Model Curriculum

QP Name: Electric Vehicle Test Engineer

QP Code: ASC/Q8406

QP Version: 1.0

NSQF Level: 5

Model Curriculum Version: 1.0

Automotive Skills Development Council | 153, Gr Floor, Okhla Industrial Area, Phase – III, Leela Building, New Delhi – 110020

Table of Contents

Training Parameters

Sector	Automotive
Sub-Sector	Research & Development
Occupation	Automotive Product Testing and Validation
Country	India
NSQF Level	5
Aligned to NCO/ISCO/ISIC Code	NCO-2015/7231.0201
Minimum Educational Qualification and Experience	B.E./B.Tech (Mechanical/Electrical/Electronics/Automobile/Instrumentation) OR 3 years Diploma (Mechanical/Electrical/Electronics/Automobile/Instrumentation) from recognised body with 1 year experience after Class 12th OR 10th Pass + ITI (Mechanic Motor Vehicle/Mechanic Auto Electrical and ELectronics) with 2 years relevant experience
Pre-Requisite License or Training	Valid Driving License
Minimum Job Entry Age	21 years
Last Reviewed On	24/06/2021
Next Review Date	24/06/2026
NSQC Approval Date	24/06/2021
QP Version	1.0
Model Curriculum Creation Date	24/06/2021
Model Curriculum Valid Up to Date	24/06/2026
Model Curriculum Version	1.0
Minimum Duration of the Course	570 Hours 00 Minutes
Maximum Duration of the Course	570 Hours 00 Minutes

Program Overview

This section summarizes the end objectives of the program along with its duration.

Training Outcomes

At the end of the program, the learner should have acquired the listed knowledge and skills.

- Identify various testing equipment, tools and gauges required during, inspection, testing and repairing process.
- Conduct inspection and repair of electric vehicle components.
- Perform steps to conduct various tests on vehicle in laboratory and on road to measure performance and identify defects.
- Work effectively and efficiently as per schedules and timelines.
- Implement safety practices.
- Use resources optimally to ensure less wastage and maximum conservation.
- Communicate effectively and develop interpersonal skills.

Compulsory Modules

The table lists the modules and their duration corresponding to the Compulsory NOS of the QP.

NOS and Module Details	Theory Duration	Practical Duration	On-the-Job Training Duration (Mandatory)	On-the-Job Training Duration (Recommended)	Total Duration
Bridge Module					
Module 1: Introduction to the role of an Electric Vehicle Test Engineer	05:00	00:00			05:00
ASC/N9810: Manage work and resources (Manufacturing) NOS Version No. – 1.0 NSQF Level – 5	**20:00**	**40:00**	-	-	**60:00**
Module 2: Manage work and resources according to safety and conservation standards	20:00	40:00	-	-	60:00
ASC/N9812 – Interact effectively with team, customers and others NOS Version No. 1.0 NSQF Level 5	**20:00**	**35:00**			**55:00**
Module 3: Communicate effectively and efficiently	20:00	35:00			55:00
ASC/N9805 – Interpret engineering drawing NOS Version No. – 1.0 NSQF Level - 4	**15:00**	**15:00**			**30:00**

Module 4: Interpret engineering drawing	15:00	15:00			30:00
ASC/N8410 – Perform testing of electric vehicle NOS Version No. – 1.0 NSQF Level - 5	**180:00**	**240:00**			**420:00**
Module 5: Testing of electric vehicle	180:00	240:00			420:00
Total Duration	**240:00**	**330:00**			**570:00**

Module Details

Module 1: Introduction to the role of an Electric Vehicle Test Engineer

Bridge module

Terminal Outcomes:

- Discuss the role and responsibilities of an Electric Vehicle Test Engineer.

Duration: *<05:00>*	**Duration**: *<00:00>*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• List the role and responsibilities of an Electric Vehicle Test Engineer. • Discuss the job opportunities for an Electric Vehicle Test Engineer in the automobile industry. • Explain about Indian electric vehicle manufacturing market. • List various automobile Original Equipment Manufacturers (OEMs) and different products/ models manufactured by them. • Discuss the inspection, testing standards and procedures involved in electric vehicle testing.	
Classroom Aids:	
Whiteboard, marker pen, projector	
Tools, Equipment and Other Requirements	

Module 2: Manage work and resources according to safety and conservation standards

Mapped to ASC/N9810, v1.0

Terminal Outcomes:

- Employ appropriate ways to maintain safe and secure working environment
- Apply material and energy conservation practices at the workplace.

Duration: *<20:00>*	**Duration**: *<40:00>*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Discuss organisational procedures for health, safety and security and individual role and responsibilities related to the same. • List the potential workplace related risks, threats and hazards, their causes and preventions. • List personal protective equipment like safety gloves, glasses, shoes and mask used at the workplace. • List various types of fire extinguisher. • Identify various safety boards/ signs placed on the shop floor. • Explain 5S standards, procedures and policies followed at workplace. • Discuss organisational procedures to deal with emergencies and accidents at the workplace and importance of following them. • State the importance of conducting safety drills or training sessions. • Explain the process of filling daily check sheet for reporting to the concerned authorities about improvements done and risks identified. • Discuss how and when to report about potential hazards identified in the workplace and limits of responsibility for dealing with them. • Outline the importance of keeping workplace, equipment, restrooms etc. clean and sanitised. • Explain the importance of following hygiene and sanitation regulations developed by organisation at the workplace. • Discuss the importance of maintaining the availability of running water, hand wash and alcohol-based sanitizers at the	• Apply appropriate ways to implement safety practices to ensure safety of people at the workplace. • Display the correct way of wearing and disposing PPE. • Demonstrate the use of fire extinguisher. • Demonstrate how to provide first aid procedure in case of emergencies. • Demonstrate how to evacuate the workplace in case of an emergency. • Employ various techniques for checking malfunctions in the machines with the support of maintenance team and as per Standard Operating Procedures (SOP). • Demonstrate to arrange tools/ equipment/ fasteners/ spare parts into proper trays, cabinets, lockers as mentioned in the 5S guidelines/work instructions. • Apply appropriate ways to organise safety drills or training sessions for others on the identified risks and safety practices. • Prepare a report about the health, safety and security breaches. • Apply appropriate ways to check that workplace, equipment, restrooms etc. are cleaned and sanitised. • Role play a situation to brief the team about the hygiene and sanitation regulations developed by organisation. • Demonstrate the correct way of washing hands using soap and water and alcohol-based hand rubs. • Apply appropriate methods to support the employees to cope with stress, anxiety etc. • Demonstrate proper waste collection and disposal mechanism depending upon types of waste.

workplace. • Discuss the significance of conforming to basic hygiene practices such as washing hands, using alcohol based hand sanitizers or soap. • Recall ways of reporting advanced hygiene and sanitation issues to the concerned authorities. • Elucidate various stress and anxiety management techniques. • Discuss the significance of greening. • Classify different categories of waste for the purpose of segregation. • Differentiate between recyclable and non-recyclable waste. • Discuss various methods of waste collection and disposal. • List the various materials used at the workplace. • Explain organisational recommended norms for storage of tools, equipment and material. • Discuss the importance of efficient utilisation of material and water. • Explain basics of electricity and prevalent energy efficient devices. • Explain the processes to optimize usage of material and energy/electricity. • Enlist common practices for conserving electricity at workplace.	• Perform the steps involved in storage of tools, equipment and material after completion of work. • Employ appropriate ways to resolve malfunctioning (fumes/ sparks/ emission/ vibration/ noise) and lapse in maintenance of equipment as per requirements. • Perform the steps to prepare a sample material and energy audit reports. • Employ practices for efficient utilization of material and energy/electricity.
Classroom Aids:	
Whiteboard, marker pen, projector	
Tools, Equipment and Other Requirements	
• Housekeeping material: Cleaning agents, cleaning cloth, waste container, dust pan and brush set, liquid soap, hand towel, fire extinguisher • Safety gears: Safety shoes, ear plug, goggles, gloves, helmet, first-aid kit	

Module 3: Communicate Effectively and Efficiently

Mapped to ASC/N9812, v1.0

Terminal Outcomes:

- Use effective communication and interpersonal skills.
- Apply sensitivity while interacting with different genders and people with disabilities.

Duration: *<20:00>*	**Duration**: *<35:00>*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Explain the importance of complying with organizational requirements to share information with team members. • Discuss the ways to adjust the communication styles to reflect sensitivity towards gender and persons with disability (PwD). • Explain the importance of respecting personal space of colleagues and customers. • Describe the ways to manage and coordinate with team members for work integration. • State the importance of team goals over individual goals, keeping commitment made to team members, and informing them in case of delays. • Discuss the importance of following the organisation's policies and procedures • Discuss the importance of rectifying errors as per feedback and minimizing mistakes. • Discuss gender-based concepts, issues and legislation as well organization standards, guidelines, rights and duties of PwD. • Discuss the importance of PwD and gender sensitization to ensure that team shows sensitivity towards them. • State the importance of following organizational standards and guidelines related to PwD. • Recall the rights and duties at workplace with respect to PwD. • Outline organisation policies and procedures pertaining to written and verbal communication.	• Employ different means and methods of communication depending upon the requirement to interact with the team members. • Employ appropriate ways to maintain good relationships with team members and superiors. • Apply appropriate techniques to resolve conflicts and manage team members for smooth workflow. • Conduct training sessions to train the team members on proper reporting of completed work and receiving feedback. • Employ suitable ways to escalate problems to superiors as and when required. • Prepare a sample report on the progress and team performance . • Role play a situation on how to offer help to people with disability (PwD) if required at work.
Classroom Aids:	
Whiteboard/blackboard, marker/chalk, duster, computer or Laptop attached to LCD projector	
Tools, Equipment and Other Requirements	

Module 4: Interpret engineering drawing

Mapped to ASC/N9805, v1.0

Terminal Outcomes:

- Describe the basics of engineering drawing.
- Interpret the machine drawings and symbols for understanding the job requirements.

Duration: *<15:00>*	**Duration: *<15:00>***
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Identify uniqueness, dimensioning and important features of 2D and 3D shapes. • Identify types of lines, angles, points and their symmetry in shapes. • Differentiate between first angle and third angle projection. • Interpret 3 axis (x, y and z axis) of projection and machine symbols used in drawing. • Describe GD&T and use of its symbols in the drawings. • Identify required limits and tolerances of component from drawing. • Explain standards used in India for making assembly drawings. • Identify organisational drawing standards for interpreting the work requirements appropriately.	• Read an object in first angle and third angle projection. • Demonstrate appropriate way of reading and interpreting the shapes (cones, cylinder, sphere, cuboid, etc) on to a 2D and 3D projection. • Interpret and read orthographic and isometric views. • Read GD&T symbols in the given drawing. • Employ appropriate ways of storing the drawings in a defined and appropriate place. • Role play a situation on how to communicate the changes in drawing to the concerned authority.
Classroom Aids:	
Whiteboard, marker pen, projector	
Tools, Equipment and Other Requirements	
• Drawing tools • Engineering drawing handbook • Sample engineering drawings	

Module 5: Testing of electric vehicle

Mapped to ASC/N8410, v2.0

Terminal Outcomes:

- Identify tools and equipment required for testing process.
- Demonstrate how to inspect and repair electric vehicle components and systems.
- Apply appropriate techniques to test electric vehicle in the laboratory and on road to observe the performance of its components and systems.

Duration: *<180:00>*	**Duration**: *<240:00>*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• List different components/aggregates of electric vehicle. • Discuss basic technology used, functioning and interconnections of various systems and components of the vehicle. • Recall fundamental terms, laws and principles of electricity used in EV. • Describe various symbols, units and terms used in wiring diagrams associated with electrical/electric systems/components of the vehicle. • Discuss the information collected from the vehicle drawings, testing sheet about the testing tasks and type of tests required to be conducted. • Discuss how to confirm the testing tasks and type of tests required to be conducted on the vehicle from the superior. • List testing equipment, measuring instruments, gauges, parts etc. required during the testing process. • Explain the selection criteria of testing equipment, measuring instruments, gauges, parts etc. required. • List the steps to be performed for arranging the testing equipment, measuring instruments, gauges, parts etc. required. • Summarise the steps to be performed for checking the tools, gauges and testing apparatus before use. • Discuss testing parameters need to be measured during the test. • Recall the necessary precautions to avoid any hazard and accident during inspection and testing process. • Recall legal regulations that need to be taken into account for handling electric	• Apply appropriate ways to select the testing equipment, measuring instruments, gauges, parts etc. required during the testing process. • Demonstrate organisational procedure for arranging the testing equipment, measuring instruments, gauges, parts etc. required during the testing process. • Demonstrate the standard operating procedure to use testing equipment, tools, gauges and measuring instruments required during job. • Apply appropriate ways to check the tools, gauges and testing apparatus for defects and calibration before use. • Show how to assess the vehicle for any repair, calibration or adjustment requirement through a test drive. • Demonstrate organisational specified procedure for dismantling and re-assembling the aggregates of vehicle. • Perform steps to visually check the bundled wiring, circuits, Integrated Circuits (IC's), Printed Circuit Boards (PCB's), wiring harnesses etc. for wear and tear, damage etc. • Apply appropriate ways to check the connections of the instruments, ECU, motors and other electronic circuits in the vehicle. • Show how to calibrate, align and adjust the settings of vehicle components as per the SOP. • Demonstrate how to set the test apparatus as per the selected testing process. • Perform steps to connect the various data capturing meters and gauges for capturing

vehicles. • List the steps to be performed for dismantling and re-assembling the aggregates of vehicle. • Discuss various sources of information available for assessing service and repair requirements of the vehicle. • Recall typical symptoms of common faults and failures in vehicle systems. • List the mandatory checks required to be conducted on the Electric Vehicle before trial run. • Explain ways for checking the connections of the instruments, ECU, motors and other electronic circuits in the vehicle. • Discuss the importance of maintaining part clearances as specified in the Work Instructions (WI)/Standard Operating Processes (SOP). • List steps for preparing test apparatus and connecting the various data capturing meters and gauges for testing process. • Discuss methods for diagnosing faults in the vehicle components and aggregates. • Describe Automotive Industry Standard (AIS) 38, 39, 40, 41, 48, 49. • List the steps to be performed for conducting tests as per Automotive Industry Standard (AIS), short circuit/open circuit test and battery tests. • Recall various types of tests like vehicle level test, component level test, EMI/EMC test, Accelerated/Highly Accelerated Life Test (HALT/HASS) and battery tests like abuse, altitude, electrochemical impedance spectroscopy (SoH). • List the steps to be performed for observing any deviations, noise or vibrations in vehicle during the testing process. • List the steps to be performed for changing or repairing the vehicle components. • Describe soldering or welding process. • Discuss various defects related to running automobiles and their potential impact on the working of the final vehicle. • List various sources and potential causes of noises and vibrations in the vehicle. • Elaborate ways for checking the vehicle components, safety features and system warning indicators before starting on road	the data points with the vehicle. • Apply appropriate ways to diagnose faults in the vehicle components and aggregates. • Perform steps to conduct tests as per Automotive Industry Standard (AIS), short circuit/open circuit test and battery tests on the vehicle. • Prepare a sample record of observations/ readings of tests as mentioned in the testing manual/WI. • Demonstrate organisational procedure to make minor modification in test setup/ vehicle/component under testing as per the requirement. • Prepare a sample report on deviations, noise or vibrations observed in vehicle during the testing process for the Electric Vehicle Test Supervisor. • Demonstrate how to change or repair the vehicle components as per requirement. • Apply appropriate ways to check the motor, battery charge, oil/lubricant and cooling water level, tyre pressure etc. before starting the on road testing of the vehicle as per the checklist and testing manual. • Apply appropriate ways to check the safety features and system warning indicators during on road testing of the vehicle as per the checklist and testing manual. • Prepare a report about malfunctions/ repairs in the vehicle, beyond own scope. • Demonstrate the organisational procedure involved in cleaning and storing the tools, equipment and process auxiliaries after completion of work • Show how to dispose waste as per organisational guidelines. • Apply appropriate ways to check, calibrate and repair the workshop tools, equipment and workstations as per schedule.

testing and during the on road testing of vehicle. • Discuss test results, data log etc. needed to be maintained and updated for vehicle testing as per SOP. • Recall organisational recommended procedure for cleaning and storing the tools, equipment and process auxiliaries after completion of work • List the steps to be performed to check, calibrate and repair the workshop tools, equipment and workstations.	
Classroom Aids:	
Whiteboard, marker pen, projector	
Tools, Equipment and Other Requirements	
• Basic tool box, Work bench with vice, DC – DC Convertor, DC Fast charger , High voltage battery, onboard charger & EVSE , In vehicle power electronics, Riveting machine, drilling machine, riveting guns, pneumatic guns, fasteners, rubber seals, soldering iron, jigs, fixtures, adhesives, vernier calliper, micrometre, compass, divider, scriber, T Square, bevel protractor, pin set, torque meter • Hand book, job orders, work order, completion material requests, and Technical Reference Books. • Safety materials: Fire extinguisher, welding helmet, Leather sleeves, leather safety gloves, leather aprons, safety glasses with side shields, ear plug, safety shoes and first-aid kit • Cleaning material: Tip cleaner, wire brush (M.S.), cleaning agents, cleaning cloth, waste container, dust pan and brush set, liquid soap, hand towel	

Annexure

Trainer Requirements

Trainer Prerequisites						
Minimum Educational Qualification	**Specialization**	**Relevant Industry Experience**		**Training Experience**		**Remarks**
		Years	***Specialization***	***Years***	***Specialization***	
B.E/B.Tech	Mechanical/Electrical /Electronics/ Automobile/ Instrumentation	2	Mechanical/ Electrical/ Automobile	1	Mechanical/ Electrical/ Automobile	NA
B.E/B.Tech	Mechanical/Electrical/ Electronics/ Automobile/ Instrumentation	3	Mechanical/ Electrical/ Automobile	0	Mechanical/ Electrical/ Automobile	NA
M.E/M.Tech	Mechanical/Electrical/ Electronics/ Automobile/ Instrumentation	1	Mechanical/ Electrical/ Automobile	1	Mechanical/ Electrical/ Automobile	NA

Trainer Certification	
Domain Certification	**Platform Certification**
"Electric Vehicle Test Engineer, ASC/Q8406, version 1.0". Minimum accepted score is 80%.	"Trainer, MEP/Q2601 v1.0" Minimum accepted score is 80%.

Assessor Requirements

Assessor Prerequisites						
Minimum Educational Qualification	**Specialization**	**Relevant Industry Experience**		**Training Experience**		**Remarks**
		Years	***Specialization***	***Years***	***Specialization***	
B.E/B.Tech	Mechanical/Electrical/ Electronics/ Automobile/ Instrumentation	3	Mechanical/ Electrical/ Automobile	1	Mechanical/ Electrical/ Automobile	NA
B.E/B.Tech	Mechanical/Electrical/ Electronics/ Automobile/ Instrumentation	4	Mechanical/ Electrical/ Automobile	0	Mechanical/ Electrical/ Automobile	NA
M.E/M.Tech	Mechanical/Electrical/ Electronics/ Automobile/ Instrumentation	2	Mechanical/ Electrical/ Automobile	1	Mechanic al/ Electrical/ Automobile	NA

Assessor Certification	
Domain Certification	**Platform Certification**
"Electric Vehicle Test Engineer, ASC/Q8406, version 1.0". Minimum accepted score is 80%.	"Assessor; MEP/Q2701 v1.0" Minimum accepted score is 80%.

`

Assessment Strategy

1. Assessment System Overview:
   - Batches assigned to the assessment agencies for conducting the assessment on SDMS/SIP or email
   - Assessment agencies send the assessment confirmation to VTP/TC looping SSC
   - Assessment agency deploys the ToA certified Assessor for executing the assessment
   - SSC monitors the assessment process & records

2. Testing Environment:
   - Confirm that the centre is available at the same address as mentioned on SDMS or SIP
   - Check the duration of the training.
   - Check the Assessment Start and End time to be as 10 a.m. and 5 p.m.
   - If the batch size is more than 30, then there should be 2 Assessors.
   - Check that the allotted time to the candidates to complete Theory & Practical Assessment is correct.
   - Check the mode of assessment—Online (TAB/Computer) or Offline (OMR/PP).
   - Confirm the number of TABs on the ground are correct to execute the Assessment smoothly.
   - Check the availability of the Lab Equipment for the particular Job Role.

3. Assessment Quality Assurance levels / Framework:
   - Question papers created by the Subject Matter Experts (SME)
   - Question papers created by the SME verified by the other subject Matter Experts
   - Questions are mapped with NOS and PC
   - Question papers are prepared considering that level 1 to 3 are for the unskilled & semi-skilled individuals, and level 4 and above are for the skilled, supervisor & higher management
   - Assessor must be ToA certified & trainer must be ToT Certified
   - Assessment agency must follow the assessment guidelines to conduct the assessment

4. Types of evidence or evidence-gathering protocol:
   - Time-stamped & geotagged reporting of the assessor from assessment location
   - Centre photographs with signboards and scheme specific branding
   - Biometric or manual attendance sheet (stamped by TP) of the trainees during the training period
   - Time-stamped & geotagged assessment (Theory + Viva + Practical) photographs & videos

5. Method of verification or validation:
   - Surprise visit to the assessment location
   - Random audit of the batch
   - Random audit of any candidate

6. Method for assessment documentation, archiving, and access
   - Hard copies of the documents are stored
   - Soft copies of the documents & photographs of the assessment are uploaded / accessed from Cloud Storage
   - Soft copies of the documents & photographs of the assessment are stored in the Hard Drives

References

Glossary

Term	Description
Declarative Knowledge	Declarative knowledge refers to facts, concepts and principles that need to be known and/or understood in order to accomplish a task or to solve a problem.
Key Learning Outcome	Key learning outcome is the statement of what a learner needs to know, understand and be able to do in order to achieve the terminal outcomes. A set of key learning outcomes will make up the training outcomes. Training outcome is specified in terms of knowledge, understanding (theory) and skills (practical application).
OJT (M)	On-the-job training (Mandatory); trainees are mandated to complete specified hours of training on site
OJT (R)	On-the-job training (Recommended); trainees are recommended the specified hours of training on site
Procedural Knowledge	Procedural knowledge addresses how to do something, or how to perform a task. It is the ability to work, or produce a tangible work output by applying cognitive, affective or psychomotor skills.
Training Outcome	Training outcome is a statement of what a learner will know, understand and be able to do upon the completion of the training.
Terminal Outcome	Terminal outcome is a statement of what a learner will know, understand and be able to do upon the completion of a module. A set of terminal outcomes help to achieve the training outcome.

Acronyms and Abbreviations

NOS	National Occupational Standard(s)
NSQF	National Skills Qualifications Framework
QP	Qualifications Pack
TVET	Technical and Vocational Education and Training
SOP	Standard Operating Procedure
WI	Work Instructions
PPE	Personal Protective equipment