Electric Vehicle Service Technician

Electives: Four Wheeler Electric Vehicle Service technician/ Two/Three wheeler Electric Vehicle Service technician/ Electric Truck/Bus Service technician

QP Code: ASC/Q1429

Version: 1.0

NSQF Level: 4

Automotive Skills Development Council || 153, GF, Okhla Industrial Area, Phase 3
New Delhi 110020

Contents

ASC/Q1429: Electric Vehicle Service Technician

Brief Job Description

An Electric Vehicle Service Technician is responsible for the repair, routine servicing and maintenance (including electrical and mechanical aggregates) of Electric and Hybrid vehicles and assist the lead technician in identifying the faults.

Personal Attributes

An individual in this job must have good communication and interpersonal skills. The person should be patient, organised, team-oriented, customer centric and have the ability to work for long hours in adverse conditions. The individual should be a keen observer and have an eye for detail and quality.

Applicable National Occupational Standards (NOS)

Compulsory NOS:

1. ASC/N9801: Organize work and resources (Service)
2. ASC/N9802: Interact effectively with colleagues, customers and others
3. ASC/N1449: Carry out routine service or minor repairs on electric vehicle and assist in diagnosis

Electives*(mandatory to select at least one):*

Elective 1: Four Wheeler Electric Vehicle Service technician

This NOS unit is about performing all tasks related to service, minor repair and diagnosis of the four wheeler electric or hybrid vehicles.

1. ASC/N1450: Carry out routine service or minor repairs on four wheeler electric/ hybrid vehicle and assist in diagnosis

Elective 2: Two/Three wheeler Electric Vehicle Service technician

This NOS unit is about an individual who performs all tasks related to service, minor repair and diagnosis on electric two/three wheeler electric vehicle.

1. ASC/N1451: Carry out routine service or minor repairs on two/three wheeler electric vehicle and assist in diagnosis

Elective 3: Electric Truck/Bus Service technician

This NOS unit is about an individual who performs all tasks related to service, minor repair and diagnosis on electric truck/bus.

1. ASC/N1452: Carry out routine service or minor repairs on electric truck/bus and assist in diagnosis

Qualification Pack (QP) Parameters

Sector	Automotive
Sub-Sector	Automotive Vehicle Service
Occupation	Technical Service & Repair
Country	India
NSQF Level	4
Aligned to NCO/ISCO/ISIC Code	NCO-2015/3115.0602
Minimum Educational Qualification & Experience	10th Class (or Certificate NSQF Level 3 ((Two/ Four Wheeler Service Assistant)) with 2 Years of experience of relevant experience OR I.T.I (Mechanic Motor Vehicle/ Mechanic Auto Electrical and Electronics) OR 12th Class with 1 Year of experience of relevant experience
Minimum Level of Education for Training in School	
Pre-Requisite License or Training	Driving License and Basic Computer Skills
Minimum Job Entry Age	18 Years
Last Reviewed On	30/12/2021
Next Review Date	30/12/2024
NSQC Approval Date	30/12/2021
Version	1.0

ASC/N9801: Organize work and resources (Service)

Description

This NOS unit is about implementing safety, planning work, adopting sustainable practices for optimising use of resources

Scope

The scope covers the following :

- Maintain safe and secure working environment
- Perform work as per quality standards
- Health and hygiene
- Material/energy conservation practices
- Effective waste management practices

Elements and Performance Criteria

Maintain safe and secure working environment

To be competent, the user/individual on the job must be able to:

PC1. organise work as per organisation's current health, safety and security policies and procedures

PC2. report any identified breaches in health, safety, and security policies and procedures to the designated person

PC3. identify the risks and hazards associated with work activities, their causes and prevention

Perform work as per quality standards

To be competent, the user/individual on the job must be able to:

PC4. ensure work area is clean and tidy

PC5. ensure that work is accomplished as per the requirements within the specified timeline

PC6. ensure team goals are given preference over individual goals

Health and hygiene

To be competent, the user/individual on the job must be able to:

PC7. sanitize workstation and equipment regularly

PC8. clean hands with soap, alcohol-based sanitizer regularly

PC9. avoid contact with ill people and self-isolate in a similar situation

PC10. wear and dispose PPEs regularly and appropriately

PC11. report advanced hygiene and sanitation issues to appropriate authority

PC12. follow stress and anxiety management techniques

Material/energy conservation practices

To be competent, the user/individual on the job must be able to:

PC13. identify ways to optimise usage of material in various tasks/activities/processes

PC14. use resources, including water, in a responsible manner

PC15. check for spills/leakages in various tasks/activities/processes

PC16. plug spills/leakages and escalate to appropriate authority if unable to rectify

PC17. carry out routine cleaning of tools, machines and equipment

PC18. check if the equipment/machine is functioning normally before commencing work and rectify wherever required

PC19. report malfunctioning (fumes/sparks/emission/vibration/noise) and lapse in maintenance of equipment

PC20. ensure electrical equipment and appliances are properly connected and turned off when not in use

Effective waste management practices

To be competent, the user/individual on the job must be able to:

PC21. identify recyclable and non-recyclable, and hazardous waste generated

PC22. segregate waste into different categories

PC23. dispose non-recyclable waste appropriately

PC24. deposit recyclable and reusable material at identified location

PC25. follow processes specified for disposal of hazardous waste

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. organisation procedures for health, safety and security, and individual role and responsibilities in this context

KU2. the organisations emergency procedures for different emergency situations and the importance of following the same

KU3. evacuation procedures for workers and visitors

KU4. how and when to report hazards as well as the limits of responsibility for dealing with hazards

KU5. potential hazards, risks and threats based on the nature of work

KU6. the implications of own work on the schedule and work of others

KU7. efficient utilisation of material and water

KU8. basics of electricity and prevalent energy efficient devices

KU9. ways to recognise common electrical problems

KU10. common practices of conserving electricity

KU11. common sources of pollution and ways to minimize it

KU12. categorisation of waste into dry, wet, recyclable, non-recyclable and items of single-use plastics

KU13. usage of different colours of dustbins

KU14. waste management and methods of waste disposal

KU15. significance of greening

KU16. organisation's policies to maintain personal health and hygiene at workplace

Generic Skills (GS)

User/individual on the job needs to know how to:

GS1. read instructions/guidelines/standard operating procedures
GS2. complete statutory documents relevant to safety and hygiene
GS3. modify work practices to improve them
GS4. ask for clarifications from superior about the job requirement
GS5. work with supervisors/team members to carry out work related tasks
GS6. complete tasks efficiently and accurately within stipulated time
GS7. inform/report to concerned person in case of any problem
GS8. make timely decisions for efficient utilization of resources
GS9. write in at least one language and complete written work with attention to detail
GS10. record data on waste disposal at workplace
GS11. be punctual, utilize time and manage workload efficiently
GS12. evaluate strategies to maintain, enhance or reduce the intensity of heightened emotional response

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Maintain safe and secure working environment	8	4	-	3
PC1. organise work as per organisation's current health, safety and security policies and procedures	-	2	-	1
PC2. report any identified breaches in health, safety, and security policies and procedures to the designated person	3	1	-	-
PC3. identify the risks and hazards associated with work activities, their causes and prevention	5	1	-	2
Perform work as per quality standards	12	8	-	6
PC4. ensure work area is clean and tidy	4	2	-	-
PC5. ensure that work is accomplished as per the requirements within the specified timeline	6	4	-	2
PC6. ensure team goals are given preference over individual goals	2	2	-	4
Health and hygiene	12	8	-	5
PC7. sanitize workstation and equipment regularly	2	2	-	2
PC8. clean hands with soap, alcohol-based sanitizer regularly	2	1	-	-
PC9. avoid contact with ill people and self-isolate in a similar situation	2	1	-	-
PC10. wear and dispose PPEs regularly and appropriately	2	2	-	1
PC11. report advanced hygiene and sanitation issues to appropriate authority	2	2	-	2
PC12. follow stress and anxiety management techniques	2	-	-	-
Material/energy conservation practices	10	4	-	3
PC13. identify ways to optimise usage of material in various tasks/activities/processes	2	-	-	1

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC14. use resources, including water, in a responsible manner	2	-	-	-
PC15. check for spills/leakages in various tasks/activities/processes	-	1	-	-
PC16. plug spills/leakages and escalate to appropriate authority if unable to rectify	-	1	-	1
PC17. carry out routine cleaning of tools, machines and equipment	2	-	-	-
PC18. check if the equipment/machine is functioning normally before commencing work and rectify wherever required	-	1	-	1
PC19. report malfunctioning (fumes/sparks/emission/vibration/noise) and lapse in maintenance of equipment	2	1	-	-
PC20. ensure electrical equipment and appliances are properly connected and turned off when not in use	2	-	-	-
Effective waste management practices	**8**	**6**	**-**	**3**
PC21. identify recyclable and non-recyclable, and hazardous waste generated	2	-	-	1
PC22. segregate waste into different categories	-	2	-	-
PC23. dispose non-recyclable waste appropriately	2	2	-	1
PC24. deposit recyclable and reusable material at identified location	2	1	-	-
PC25. follow processes specified for disposal of hazardous waste	2	1	-	1
NOS Total	**50**	**30**	**-**	**20**

National Occupational Standards (NOS) Parameters

NOS Code	ASC/N9801
NOS Name	Organize work and resources (Service)
Sector	Automotive
Sub-Sector	Generic
Occupation	Generic
NSQF Level	3
Credits	TBD
Version	1.0
Last Reviewed Date	30/09/2021
Next Review Date	30/09/2024
Deactivation Date	30/09/2024
NSQC Clearance Date	30/09/2021

ASC/N9802: Interact effectively with colleagues, customers and others

Description

This NOS unit is about communicating with customers and colleagues/superiors, either in own work group or in other work groups within organisation.

Scope

The scope covers the following :

- Communicate effectively with colleagues, customers and others
- Interact with supervisor or superior

Elements and Performance Criteria

Communicate effectively with colleagues, customers and others

To be competent, the user/individual on the job must be able to:

PC1. maintain clear communication with colleagues, customers and others, wherever needed, through all means i.e. face-to-face, telephonic or written

PC2. adjust communication styles to reflect gender and persons with disability (PwD) sensitivity

PC3. work in a way that shows respect for colleagues and others

PC4. follow the organisation's policies and procedures while working in a team

PC5. respect personal space of colleagues and customers

Interact with supervisor or superior

To be competent, the user/individual on the job must be able to:

PC6. identify work requirements by receiving instructions from reporting supervisor

PC7. escalate problems to supervisors that cannot be handled including repairs and maintenance of machine

PC8. report the completed work

PC9. rectify errors as per feedback

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. the importance of effective communication and establishing good working relationships with colleagues and supervisor

KU2. different methods of communication as per the circumstances

KU3. gender based concepts, issues and legislation

Generic Skills (GS)

User/individual on the job needs to know how to:

GS1. read instructions/guidelines/procedures

GS2. listen effectively and orally communicate information
GS3. ask for clarification and advice from the concerned person
GS4. maintain positive and effective relationships with colleagues and customers
GS5. evaluate the possible solution(s) to the problem
GS6. deliver consistent and reliable service to customers
GS7. complete written work with attention to detail
GS8. check that the work meets customer requirements

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Communicate effectively with colleagues, customers and others	36	11	-	14
PC1. maintain clear communication with colleagues, customers and others, wherever needed, through all means i.e. face-to-face, telephonic or written	8	-	-	4
PC2. adjust communication styles to reflect gender and persons with disability (PwD) sensitivity	8	-	-	-
PC3. work in a way that shows respect for colleagues and others	7	4	-	3
PC4. follow the organisation's policies and procedures while working in a team	7	4	-	3
PC5. respect personal space of colleagues and customers	6	3	-	4
Interact with supervisor or superior	14	19	-	6
PC6. identify work requirements by receiving instructions from reporting supervisor	7	4	-	-
PC7. escalate problems to supervisors that cannot be handled including repairs and maintenance of machine	-	5	-	3
PC8. report the completed work	7	5	-	-
PC9. rectify errors as per feedback	-	5	-	3
NOS Total	**50**	**30**	**-**	**20**

National Occupational Standards (NOS) Parameters

NOS Code	ASC/N9802
NOS Name	Interact effectively with colleagues, customers and others
Sector	Automotive
Sub-Sector	Generic
Occupation	Generic
NSQF Level	3
Credits	TBD
Version	1.0
Last Reviewed Date	30/09/2021
Next Review Date	25/11/2026
Deactivation Date	25/11/2026
NSQC Clearance Date	25/11/2021

ASC/N1449: Carry out routine service or minor repairs on electric vehicle and assist in diagnosis

Description

This NOS unit is about performing all tasks related to service, minor repair and diagnosis of electric vehicle.

Scope

The scope covers the following :

- Prepare to carry out routine service or minor repair and assist in fault diagnosis
- Perform routine service and minor repairs
- Assist lead technician in diagnosis or troubleshooting the faults
- Post service/repair/diagnostic activities

Elements and Performance Criteria

Prepare to carry out routine service or minor repair and assist in fault diagnosis

To be competent, the user/individual on the job must be able to:

PC1. review the job card and understand work to be carried out on the electric vehicle

PC2. identify the auto components related to the various aggregates in the electric vehicle

PC3. ensure no HV (High Voltage) activity is being conducted around workstation prior to commencement of work

PC4. collect workshop tools/measuring devices/equipment required to carry out job on electric vehicle and check their condition/calibration

PC5. prepare the electric vehicle according to nature of job to be performed: general and mechanical job on the vehicle/electrical work in non-live state/troubleshoot and replace parts in live state of HV system

PC6. mark the electric vehicle and safeguard the working area during electrical work

PC7. wear PPE according to nature of job to be performed on electric vehicle

PC8. conduct visual inspection on the electric vehicle to identify defects in HV components and identify indirect faults in electrical/electronic aggregate due to other system/component

PC9. assess mechanical aggregates such as steering gear, suspension, axle, brakes, etc. of the electric vehicle for any external impact/bend/leak/incorrect level/wear & tear

PC10. report the malfunctions/repairs in the electric vehicle beyond own scope to the concerned person

Perform routine service and minor repairs

To be competent, the user/individual on the job must be able to:

PC11. take precautions to avoid damage to the electric vehicle and its components while working on various aggregates

PC12. use appropriate tools, equipment, and consumables as per nature of job and Standard Operating Procedure (SOP) recommended by the organization

PC13. perform task on the HV system as per following stages: general and mechanical tasks on the electric vehicle which do not require isolation of the HV systems, mechanical work in non live state of the HV systems and replace parts in live state of the HV system

PC14. test electric vehicle's electrical/electronic components performance wherever applicable as per OEM SOP

PC15. remove parts relevant to various mechanical aggregates of electric vehicle and place them securely as specified by OEM

PC16. clean and condition dismantled mechanical and electrical components of electric vehicle prior to assembly

PC17. perform minor repair/replacement/calibration/ of mechanical system/aggregate such as steering gear, suspension, axle, brakes etc. including HVAC, wherever applicable

PC18. refill/replace, as required quantity and appropriate grade of brake fluid or other lubricant/fluids in the engine aggregates as per OEM guidelines

PC19. maintain the documentation related to inspection, servicing and minor repair performed on the electric vehicle

Assist lead technician in diagnosis or troubleshooting the faults

To be competent, the user/individual on the job must be able to:

PC20. conduct test drive of the electric vehicle to assist the lead technician in assessing the service/repair requirement or calibration/adjustments, if any

PC21. follow lead technician instructions to choose and use the appropriate device/equipment to inspect/test electric vehicle/system/component performance to diagnose defect or faults in the electric vehicle

PC22. carry out inspection or test on electric vehicle mechanical and electrical systems according to lead technician instructions

PC23. interpret and compare results of diagnostic inspections/tests with vehicle specifications and regulatory requirements

PC24. maintain the documentation related to inspections and troubleshooting performed on the electric vehicle

PC25. report the results to lead technician and seek assistance if further tests or inspections are required to conclude the diagnosis or troubleshooting

Post service/repair/diagnostic activities

To be competent, the user/individual on the job must be able to:

PC26. check the performance of electric vehicle/aggregate post repair and report to supervisor/service advisor if further inspection is required by another specialist

PC27. ensure completeness of tasks assigned before releasing the electric vehicle for the next procedure

PC28. dispose of materials such as old batteries, scrap of failed parts/aggregates as per organization's policies

PC29. return leftover consumable/parts, tools/equipment, and report if any malfunctions are observed to the person concerned

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. the automotive industry in India, workshop structure and role and responsibilities of different people in the workshop

KU2. SOP for receiving vehicles, opening job card, allocation of work, invoicing, vehicle delivery, handling complaints, etc.

KU3. different components/aggregates as well as auto component manufacturer's specifications of the electric vehicle

KU4. basic technology used in functioning of various systems and components of the electric vehicle including electrical machines and devices such as: DC/DC converters, AC motor, DC motor, charging systems etc

KU5. interconnection of systems with each other and effect of one system on other system

KU6. fundamental terms, laws and principles of electricity used in electric vehicles such as: principles of storing electrical voltage, ohms law, voltage, current (AC/DC/HV), resistance, power, capacitance, electrostatics, magnetic, inductance, discrete electronic components, and radio frequency (automotive digital computers, automotive communication protocols such as CAN, LIN, MOST, etc.)

KU7. use of relevant measuring device/equipment and interpretation of all relevant mathematical calculations

KU8. various electrical and electronic signals such as electrical inputs, outputs, voltage, pulse width modulation, digital signal (including infra-red and fiber optics) etc.

KU9. symbols, units and terms used in wiring diagrams associated with electrical/electric systems/components of the electric vehicle

KU10. how to use a computer, online application and OEM technical information/assistance portals

KU11. various sources of information available for assessing service and repair requirements of the electric vehicle including diagnostic displays, visual inspections, test drives, vehicle/equipment manufacturer specifications, and tolerance limits of components

KU12. standard schedules and checklists recommended by the OEM/auto component manufacturer for servicing of electric vehicle

KU13. typical symptoms of common faults and failures of mechanical, electrical and electronic systems of the electric vehicle

KU14. safety, health and environmental policies and regulations for the workplace as well as for automotive trade in general

KU15. Standard Operating Procedures (SOPs) of the organization/ dealership for inspection and diagnosis of faults in the electric vehicle as prescribed by the OEM/components manufacturer

KU16. how to work on the HV systems which do not require isolation, troubleshooting and replacing parts on the active HV system

KU17. SOP recommended by OEM for using tools/equipment for diagnosis or troubleshooting such as special service tools, measuring instrument, volt meters, ammeters, ohmmeters, battery tester, dedicated and computer based diagnostic equipment, oscilloscopes, etc.

KU18. various workshop tools/measuring devices/equipment required to carry out job on electric vehicle and their common errors or defects

KU19. documentation requirements for each procedure carried out as part of roles and responsibilities as specified by OEM/ auto component manufacturer

KU20. organizational/professional code of ethics and standards of practice

KU21. electrical hazards, protective measures and first aid: in case of electric shock, electrical arc in public grid or in an electrical vehicle, impact of electric current/arc, secondary accidents

KU22. five safety rules for electrical work on HV systems before starting the work i.e. isolate, safeguard reconnection, verify the non-live state, earth or short-circuit and shroud or safeguard adjacent live parts

KU23. safety requirements recommended by the OEM for equipment/electric vehicle components during diagnosis, troubleshooting and root cause analysis on various aggregates

KU24. legal regulations that need to be taken into account for handling electric vehicles in the workshop

KU25. Occupational Safety and Health (OSH) measures required for working on electric vehicle

Generic Skills (GS)

User/individual on the job needs to know how to:

GS1. read and interpret workplace related documentation

GS2. interpret the needs of customers by understanding the key issues

GS3. communicate using terms, names, grades and other nomenclature pertaining to the automotive trade

GS4. analyse and apply the information gathered from observation, experience, reasoning or communication to act efficiently

GS5. identify potential workplace problems and take suitable action

GS6. read various sources of information available for assessing service and repair requirements

GS7. write any work-related information

GS8. write in English/regional language

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Prepare to carry out routine service or minor repair and assist in fault diagnosis	5	14	-	6
PC1. review the job card and understand work to be carried out on the electric vehicle	-	1	-	1
PC2. identify the auto components related to the various aggregates in the electric vehicle	1	2	-	1
PC3. ensure no HV (High Voltage) activity is being conducted around workstation prior to commencement of work	1	1	-	-
PC4. collect workshop tools/measuring devices/equipment required to carry out job on electric vehicle and check their condition/calibration	1	2	-	1
PC5. prepare the electric vehicle according to nature of job to be performed: general and mechanical job on the vehicle/electrical work in non-live state/troubleshoot and replace parts in live state of HV system	-	1	-	-
PC6. mark the electric vehicle and safeguard the working area during electrical work	-	1	-	-
PC7. wear PPE according to nature of job to be performed on electric vehicle	1	1	-	1
PC8. conduct visual inspection on the electric vehicle to identify defects in HV components and identify indirect faults in electrical/electronic aggregate due to other system/component	-	2	-	1
PC9. assess mechanical aggregates such as steering gear, suspension, axle, brakes, etc. of the electric vehicle for any external impact/bend/leak/incorrect level/wear & tear	1	2	-	1
PC10. report the malfunctions/repairs in the electric vehicle beyond own scope to the concerned person	-	1	-	-
Perform routine service and minor repairs	12	18	-	5
PC11. take precautions to avoid damage to the electric vehicle and its components while working on various aggregates	1	2	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC12. use appropriate tools, equipment, and consumables as per nature of job and Standard Operating Procedure (SOP) recommended by the organization	1	2	-	1
PC13. perform task on the HV system as per following stages: general and mechanical tasks on the electric vehicle which do not require isolation of the HV systems, mechanical work in non live state of the HV systems and replace parts in live state of the HV system	2	2	-	-
PC14. test electric vehicle's electrical/electronic components performance wherever applicable as per OEM SOP	2	3	-	2
PC15. remove parts relevant to various mechanical aggregates of electric vehicle and place them securely as specified by OEM	1	2	-	-
PC16. clean and condition dismantled mechanical and electrical components of electric vehicle prior to assembly	1	1	-	-
PC17. perform minor repair/replacement/calibration/ of mechanical system/aggregate such as steering gear, suspension, axle, brakes etc. including HVAC, wherever applicable	2	3	-	1
PC18. refill/replace, as required quantity and appropriate grade of brake fluid or other lubricant/fluids in the engine aggregates as per OEM guidelines	1	2	-	1
PC19. maintain the documentation related to inspection, servicing and minor repair performed on the electric vehicle	1	1	-	-
Assist lead technician in diagnosis or troubleshooting the faults	**8**	**10**	**-**	**5**
PC20. conduct test drive of the electric vehicle to assist the lead technician in assessing the service/repair requirement or calibration/adjustments, if any	-	2	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC21. follow lead technician instructions to choose and use the appropriate device/equipment to inspect/test electric vehicle/system/component performance to diagnose defect or faults in the electric vehicle	2	2	-	2
PC22. carry out inspection or test on electric vehicle mechanical and electrical systems according to lead technician instructions	2	2	-	2
PC23. interpret and compare results of diagnostic inspections/tests with vehicle specifications and regulatory requirements	2	2	-	1
PC24. maintain the documentation related to inspections and troubleshooting performed on the electric vehicle	1	1	-	-
PC25. report the results to lead technician and seek assistance if further tests or inspections are required to conclude the diagnosis or troubleshooting	1	1	-	-
Post service/repair/diagnostic activities	**5**	**8**	**-**	**4**
PC26. check the performance of electric vehicle/aggregate post repair and report to supervisor/service advisor if further inspection is required by another specialist	2	3	-	2
PC27. ensure completeness of tasks assigned before releasing the electric vehicle for the next procedure	1	2	-	1
PC28. dispose of materials such as old batteries, scrap of failed parts/aggregates as per organization's policies	1	2	-	1
PC29. return leftover consumable/parts, tools/equipment, and report if any malfunctions are observed to the person concerned	1	1	-	-
NOS Total	**30**	**50**	**-**	**20**

National Occupational Standards (NOS) Parameters

NOS Code	ASC/N1449
NOS Name	Carry out routine service or minor repairs on electric vehicle and assist in diagnosis
Sector	Automotive
Sub-Sector	Automotive Vehicle Service
Occupation	Technical Service & Repair
NSQF Level	4
Credits	TBD
Version	1.0
Last Reviewed Date	30/12/2021
Next Review Date	30/12/2024
Deactivation Date	30/12/2024
NSQC Clearance Date	30/12/2021

ASC/N1450: Carry out routine service or minor repairs on four wheeler electric/ hybrid vehicle and assist in diagnosis

Description

This NOS unit is about performing all tasks related to service, minor repair and diagnosis of the four wheeler electric/ hybrid vehicle.

Scope

The scope covers the following :

- Prepare to carry out routine service or minor repair and assist in fault diagnosis
- Perform routine service and minor repairs
- Assist lead technician in diagnosis or troubleshooting the faults
- Post service/repair/diagnostic activities

Elements and Performance Criteria

• Prepare to carry out routine service or minor repair and assist in fault diagnosis

To be competent, the user/individual on the job must be able to:

PC1. review the job card and understand work to be carried out on the four wheeler electric/ hybrid vehicle

PC2. identify the auto components related to the various aggregates in the four wheeler electric/ hybrid vehicle

PC3. ensure no HV (High Voltage) activity is being conducted around workstation prior to commencement of work on four wheeler electric/ hybrid vehicle

PC4. collect workshop tools/measuring devices/equipment required to carry out job on the four wheeler electric/ hybrid vehicle and check their condition/calibration

PC5. prepare the four wheeler electric/ hybrid vehicle according to nature of job to be performed: general and mechanical job on the vehicle/electrical work in non-live state/troubleshoot and replace parts in live state of HV system

PC6. mark the four wheeler electric/ hybrid vehicle and safeguard the working area during electrical work

PC7. wear PPE according to nature of job to be performed on the four wheeler electric/ hybrid vehicle

PC8. conduct visual inspection of the four wheeler electric/ hybrid vehicle to identify defects in HV components and identify indirect faults in electrical/electronic aggregate due to other system/component

PC9. assess mechanical aggregates such as engine/traction motor, transmission, axles, brakes etc. of the four wheeler electric/ hybrid vehicle for any external impact/bend/leak/incorrect level/wear & tear

PC10. report the malfunctions/repairs in the four wheeler electric/ hybrid vehicle beyond own scope to the concerned person

Perform routine service and minor repairs

To be competent, the user/individual on the job must be able to:

PC11. take precautions to avoid damage to the four wheeler electric/ hybrid vehicle and its components while working on various aggregates

PC12. use appropriate tools, equipment, and consumables as per nature of job and Standard Operating Procedure (SOP) recommended by the organization

PC13. perform task on the HV system as per following stages: general and mechanical tasks on the four wheeler electric/ hybrid vehicle which do not require isolation of the HV systems, mechanical work in non live state of the HV systems and replace parts in live state of the HV system

PC14. test the four wheeler electric/ hybrid vehicle's electrical/electronic components performance wherever applicable as per OEM SOP

PC15. remove parts relevant to various mechanical aggregates of the four wheeler electric/ hybrid vehicle and place them securely as specified by OEM

PC16. clean and condition dismantled mechanical and electrical components of the four wheeler electric/ hybrid vehicle prior to assembly

PC17. perform minor repair/replacement/calibration/ of mechanical system/aggregate of the four wheeler electric/ hybrid vehicle such as drive line, running systems, etc. including HVAC, power assisted braking & steering systems

PC18. refill/replace, as required quantity and appropriate grade of coolants, engine oil, other lubricant/fluids in the four wheeler electric/ hybrid vehicle as per OEM guidelines

PC19. maintain the documentation related to inspection, servicing and minor repair perform on the four wheeler electric/ hybrid vehicle

Assist lead technician in diagnosis or troubleshooting the faults

To be competent, the user/individual on the job must be able to:

PC20. conduct test drive of the four wheeler electric/ hybrid vehicle to assist the lead technician in assessing the service/repair requirement or calibration/adjustments, if any

PC21. follow lead technician instructions to choose and use the appropriate device/equipment to inspect/test the four wheeler electric/ hybrid vehicle/system/component performance to diagnose defect or faults in the electric/hybrid vehicle

PC22. carry out inspection or test on the four wheeler electric/ hybrid vehicle mechanical and electrical systems according to lead technician instructions

PC23. interpret and compare results of diagnostic inspections/tests with four wheeler electric/ hybrid vehicle specifications and regulatory requirements

PC24. maintain the documentation related to inspections and troubleshooting performed on the four wheeler electric/ hybrid vehicle

PC25. report the results to lead technician and seek assistance if further tests or inspections are required to conclude the diagnosis or troubleshooting

Post service/repair/diagnostic activities

To be competent, the user/individual on the job must be able to:

PC26. check the performance of four wheeler electric/ hybrid vehicle/aggregate post repair and report to supervisor/service advisor if further inspection is required by another specialist

PC27. ensure completeness of tasks assigned before releasing the four wheeler electric/ hybrid vehicle for the next procedure

PC28. dispose of materials such as old batteries, scrap of failed parts/aggregates as per organization's policies

PC29. return leftover consumable/parts, tools/equipment, and report if any malfunctions are observed to the person concerned

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. the automotive industry in India, workshop structure and role and responsibilities of different people in the workshop

KU2. SOP for receiving vehicles, opening job card, allocation of work, invoicing, vehicle delivery, handling complaints, etc.

KU3. different components/aggregates as well as auto component manufacturer's specifications of the vehicle

KU4. basic technology used in and functioning of various systems and components of the four wheeler electric/ hybrid vehicle such as engine, transmission, batteries, body management system, telematics, brake system, air-conditioning systems, active & passive safety system, media and other systems (including electrical machines and devices used in electric vehicles such as: generator, DC/AC and DC/DC converters, AC motor, DC motor, charging systems etc.)

KU5. interconnection of systems with each other and effect of one system on other system

KU6. fundamental terms, laws and principles of electricity used in four wheeler electric/ hybrid vehicle such as: principles of storing electrical voltage, ohms law, voltage, current (AC/DC/HV), resistance, power, capacitance, electrostatics, magnetic, inductance, discrete electronic components, and radio frequency (automotive digital computers, automotive communication protocols such as CAN, LIN, MOST, etc.)

KU7. use of relevant measuring device/equipment and interpretation of all relevant mathematical calculations

KU8. various electrical and electronic signals such as electrical inputs, outputs, voltage, pulse width modulation, digital signal (including infra-red and fiber optics) etc.

KU9. symbols, units and terms used in wiring diagrams associated with electrical/electric systems/components of the four wheeler electric/ hybrid vehicle

KU10. how to use computer, on-line application and OEM technical information/assistance portals

KU11. various sources of information available for assessing service and repair requirements of the four wheeler electric/ hybrid vehicle including diagnostic displays, visual inspections, test drives, vehicle/equipment manufacturer specifications, and tolerance limits of components

KU12. standard schedules and checklists recommended by the OEM/auto component manufacturer for servicing of four wheeler electric/ hybrid vehicle

KU13. typical symptoms of common faults and failures in four wheeler electric/ hybrid vehicle mechanical, electrical and electronic systems

KU14. safety, health and environmental policies and regulations for the workplace as well as for automotive trade in general

KU15. Standard Operating Procedures (SOPs) of the organization/ dealership for inspection and diagnosis of faults in a four wheeler electric/ hybrid vehicle as prescribed by the OEM/components manufacturer

KU16. how to work on the HV systems which do not require isolation, troubleshooting and replacing parts on the active HV system

KU17. SOP recommended by OEM for using tools/equipment for diagnosis or troubleshooting such as special service tools, measuring instrument, volt meters, ammeters, ohmmeters, battery tester, dedicated and computer based diagnostic equipment, oscilloscopes etc.

KU18. various workshop tools/measuring devices/equipment required to carry out job on four wheeler electric/ hybrid vehicle and their common errors or defects

KU19. documentation requirements for each procedure carried out as part of roles and responsibilities as specified by OEM/auto component manufacturer

KU20. organizational/professional code of ethics and standards of practice

KU21. electrical hazards, protective measures and first aid: in case of electric shock, electrical arc in public grid or in the four wheeler electric/ hybrid vehicle, impact of electric current/arc, secondary accidents

KU22. five safety rules for electrical work on HV systems before starting the work i.e. isolate, safeguard reconnection, verify the non-live state, earth or short-circuit and shroud or safeguard adjacent live parts

KU23. safety requirements recommended by the OEM for equipment /four wheeler electric/ hybrid vehicle components during diagnosis, troubleshooting and root cause analysis on various aggregates

KU24. legal regulations that need to be taken into account for handling four wheeler electric/ hybrid vehicle in the workshop

KU25. Occupational Safety and Health (OSH) measures required for working on four wheeler electric/hybrid vehicle

Generic Skills (GS)

User/individual on the job needs to know how to:

GS1. read and interpret workplace related documentation

GS2. interpret the needs of customers by understanding the key issues

GS3. communicate using terms, names, grades and other nomenclature pertaining to the automotive trade

GS4. analyse and apply the information gathered from observation, experience, reasoning or communication to act efficiently

GS5. identify potential workplace problem and take suitable action

GS6. read various sources of information available for assessing service and repair requirements

GS7. write any work-related information

GS8. write in English/regional language

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
• Prepare to carry out routine service or minor repair and assist in fault diagnosis	5	14	-	6
PC1. review the job card and understand work to be carried out on the four wheeler electric/ hybrid vehicle	-	1	-	1
PC2. identify the auto components related to the various aggregates in the four wheeler electric/ hybrid vehicle	1	2	-	1
PC3. ensure no HV (High Voltage) activity is being conducted around workstation prior to commencement of work on four wheeler electric/ hybrid vehicle	1	1	-	-
PC4. collect workshop tools/measuring devices/equipment required to carry out job on the four wheeler electric/ hybrid vehicle and check their condition/calibration	1	2	-	1
PC5. prepare the four wheeler electric/ hybrid vehicle according to nature of job to be performed: general and mechanical job on the vehicle/electrical work in non-live state/troubleshoot and replace parts in live state of HV system	-	1	-	-
PC6. mark the four wheeler electric/ hybrid vehicle and safeguard the working area during electrical work	-	1	-	-
PC7. wear PPE according to nature of job to be performed on the four wheeler electric/ hybrid vehicle	1	1	-	1
PC8. conduct visual inspection of the four wheeler electric/ hybrid vehicle to identify defects in HV components and identify indirect faults in electrical/electronic aggregate due to other system/component	-	2	-	1
PC9. assess mechanical aggregates such as engine/traction motor, transmission, axles, brakes etc. of the four wheeler electric/ hybrid vehicle for any external impact/bend/leak/incorrect level/wear & tear	1	2	-	1
PC10. report the malfunctions/repairs in the four wheeler electric/ hybrid vehicle beyond own scope to the concerned person	-	1	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Perform routine service and minor repairs	12	18	-	5
PC11. take precautions to avoid damage to the four wheeler electric/ hybrid vehicle and its components while working on various aggregates	1	2	-	-
PC12. use appropriate tools, equipment, and consumables as per nature of job and Standard Operating Procedure (SOP) recommended by the organization	1	2	-	1
PC13. perform task on the HV system as per following stages: general and mechanical tasks on the four wheeler electric/ hybrid vehicle which do not require isolation of the HV systems, mechanical work in non live state of the HV systems and replace parts in live state of the HV system	2	2	-	-
PC14. test the four wheeler electric/ hybrid vehicle's electrical/electronic components performance wherever applicable as per OEM SOP	2	3	-	2
PC15. remove parts relevant to various mechanical aggregates of the four wheeler electric/ hybrid vehicle and place them securely as specified by OEM	1	2	-	-
PC16. clean and condition dismantled mechanical and electrical components of the four wheeler electric/ hybrid vehicle prior to assembly	1	1	-	-
PC17. perform minor repair/replacement/calibration/ of mechanical system/aggregate of the four wheeler electric/ hybrid vehicle such as drive line, running systems, etc. including HVAC, power assisted braking & steering systems	2	3	-	1
PC18. refill/replace, as required quantity and appropriate grade of coolants, engine oil, other lubricant/fluids in the four wheeler electric/ hybrid vehicle as per OEM guidelines	1	2	-	1
PC19. maintain the documentation related to inspection, servicing and minor repair perform on the four wheeler electric/ hybrid vehicle	1	1	-	-
Assist lead technician in diagnosis or troubleshooting the faults	8	10	-	5

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC20. conduct test drive of the four wheeler electric/ hybrid vehicle to assist the lead technician in assessing the service/repair requirement or calibration/adjustments, if any	-	2	-	-
PC21. follow lead technician instructions to choose and use the appropriate device/equipment to inspect/test the four wheeler electric/ hybrid vehicle/system/component performance to diagnose defect or faults in the electric/hybrid vehicle	2	2	-	2
PC22. carry out inspection or test on the four wheeler electric/ hybrid vehicle mechanical and electrical systems according to lead technician instructions	2	2	-	2
PC23. interpret and compare results of diagnostic inspections/tests with four wheeler electric/ hybrid vehicle specifications and regulatory requirements	2	2	-	1
PC24. maintain the documentation related to inspections and troubleshooting performed on the four wheeler electric/ hybrid vehicle	1	1	-	-
PC25. report the results to lead technician and seek assistance if further tests or inspections are required to conclude the diagnosis or troubleshooting	1	1	-	-
Post service/repair/diagnostic activities	**5**	**8**	**-**	**4**
PC26. check the performance of four wheeler electric/ hybrid vehicle/aggregate post repair and report to supervisor/service advisor if further inspection is required by another specialist	2	3	-	2
PC27. ensure completeness of tasks assigned before releasing the four wheeler electric/ hybrid vehicle for the next procedure	1	2	-	1
PC28. dispose of materials such as old batteries, scrap of failed parts/aggregates as per organization's policies	1	2	-	1
PC29. return leftover consumable/parts, tools/equipment, and report if any malfunctions are observed to the person concerned	1	1	-	-
NOS Total	**30**	**50**	**-**	**20**

National Occupational Standards (NOS) Parameters

NOS Code	ASC/N1450
NOS Name	Carry out routine service or minor repairs on four wheeler electric/ hybrid vehicle and assist in diagnosis
Sector	Automotive
Sub-Sector	Automotive Vehicle Service
Occupation	Technical Service & Repair
NSQF Level	4
Credits	TBD
Version	1.0
Last Reviewed Date	30/12/2021
Next Review Date	30/12/2024
Deactivation Date	30/12/2024
NSQC Clearance Date	30/12/2021

ASC/N1451: Carry out routine service or minor repairs on two/three wheeler electric vehicle and assist in diagnosis

Description

This NOS unit is about an individual who performs all tasks related to service, minor repair and diagnosis on two/three wheeler electric vehicle.

Scope

The scope covers the following :

- Prepare to carry out routine service or minor repair and assist in fault diagnosis
- Perform routine service and minor repairs
- Assist lead technician in diagnosis or troubleshooting the faults
- Post service/repair/diagnostic activities

Elements and Performance Criteria

Prepare to carry out routine service or minor repair and assist in fault diagnosis

To be competent, the user/individual on the job must be able to:

PC1. review the job card and understand work to be carried out on two/three wheeler electric vehicle

PC2. identify the auto components related to the various aggregates in the two/three wheeler electric vehicle

PC3. ensure no HV (High Voltage) activity is being conducted around workstation prior to commencement of work on two/three wheeler electric vehicle

PC4. collect workshop tools/measuring devices/equipment required to carry out job on two/three wheeler electric vehicle and check their condition/calibration

PC5. prepare two/three wheeler electric vehicle according to nature of job to be performed: general and mechanical/electrical work in non-live state/troubleshoot and replace parts in live state HV system

PC6. mark the two/three wheeler electric vehicle and safeguard the working area during electrical work

PC7. wear PPE according to nature of job to be performed on the two/three wheeler electric vehicle

PC8. conduct visual inspection of the two/three wheeler electric vehicle to identify defects in HV components and identify indirect faults in electrical/electronic aggregate due to other system/component

PC9. assess mechanical aggregates such as brakes, suspension, axles etc. of the two/three wheeler electric vehicle for any external impact/bend/leak, incorrect level, wear & tear

PC10. report the malfunctions/repairs in the two/three wheeler electric vehicle beyond own scope to the concerned person

Perform routine service and minor repairs

To be competent, the user/individual on the job must be able to:

PC11. take precautions to avoid damage to the two/three wheeler electric vehicle and its components while working on various aggregates

PC12. use appropriate tools, equipment, and consumables as per nature of job and Standard Operating Procedure (SOP) recommended by the organisation

PC13. perform task on the HV system as per following stages: general and mechanical tasks on the two/three wheeler electric vehicle which do not require isolation of the HV systems, mechanical work in non-live state of the HV systems and replace parts in live state of the HV system

PC14. test the two/three wheeler electric vehicle's electrical/electronic system functioning of two/three wheeler vehicle wherever applicable as per OEM SOP

PC15. remove parts relevant to various mechanical aggregates of two/three wheeler electric vehicle and place them securely as specified by OEM

PC16. clean and condition dismantled mechanical and electrical components of two/three wheeler electric vehicle prior to assembly

PC17. perform minor repair/replacement/calibration of mechanical components/aggregates of the two/three wheeler electric vehicle such as brake pedal/lever free play adjustment, headlight beam alignment, etc.

PC18. refill/replace, as required quantity and appropriate grade of brake or other fluid/lubricant in the two/three wheeler electric vehicle as per OEM guidelines

PC19. maintain the documentation related to inspection, servicing and minor repair performed on the two/three wheeler electric vehicle

Assist lead technician in diagnosis or troubleshooting the faults

To be competent, the user/individual on the job must be able to:

PC20. conduct test drive of the two/three wheeler electric vehicle to assist the lead technician in assessing the service/repair requirement or calibration/adjustments, if any

PC21. follow lead technician instructions to choose and use the appropriate device/equipment to inspect/test the two/three wheeler electric vehicle/system/component performance to diagnose defect or faults

PC22. carry out inspection or tests on the two/three wheeler electric vehicle mechanical and electrical systems according to lead technician instructions

PC23. interpret and compare results of diagnostic inspections/tests with two/three wheeler electric vehicle specifications or regulatory requirements

PC24. maintain the documentation related to inspections and troubleshooting performed on the two/three wheeler electric vehicle

PC25. report the results to lead technician and seek assistance if further tests or inspections are required to conclude the diagnosis or troubleshooting

Post service/repair/diagnostic activities

To be competent, the user/individual on the job must be able to:

PC26. check the performance of the two/three wheeler electric vehicle/aggregate post repair and report to lead technician/supervisor if further inspection is required by another specialist

PC27. ensure completeness of tasks assigned before releasing the two/three wheeler electric vehicle for the next procedure

PC28. dispose of materials such as old batteries, scrap of failed parts/aggregates as per organization's policies

PC29. return leftover consumable/parts, tools/equipment, and report if any malfunctions are observed to the person concerned

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. the automotive industry in India, workshop structure and role and responsibilities of different people in the workshop

KU2. SOP for receiving two/three wheeler electric vehicle, opening job card, allocation of work, invoicing, vehicle delivery, handling complaints, etc.

KU3. different components/aggregates as well as auto component manufacturer's specifications for the same

KU4. basic technology used in and functioning of various systems and components of the two/three wheeler electric vehicle system such as: brakes, suspension, steering, hub drive/chain drive, etc. including electrical machines and devices used in electric vehicles such as: generator, DC/AC and DC/DC converters, Drive motor/hub, charging systems, regenerative braking, etc.

KU5. interconnection of systems with each other and effect of one system on other system

KU6. fundamental terms, laws and principles of electricity used in two/three wheeler electric vehicles such as: principles of storing electrical voltage, ohms law, voltage, current (AC/DC/HV), resistance, power, capacitance, electrostatics, magnetic, inductance, discrete electronic components, and radio frequency (automotive digital computers, automotive communication protocols such as CAN, LIN, etc.)

KU7. use of relevant measuring device/equipment and interpretation of all relevant mathematical calculations

KU8. various electrical and electronic signals such as electrical inputs, outputs, voltage, pulse width modulation, digital signal, etc.

KU9. symbols, units and terms used in wiring diagrams associated with electrical/electric systems/components of the two/three wheeler electric vehicle

KU10. how to use computer, on-line application and OEM technical information/assistance portals

KU11. various sources of information available for assessing service and repair requirements of the two/three wheeler electric vehicle including diagnostic displays, visual inspections, test drives, vehicle/equipment manufacturer specifications, and tolerance limits of components

KU12. standard schedules and checklists recommended by the OEM/auto component manufacturer for servicing of two/three wheeler electric vehicle or components

KU13. typical symptoms of common faults and failures in vehicle mechanical, electrical and electronic systems of two/three wheeler electric vehicle

KU14. safety, health and environmental policies and regulations for the workplace as well as for automotive trade in general

KU15. Standard Operating Procedures (SOPs) of the organization/ dealership for inspection and diagnosis of faults in a two/three wheeler electric vehicle as prescribed by the OEM/components manufacturer

KU16. how to work on the HV systems which do not require isolation, troubleshooting and replacing parts on the active HV system

KU17. SOP recommended by OEM for using tools/equipment for diagnosis or troubleshooting such as special service tools, measuring instrument, volt meters, ammeters, ohmmeters, battery tester, dedicated and computer based diagnostic equipment, oscilloscopes etc.

KU18. various workshop tools/measuring devices/equipment required to carry out job on two/three wheeler electric vehicle and their common errors or defects

KU19. documentation requirements for each procedure carried out as part of roles and responsibilities as specified by OEM/ auto component manufacturer

KU20. organizational/professional code of ethics and standards of practice

KU21. electrical hazards, protective measures and first aid: in case of electric shock, electrical arc in public grid or in two/three wheeler electric vehicle, impact of electric current/arc, secondary accidents

KU22. five safety rules for electrical work on HV systems before starting the work i.e. isolate, safeguard reconnection, verify the non-live state, earth or short-circuit and shroud or safeguard adjacent live parts

KU23. safety requirements recommended by the OEM for equipment/two/three wheeler electric vehicle components during diagnosis, troubleshooting and root cause analysis on various aggregates

KU24. legal regulations that need to be taken into account for handling two/three wheeler electric vehicle in the workshop

KU25. Occupational Safety and Health (OSH) measures required for working on two/three wheeler electric vehicle

Generic Skills (GS)

User/individual on the job needs to know how to:

GS1. read and interpret workplace related documentation

GS2. interpret the needs of customers by understanding the key issues

GS3. communicate using terms, names, grades and other nomenclature pertaining to the automotive trade

GS4. analyse and apply the information gathered from observation, experience, reasoning or communication to act efficiently

GS5. identify potential workplace problem and take suitable action

GS6. read various sources of information available for assessing service and repair requirements

GS7. write any work-related information

GS8. write in English/regional language

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Prepare to carry out routine service or minor repair and assist in fault diagnosis	5	14	-	6
PC1. review the job card and understand work to be carried out on two/three wheeler electric vehicle	-	1	-	1
PC2. identify the auto components related to the various aggregates in the two/three wheeler electric vehicle	1	2	-	1
PC3. ensure no HV (High Voltage) activity is being conducted around workstation prior to commencement of work on two/three wheeler electric vehicle	1	1	-	-
PC4. collect workshop tools/measuring devices/equipment required to carry out job on two/three wheeler electric vehicle and check their condition/calibration	1	2	-	1
PC5. prepare two/three wheeler electric vehicle according to nature of job to be performed: general and mechanical/electrical work in non-live state/troubleshoot and replace parts in live state HV system	-	1	-	-
PC6. mark the two/three wheeler electric vehicle and safeguard the working area during electrical work	-	1	-	-
PC7. wear PPE according to nature of job to be performed on the two/three wheeler electric vehicle	1	1	-	1
PC8. conduct visual inspection of the two/three wheeler electric vehicle to identify defects in HV components and identify indirect faults in electrical/electronic aggregate due to other system/component	-	2	-	1
PC9. assess mechanical aggregates such as brakes, suspension, axles etc. of the two/three wheeler electric vehicle for any external impact/bend/leak, incorrect level, wear & tear	1	2	-	1
PC10. report the malfunctions/repairs in the two/three wheeler electric vehicle beyond own scope to the concerned person	-	1	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Perform routine service and minor repairs	12	18	-	5
PC11. take precautions to avoid damage to the two/three wheeler electric vehicle and its components while working on various aggregates	1	2	-	-
PC12. use appropriate tools, equipment, and consumables as per nature of job and Standard Operating Procedure (SOP) recommended by the organisation	1	2	-	1
PC13. perform task on the HV system as per following stages: general and mechanical tasks on the two/three wheeler electric vehicle which do not require isolation of the HV systems, mechanical work in non-live state of the HV systems and replace parts in live state of the HV system	2	2	-	-
PC14. test the two/three wheeler electric vehicle's electrical/electronic system functioning of two/three wheeler vehicle wherever applicable as per OEM SOP	2	3	-	2
PC15. remove parts relevant to various mechanical aggregates of two/three wheeler electric vehicle and place them securely as specified by OEM	1	2	-	-
PC16. clean and condition dismantled mechanical and electrical components of two/three wheeler electric vehicle prior to assembly	1	1	-	-
PC17. perform minor repair/replacement/calibration of mechanical components/aggregates of the two/three wheeler electric vehicle such as brake pedal/lever free play adjustment, headlight beam alignment, etc.	2	3	-	1
PC18. refill/replace, as required quantity and appropriate grade of brake or other fluid/lubricant in the two/three wheeler electric vehicle as per OEM guidelines	1	2	-	1
PC19. maintain the documentation related to inspection, servicing and minor repair performed on the two/three wheeler electric vehicle	1	1	-	-
Assist lead technician in diagnosis or troubleshooting the faults	8	10	-	5

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC20. conduct test drive of the two/three wheeler electric vehicle to assist the lead technician in assessing the service/repair requirement or calibration/adjustments, if any	-	2	-	-
PC21. follow lead technician instructions to choose and use the appropriate device/equipment to inspect/test the two/three wheeler electric vehicle/system/component performance to diagnose defect or faults	2	2	-	2
PC22. carry out inspection or tests on the two/three wheeler electric vehicle mechanical and electrical systems according to lead technician instructions	2	2	-	2
PC23. interpret and compare results of diagnostic inspections/tests with two/three wheeler electric vehicle specifications or regulatory requirements	2	2	-	1
PC24. maintain the documentation related to inspections and troubleshooting performed on the two/three wheeler electric vehicle	1	1	-	-
PC25. report the results to lead technician and seek assistance if further tests or inspections are required to conclude the diagnosis or troubleshooting	1	1	-	-
Post service/repair/diagnostic activities	**5**	**8**	**-**	**4**
PC26. check the performance of the two/three wheeler electric vehicle/aggregate post repair and report to lead technician/supervisor if further inspection is required by another specialist	2	3	-	2
PC27. ensure completeness of tasks assigned before releasing the two/three wheeler electric vehicle for the next procedure	1	2	-	1
PC28. dispose of materials such as old batteries, scrap of failed parts/aggregates as per organization's policies	1	2	-	1
PC29. return leftover consumable/parts, tools/equipment, and report if any malfunctions are observed to the person concerned	1	1	-	-
NOS Total	**30**	**50**	**-**	**20**

National Occupational Standards (NOS) Parameters

NOS Code	ASC/N1451
NOS Name	Carry out routine service or minor repairs on two/three wheeler electric vehicle and assist in diagnosis
Sector	Automotive
Sub-Sector	Automotive Vehicle Service
Occupation	Technical Service & Repair
NSQF Level	4
Credits	TBD
Version	1.0
Last Reviewed Date	30/12/2021
Next Review Date	30/12/2024
Deactivation Date	30/12/2024
NSQC Clearance Date	30/12/2021

ASC/N1452: Carry out routine service or minor repairs on electric truck/bus and assist in diagnosis

Description

This NOS unit is about an individual who performs all tasks related to service, minor repair and diagnosis on electric truck/bus.

Scope

The scope covers the following :

- Prepare to carry out routine service or minor repair and assist in fault diagnosis
- Perform routine service and minor repairs
- Assist lead technician in diagnosis or troubleshooting the faults
- Post service/repair/diagnostic activities

Elements and Performance Criteria

Prepare to carry out routine service or minor repair and assist in fault diagnosis

To be competent, the user/individual on the job must be able to:

PC1. review the job card and understand work to be carried out on electric truck/bus

PC2. identify the auto components related to the various aggregates in the electric truck/bus

PC3. ensure no HV (High Voltage) activity is being conducted around workstation prior to commencement of work on the electric truck/bus

PC4. collect workshop tools/measuring devices/equipment required to carry out job on the electric truck/bus and check their condition/calibration

PC5. prepare the electric truck/bus according to nature of job to be performed: general and mechanical job on the vehicle/electrical work in non-live state/troubleshoot and replace parts in live state HV system

PC6. mark the electric truck/bus and safeguard the working area during electrical work

PC7. wear PPE according to nature of job to be performed on the electric truck/bus

PC8. conduct visual inspection of the electric truck/bus to identify defects in HV components and identify indirect faults in electrical/electronic aggregate due to other system/component

PC9. assess mechanical aggregates such as brakes, suspension, axles, transmission, steering etc. of the electric truck/bus for any external impact/bend/leak, incorrect level, wear & tear

PC10. report the malfunctions/repairs in the electric truck/bus beyond own scope to the concerned person

Perform routine service and minor repairs

To be competent, the user/individual on the job must be able to:

PC11. take precautions to avoid damage to the electric truck/bus and its components while working on various aggregates

PC12. use appropriate tools, equipment, and consumables as per nature of job and Standard Operating Procedure (SOP) recommended by the organisation

PC13. perform task on the HV system as per following stages: general and mechanical tasks on the electric truck/bus which do not require isolation of the HV systems, mechanical work in non-live state of the HV systems and replace parts in live state of the HV system

PC14. test the heavy commercial electric vehicle's electrical/electronic system functioning of electric truck/bus wherever applicable as per OEM SOP

PC15. remove parts relevant to various mechanical aggregates of electric truck/bus and place them securely as specified by OEM

PC16. clean and condition dismantled mechanical and electrical components of electric truck/bus prior to assembly

PC17. perform minor repair/replacement/calibration on electric truck/bus, systems such as drive line, mechanical/air suspension systems, air brakes & steering systems etc. including HVAC, etc.

PC18. refill/replace, as required quantity and appropriate grade of fluid/lubricant in the electric truck/bus as per OEM guidelines

PC19. maintain the documentation related to inspection, servicing and minor repair performed on the electric truck/bus

Assist lead technician in diagnosis or troubleshooting the faults

To be competent, the user/individual on the job must be able to:

PC20. conduct test drive of the electric truck/bus to assist the lead technician in assessing the service/repair requirement or calibration/adjustments, if any

PC21. follow lead technician instructions to choose and use the appropriate device/equipment to inspect/test system/component of electric truck/bus performance to diagnose defect or faults in electric vehicle

PC22. carry out inspection or test on mechanical and electrical systems of electric truck/bus according to lead technician instructions

PC23. interpret and compare results of diagnostic inspections/tests with electric truck/bus specifications or regulatory requirements

PC24. maintain the documentation related to inspections and troubleshooting performed on the electric truck/bus

PC25. report the results to lead technician and seek assistance if further tests or inspections are required to conclude the diagnosis or troubleshooting

Post service/repair/diagnostic activities

To be competent, the user/individual on the job must be able to:

PC26. check the performance of electric truck/bus aggregate post repair and report to lead technician/supervisor if further inspection is required by another specialist

PC27. ensure completeness of tasks assigned before releasing the electric truck/bus for the next procedure

PC28. dispose of materials such as old batteries, scrap of failed parts/aggregates as per organization's policies

PC29. return leftover consumable/parts, tools/equipment, and report if any malfunctions are observed to the person concerned

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. the automotive industry in India, workshop structure and role and responsibilities of different people in the workshop

KU2. SOP for receiving electric truck/bus, opening job card, allocation of work, invoicing, vehicle delivery, handling complaints, etc.

KU3. different components/aggregates as well as auto component manufacturer's specifications for the same

KU4. basic technology used in and functioning of various systems of the electric truck/bus such as brakes, suspension, steering, body management system, telematics, air- conditioning systems, active & passive safety system, media and other systems brakes, suspension, steering, etc. including electrical devices used in electric vehicles such as: generator, DC/AC and DC/DC converters, AC motor, DC motor, regenerative brakes, etc.

KU5. interconnection of systems with each other and effect of one system on other system

KU6. fundamental terms, laws and principles of electricity used in electric truck/bus such as: principles of storing electrical voltage, ohms law, voltage, current (AC/DC/HV), resistance, power, capacitance, electrostatics, magnetic, inductance, discrete electronic components, and radio frequency (automotive digital computers, automotive communication protocols such as CAN, LIN, MOST, etc.)

KU7. use of relevant measuring device/equipment and interpretation of all relevant mathematical calculations

KU8. various electrical and electronic signals such as electrical inputs, outputs, voltage, pulse width modulation, digital signal, etc.

KU9. symbols, units and terms used in wiring diagrams associated with electrical/electric systems/components of the electric truck/bus

KU10. how to use computer, on-line application and OEM technical information/assistance portals

KU11. various sources of information available for assessing service and repair requirements of the electric truck/bus including diagnostic displays, visual inspections, test drives, vehicle/equipment manufacturer specifications, and tolerance limits of components

KU12. standard schedules and checklists recommended by the OEM/auto component manufacturer for servicing of electric truck/bus or components

KU13. typical symptoms of common faults and failures in vehicle mechanical, electrical and electronic systems

KU14. safety, health and environmental policies and regulations for the workplace as well as for automotive trade in general

KU15. Standard Operating Procedures (SOPs) of the organization/ dealership for inspection and diagnosis of faults in a electric truck/bus as prescribed by the OEM/components manufacturer

KU16. how to work on the HV systems which do not require isolation, troubleshooting and replacing parts on the active HV system

KU17. SOP recommended by OEM for using tools/equipment for diagnosis or troubleshooting such as special service tools, measuring instrument, volt meters, ammeters, ohmmeters, battery tester, dedicated and computer based diagnostic equipment, oscilloscopes etc.

KU18. various workshop tools/measuring devices/equipment required to carry out job on electric vehicle and their common errors or defects

KU19. documentation requirements for each procedure carried out as part of roles and responsibilities as specified by OEM/ auto component manufacturer

KU20. organizational/professional code of ethics and standards of practice

KU21. electrical hazards, protective measures and first aid: in case of electric shock, electrical arc in public grid or in an electric truck/bus, impact of electric current/arc, secondary accidents

KU22. five safety rules for electrical work on HV systems before starting the work i.e. isolate, safeguard reconnection, verify the non-live state, earth or short-circuit and shroud or safeguard adjacent live parts

KU23. safety requirements recommended by the OEM for equipment /electric truck/bus components during diagnosis, troubleshooting and root cause analysis on various aggregates

KU24. legal regulations that need to be taken into account for handling electric truck/bus in the workshop

KU25. Occupational Safety and Health (OSH) measures required for working on electric truck/bus

Generic Skills (GS)

User/individual on the job needs to know how to:

GS1. read and interpret workplace related documentation

GS2. interpret the needs of customers by understanding the key issues

GS3. communicate using terms, names, grades and other nomenclature pertaining to the automotive trade

GS4. analyse and apply the information gathered from observation, experience, reasoning or communication to act efficiently

GS5. identify potential workplace problem and take suitable action

GS6. read various sources of information available for assessing service and repair requirements

GS7. write any work-related information

GS8. write in English/regional language

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Prepare to carry out routine service or minor repair and assist in fault diagnosis	5	14	-	6
PC1. review the job card and understand work to be carried out on electric truck/bus	-	1	-	1
PC2. identify the auto components related to the various aggregates in the electric truck/bus	1	2	-	1
PC3. ensure no HV (High Voltage) activity is being conducted around workstation prior to commencement of work on the electric truck/bus	1	1	-	-
PC4. collect workshop tools/measuring devices/equipment required to carry out job on the electric truck/bus and check their condition/calibration	1	2	-	1
PC5. prepare the electric truck/bus according to nature of job to be performed: general and mechanical job on the vehicle/electrical work in non-live state/troubleshoot and replace parts in live state HV system	-	1	-	-
PC6. mark the electric truck/bus and safeguard the working area during electrical work	-	1	-	-
PC7. wear PPE according to nature of job to be performed on the electric truck/bus	1	1	-	1
PC8. conduct visual inspection of the electric truck/bus to identify defects in HV components and identify indirect faults in electrical/electronic aggregate due to other system/component	-	2	-	1
PC9. assess mechanical aggregates such as brakes, suspension, axles, transmission, steering etc. of the electric truck/bus for any external impact/bend/leak, incorrect level, wear & tear	1	2	-	1
PC10. report the malfunctions/repairs in the electric truck/bus beyond own scope to the concerned person	-	1	-	-
Perform routine service and minor repairs	12	18	-	5

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC11. take precautions to avoid damage to the electric truck/bus and its components while working on various aggregates	1	2	-	-
PC12. use appropriate tools, equipment, and consumables as per nature of job and Standard Operating Procedure (SOP) recommended by the organisation	1	2	-	1
PC13. perform task on the HV system as per following stages: general and mechanical tasks on the electric truck/bus which do not require isolation of the HV systems, mechanical work in non-live state of the HV systems and replace parts in live state of the HV system	2	2	-	-
PC14. test the heavy commercial electric vehicle's electrical/electronic system functioning of electric truck/bus wherever applicable as per OEM SOP	2	3	-	2
PC15. remove parts relevant to various mechanical aggregates of electric truck/bus and place them securely as specified by OEM	1	2	-	-
PC16. clean and condition dismantled mechanical and electrical components of electric truck/bus prior to assembly	1	1	-	-
PC17. perform minor repair/replacement/calibration on electric truck/bus, systems such as drive line, mechanical/air suspension systems, air brakes & steering systems etc. including HVAC, etc.	2	3	-	1
PC18. refill/replace, as required quantity and appropriate grade of fluid/lubricant in the electric truck/bus as per OEM guidelines	1	2	-	1
PC19. maintain the documentation related to inspection, servicing and minor repair performed on the electric truck/bus	1	1	-	-
Assist lead technician in diagnosis or troubleshooting the faults	**8**	**10**	**-**	**5**
PC20. conduct test drive of the electric truck/bus to assist the lead technician in assessing the service/repair requirement or calibration/adjustments, if any	-	2	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC21. follow lead technician instructions to choose and use the appropriate device/equipment to inspect/test system/component of electric truck/bus performance to diagnose defect or faults in electric vehicle	2	2	-	2
PC22. carry out inspection or test on mechanical and electrical systems of electric truck/bus according to lead technician instructions	2	2	-	2
PC23. interpret and compare results of diagnostic inspections/tests with electric truck/bus specifications or regulatory requirements	2	2	-	1
PC24. maintain the documentation related to inspections and troubleshooting performed on the electric truck/bus	1	1	-	-
PC25. report the results to lead technician and seek assistance if further tests or inspections are required to conclude the diagnosis or troubleshooting	1	1	-	-
Post service/repair/diagnostic activities	**5**	**8**	**-**	**4**
PC26. check the performance of electric truck/bus aggregate post repair and report to lead technician/supervisor if further inspection is required by another specialist	2	3	-	2
PC27. ensure completeness of tasks assigned before releasing the electric truck/bus for the next procedure	1	2	-	1
PC28. dispose of materials such as old batteries, scrap of failed parts/aggregates as per organization's policies	1	2	-	1
PC29. return leftover consumable/parts, tools/equipment, and report if any malfunctions are observed to the person concerned	1	1	-	-
NOS Total	**30**	**50**	**-**	**20**

National Occupational Standards (NOS) Parameters

NOS Code	ASC/N1452
NOS Name	Carry out routine service or minor repairs on electric truck/bus and assist in diagnosis
Sector	Automotive
Sub-Sector	Automotive Vehicle Service
Occupation	Technical Service & Repair
NSQF Level	4
Credits	TBD
Version	1.0
Last Reviewed Date	30/12/2021
Next Review Date	30/12/2024
Deactivation Date	30/12/2024
NSQC Clearance Date	30/12/2021

Assessment Guidelines and Assessment Weightage

Assessment Guidelines

1. Criteria for assessment for each Qualification Pack will be created by the Sector Skill Council. Each Performance Criteria (PC) will be assigned marks proportional to its importance in NOS. SSC will also lay down the proportion of marks for Theory and Skills Practical for each PC.

2. The assessment for the theory part will be based on the knowledge bank of questions created by the SSC.

3. Assessment will be conducted for all compulsory NOS, and where applicable, on the selected elective/option NOS/set of NOS.

4. Individual assessment agencies will create unique question papers for the theory part for each candidate at each examination/training center (as per assessment criteria below).

5. Individual assessment agencies will create unique evaluations for skill practical for every student at each examination/ training center based on these criteria.

6. In case of unsuccessful completion, the trainee may seek reassessment on the Qualification Pack.

Minimum Aggregate Passing % at QP Level : 70

(**Please note**: Every Trainee should score a minimum aggregate passing percentage as specified above, to successfully clear the Qualification Pack assessment.)

Assessment Weightage

Compulsory NOS

National Occupational Standards	Theory Marks	Practical Marks	Project Marks	Viva Marks	Total Marks	Weightage
ASC/N9801.Organize work and resources (Service)	50	30	-	20	100	15
ASC/N9802.Interact effectively with colleagues, customers and others	50	30	-	20	100	10
ASC/N1449.Carry out routine service or minor repairs and assist in diagnosis	30	50	-	20	100	25
Total	**130**	**110**	**-**	**60**	**300**	**50**

Elective: 1 Four Wheeler Electric Vehicle Service technician

National Occupational Standards	Theory Marks	Practical Marks	Project Marks	Viva Marks	Total Marks	Weightage
ASC/N1450.Carry out routine service or minor repairs on four wheeler electric/ hybrid vehicle and assist in diagnosis	30	50	-	20	100	50
Total	**30**	**50**	**0**	**20**	**100**	**50**

Elective: 2 Two/Three wheeler Electric Vehicle Service technician

National Occupational Standards	Theory Marks	Practical Marks	Project Marks	Viva Marks	Total Marks	Weightage
ASC/N1451.Carry out routine service or minor repairs on two/three wheeler electric vehicle and assist in diagnosis	30	50	-	20	100	50
Total	**30**	**50**	**0**	**20**	**100**	**50**

Elective: 3 Electric Truck/Bus Service technician

National Occupational Standards	Theory Marks	Practical Marks	Project Marks	Viva Marks	Total Marks	Weightage
ASC/N1452.Carry out routine service or minor repairs on electric truck/bus and assist in diagnosis	30	50	-	20	100	50
Total	**30**	**50**	**0**	**20**	**100**	**50**

Acronyms

NOS	National Occupational Standard(s)
NSQF	National Skills Qualifications Framework
QP	Qualifications Pack
TVET	Technical and Vocational Education and Training
PwD	Persons with Disability

Glossary

Sector	Sector is a conglomeration of different business operations having similar business and interests. It may also be defined as a distinct subset of the economy whose components share similar characteristics and interests.
Sub-sector	Sub-sector is derived from a further breakdown based on the characteristics and interests of its components.
Occupation	Occupation is a set of job roles, which perform similar/ related set of functions in an industry.
Job role	Job role defines a unique set of functions that together form a unique employment opportunity in an organisation.
Occupational Standards (OS)	OS specify the standards of performance an individual must achieve when carrying out a function in the workplace, together with the Knowledge and Understanding (KU) they need to meet that standard consistently. Occupational Standards are applicable both in the Indian and global contexts.
Performance Criteria (PC)	Performance Criteria (PC) are statements that together specify the standard of performance required when carrying out a task.
National Occupational Standards (NOS)	NOS are occupational standards which apply uniquely in the Indian context.
Qualifications Pack (QP)	QP comprises the set of OS, together with the educational, training and other criteria required to perform a job role. A QP is assigned a unique qualifications pack code.
Unit Code	Unit code is a unique identifier for an Occupational Standard, which is denoted by an 'N'
Unit Title	Unit title gives a clear overall statement about what the incumbent should be able to do.
Description	Description gives a short summary of the unit content. This would be helpful to anyone searching on a database to verify that this is the appropriate OS they are looking for.
Scope	Scope is a set of statements specifying the range of variables that an individual may have to deal with in carrying out the function which have a critical impact on quality of performance required.
Knowledge and Understanding (KU)	Knowledge and Understanding (KU) are statements which together specify the technical, generic, professional and organisational specific knowledge that an individual needs in order to perform to the required standard.

Organisational Context	Organisational context includes the way the organisation is structured and how it operates, including the extent of operative knowledge managers have of their relevant areas of responsibility.
Technical Knowledge	Technical knowledge is the specific knowledge needed to accomplish specific designated responsibilities.
Core Skills/ Generic Skills (GS)	Core skills or Generic Skills (GS) are a group of skills that are the key to learning and working in today's world. These skills are typically needed in any work environment in today's world. These skills are typically needed in any work environment. In the context of the OS, these include communication related skills that are applicable to most job roles.
Electives	Electives are NOS/set of NOS that are identified by the sector as contributive to specialization in a job role. There may be multiple electives within a QP for each specialized job role. Trainees must select at least one elective for the successful completion of a QP with Electives.
Options	Options are NOS/set of NOS that are identified by the sector as additional skills. There may be multiple options within a QP. It is not mandatory to select any of the options to complete a QP with Options.