Model Curriculum

QP Name: Electric Vehicle Product Design Engineer

QP Code: ASC/Q8104

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 Designing
Country	India
NSQF Level	5
Aligned to NCO/ISCO/ISIC Code	NCO-2015/2144.0803
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	NA
Minimum Job Entry Age	21 years
Last Reviewed On	30/09/2021
Next Review Date	30/09/2024
NSQC Approval Date	30/09/2021
QP Version	1.0
Model Curriculum Creation Date	30/09/2021
Model Curriculum Valid Up to Date	30/09/2024
Model Curriculum Version	1.0
Minimum Duration of the Course	510 Hours 00 Minutes
Maximum Duration of the Course	510 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.

- Read the drawings to identify specifications and requirements for the product designing process.
- Perform steps to finalise product specifications and conduct reliability check of product design in co-ordination with line manager.
- Carry out designing of EV on simulation tools, software and applications.
- 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 Product Design 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 colleagues, 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/N8106 – Support the manager in finalising the	**60:00**	**120:00**			**180:00**

design specifications and reliability parameters of the product **NOS Version No. – 1.0** **NSQF Level – 5**					
Module 5: Support the manager in finalising the design requirements of the product	60:00	120:00			180:00
ASC/N8107 – Design Vehicles and components using simulation tools **NOS Version No. – 1.0** **NSQF Level - 5**	**60:00**	**120:00**			**180:00**
Module 6: Designing of vehicles and their components	60:00	120:00			180:00
Total Duration	**180:00**	**330:00**			**510:00**

Module Details

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

Bridge module

Terminal Outcomes:

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

Duration: *<05:00>*	**Duration**: *<00:00>*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• List the role and responsibilities of an Electric Vehicle Product Design Engineer. • Discuss the job opportunities for an Electric Vehicle Product Design 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 product designing 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: Support the manager in finalising the design requirements of the product

Mapped to ASC/N8106, v1.0

Terminal Outcomes:

- Read the drawings to identify specifications and requirements for the product designing process.
- Demonstrate how to support the manager in finalising the specifications of product design.
- Apply appropriate techniques to check the reliability and validity of product design.

Duration: *<60:00>*	**Duration**: *<120:00>*
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. • Discuss the information needed to be collected from the Cross Functional Team (CFT) about the product requirements. • Illustrate the hierarchy followed in the organisation for getting approvals for the product design. • Discuss various design specifications and parameters such as road scenarios, vehicle aesthetic appeal & ergonomics, shape/ size/ environmental impact etc. and their impact on design of product. • Elaborate ways to analyse the type of component, technology, technique and design parameters for the design of product. • List various simulation tools such as CAD, CAM etc. required during the product designing process. • Discuss the selection criteria of simulation tools required during the product designing process. • Illustrate the process flow of designing the vehicle and its components. • Elaborate ways to identify reliability requirements on the basis of benchmarks, competitive analysis, cost, safety, etc. to finalise the product design. • Explain procedure of testing and validation of the simulation. • List ways to check the reliability and	• Read the basic electrical drawings, controller logic, symbols and wiring layout. • Show how to select the simulation tools required during the product designing process. • Demonstrate the use of simulation tools. • Demonstrate how to create specifications of design in coordination with the line manager. • Role play a situation to support the line manager in deciding means for providing design input and requirements of product. • Apply appropriate ways to create a mechanism for capturing design output and ensure all the required design specifications are achieved and output is in conformance with the input. • Role play a situation on how to take support from production design manager in prioritizing key reliability risk items and the corresponding risk reduction strategy. • Demonstrate use of Life Data Analysis (LDA) techniques to estimate the product design reliability and calculate various reliability-related metrics. • Perform steps to conduct Reliability Growth (RG) testing and analyse effective methodology to identify defects in product design. • Apply appropriate ways to improve the design during/ post testing inputs.

validity of the product design. • Elaborate ways to estimate and analyse the reliability of products design by using simulation models, prior warranty and tests data from similar models. • Elaborate ways to analyse the failure risks and mechanics of the product design. • Discuss Design of Experiments (DoE) methodology and how to use it for identifying factors significant to the life of the vehicle. • Summarise Life Data Analysis (LDA) techniques and their use. • List the steps to be performed for conducting Reliability Growth (RG) testing of product design. • Discuss the records needed to be maintained for vehicle product designing and reliability study as per SOP.	
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	

Module 6: Designing of vehicles and their components

Mapped to ASC/N8107, v1.0

Terminal Outcomes:

- Identify simulation tools, software and applications required for product designing work.
- Perform the steps to carry out simulations on the product design.
- Demonstrate use of telematics system and HMI (Human Machine Interface) to achieve specific performance and goal objectives.

Duration: *<60:00>*	**Duration**: *<120:00>*
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• List various simulation tools, software and applications required during designing work. • Elaborate ways to analyse the EV design structural strength, components tolerance limits, model strength on different loads etc. • Discuss how to integrate and calibrate the vehicle. • Illustrate the structural design of Battery Management System (BMS) and Electromagnetic Compatibility (EMC) criteria. • Discuss the process of conducting failure analysis and impact of each cause of failure on vehicle. • Discuss possible failure scenarios which can occur in a simulation model. • List the steps to be performed for creating failure modes in simulation model. • Discuss how to identify seriousness of each cause by a rating system. • Discuss process controls which are applicable and which can be established for a failure cause. • Explain detection rating (DR) for a failure cause. • List the steps to be performed for testing and validation of the simulation model. • Elucidate high performance HMI (Human Machine Interface) philosophy, style and use in EV model designing. • Describe functioning of telematics system. • Elaborate ways to analyse controls needed to be monitored and manipulated to achieve the desired requirements. • Discuss parameters used for evaluating the performance of the design.	• Show how to transform the functional architecture of vehicle design to physical architecture. • Demonstrate organisational specified procedure of creating EV product designs as per the defined geometrical parameters. • Show how to build a simulated model of the EV design as per the work instructions. • Apply appropriate ways to check and validate the EV design structural strength, components tolerance limits, model strength on different loads etc. • Demonstrate the organizational specified procedure to integrate the smaller circuits, different sensors and actuators in the design. • Show how to validate and simulate the battery points in design by using BMS software. • Demonstrate how to support line manager in preparing and validating the standardized Work Analysis Sheet for basic processes used in the simulation. • Perform steps to create failure modes in simulation model to identify all possible failure scenarios, root causes and consequence of each failure mode. • Prepare a sample rating system to identify the seriousness of each cause as per organisational standards. • Apply appropriate ways to implement recommended actions to lower the severity or occurrence of each cause. • Demonstrate how to formulate the simulation model and check the architectural design in co-ordination with line manager.

• Discuss information, records and data needed to be collected, maintained and stored related to product designing and validation as per SOP. • Discuss how to plan and control the entire system though status control reports, meetings reviews, etc. • Discuss the importance of continuous system integration and validation of the related data.	• Perform steps to run the simulation, test the model, analyse results of test by comparing behaviour with the actual environment and making changes accordingly in the model. • Demonstrate how to check the feasibility of vehicle and its components to validate the simulation model. • Prepare as sample work combination sheet having the details of processes used, work sequence order and changes done after failure analysis in the simulation. • Show how to validate if the telematics system is functioning as per the requirement. • Demonstrate use of high performance HMI (Human Machine Interface) to achieve required standards and performance in EV model designing. • Demonstrate organisational specified procedure of creating high performance graphics by following the HMI and addressing the identified tasks. • Demonstrate organisational procedure of installation and commissioning of the new HMI. • Role play a situation on how to organise training on the new HMI. • Employ practices to control, maintain and periodically re-assess the HMI performance of vehicle. • Apply appropriate ways to collect, maintain and store information, records and data related to product design, product structure management, product material, process management of the product, product development and tools to be used, history, present use, serialization, part status, customer preference etc. as per SOP.
Classroom Aids:	
Whiteboard, marker pen, projector	
Tools, Equipment and Other Requirements	
• Designing software Auto CAD,Pro-E , Turbo CAD designer , simulia	

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 Mechanical/Electrical/ Electronics/ Automobile/ Instrumentation	1	Mechanical/Electrical/ Electronics/ Automobile/ Instrumentation	NA
B.E/B.Tech	Mechanical/ Electrical/ Auto Mechanical/Electrical/ Electronics/ Automobile/ Instrumentation mobile	3	Mechanical/Electrical/ Electronics/ Automobile/ Instrumentation	0	Mechanical/Electrical/ Electronics/ Automobile/ Instrumentation	NA
M.E/M.Tech	Mechanical/Electrical/ Electronics/ Automobile/ Instrumentation	1	Mechanical/Electrical/ Electronics/ Automobile/ Instrumentation	1	Mechanical/Electrical/ Electronics/ Automobile/ Instrumentation	NA

Trainer Certification	
Domain Certification	**Platform Certification**
"Electric Vehicle Product Design Engineer, ASC/Q8104, 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/ Electronics/ Automobile/ Instrumentation	1	Mechanical/Electrical/ Electronics/ Automobile/ Instrumentation	NA
B.E/B.Tech	Mechanical/Electrical/ Electronics/ Automobile/ Instrumentation	4	Mechanical/Electrical/ Electronics/ Automobile/ Instrumentation	0	Mechanical/Electrical /Electronics/ Automobile/ Instrumentation	NA
M.E/M.Tech	Mechanical/Electrical/ Electronics/ Automobile/ Instrumentation	2	Mechanical/Electrical/ Electronics/ Automobile/ Instrumentation	1	Mechanical/Electrical /Electronics/ Automobile/ Instrumentation	NA

Assessor Certification	
Domain Certification	**Platform Certification**
"Electric Vehicle Product Design Engineer, ASC/Q8104, version 1.0". Minimum accepted score is 80%.	"Assessor; MEP/Q2701 v1.0" Minimum accepted score is 80%.

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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