A suitable repair or replacement of a component(s) that rectifies the fault(s) identified from the diagnostic activities carried out

IMIAEMEI06

Diagnose and rectify motor vehicle electrical unit and component faults

Developed by	IMI
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Validity	Current
Status	Original
Originating Organisation	IMI
Original URN	IMIAEMEI06
Relevant Occupations	Auto and Mobile Installation Technicians; Auto-electrical Technician (Automotive)
Suite	Auto Electrical and Mobile Electrical Installation
Keywords	Diagnose rectify motor vehicle electrical unit component faults

IMIEV1

Carry out non high energy electrical system work on or near electric and hybrid vehicles

Overview

This standard is for people who work on or near electric and hybrid vehicles but do not work on the vehicle's high energy electrical system. Examples of these job roles include:
sales staff, cleaners/valeters or vehicle fitters. The standard includes essential knowledge of the hazards associated with electric and hybrid vehicles and the precautions to follow to avoid these.
Note: This standard does not deem someone competent to maintain, service or repair high energy electrical systems.

Carry out non high energy electrical system work on or near electric and hybrid vehicles

Performance criteria

You must be able to:

1. collect relevant information about the **electric/hybrid vehicle** and any potential hazards
2. wear personal protective equipment appropriate to the work activities you are carrying out
3. follow the correct procedures to ensure the electric/hybrid vehicle has been made safe prior to starting any work
4. carry out **work activities** in a way that avoids contact with, or damage to, **high energy electrical systems** and their components
5. refer any problems with the electric/hybrid vehicle to a relevant person in your workplace
6. report the work activities you have carried out on or near the electric /hybrid vehicle to relevant colleagues

Knowledge and understanding

You need to know and understand:

1. the hazards associated with high energy electrical vehicle components
2. the health and safety legislation and workplace procedures relevant to working on or near electric/hybrid vehicles, including the appropriate personal protective equipment and its use
3. your workplace procedures for:
3.1 checking that the vehicle has been made safe as appropriate to the work you are carrying out
3.2 referring/reporting problems when working with electric/hybrid vehicles
3.3 making others aware of the work carried out on electric/hybrid vehicles
4. the differences between an electric/hybrid and non-electric vehicle
5. how to operate an electric/hybrid vehicle safely
6. how to charge an electric/hybrid vehicle with plug-in capability
7. the precautions necessary when using plug-in charging equipment
8. how to make an electric/hybrid vehicle safe, including isolating high energy electrical systems where required within your level of training
9. the implications of electrical conductivity through the human body and other potential medical conditions that can occur regardless of current type present in the electric/hybrid vehicle
10. how to find, interpret and use sources of information applicable to electric/hybrid vehicles as appropriate to your job role
11. the hazards associated with electric/hybrid vehicle batteries when exposed to extreme temperatures, impact and other adverse conditions

Scope/range

Scope of this standard

1. **Electric/hybrid vehicle** - any vehicle that is powered wholly or in part by an electrical drive train. This includes electric hybrid plug-in vehicles.

2. **High energy electrical/high voltage** – typical voltages used for a range of Electric and Hybrid Vehicles 100-650V ECE R100(relating to vehicle regulations) paragraph 2.14 clearly defines high voltage: “High Voltage" means the classification of an electric component or circuit, if its working voltage is > 60 V and 1500 V DC or > 30 V and 1000 V AC root mean square (rms).’

3. **Work activities** – not involving work on the high energy electrical system and its components.

IMIEV1

Carry out non high energy electrical system work on or near electric and hybrid vehicles

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Status	Original
Originating Organisation	IMI
Original URN	IMIEV1
Relevant Occupations	Sales Executive (Automotive); Sales Controller (Automotive); Vehicle Fitting Operations (Automotive); Vehicle Valeter (Automotive); Specialist Tyre Fitting Operations (Automotive); Hire and Rental Delivery and Collection Operations; Hire and Rental Operations; Hire and Rental Counter Operations; Rental and Leasing Customer Service Advisor (Automotive); Rental and Leasing Maintenance Advisors (Automotive); Rental and Leasing Technical Service Advisor (Automotive); Body Repair Technician (Automotive); Body Repair and Alignment Technician (Automotive); Cosmetic Refinishing Technician (Automotive); Cosmetic Senior Refinishing Technician (Automotive); PDR Senior Technician (Automotive); PDR Technician (Automotive); Body Builder (Automotive); Body Builder Workshop Controller (Automotive); Vehicle Damage Assessment Operators; Vehicle Damage Assessor (Automotive); Vehicle Fitters; Insurance Engineer (Automotive)
Suite	Electric and Hybrid Vehicles
Keywords	electric; vehicle; hybrid; high energy; status; hazards; work activities

IMIEV2
Carry out work on broken down and damaged electric and hybrid vehicles

Overview

This standard is designed for staff who deal with broken down or accident damaged electric and hybrid vehicles, for example, those working for roadside recovery operators and the emergency services. It contains the knowledge and competence required to carry out a risk assessment and work safely around an electric/hybrid vehicle that may have damage to its high and/or low energy age electrical systems.

Note: *This standard does not deem someone competent to maintain, service or repair high energy electrical systems and their components.*

IMIEV2
Carry out work on broken down and damaged electric and hybrid vehicles

Performance criteria

You must be able to:

P1 wear personal protective equipment appropriate to the work activities you are carrying out

P2 collect and evaluate relevant information about the **electric/hybrid vehicle** and any potential hazards

P3 identify the hazards and assess the risks presented by the **electric/hybrid vehicle**

P4 follow the correct procedures to make the **electric/hybrid vehicle** safe prior to starting any **work activities**, including where necessary, isolating **high energy electrical** systems, within your level of training

P5 carry out **work activities** in a way that minimises risks to yourself and other people

P6 refer any problems with the **electric/hybrid vehicle** that you cannot deal with yourself to a relevant person in your organisation and follow their instructions

P7 report the **work activities** you have carried out on or near the **electric/hybrid vehicle** to relevant colleagues

IMIEV2
Carry out work on broken down and damaged electric and hybrid vehicles

Knowledge and understanding

You need to know and understand:

Safety precautions

K1 the potential hazards associated with high and low voltage systems including batteries and other **high energy electrical** vehicle components

K2 the health and safety legislation and workplace procedures relevant to working with **electric/hybrid vehicles**, as appropriate to your work role, including the appropriate personal protective equipment and its use

K3 the legislation relevant to the **work activities** described in the scoping statement for this standard.

K4 your organisation's procedures for the:

K4.1 referral/reporting of problems when working with **electric/hybrid vehicles**

K4.2 reporting work carried out on **electric/hybrid vehicles**

K5 the differences between an on **electric/hybrid vehicle** and non-electric vehicle

K6 how to operate an on **electric/hybrid vehicle** safely

K7 the charging systems associated with **electric/hybrid vehicles** and how to charge them safely, including the use of plug-in charging equipment

K8 how to carry out a risk assessment on damaged and broken down on **electric/hybrid vehicles**

K9 how to make electric vehicles safe in order to carry **out work activities**, including isolating **high energy electrical** systems, where required, within your level of training

K10 how to reduce the risk of hazards when working on and around on **electric/hybrid vehicles**

K11 the hazards associated with on **electric/hybrid vehicle** batteries when exposed to extreme temperatures, impact and other adverse conditions

K12 the specific vehicle manufacturer restrictions regarding non-start and recovery, for example jump starting (hybrid only) and towing/lifting

IMIEV2
Carry out work on broken down and damaged electric and hybrid vehicles

K13 the implications of electrical conductivity through the human body and the potential medical conditions that can occur regardless of voltage or current type present in an **electric/hybrid vehicle**

Use of technical information

You need to know and understand:

K14 how to find, interpret and use sources of information applicable to a **electric/hybrid vehicle** as relevant to your job role

High Energy Electrical component construction

You need to know and understand:

K15 how **high energy electrical** components function and are constructed, including battery modules, electric motors and associated electrical components

Systems

You need to know and understand:

K16 how to identify the typical location of **high energy electrical** cables and components, for example, labelling and colour

K17 the different types of energy storage systems and voltages associated with on **electric/hybrid vehicles**

IMIEV2
Carry out work on broken down and damaged electric and hybrid vehicles

Additional Information

Scope/range

1 **Electric/hybrid vehicles**– any vehicle that is powered wholly or in part by an electrical drive train. This includes electric hybrid plug-in vehicles

2 **High energy electrical/high voltage** – typical voltages used for a range of Electric and Hybrid Vehicles 100-650V **ECE R100** (relating to vehicle regulations) paragraph 2.14 clearly defines high voltage: “High Voltage" means the classification of an electric component or circuit, if its working voltage is > 60 V and ≤ 1500 V DC or > 30 V and ≤ 1000 V AC root mean square (rms).

3 **Status of vehicle** – broken down or with damage which may present high or low voltage electrical hazards.

4 **Work activities** – recovering or dealing with electric/hybrid vehicles as part of an emergency response.

IMIEV2
Carry out work on broken down and damaged electric and hybrid vehicles

Developed by	The Institute of The Motor Industry (IMI)
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Indicative review date	September 2012
Validity	Current
Status	Original
Originating organisation	The Institute of The Motor Industry (IMI)
Original URN	IMIEV2
Relevant occupations	Roadside Recovery Operator (Automotive); Roadside Assistance Senior Operator (Automotive); Roadside Assistance; Roadside Assistance Manager (Automotive); Vehicle Recovery Operator (Automotive); Vehicle Recovery Technical Operator (Automotive); Supervisory Vehicle Recovery Technical Operator (Automotive)
Suite	Electric and Hybrid Vehicles; Vehicle Recovery; Roadside Assistance
Key words	Electric vehicles; hybrid vehicles; high energy electrical; status of vehicle; hazards; work activities

IMIEV3
Service and repair non-live electric and hybrid vehicle systems

Overview

This unit covers the competence and knowledge technicians need to carry out servicing and general repairs on non-live high energy electrical systems and components on electric and hybrid vehicles safely. The unit also ensures that the technician is aware of the effect that high energy electrical component technology has on other vehicle systems.

Note: *This unit only covers the competence and knowledge required to work on* ***non-live*** *high energy electrical components and associated systems. It does not enable a candidate to dismantle 'live' components, for example battery packs.*

IMIEV3
Service and repair non-live electric and hybrid vehicle systems

Performance criteria

You must be able to:

P1 wear suitable personal protective equipment and use appropriate vehicle coverings throughout all **work activities**

P2 ensure the **electric/hybrid vehicle** is safe to work on

P3 support your work activities by reviewing:

- P3.1 vehicle technical data
- P3.2 removal and replacement procedures
- P3.3 legal requirements

P4 prepare, test and use all the test and diagnostic **equipment** required following manufacturers' instructions

P5 carry out all removal and replacement activities following:

- P5.1 manufacturers' instructions
- P5.2 recognised researched repair methods
- P5.3 health and safety requirements

P6 work in a way which minimises the risk of:

- P6.1 damage to other vehicle systems, components and units
- P6.2 damage to your working environment and injury to yourself and others

P7 ensure replaced **high energy electrical components** meet the manufacturers' recommendations or conform to operating specification

P8 record and report any additional faults you notice during the course of your work

P9 use suitable **testing methods** to evaluate the performance of the reassembled **high energy electrical** system accurately

P10 ensure the reassembled system performs to the vehicle operating specification and legal requirements before return to the customer

P11 ensure your records are accurate, complete and passed to the relevant person(s) promptly in the format required

IMIEV3
Service and repair non-live electric and hybrid vehicle systems

Safety Precautions

Knowledge and understanding

You need to know and understand:

K1 the health and safety legislation and workplace procedures relevant to working with **electric/hybrid vehicles** including appropriate personal protective equipment and its use

K2 the legislation relevant to the activities described in the Scoping Statement for this NOS

K3 your workplace procedures for the:

3.1 referral/reporting of problems when working with **electric/hybrid vehicles**

K3.2 how to make others aware of the work carried out **on electric/hybrid vehicles**

K4 the differences between an **electric/hybrid vehicle** and non-electric vehicles

K5 the charging systems associated with **electric/hybrid vehicles** and how to charge **electric/hybrid vehicles** safely

K6 the precautions necessary when using plug-in charging equipment.

K7 how to carry out a risk assessment on damaged and broken down **electric/hybrid vehicles**

K8 how to make **electric/hybrid vehicles** safe in order to carry out work activities, including isolating **high energy electrical** systems, where required, within your level of training

K9 how to safely ensure that **high energy electrical** system is not live

K10 how to reduce the risk of hazards when working on and around **electric/hybrid vehicles**

K11 the hazards associated with **electric/hybrid vehicle** batteries when exposed to extreme temperatures, impact and other adverse conditions

K12 the specific vehicle manufacturer restrictions regarding non-start and recovery, for example jump starting (hybrid only) and towing/lifting

K13 the implications of electrical conductivity through the human body and the potential medical conditions that can occur regardless of voltage or current type present in an **electric/hybrid vehicle**

K14 the disposal of waste materials including recycling obligations, as well as COSHH regulations with regards to hazardous battery chemicals and compounds

K15 how to reduce the risk of hazards when working on and around **electric/hybrid vehicles**

K16 how to work safely avoiding damage to other vehicle systems, components and units and contact with leakage and hazardous substances

Use of technical information

You need to know and understand:

K17 how to find, interpret and use sources of information applicable to component repair and replacement within **high energy electrical** systems

K18 the importance of using the correct sources of technical information

Electrical/hybrid vehicle component construction

You need to know and understand:

K19 how **high energy electrical** components function and are constructed, including battery modules, electric motors and associated electrical components

Electrical/hybrid vehicle systems and component removal and replacement

You need to know and understand:

K20 how to identify the components that make up the **high energy electrical** system

K21 how to identify the typical location of **high energy electrical** cabling and associated components including using wiring labelling and colour.

K22 the different types of energy storage systems and voltages associated with **electric/hybrid vehicles**.

K23 the manufacturer's specification for the type and quality of components to be used.

K24 how to store, dispose of, recycle and return any removed **high energy electrical** components in line with legislation and organisational procedures.

IMIEV3
Service and repair non-live electric and hybrid vehicle systems

Electrical and electronic principles

You need to know and understand:

K25 vehicle earthing principles and earthing methods as appropriate to **electric/hybrid vehicles**

K26 basic electrical and electronic principles, including ohms law, voltage, power, current (ac/dc), resistance, magnetism, electromagnetism and electromagnetic induction

K27 specific high energy circuit protection

K28 electrical and electronic principles associated with ancillary systems, including types of sensors and actuators, their application and operation

K29 the interaction between electrical, electronic and mechanical components within **electric/hybrid vehicle** systems

K30 how electric vehicle systems interlink and interact, including multiplexing

Use of electrical testing equipment and electrical testing techniques

You need to know and understand:

K31 how to use the electrical testing equipment required

K32 how to prepare, test and use all the repair and replacement equipment required

K33 how to conduct tests on non-live **high energy electrical** systems following electrical safety and workplace procedures

K34 how to determine the serviceability of a component in a **high energy electrical** system

K35 how to interpret the results of your tests and make recommendations based on these results

K36 the importance of basing your recommendations on test results

K37 how to perform safety and operational checks on the tools and equipment required to remove and replace electrical components

IMIEV3

Service and repair non-live electric and hybrid vehicle systems

Vehicle electrical equipment faults and their correction

You need to know and understand:

K38 how to identify faults and damage in **electric/hybrid vehicle high energy electrical** systems

K39 the common underlying causes of faults and damage in **high energy electrical** components

K40 how to test and evaluate the performance of replacement components and the reassembled system against operating specifications and legal requirements

K41 the importance of ensuring electrical components are functioning correctly before release to the customer

Additional Information

Scope/range

1 **Electric/hybrid vehicle** – any vehicle that is powered wholly or in part by an electrical drive train. This includes electric hybrid plug-in vehicles.

2 **High energy electrical/high voltage** – typical voltages used for a range of Electric and Hybrid Vehicles 100-650V **ECE R100** (relating to vehicle regulations) paragraph 2.14 clearly defines high voltage: “High Voltage" means the classification of an electric component or circuit, if its working voltage is > 60 V and ≤ 1500 V DC or > 30 V and ≤ 1000 V AC root mean square (rms).’

3 **Additional equipment includes**:

3.1 hand tools

3.2 code readers

3.3 specialist tools, for example manufacturer specific software

3.4 safe and appropriate electrical testing equipment

3.5 relevant safety equipment

4 **Testing methods include**:

4.1 visual

4.2 aural

4.3 functional

4.4 measurement

5 **Components include:**

5.1 batteries/stack, pod, module

5.2 motors

5.3 cabling

5.4 relays/control units

5.5 charger and charging points

5.6 isolators

5.7 inverters

5.8 battery management interface

5.9 ignition/key-on control switch

5.10 driver display panel

5.11 multi-battery server unit

5.12 drive trains

5.13 power sources

5.14 ancillary systems and components

6. **Work activities**

6.1 servicing non-live high energy electrical systems and components

6.2 general repair of non-live high energy electrical systems and components

7.**Diagnostic testing as defined by:**

7.1 verifying the fault

7.2 collecting further information

7.3 evaluating the evidence

7.4 carrying out further tests in a logical sequence

7.5 rectifying the problem

7.6 checking all systems

IMIEV3
Service and repair non-live electric and hybrid vehicle systems

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Originating organisation	The Institute of The Motor Industry (IMI)
Original URN	IMIEV3
Relevant occupations	Heavy Vehicle Trailer Service Technician (Automotive); Heavy Vehicle Trailer Diagnostic Technician (Automotive); Heavy Vehicle Trailer Master Technician (Automotive); Heavy Vehicle Trailer Fleet/Service Manager (Automotive); Heavy Vehicle Service Technician (Automotive); Heavy Vehicle Diagnostic Technician (Automotive); Heavy Vehicle Master Technician (Automotive); Heavy Vehicle Fleet/Service Manager (Automotive); Light Vehicle Service Technician (Automotive); Light Vehicle Diagnostic Technician (Automotive); Light Vehicle Master Technician (Automotive); Light Vehicle Fleet/Service Manager (Automotive); Mechanical, Electrical and Trim Assistant Technician (Automotive); Mechanical, Electrical and Trim Technician (Automotive); Motorcycle Service Technician (Automotive); Motorcycle Diagnostic Technician (Automotive); Motorcycle Master Technician (Automotive) Motorcycle Fleet/Service Manager (Automotive); Lift Truck Service Technician (Automotive); Lift Truck Trailer Diagnostic Technician (Automotive); Lift Truck Trailer Master Technician (Automotive); Lift Truck Workshop Controller (Automotive); Auto-electrical Technician (Automotive); Automotive Aftermarket Electrical Enhancement Technician (Automotive); Workshop Supervisor (Automotive); Heavy Vehicle Service Technician (Automotive); Heavy Vehicle Diagnostic Technician (Automotive); Heavy Vehicle Master Technician (Automotive); Heavy Vehicle Fleet/Service Manager (Automotive); Light Vehicle Service Technician (Automotive); Light Vehicle Diagnostic Technician (Automotive); Light Vehicle Master technician (Automotive); Light Vehicle Fleet/Service Manager (Automotive)
Suite	Electric and Hybrid Vehicles; Maintenance & Repair - Light Vehicle; Maintenance & Repair – Motorcycle; Maintenance and Repair - Heavy Vehicle;

IMIEV3

Service and repair non-live electric and hybrid vehicle systems

Maintenance and Repair - Heavy Vehicle Trailer; Maintenance and Repair - Lift Truck; Auto Electrical & Mobile Electrical Installation; Accident Repair - Mechanical, Electrical and Trim; Maintenance and Repair – Heavy Vehicle; Maintenance and Repair – Light Vehicle

Key words Electric vehicle; hybrid vehicle; high energy electrical; status of vehicle; hazards; work activities; Heavy; commercial; service; maintenance; repair; Light; service; maintenance; repair

IMIEV4

Isolate and reinstate an electric and hybrid vehicle

Overview

This standard is about assessing an electric and hybrid vehicle and isolating it to make it safe to work on. It also covers how to reinstate the vehicle once the required work has been carried out.

Warning: It has been recommended by industry experts that only those with suitable training and experience on working with electric and hybrid vehicles should carry out the functions below.

Performance criteria

You must be able to:

Isolating the vehicle

1. locate relevant information about the electric and hybrid vehicle and use it to determine any potential hazards
2. identify any potential hazards by carrying out a visual assessment of the vehicle
3. identify high voltage components and cabling
4. notify relevant colleagues of your intention to work on a high voltage vehicle
5. select and use correct personal protective equipment in order to carry out the isolation process
6. follow the correct procedures to isolate the high voltage system
7. work in a way which minimises the risk of:

7.1 injury to yourself and others

7.2 damage to your working environment

7.3 damage to other vehicle systems, components and units

8. carry out an appropriate test to ensure the residual voltage is below manufacturers' specification and therefore the vehicle is safe to work on
9. refer any problems with the electric and hybrid vehicle to a relevant person in your workplace
10. ensure that test equipment operates correctly

Reinstating the high voltage system

11. select and use correct personal protective equipment in order to carry out the reinstatement process
12. follow the correct procedures for reinstatement of the high voltage system
13. use suitable testing methods to evaluate the performance of the reassembled high energy electrical vehicle system accurately
14. ensure the reassembled system performs to the vehicle manufacturers' operating specification and legal requirements before the vehicle is returned to the customer
15. ensure records are accurate, complete and passed to the relevant person(s)promptly in the format required

Knowledge and understanding

You need to know and understand:

Isolating a vehicle

1. the importance of knowing how and where to access relevant information on the specific electric and hybrid vehicle systems
2. the potential hazards associated with working high energy vehicles and how to identify them
3. how to determine the location and route of the high voltage components and cabling
4. how to select and use the correct electrical testing equipment required
5. the terminology used within electric/hybrid vehicle systems
6. the current health and safety legislation and specific vehicle manufacturers' repair and safety procedures relevant to working with electric/hybrid vehicles
7. how to select and use appropriate and correct personal protective equipment
8. the legislation relevant to the activities described in the Scope for this standard
9. how to work in a way which minimises the risk of:

9.1 injury to yourself and others

9.2 damage to your working environment

9.3 damage to other vehicle systems, components and units

10. your workplace procedures for the referral/reporting of problems when working with electric/hybrid vehicles
11. how to make others aware of the work carried out on electric/hybrid vehicles
12. the precautions necessary when charging, jump starting or towing an electric/hybrid vehicle
13. how to make electric/hybrid vehicles safe in order to carry out work activities, including isolating high energy electrical vehicle systems
14. how to accurately test that the residual voltage is below manufacturer's specification following the isolation process
15. the hazards associated with electric/hybrid high energy vehicle system batteries when exposed to extreme temperatures, impact and other adverse conditions
16. specific high energy vehicle safety systems
17. how to interpret test results and make recommendations based on these results and the importance of basing recommendations on test results
18. how to calibrate and test equipment prior to use

Reinstating the vehicle

19. how to select and use appropriate and correct personal protective equipment to carry out the reinstatement process

20. the correct procedures for reinstating the vehicle
21. how to test and evaluate the performance of replacement components and the reassembled system against manufacturers' operating specifications and legal requirements
22. the importance of ensuring all high energy electrical vehicle systems are functioning correctly and safely before the vehicle is released to the customer
23. how to ensure records of work are accurate complete and passed to the relevant person in the format required

Scope/range

Range of this standard

1. **Testing methods include:**
a. visual
b. aural
c. functional
d. measurement

2. **Components include**:
a. batteries/stack, pod, module
b. motors
c. cables
d. wiring

Scope of this standard

Electric/Hybrid vehicle – any vehicle that is powered wholly or in part by an electrical drive train. This includes electric hybrid plug-in vehicles.

High energy electrical/high voltage – typical voltages used for a range of Electric and Hybrid Vehicles 100-650V ECE R100 (relating to vehicle regulations) paragraph 2.14 clearly defines high voltage: “High Voltage" means the classification of an electric component or circuit, if its working voltage is > 60 V and 1500 V DC or > 30 V and 1000 V AC root mean square (rms).’
This definition should not be confused with commercial high voltage systems

Glossary

IMIEV4

Isolate and reinstate an electric and hybrid vehicle

Developed by	IMI
Version Number	1
Date Approved	December 2014
Indicative Review Date	December 2017
Validity	Current
Status	Original
Originating Organisation	IMI
Original URN	IMIEV4
Relevant Occupations	Heavy Vehicle Trailer Diagnostic Technician (Automotive); Heavy Vehicle Trailer Fleet/Service Manager (Automotive); Heavy Vehicle Trailer Master Technician (Automotive); Heavy Vehicle Trailer Service Technician (Automotive); Light Vehicle Diagnostic Technician (Automotive); Light Vehicle Fleet/Service Manager (Automotive); Light Vehicle Master Technician (Automotive); Light Vehicle Service Technician (Automotive); Mechanical, Electrical and Trim Assistant Technician (Automotive); Mechanical, Electrical and Trim Technician (Automotive); Auto-electrical Technician (Automotive); Automotive Aftermarket Electrical Enhancement Technician (Automotive)
Suite	Electric and Hybrid Vehicles
Keywords	isolate reinstate electric hybrid vehicle hazard electrical safe

IMIEV5

Diagnose, test and repair electric and hybrid vehicle high voltage batteries

Overview

This standard is about working on live or potentially live battery systems and the related high voltage components in electric and hybrid vehicles. **Warning: It has been recommended by industry experts that only those with appropriate training and experience on working with high voltage components of electric and hybrid vehicles should carry out the functions below.**

Performance criteria

You must be able to:

Health and safety procedures

1. observe safety information prior to commencing work on the high voltage vehicle
2. carry out a dynamic risk assessment of the vehicle and the work to be carried out
3. select and wear correct and appropriate personal protective clothing and equipment as advised by the manufacturer
4. carry out thorough inspection of the external and visible parts of the high voltage battery for signs of damage
5. check for external damage to high voltage connections or cables
6. follow your organisation's and manufacturer's instructions if damage to the high voltage components has been found

Diagnosing and repairing damaged batteries and components

7. use diagnostic and test equipment in line with manufacturer's guidelines to ensure the integrity of the high voltage battery and the high voltage system prior to commencing any repairs
8. interpret the results obtained from the diagnostic test equipment
9. ensure all work carried out takes place immediately following inspection where possible. Re-inspection is recommended following timescales recommended by manufacturers.
10. isolate the high voltage system as per manufacturer's guidance
11. select appropriate tools/lifting equipment in line with manufacturer's guidelines and specification
12. carry out a visual inspection of the lifting/supporting tools and equipment prior to use
13. remove the high voltage battery following manufacturers' guidelines and place in a suitable, isolated area with restricted access
14. remove the battery housing or inspection covers to carry out a visual inspection avoiding contact with any components. When possible, never leave the battery unattended.
15. ensure the high voltage battery is made safe and access to the storage area restricted if the battery is to be left unattended
16. reduce the battery voltage to a safe working limit in line with manufacturers guidelines where possible
17. select and wear appropriate Personal Protective Equipment (PPE) when the battery voltage cannot be reduced to a safe working limit
18. inspect all new components for damage prior to installation using visual inspection methods

19. carry out all removal and replacement activities following:
19.1 manufacturer's instructions
19.2 recognised researched repair methods
19.3 health and safety requirements
20. carry out a thorough inspection where possible, along with a suitably experienced colleague, to ensure the integrity of the repair prior to restablishing the normal operating battery system voltage
21. re-establish the normal operating battery voltage in line with manufacturers guidelines
22. reassemble the battery housing/inspection covers
23. recommission the battery in line with manufacturers guidelines using specialist, high voltage test equipment
24. reinstall the battery following manufacturers recommended guidelines with particular attention to any potential equalisation connections
25. reinstate the vehicle following manufacturers guidelines
26. carry out diagnostic test prior the handover of the vehicle
27. ensure records of work are accurate complete and passed to the relevant person in the format required

Knowledge and understanding

You need to know and understand:

Health and safety procedures

1. the procedure for authorisation to allow an individual to work on high voltage systems
2. how to carry out a dynamic risk assessment of the vehicle and the work to be carried out
3. the current health and safety legislation and specific vehicle manufacturers repair and safety procedures relevant to working with electric and hybrid vehicles
4. how and where to access relevant information on the specific electric and hybrid vehicle systems
5. the terminology used within electric and hybrid vehicle systems
6. how to inform and make others aware of the potential hazards prior to and when work is being carried out on high voltage systems
7. how to work in a way that minimises the risk of:

7.1 injury to yourself and others

7.2 damage to your working environment

7.3 damage to other vehicle systems, components and units

8. the hazards associated with electric/hybrid high energy vehicle systems, batteries when exposed to extreme temperatures, impact and other adverse conditions
9. how to identify high voltage components and/or parts that are connected to the high voltage system within the battery

Diagnosing and repairing damaged batteries and components

10. how to identify any damage to the battery and the high voltage connections and cables
11. how to use diagnostic and test equipment and interpret the results to ensure the integrity of the high voltage system
12. series circuits and connection of multiple battery cells and the effect on voltage levels
13. how to safely isolate the vehicle following manufacturer's guidelines
14. how to select and visually inspect the appropriate tools and lifting equipment for battery removal
15. the procedure for the safe removal and storage of the high voltage battery
16. the importance of storing the high voltage battery in a safe, restricted area if left unattended
17. how to reduce the battery voltage to a safe working limit in line with manufacturers guidelines

18. the correct recognised repair methods for batteries and how to carry them out observing health and safety requirements
19. how to ensure the integrity of the repair prior to re-establishing the normal operating battery system voltage
20. how to use specialist, high voltage equipment to recommission the battery
21. how to reinstate the vehicle following manufacturer's guidelines
22. basic first aid and safety training including the correct procedures that must be followed in the event of electric shock
23. how to safely dispose of or recycle battery components inline with legislation and organisation procedures
24. how to accurately report the work that has been carried out on the vehicle to relevant persons

Scope/range

Scope of this standard

Battery damage includes:

a. over heating

b. physical impact damage

c. chemical leakage

d. smoke

e. water damage

High voltage tests and equipment includes:

a. pressure testing equipment to ensure the battery is properly sealed (IP Testing)

b. isolation/dielectric test to ensure the integrity of the high voltage system

c. cell symmetry test

Protective clothing/equipment includes:

a. insulted high voltage gloves

b. face shield

c. fire resistant clothing/apron

d. insulated tools

Glossary

Electric/hybrid vehicle – any vehicle that is powered wholly or in part by an electrical drive train

High energy electrical/high voltage – typical voltages used for a range of Electric and Hybrid Vehicles 100-650V ECE R100 (relating to vehicle regulations) paragraph 2.14 clearly defines high voltage: “High Voltage" means the classification of an electric component or circuit, if its working voltage is > 60 V and 1500 V DC or > 30 V and 1000 V AC root mean square (rms).’

Live: Equipment that is at a voltage by being connected to a source of electricity. This implies that, unless otherwise stated, the live parts are exposed so that they can be touched either directly or indirectly by means of some conducting object and that they are either live at a dangerous energy level or dangerous potential, ie over 50 V ac or 120 V dc in dry conditions - see BSI publication PD 6519:5

Links to other NOS

IMIEV4 Isolate and reinstate electric and hybrid vehicles

IMIEV5

Diagnose, test and repair electric and hybrid vehicle high voltage batteries

Developed by	IMI
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Suite	Electric and Hybrid Vehicles
Keywords	diagnose repair test electric hybrid vehicle high voltage batteries