Model Curriculum

Maintenance Technician Electrical

SECTOR: AUTOMOTIVE
SUB-SECTOR: MANUFACTURING SUPPORT
OCCUPATION: MAINTENANCE
REF ID: ASC/Q6803, VERSION 1.0
NSQF LEVEL: 4

Skill India
कौशल भारत-कुशल भारत

AUTOMOTIVE SKILLS DEVELOPMENT COUNCIL

N·S·D·C National Skill Development Corporation
Transforming the skill landscape

Certificate

CURRICULUM COMPLIANCE TO QUALIFICATION PACK - NATIONAL OCCUPATIONAL STANDARDS

is hereby issued by the

AUTOMOTIVE SKILLS DEVELOPMENT COUNCIL

for

MODEL CURRICULUM

Complying to National Occupational Standards of
Job Role/Qualification Pack "**Maintenance Technician Electrical**" QP No: "**ASC/Q6803 Level 4**"

Date of Issuance: January 05th, 2019

Valid up to: January 04th, 2021*

*Valid up to the next review date of the Qualification Pack

Authorised Signatory
(Automotive Skills Development Council)

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Maintenance Technician - Electrical

CURRICULUM / SYLLABUS

This program is aimed at training candidates for the job of a "**Maintenance Technician - Electrical**", in the "**Automotive**" Sector/Industry and aims at building the following key competencies amongst the learner

Program Name	**Maintenance Technician - Electrical**		
Qualification Pack Code	ASC/Q6803		
Version No.	1.0	**Version Update Date**	25 - April -2019
Pre-requisites to Training	Diploma /B. Tech/ BE in Industrial / Electrical / Electronics Engineering		
Training Outcomes	**After completing this programme, participants will be able to:** • Identify the various equipment and machinery used in the maintenance process. • Perform operation of equipment and machinery safely. • Carry out the preventive / breakdown maintenance of the electrical systems of the equipment in the plant. • Follow organizational policies and procedures for working with colleagues. • Follow prevailing environmental norms, government policies and to eliminate common breaches in health and safety procedure • Ensure all 5S activity both at the shop floor and at the office area to facilitate an increase in work production.		

This course encompasses 5 out of 5 National Occupational Standards (NOS) of "**Maintenance Technician - Electrical**" Qualification Pack issued by "Automotive Skills Development Council".

Sr. No.	Module	Key Learning Outcomes	Equipment Required
1	**Introduction** **Theory Duration** (hh:mm) 10:00 **Practical Duration** (hh:mm) 00.00 **Corresponding NOS Code** Bridge Module	• Explain about the course and its scope • List OEM'S and different products/ models manufactured by them. • Describe service process of an automotive workshop. • List responsibilities of Maintenance Technician – Electrical. • List job opportunities for a Maintenance Technician – Electrical.	

2.	**Develop Understanding of the equipment in the plant**
	
	Theory Duration
	(hh:mm)
	40:00
	
	Practical Duration
	(hh:mm)
	60:00
	
	Corresponding NOS Code
	ASC/ NQ6804
		• Explain the following electrical and electronic systems, components and assembly in an automobile plant:
		  ○ Electric motors, controls, sensors, fuses, Programable Logic Controller (PLC),
		  ○ Working mechanism and operation including of motors, sensors, controls, fuses and PLC
		  ○ Operational precautions, fault detection process in machines and system
		• Interpret the Standard Operating Procedure for the electrical and electronic system installed in plant
		• Create maintenance schedules for
		  ○ routine maintenance activities by operator/ M/c technician
		  ○ special periodic maintenance by the maintenance team
		• Interpret information from sketches and engineering drawings.
		• Describe possibilities of impending breakdowns, fuse blow-outs, failures, life cycles of electrical units etc.
		• Interpret wiring / control systems/ circuit drawings
		• List material and tools required for material handling, wiring, soldering iron, etc
		• List electrical components and systems such as wires, fuses, etc., required for maintenance work
		• Carry out sequence of operations for each maintenance process as per SOP
		• Perform operation of machinery and equipment used for each process.
			• PPTs of wiring diagrams and mechanical drawings
			• **Hand Tools:** Hammer ball peen, screw driver set, files, torque, wrenches, drills, taps.
			• **Measuring equipment**: Vernier calliper, micrometre, feeler gauges, steel ruler, measuring tape, multimeter.
			• **Electrical testing equipment:** volt meter, ammeters ohm meter, battery testing equipment, neon light and oscilloscope
			• Wire stripper, crimping tool, soldering gun.
			• **Electronic components:** resistor, capacitor, diode, IC, cables, fasteners, connectors.
			• Electrical motors, controls, sensors, fuses, PLC's
			• **PPE**: Gloves, safety shoes, goggles, ear plugs, safety helmet
			• **Workshop Safety:** Fire extinguishers, first aid kit

Sr. No.	Module	Key Learning Outcomes	Equipment Required

3	**Carry out Preventive / breakdown Maintenance**
	
	Theory Duration (hh:mm) 80:00
	
	Practical Duration (hh:mm) 90:00
	
	Corresponding NOS Code ASC/ N6805
		• Describe the following terms in the maintenance schedules
		  ○ Predictive maintenance
		  ○ Scheduled maintenance
		  ○ Breakdown maintenance
		• Follow checklist of maintenance activities.
		• Interpret information from electrical - wiring drawings of existing layout/ equipment.
		• List consumables, replacement spare parts required
		• Support seniors/ external experts in predictive / scheduled/ breakdown maintenance activity.
		• Create manpower deployment plan for maintenance activities
		• Carry out replacement of spare parts of equipment as per the schedule.
		• Inspect the internal conditions of wiring, motherboards etc.
		• Carry out assembling of back, covers, guards, clamps, insulation etc. of equipment.
		• Operate electrical equipment like motors etc.
		• Carry out post maintenance operations and testing of PLC, SCADA and electrical equipment.
		• Evaluate the breakdown maintenance sequence of activities.
		• Analyse the working and operational cycles of equipment in accordance to SOP
		• Create the list of activities for changing, correcting the situation after opening, verifying contact/ insulation conditions, failure of internal wires etc.
			• PPTs of wiring diagrams and mechanical drawings
			• **Hand Tools:** Hammer ball peen, screw driver set, files, torque, wrenches, drills, taps.
			• **Measuring equipment**: Vernier calliper, micrometre, feeler gauges, steel ruler, measuring tape, multimeter.
			• **Electrical testing equipment:** volt meter, ammeters ohm meter, battery testing equipment, neon light and oscilloscope
			• Wire stripper, crimping tool, soldering gun.
			• **Electronic components:** resistor, capacitor, diode, IC, cables, fasteners, connectors.
			• Electrical motors, controls, sensors, fuses, PLC's
			• **PPE**: Gloves, safety shoes, goggles, ear plugs, safety helmet
			• **Workshop Safety:** Fire extinguishers, first aid kit

4	**Work effectively in a team** **Theory Duration** (hh:mm) 25:00 **Practical Duration** (hh:mm)	• Demonstrate effective ways of interaction and communication at work place • Describe all forms of verbal and non-verbal methods to communication • Follow proper personal and professional etiquettes at work. • Outline knowledge and understanding required for working in a team	Case studies

Sr. No.	Module	Key Learning Outcomes	Equipment Required
	35:00 **Corresponding NOS Code** ASC/N0002	• Demonstrate appropriate usage of resources and material at workplace.	
6	**Maintain a safe, clean and healthy working environment** **Theory Duration** (hh:mm) 25:00 **Practical Duration** (hh:mm) 35:00 **Corresponding NOS Code** ASC/N0006	• List workplace hazards and risks • Use personal protective equipment like safety gloves, safety glasses, safety shoes and safety helmet at workplace. • Identify activities which can cause potential injury • Report concerned authorities about the potential risks • Report concerned authorities about machine breakdowns, damages • Support the safety team and the supervisor in creating the risk mitigation plan • Follow the instructions given in the equipment manual • Follow the safety, health and environment related practices • Follow safety signs placed on the shop floor • Demonstrate use of fire-fighting equipment • List the contents of first aid kit. • Maintain a clean and safe working environment • Attend all safety and fire drills to be self-aware of safety hazards and preventive techniques • Maintain high standards of personal hygiene at the work place • Follow organizational procedure of waste disposal • Report appropriately to medical officer/ HR in case of self or an employee's illness	**Housekeeping material**: Cleaning agents, cleaning cloth, waste container, dust pan & brush set, liquid soap, hand towel, fire extinguisher, **Safety gears:** Safety shoes, Ear plug, goggles, gloves, helmet, first aid kit
7	**Maintaining 5S at the work premises** **Theory Duration** (hh:mm) 20:00 **Practical Duration** (hh:mm) 30:00 **Corresponding**	• Examine that work area, tools, equipment and materials are clean • Maintain proper storage for the inventory, cleaning material and equipment. • Demonstrate personal hygiene and cleanliness at workplace. • Identify daily cleaning standards and schedules to create a clean working environment • Sort and label materials, tools and equipment's and spare parts while storing.	5S Charts, Posters and literature

Sr. No.	Module	Key Learning Outcomes	Equipment Required
	NOS Code ASC/N0021	• Segregate waste into hazardous and non-hazardous waste and dispose the waste as per SOP. • Follow 5S guidelines at workplace	
	Total Duration **Theory Duration** (hh:mm) 200:00 **Practical Duration** (hh:mm) 250:00	• PPTs of wiring diagrams and mechanical drawings • Hand Tools: Hammer ball peen, screw driver set, files, torque, wrenches, drills, taps. • Measuring equipment: Vernier calliper, Micrometre, Feeler Gauge, steel ruler, Measuring tape, Multimeter. • Electrical testing equipment: Volt meter, Ammeters ohm meter, battery testing equipment, neon light and oscilloscope • Wire stripper, crimping tool, soldering gun. • Electronic components – resistor, capacitor, diode, IC etc., cables, fasteners, connectors. • Electrical Motors, controls, sensors, fuses, PLC's • PPE: Gloves, Safety shoes, goggles, ear plugs, safety helmet • Workshop Safety: Fire extinguishers, First aid kit • Cleaning agents, Cleaning cloth, Waste container, Dust pan & brush set, Liquid soap.	

Grand Total Course Duration: **450 Hours, 0 Minutes**

*(This syllabus/ curriculum has been approved by **Automotive Skills Development Council)***

Trainer Prerequisites for Job role: "Maintenance Technician - Electrical" mapped to Qualification Pack: "ASC/Q6803, Version 1.0"

S. No.	Area	Details
1	**Description**	To deliver accredited training service, mapping to the curriculum detailed above, in accordance with the Qualification Pack "ASC/Q6803, Version 1.0".
2	**Personal Attributes**	• Aptitude for conducting training, and pre/ post work toensurecompetent, employable candidates at the end of the training. • Strong communication skills, interpersonal skills, ability to work as part of a team; a passion for quality and for developing others; well organized and focused. • Eager to learn and keep oneself abreast of the latest developments and newer technologies used in the various systems of the vehicle and its aggregates is highly desirable. • Should be able to demonstrate the usage of workshop equipment, instruments, special instruments and tools. • Should have sharp diagnostic abilities for identifying reasons of problems in Machining Equipment and vehicles and troubleshoot. • Should be hands-on with maintenance of electrical equipment to provide actual training.
3	**Minimum Educational Qualifications**	B.E./ B. Tech in electrical and electronics engineering
4a	**Domain Certification**	Certified for Job Role: "Maintenance Technician - Electrical" mapped to QP: ASC/Q6803, v1.0. Minimum qualifying score-80%, as per ASDC guidelines
4b	**Platform Certification**	Recommended that the Trainer is certified for the Job Role: "Trainer", mapped to the Qualification Pack: "MEP/ Q2601". Minimum accepted score as per ASDC guidelines is 80%.
5	**Experience**	5 years for B.E./ B. Tech in electrical and electronics engineering

Annexure: Assessment Criteria

Assessment Criteria	
Job Role	Maintenance Technician - Electrical
Qualification Pack	ASC/Q6803, v1.0
Sector Skill Council	Automotive

Sr. No.	Guidelines for Assessment
1	Assessment to be conducted by ASDC as per competency output defined in the NOS/QP and the assessment criteria provided in the NOS/QP
2	Assessment to be carried out by a third-party assessment body duly affiliated to the SSC.
3	ASDC assessments will be comprehensive and cover all aspects of acquired knowledge, practical skills and basic ability to communicate. Accordingly, evaluation process would include: i. Theory/Knowledge test ii. Practical demonstration test iii. Face to Face Viva-Voice
4	Theory/Knowledge assessment will be carried out on line through a link provided for each assessment that generates a random paper from a bank of questions available at the back end. • Exception to an online test in favour of Paper Test would be subject to non-availability of requisite broad band and/or hardware. • On line test would be conducted in the presence of an ASDC assessor till web enabled pr octoring is deployed.
5	ASDC assessor would be conducting Practical and Viva as per the criteria provided in the NOS/QP.
6	Cut off criteria for certification (Marks obtained in 70%)

Assessable Outcome	Assessment Criteria	Total Mark	Out of	Marks allocation	
				Theory	Practical
1. ASC/N6804 Develop understanding of the equipment	PC1. Understand the following from the equipment manual • Assembly sub systems, sequence • Electrical Motors, controls, sensors, fuses, PLC's used • Mechanisms & operation including controls, automation • Standard parts & ones specific to the machine • Wiring / control systems/ circuit diagrams • Motherboard • Standard recommended spares • Consumables required to be used. • Precautions, fault detection guidelines • Frequency recommended for maintenance vis-a vis operating loads • Frequency recommended for maintenance vis-a vis operating loads	100	14	5	9
	PC2. Lay down the system for the		8	2	6

	maintenance cycle of each equipment by sticking appropriate stickers or recording maintenance schedules • for routine activities by operator/ M/c technician • special periodic – by the maintenance team				
	PC3. Keep the special / standard tool kits ready for usage at short notice.		7	2	5
	PC4. For special purpose equipment made for the organization ensure that the drawings & other information matches with the current status of the equipment.		7	2	5
	PC5. Learn new points and update the troubleshooting check sheets available with the manual.		7	2	5
	PC6. Learn while giving support to seniors/ external experts in predictive / breakdown maintenance activity.		5	2	3
	PC7. Plan the time and schedule for preventive maintenance cycle based on the equipment manufacturer's recommendations and the history of similar equipment handled, used in the plant.		7	2	5
	PC8. Plan the installation/ shifting activity in totality considering special experts/ external support and material and tools required for the civil, material handling activity, consumables, wiring, soldering connections, testing cycles and everything mentioned in the equipment manual.		7	2	5
	PC9. Discuss with seniors in manufacturing, maintenance for planning activity prior to the schedule to ensure all points are adequately considered.		7	2	5
	PC10. Plan as much as possible standardization of electrical elements such as wires, fuses, PLC's etc. while new lines/shifting activities are being planned.		4	1	3
	PC11. Plan for support from production, other specialist teams in maintenance based on their schedules.		7	2	5
	PC12. Plan support from outside experts for special techniques.		5	2	3
	PC13. Study the process cycle while the equipment is working to completely understand the duty conditions and working principles etc.		7	2	5

	PC14. Study the standard working, running schedule for the equipment to find slots for maintenance activities		4	1	3
	PC15. Study the critical areas to find out possibilities of impending breakdowns, fuse blow-outs, failures, life cycles of electrical units etc.		4	1	3
	Total		**100**	**30**	**70**
2. ASC/N6805 Carrying out the preventive & breakdown maintenance activities	PC1. Understand the following from the maintenance schedules • Calendar for the equipment scheduled for preventive maintenance • Standard and special tool kits required for carrying out the task • Consumables, replacement spare parts required	150	16	5	11
	PC2. Verify routine check list activities have been conducted by the user-operator		7	2	5
	PC3. Be part of the team planning new equipment, installations, layout planning etc. so that the maintenance aspect is planned appropriately in the specifications and norms.		7	2	5
	PC4. Open the equipment and replace the scheduled spare parts as per the schedule replenish / change the consumables.		7	2	5
	PC5. Check / confirm internal conditions of wiring, motherboards etc. to verify working status to expected conditions. Discuss with the user/ operator to learn about problems /unusual phenomenon noticed on the equipment.		7	2	5
	PC6. Assemble back, covers, guards, clamps & prepare for taking the trials.		7	2	5
	PC7. Change the maintenance due / status sticker on the equipment.		7	2	5
	PC8. To attend the breakdown maintenance, verify in appropriate sequence for the equipment • Charge leakage / short circuit from parts • Breakage of wires, clamps • Unusual contacts of electrical wires with moving parts • Erratic / problematic performance • Any problem condition as reported in the complaint		11	4	7
	PC9. Plan sequence of activities for changing, correcting the situation after opening, verifying contact/ insulation conditions, failure of internal wires etc. and ensure the circuit elements, consumables are available at the workplace.		7	2	5
	PC10. Use appropriate PPE, material handling		11	4	7

	equipment and tools and carry out the task. Use recommended methods, consumables, tools for • Electrical / electronic connections • Verification of continuity • joints, including soldered				
	PC11. Take support from experts, user, team members from maintenance during the activity if required.		7	2	5
	PC12. Clock the time for the task so that the scheduling and planning can be improved in future.		7	2	5
	PC13. When carrying out the installation/ shifting activity record the time and unplanned tasks encountered in the activity.		7	2	5
	PC14. Discuss with seniors in manufacturing, maintenance for improving the activity to ensure all points are adequately considered.		7	2	5
	PC15. Take trials of running step by step increasing duty conditions gradually and verify specified parameters are attained and no abnormalities achieved		7	2	5
	PC16. Study the standard working, running for a few cycles of the equipment to ascertain normal working in presence of the user.		7	2	5
	PC17. Handover the equipment to the user.		7	2	5
	PC18. Update the history sheet with the replacement details.		7	2	5
	PC19. Discuss with seniors and decide if any change is necessary for preventive schedules based on the breakdown activity.		7	2	5
	Total		**150**	**45**	**105**
3. ASC/N0002 Work effectively in a team	PC1. Maintain clear communication with colleagues	100	10	3	7
	PC2. Work with colleagues		10	3	7
	PC3. Pass on information to colleagues in line with organisational requirements		13	4	9
	PC4. Work in ways that show respect for colleagues		12	3	9
	PC5. Carry out commitments made to colleagues		12	4	8
	PC6. Let colleagues know in good time if cannot carry out commitments, explaining the reasons		12	4	8
	PC7. Identify problems in working with colleagues and take the initiative to solve these problems		11	3	8
	PC8. Follow the organisation's policies and procedures for working with colleagues		10	3	7
	PC9. Ability to share resources with other members as per priority of tasks		10	3	7

	Total		**100**	**30**	**70**
4. ASC/N0006 Maintain safe, healthy environment friendly workplace	PC1. Identify activities which can cause potential injury through sharp objects, burns, fall, electricity, gas leakages, radiation, poisonous fumes, chemicals, loud noise	100	7	2	5
	PC2. Inform the concerned authorities about the potential risks identified in the processes, workplace area/ layout, materials used etc.		7	2	5
	PC3. Inform the concerned authorities about machine breakdowns, damages which can potentially harm man/machine during operations		9	3	6
	PC4. Create awareness amongst other by sharing information on the identified risks.		10	3	7
	PC5. Follow the instructions given on the equipment manual describing the operating process of the equipment		10	3	7
	PC6. Follow the Safety, Health and Environment related practices developed by the organization		10	3	7
	PC7. Operate the machine using the recommended Personal Protective Equipment (PPE)		10	3	7
	PC8. Maintain a clean and safe working environment near the work place and ensure there is no spillage of chemicals, production waste, oil, solvents etc.		10	3	7
	PC9. Maintain high standards of personal hygiene at the workplace		10	3	7
	PC10. Ensure that the waste disposal is done in the designated area and manner as per organization SOP.		10	3	7
	PC11. Inform appropriately the medical officer/ HR in case of self or an employee's illness of contagious nature so that preventive actions can be planned for others		7	2	5
	Total		**100**	**30**	**70**
5. ASC/N0021 Maintain 5S activities at the workplace	PC1. Follow the sorting process and check that the tools, fixtures & jigs that are lying on workstations are the ones in use and un-necessary items are not cluttering the workbenches or work surfaces.	150	4	1	3
	PC2. Ensure segregation of waste in hazardous/ non-Hazardous waste as per the sorting work instructions.		4	1	3
	PC3. Follow the technique of waste disposal and waste storage in the proper bins as per SOP.		6	2	4
	PC4. Segregate the items which are labelled as red tag items for the process area		6	2	4

	and keep them in the correct places.				
	PC5. Sort the tools/ equipment/ fasteners/ spare parts as per specifications/ utility into proper trays, cabinets, lockers as mentioned in the 5S guidelines/ work instructions.		6	2	4
	PC6. Ensure that areas of material storage areas are not overflowing.		6	2	4
	PC7. Properly stack the various types of boxes and containers as per the size/ utility to avoid any fall of items/ breakage and also enable easy sorting when required.		7	2	5
	PC8. Return the extra material and tools to the designated sections and make sure that no additional material/ tool is lying near the work area.		7	2	5
	PC9. Follow the floor markings/ area markings used for demarcating the various sections in the plant as per the prescribed instructions and standards.		8	3	5
	PC10. Follow the proper labelling mechanism of instruments/ boxes/ containers and maintaining reference files/ documents with the codes and the lists.		7	2	5
	PC11. Check that the items in the respective areas have been identified as broken or damaged.		7	2	5
	PC12. Follow the given instructions and check for labelling of fluids, oils. Lubricants, solvents, chemicals etc. And proper storage of the same to avoid spillage, leakage, fire etc.		7	2	5
	PC13. Make sure that all material and tools are stored in the designated places and in the manner indicated in the 5S instructions.		7	2	5
	PC14. Check whether safety glasses are clean and in good condition.		4	1	3
	PC15. Keep all outside surfaces of recycling containers are clean		4	1	3
	PC16. Ensure that the area has floors swept, machinery clean and generally clean. In case of cleaning, ensure that proper displays are maintained on the floor which indicate potential safety hazards		7	2	5
	PC17. Check whether all hoses, cabling & wires are clean, in good condition and clamped to avoid any mishap or mix up.		7	2	5
	PC18. Ensure workbenches and work surfaces are clean and in good condition.		4	1	3
	PC19. Follow the cleaning schedule for the lighting system to ensure proper illumination.		4	1	3
	PC20. Store the cleaning material and equipment in the correct location and in		4	1	3

	good condition.				
	PC21. Ensure self-cleanliness - clean uniform, clean shoes, clean gloves, clean helmets, personal hygiene.		4	1	3
	PC22. Follow the daily cleaning standards and schedules to create a clean working environment.		6	2	4
	PC23. Attend all training programs for employees on 5S.		6	2	4
	PC24. Support the team during the audit of 5S.		6	2	4
	PC25. Participate actively in employee work groups on 5S and encourage team members for active participation.		6	2	4
	PC26. Follow the guidelines for What to do and What not to do to build sustainability in 5S as mentioned in the 5S check lists/ work instructions.		6	2	4
	Total		**150**	**45**	**105**
	Grand Total	**600**	**600**	**180**	**420**
	Percentage Weightage (%)			**30**	**70**