Model Curriculum

QP Name: Lab Technician – Metal Testing

QP Code: CSC/Q0602

Version: 2.0

NSQF Level: 4

Model Curriculum Version: 1.0

Capital Goods Skill Council || Awfice Space Solutions Pvt. Ltd, 1st Floor, L-29, Outer Circle, Connaught Place, New Delhi – 110001

Table of Contents

Training Parameters

Sector	Capital Goods
Sub-Sector	Machine Tools, Dies, Moulds and Press Tools, Plastics Manufacturing Machinery, Textile Manufacturing Machinery, Process Plant Machinery,Electrical and Power Machinery, Light Engineering Goods
Occupation	Quality
Country	India
NSQF Level	4
Aligned to NCO/ISCO/ISIC Code	NCO-2015/8223.69
Minimum Educational Qualification and Experience	8th Class Pass + ITI (2years) with 2 years of experience in the relevant field OR 10th Class Pass with 2 years of experience in the relevant field OR 10th Class Pass + ITI (1 year after Class 10th) with 1 year of experience in the relevant field OR 10th Class Pass + ITI (2 years after Class 10th) OR 12th Class Pass with 6 months of experience in the relevant field OR Certified in NSQF-L3 Operator – Quality with 2 years of experience in the relevant field
Pre-Requisite License or Training	NA
Minimum Job Entry Age	18 Years
Last Reviewed On	NA
Next Review Date	NA
NSQC Approval Date	NA
QP Version	2.0

Model Curriculum Creation Date	NA
Model Curriculum Valid Up to Date	NA
Model Curriculum Version	1.0
Minimum Duration of the Course	450 Hours
Maximum Duration of the Course	450 Hours

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 to:

- Explain the importance of following the health and safety practices at work.
- Demonstrate ways to coordinate with co-workers to achieve work efficiency.
- Demonstrate the process of carrying out metal testing in the lab.

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	**04:00**	**00:00**	**0:00**	**00:00**	**04:00**
Module 1: Introduction to the role of a Lab Technician – Metal Testing	04:00	00:00	0:00	00:00	04:00
CSC/N1335 Follow the health and safety practices at work **NOS Version- 2.0** **NSQF Level- 3**	**20:00**	**60:00**	**0:00**	**00:00**	**80:00**
Module 2: Health and safety practices	20:00	60:00	0:00	00:00	80:00
CSC/N1336 Coordinate with co-workers to achieve work efficiency **NOS Version-2.0** **NSQF Level- 3**	**20:00**	**60:00**	**0:00**	**00:00**	**80:00**
Module 3: Process of coordinating with co-workers to achieve work efficiency	20:00	60:00	0:00	00:00	80:00
CSC/N0602 Carry out metal testing in the lab **NOS Version- 2.0** **NSQF Level- 4**	**106:00**	**180:00**	**0:00**	**00:00**	**286:00**
Module 4: Process of carrying out metal testing in the lab	106:00	180:00	0:00	00:00	286:00

Total Duration	**150:00**	**300:00**	**0:00**	**00:00**	**450:00**

Module Details

Module 1: Introduction to the role of a Lab Technician – Metal Testing

Bridge Module

Terminal Outcomes:

- Discuss the job role of a Lab Technician – Metal Testing.

Duration: 04:00	Duration: 0:00
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Describe the size and scope of the capital good industry and its sub-sectors. • Discuss the role and responsibilities of a Lab Technician – Metal Testing. • Identify various employment opportunities for a Lab Technician – Metal Testing.	
Classroom Aids	
Training Kit - Trainer Guide, Presentations, Whiteboard, Marker, Projector, Laptop, Video Films	
Tools, Equipment and Other Requirements	
NA	

Module 2: Health and safety Practices

Mapped to CSC/N1335 v2.0

Terminal Outcomes:

- Demonstrate ways to maintain personal health and safety.
- Describe the process of assisting in hazard management.
- Explain how to check the first aid box, firefighting and safety equipment.
- Describe the process of assisting in waste management.
- Explain the importance of following the fire safety guidelines.
- Explain the importance of following the emergency and first-aid procedures.
- Demonstrate the process of carrying out relevant documentation and review.

Duration: 20:00	**Duration: 60:00**
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Explain the recommended practices to be followed to ensure protection from infections and transmission to others, such as the use of hand sanitizer and face mask. • Explain the importance and process of checking the work conditions, assessing the potential health and safety risks, and take appropriate measures to mitigate them. • Explain the importance and process of selecting and using the appropriate PPE relevant to the task and work conditions. • Explain the recommended techniques to be followed while lifting and moving heavy objects to avoid injury. • Explain the importance of following the manufacturer's instructions and workplace safety guidelines while working on heavy machinery, tools and equipment. • Explain the importance and process of identifying existing and potential hazards at work. • Describe the process of assessing the potential risks and injuries associated with the various hazards. • Explain how to prevent or minimise different types of hazards.	• Demonstrate the use of appropriate Personal Protective Equipment (PPE) relevant to the task and work conditions. • Demonstrate how to handle hazardous materials safely. • Demonstrate the process of testing the firefighting and various safety equipment to ensure they are in usable condition. • Demonstrate the process of recycling and disposing different types of waste appropriately. • Demonstrate how to use the appropriate type of fire extinguisher to extinguish different types of fires safely. • Demonstrate how to administer appropriate first aid to the injured personnel. • Demonstrate the process of performing Cardiopulmonary Resuscitation (CPR) on a potential victim of cardiac arrest. • Demonstrate the process of carrying out appropriate documentation following a health and safety incident at work, including all the required information.

• Explain how to handle and store hazardous materials safely. • Explain the importance of ensuring the first aid box is updated with the relevant first aid supplies. • Describe the process of checking and testing the firefighting and various safety equipment to ensure they are in a usable condition. • Explain the criteria for segregating waste into appropriate categories. • Describe the appropriate methods for recycling the recyclable waste. • Describe the process of disposing of the non-recyclable waste safely and the applicable regulations. • Explain the use of different types of fire extinguishers to extinguish different types of fires. • State the recommended practices to be followed for a safe rescue during a fire emergency. • Explain how to request assistance from the fire department to extinguish a serious fire. • Explain the appropriate practices to be followed during workplace emergencies to ensure safety and minimise loss to organisational property. • State the common health and safety hazards present in a work environment, associated risks, and how to mitigate them. • State the safe working practices to be followed while working at various hazardous sites and using electrical equipment. • Explain the importance of ensuring easy access to firefighting and safety equipment. • Explain the appropriate preventative and remedial actions to be taken in the case of exposure to toxic materials, such as poisonous	

chemicals and gases. • Explain various causes of fire in different work environments and the recommended precautions to be taken to prevent fire accidents. • Describe different methods of extinguishing fire. • List different materials used for extinguishing fire. • Explain the applicable rescue techniques to be followed during a fire emergency. • Explain the importance of placing safety signs and instructions at strategic locations in a workplace and following them. • Explain different types of first aid treatment to be provided for different types of injuries. • State the potential injuries associated with incorrect manual handling. • Explain how to move an injured person safely. • State various hazards associated with the use of various machinery, tools, implements, equipment and materials. • Explain the importance of ensuring no obstruction and free access to fire exits. • Explain how to free a person from electrocution safely. • Explain how to administer appropriate first aid to an injured person. • Explain how to perform Cardiopulmonary Resuscitation (CPR). • Explain the importance of coordinating with the emergency services to request urgent medical assistance for persons requiring professional medical attention or hospitalisation. • State the appropriate documentation	

to be carried out following a health and safety incident at work, and the relevant information to be included. • Explain the importance and process of reviewing the health and safety conditions at work regularly or following an incident. • Explain the importance and process of implementing appropriate changes to improve the health and safety conditions at work.	
Classroom Aids	
Computer, Projection Equipment, PowerPoint Presentation and Software, Facilitator's Guide, Participant's Handbook.	
Tools, Equipment and Other Requirements	
Personal Protective Equipment, Cleaning Equipment and Materials, Sanitizer, Soap, Mask	

Module 3: Process of coordinating with co-workers to achieve work efficiency

Mapped to NOS CSC/N1336 v2.0

Terminal Outcomes:

- Demonstrate ways to Work and communicate effectively with co-workers.
- Discuss ways to promote diversity and inclusion at the workplace.

Duration: 20:00	Duration: 60:00
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Explain the importance and process of effective communication in the workplace. • Explain the barriers to effective communication and how to overcome them. • Explain the importance of teamwork in an organisation's and individual's success. • Explain the importance of active listening in the work environment. • State the appropriate techniques to be followed for active listening. • Explain the importance of tone and pitch ineffective communication. • Explain the importance of avoiding casual expletives and unpleasant terms while communicating professional circles. • Explain the importance of maintaining discipline and ethical behaviour at work. • **State** the common reasons for interpersonal conflict and how to resolve them. • Explain the importance of developing effective working relationships for professional success. • Describe the process of expressing and addressing grievances appropriately and effectively. • Explain the importance and process of planning daily tasks to ensure their timely completion and efficient use of	• Demonstrate the process of preparing the relevant documents and reports as per the supervisor's instructions, providing appropriate information clearly and systematically. • Demonstrate how to mentor and assist subordinates in the execution of their work responsibilities. • Demonstrate the process of using various resources efficiently to ensure maximum utilisation and minimum wastage. • Demonstrate how to communicate clearly and politely to ensure effective communication with co-workers. • Demonstrate appropriate verbal and non-verbal communication that is respectful of genders and disability.

time. • Explain the importance of adhering to the limits of authority at work. • Explain the importance of following the applicable quality standards and timescales at work. • Explain the importance of coordinating with co-workers to achieve the work objectives efficiently. • Explain the relevant documentation requirements. • Explain the importance of providing appropriate information clearly and systematically in work documents. • State the escalation matrix to be followed to deal with out of authority tasks and concerns. • Explain the importance and process of mentoring and assisting subordinates in the execution of their work responsibilities. • Explain how to identify possible disruptions to work prevent them. • Explain how to use various resources efficiently to ensure maximum utilisation and minimum wastage. • Explain the recommended practices to be followed at work to avoid and resolve conflicts at work. • Explain the importance and process of efficient and timely dissemination of information to the authorised personnel. • Explain the procedure to report inappropriate behaviour e.g., harassment.	
Classroom Aids:	
Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop	
Tools, Equipment and Other Requirements	
NA	

Module 4: Process of carrying out metal testing in the lab

Mapped to CSC/N0602 v2.0

Terminal Outcomes:

- Describe the process of preparing for carrying out metal testing.
- Demonstrate the process of carrying out metal testing.
- Explain the importance of using resources optimally.

Duration: 106:00	Duration: 180:00
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Explain the concepts and benefits of Industry 4.0 and Industrial Internet of Things (IIoT). • Describe the process of maintaining various records manually and electronically. • Explain the importance of recording the relevant information during the various stages of testing. • List different types of metals, metal alloys and non-metals and various methods and techniques followed for their testing. • State the terminology relevant to metal testing procedures. • Explain the principles of metal testing and appropriate tests to be conducted on various metals. • List different types of chemicals, equipment and meters used for testing different types of material such as cast iron, bronze; low-carbon, low alloy, high yield and stainless steel; aluminium/aluminium alloys. • Explain how to set various operational performance parameters on testing equipment and meters, such as omissions, leaks, contamination etc. • Explain the importance of monitoring the equipment settings and functioning during the testing process. • Explain the criteria for selecting testing tools, equipment, methods	• Demonstrate how to assemble and calibrate the testing tools and equipment for carrying out metal testing. • Show how to prepare the test samples following the applicable procedures, and check their integrity. • Demonstrate the process of carrying out the required tests following the recommended process, such as the microscopic study of metal samples. • Demonstrate how to test the properties and stresses of a variety of metal alloys. • Demonstrate how to operate the laboratory furnaces taking the relevant safety precautions. • Demonstrate the process of carrying out minor repair and maintenance of the testing tools and equipment. • Prepare sample records manually and electronically with respect to the testing activities undertaken in the lab. • Demonstrate how to analyse the testing data to draw appropriate conclusions, and prepare the relevant reports. • Demonstrate the use of various industry 4.0 manufacturing technologies. • Demonstrate the process of optimising the usage of electricity and other resources in various tasks and processes.

and techniques. • State the relevant health, safety and environmental regulations to be adhered to while carrying out lab testing. • Describe the process of sampling different types of metals for testing. • Describe the process of preparing, handling and storing metal samples. • List various hazards associated with metal testing such as hot equipment and materials/products, moving loads, rotating/moving equipment and how to minimise them. • Explain the applicable quality control requirements in metal testing processes. • Explain how to set up various metal testing tools, equipment, instruments, test materials and consumables for use. • Describe the process of determining the requirement of testing equipment to be used and the precautions to be taken while handling them. • Explain the use of the relevant testing tools and equipment. • Explain the importance of carrying out various tests as per the defined procedure. • Explain the importance and process of testing the equipment calibration. • List the circumstances under which the test equipment and the metal test samples may be deemed unsuitable for the testing activities and the appropriate action to be taken. • Explain the importance of conducting metal testing according to the production and quality control procedures. • List various problems encountered during metal testing and how to	

prevent and resolve them. • Explain the benefits and methods of resource optimisation.	
Classroom Aids	
Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop	
Tools, Equipment and Other Requirements	
Metal Samples, Universal Testing Machine, Carbon and Sulphur Determination Apparatus, Melt Flow Index Apparatus, Impact Hardness Tester, Measuring Microscope, Ferrite Meter, Spectrometer and Hand Tools, Personal Protective Equipment (PPE)	

Annexure

Trainer Requirements

Trainer Prerequisites						
Minimum Educational Qualification	**Specialization**	**Relevant Industry Experience**		**Training Experience**		**Remarks**
		Years	***Specialization***	***Years***	***Specialization***	
Diploma /Degree	Diploma /Degree in Mechanical Engineering	4	Lab Technician – Metal Testing	0		Practical skills and knowledge required in the relevant field

Trainer Certification	
Domain Certification	**Platform Certification**
Certified for Job Role: "**Lab Technician – Metal Testing**" mapped to QP: "CSC/Q0602, v1.0". Minimum accepted score is 80%	Recommended that the Trainer is certified for the Job Role: "Trainer", mapped to the Qualification Pack: "MEP/Q0102". Minimum accepted as per respective SSC guidelines is 80%.

Assessor Requirements

Assessor Prerequisites						
Minimum Educational Qualification	**Specialization**	**Relevant Industry Experience**		**Training/Assessment Experience**		**Remarks**
		Years	***Specialization***	***Years***	***Specialization***	
Diploma /Degree	Diploma /Degree in Mechanical Engineering	4	Lab Technician – Metal Testing	0		Practical skills and knowledge required in the relevant field

Assessor Certification	
Domain Certification	**Platform Certification**
Certified for Job Role: "**Lab Technician – Metal Testing**" mapped to QP: "CSC/Q0602, v1.0". Minimum accepted score is 80%	Certified for the Job Role: "Assessor", mapped to the Qualification Pack: "MEP/Q2701, v1.0", with a minimum score of 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
    - The assessment agency deploys the ToA certified Assessor for executing the assessment
    - SSC monitors the assessment process & records
2. Testing Environment

    To ensure a conducive environment for conducting a test, the trainer will:
    - 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 10 a.m. and 5 p.m. respectively
    - Ensure there are 2 Assessors if the batch size is more than 30.
    - 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 levels 1 to 3 are for the unskilled & semi-skilled individuals, and levels 4 and above are for the skilled, supervisor & higher management
    - The assessor must be ToA certified and the trainer must be ToT Certified
    - The 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:

    To verify the details submitted by the training centre, the assessor will undertake:
    - A surprise visit to the assessment location
    - A random audit of the batch
    - A random audit of any candidate
6. Method for assessment documentation, archiving, and access

    To protect the assessment papers and information, the assessor will ensure:
    - 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 on the Hard drive

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	The 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
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	The 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

Term	Description
NOS	National Skills Qualification Committee
NSQF	National Skills Qualification Framework
OJT	On-the-Job Training
OMR	Optical Mark Recognition
PC	Performance Criteria
PwD	Persons with Disabilities
QP	Qualification Pack
SDMS	Skill Development & Management System
SIP	Skill India Portal
SSC	Sector Skill Council
TC	Trainer Certificate
ToA	Training of Assessors
ToT	Training of Trainers
TP	Training Provider