Model Curriculum

QP Name: Quality Technician - Construction

QP Code: ICE/CON/Q5001

Version: 1.0

NSQF Level: 4

Model Curriculum Version: 1.0

The Institution of Civil Engineers
309-310, Suncity Trade Tower, Sector 21, Gurugram, Haryana - 122016

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Training Parameters

Sector	Construction
Sub-Sector	Real Estate and Infrastructure Construction
Occupation	Quality Assurance and Quality Control
Country	India
NSQF Level	4
Aligned to NCO/ISCO/ISIC Code	NCO-2015/3112.9900
Minimum Educational Qualification and Experience	12th grade Pass (Physics Chemistry Mathematics) with NA of experience OR 11th grade pass with 1.5 years of experience relevant experience in roads and highways construction OR 10th grade pass with 3 Years of experience relevant experience in roads and highways construction OR Previous relevant Qualification of NSQF Level (3.5 level) with 1.5 years of experience relevant experience in roads and highways construction12th grade pass (PCM) OR Previous relevant Qualification of NSQF Level (3 level) with 3 years of experience relevant experience in roads and highways construction12th grade pass (PCM)
Pre-Requisite License or Training	NIL
Minimum Job Entry Age	18 Years
Last Reviewed On	NA
Next Review Date	17/01/2028
NSQC Approval Date	17/01/2025
QP Version	1.0
Model Curriculum Creation Date	17/01/2025
Model Curriculum Valid Up to Date	17/01/2028
Model Curriculum Version	1.0

Minimum Duration of the Course	540 Hours
Maximum Duration of the Course	540 Hours

Program Overview

This section summarises 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 operation of the Universal Testing Machine (UTM) to perform strength tests on construction materials.
- Describe the process of conducting Ground Penetrating Radar (GPR) testing to evaluate subsurface structures at construction sites.
- Discuss the method of digital testing on concrete to assess parameters such as moisture content, density, and structural integrity.
- Elucidate the process of Ultrasonic Testing (UT) on construction materials to identify internal defects or flaws.
- Explain the application of Eddy Current Testing (ECT) on construction materials to detect surface and near-surface defects.
- Describe the standard procedures for testing soil, aggregate, bitumen, steel, and concrete mixes, including non-destructive testing on concrete.
- Discuss the use of specialized highway testing equipment, such as FWD, NSV, Benkelman Beam, and Total Station, to assess road quality.
- Elucidate the steps required to set up a project lab with appropriate layout, foundations, and equipment for construction material testing.
- Explain the basics and functions of essential construction machinery, including Hot Mix Plant, Batching Plant, and Paver.
- Describe the process for preparing lab programs and compiling daily and monthly progress reports to document test results and findings.
- Follow the appropriate health, safety, and environmental standards in construction material testing.
- Explain the importance of employability skills.

Compulsory Modules

The table lists the modules and their duration corresponding to the Compulsory NOS of the micro-credential.

NOS and Module Details	Theory Duration	Practical Duration	On-the-Job Training Duration (Mandatory)	On-the-Job Training Duration (Recommended)	Total Duration
ICE/CON/N5001: Conduct construction material testing using the Universal Testing Machine (UTM) NOS Version- 1.0	20:00	40:00	00:00	00:00	60:00

NSQF Level- 4.0					
Module 1: Introduction to the Construction Industry and the job role of a Quality Technician - Construction	05:00	00:00	00:00	00:00	05:00
Module 2: Setting Up and Preparing for UTM-Based Material Testing	10:00	20:00	00:00	00:00	30:00
Module 3: Conducting, Analyzing, and Reporting UTM Material Tests	05:00	20:00	00:00	00:00	25:00
ICE/CON/N5002: Carry out Ground Penetrating Radar (GPR) testing **NOS Version- 1.0** **NSQF Level- 4.0**	**10:00**	**20:00**	**30:00**	**00:00**	**60:00**
Module 4: Planning, Preparing, and Conducting GPR Surveys	05:00	10:00	15:00	00:00	30:00
Module 5: Interpreting GPR Data, Reporting, and Equipment Maintenance	05:00	10:00	15:00	00:00	30:00
ICE/CON/N5003: Carry out digital concrete testing **NOS Version- 1.0** **NSQF Level- 4.0**	**10:00**	**20:00**	**30:00**	**00:00**	**60:00**
Module 6: Sample Preparation and Equipment Setup for Digital Concrete Testing	05:00	10:00	15:00	00:00	30:00
Module 7: Conducting Digital Concrete Tests, Data Analysis, and Equipment Maintenance	05:00	10:00	15:00	00:00	30:00
ICE/CON/N5004: Carry out Ultrasonic Testing	**10:00**	**20:00**	**30:00**	**00:00**	**60:00**

(UT) of construction materials **NOS Version- 1.0** **NSQF Level- 4.0**					
Module 8: Preparation and Setup for Ultrasonic Testing	05:00	10:00	15:00	00:00	30:00
Module 9: Conducting, Analyzing, and Reporting Ultrasonic Testing Results	05:00	10:00	15:00	00:00	30:00
ICE/CON/N5005: Carry out Eddy Current Testing (ECT) of construction materials **NOS Version- 1.0** **NSQF Level- 4.0**	**10:00**	**20:00**	**00:00**	**00:00**	**30:00**
Module 10: Perform Eddy Current Testing (ECT) on Construction Materials	10:00	20:00	00:00	00:00	30:00
ICE/CON/N5006: Conduct tests on soil, aggregate, bitumen, steel, different construction mixes, and NDT on concrete **NOS Version- 1.0** **NSQF Level- 4.0**	**10:00**	**50:00**	**00:00**	**00:00**	**60:00**
Module 11: Conduct Material Tests on Soil, Aggregate, and Bitumen	05:00	25:00	00:00	00:00	30:00
Module 12: Conduct Tests on Steel, Construction Mixes, and Non-Destructive Testing (NDT) on Concrete	05:00	25:00	00:00	00:00	30:00
ICE/CON/N5007: Carry out highway testing through FWD, NSV,	**10:00**	**20:00**	**00:00**	**00:00**	**30:00**

Benkelman Beam, and Total Station **NOS Version- 1.0** **NSQF Level- 4.0**					
Module 13: Conduct Highway Testing Using FWD and Benkelman Beam	05:00	10:00	00:00	00:00	15:00
Module 14: Conduct Highway Surface and Geometric Testing Using NSV and Total Station	05:00	10:00	00:00	00:00	15:00
ICE/CON/N5008: Set up the project civil lab **NOS Version- 1.0** **NSQF Level- 4.0**	**10:00**	**20:00**	**00:00**	**00:00**	**30:00**
Module 15: Laboratory Design and Layout Planning	05:00	10:00	00:00	00:00	15:00
Module 16: Equipment and Testing Setup	05:00	10:00	00:00	00:00	15:00
ICE/CON/N5009: Basics of plants and machinery (Hot Mix Plant, Batching Plant, Paver, Grader, Loader) **NOS Version- 1.0** **NSQF Level- 4.0**	**10:00**	**20:00**	**00:00**	**00:00**	**30:00**
Module 17: Operations of Hot Mix and Batching Plants	05:00	10:00	00:00	00:00	15:00
Module 18: Basic Operations of Road Construction Machinery	05:00	10:00	00:00	00:00	15:00
ICE/CON/N50010: Basics of preparation of lab program and reporting daily progress report and monthly progress report	**10:00**	**20:00**	**00:00**	**00:00**	**30:00**

NOS Version- 1.0 **NSQF Level- 4.0**					
Module 19: Fundamentals of Laboratory Testing and Reporting Progress	10:00	20:00	00:00	00:00	30:00
ICE/CON/N5011: Follow health, safety, and environmental standards in construction material testing	**10:00**	**20:00**	**00:00**	**00:00**	**30:00**
Module 20: Health and Safety Measures for Construction Material Testing	10:00	20:00	00:00	00:00	30:00
DGT/VSQ/N0102: Employability Skills (60 Hours) **NOS Version- 1.0** **NSQF Level- 4.0**	**60:00**	**00:00**	**00:00**	**00:00**	**60:00**
Module 20: Employability Skills (60 Hours)	60:00	00:00	00:00	00:00	60:00
Total Duration	**180:00**	**270:00**	**90:00**	**00:00**	**540:00**

Module Details

Module 1: Introduction to Construction Industry and job role of a Quality Technician - Construction

Mapped to* ICE/CON/N5001 *, v1.0

Terminal Outcomes:

- Explain the importance of Construction Industry.
- Discuss the roles and responsibilities of a Quality Lab & Field Technician.

Duration: **05:00 (in Hrs)**	**Duration**: **00:00 (in Hrs)**
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Define the Construction Industry. • Describe the main sectors within the construction industry and their impact on infrastructure development. • Discuss the scope of employment in the Construction Industry. • Explain the role and responsibilities of a Quality Technician in construction projects. • Discuss the skills and qualifications necessary for the career of a Quality Technician- Construction.	-
Classroom Aids	
Training Kit - Trainer Guide, Presentations, Whiteboard, Marker, Projector, Laptop, Video Films	
Tools, Equipment and Other Requirements	
NA	

Module 2: Setting Up and Preparing for UTM-Based Material Testing

Mapped to* ICE/CON/N5001*, v1.0

Terminal Outcomes:

- Define the steps to set up and calibrate the UTM with correct fixtures, ensuring all safety protocols are followed.
- Explain how to select and prepare representative material samples, inspecting for defects.
- Describe how to condition test specimens to meet temperature and humidity requirements, ensuring they are free from defects.

Duration: 10:00 (in Hrs)	**Duration: 20:00 (in Hrs)**
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Explain different materials, such as steel, concrete, and composite materials commonly used in construction. • Explain mechanical properties such as tensile strength, compressive strength, elasticity, and ductility of different construction materials. • Identify different components of a Universal Testing Machine (UTM) such as load cells, grips, crosshead, and control panels. • Describe the calibration procedures for a UTM to ensure accurate measurements. • Understand relevant industry standards, such as ASTM and ISO, which govern construction material testing. • Describe the importance of adhering to the industry standards and testing procedures for material testing.	• Demonstrate the calibration and setup of the UTM based on specific test requirements to ensure accurate measurements. • Show how to select and install the appropriate fixtures or grips depending on the type of test (tensile, compressive, flexural, or shear). • Demonstrate securing the material properly in the UTM and checking for any obstructions around the machine to ensure safe testing procedures. • Show how to identify and select a representative sample of the construction material that meets testing requirements. • Demonstrate the preparation of specimens with dimensions and shapes specified in relevant testing standards to ensure reliable results. • Show how to inspect samples for visible defects or irregularities that may affect the test results, ensuring they are within tolerance limits. • Demonstrate adjusting the sample's temperature or humidity as specified, conditioning it to meet testing requirements before starting the test.
Classroom Aids:	
Training Kit (Trainer Guide, Presentations), Whiteboard, Marker, Projector, Laptop	

Tools, Equipment and Other Requirements:
Universal Testing Machine (UTM), PPE (gloves, safety shoes)

Module 3: Conducting, Analyzing, and Reporting UTM Material Tests

Mapped to* ICE/CON/N5001*, v1.0

Terminal Outcomes:

- Explain how to perform tensile, compressive, flexural, and shear tests on samples using UTM fixtures, and record measurements like tensile strength, compressive strength, and deflection.
- Explain how to analyse test data to determine mechanical properties such as yield strength and modulus of elasticity, comparing findings with industry standards for material compliance.
- Describe how to prepare a detailed test report with methodology, conditions, results, and analysis, following industry reporting standards.

Duration: 05:00 (in Hrs)	**Duration: 20:00 (in Hrs)**
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Explain the process of conducting tensile testing using a UTM to determine the tensile strength and elongation of a material. • Describe the process of conducting compressive testing with a UTM to measure a material's compressive strength. • Explain the process of conducting bending tests using a UTM to determine the flexural strength of a material. • Describe the process of performing shear testing on a material to measure its resistance to shear forces. • Explain how to interpret stress-strain curves and other graphical data generated by the UTM. • Describe how to analyse test results from a UTM to check if the material meets the required standards and specifications. • List the steps for documenting material testing procedures, observations, and results accurately. • Describe the importance of recording data systematically for future reference and quality control. • Identify common issues with the UTM, such as misalignment or load cell errors, and describe how to troubleshoot them.	• Show how to place the sample in the tensile grips and apply load gradually to measure tensile properties. • Demonstrate the process of recording the elongation and ultimate tensile strength during tensile testing. • Show how to position the sample between compression plates and apply load to determine compressive strength and deformation. • Demonstrate how to support the sample at two points, apply the load at the centre, and record flexural strength and deflection. • Show how to secure the sample and apply load perpendicular to the axis to measure shear strength. • Demonstrate how to use the UTM's software or data acquisition system to accurately capture load, displacement, and stress-strain data. • Show how to monitor the test process and ensure alignment with expected results for reliability. • Demonstrate how to analyse data to determine mechanical properties, such as yield strength, ultimate strength, modulus of elasticity, and shear modulus.

• Explain the importance of following appropriate corrective actions during troubleshooting to ensure test results are accurate and reliable.	• Show how to compare test results against relevant standards to assess material compliance. • Demonstrate how to identify anomalies or deviations in test data and assess possible causes, such as calibration issues, sample defects, or incorrect procedures. • Show how to prepare a report including methodology, test conditions, observed data, and analysis results. • Demonstrate how to ensure that the report is clear, concise, and adheres to required formats and protocols.
Classroom Aids:	
Training Kit (Trainer Guide, Presentations), Whiteboard, Marker, Projector, Laptop	
Tools, Equipment and Other Requirements:	
Universal Testing Machine (UTM), Data analysis software (e.g., MATLAB), PPE (gloves, safety glasses)	

Module 4: Planning, Preparing, and Conducting GPR Surveys

Mapped to* ICE/CON/N5002, *v1.0

Terminal Outcomes:

- Explain the process of planning and preparing for GPR testing, including site assessment, equipment calibration, and safety compliance for accurate subsurface evaluation.
- Describe the steps for designing and executing GPR surveys, establishing a survey layout, marking grid points, and adjusting settings based on material types for comprehensive data collection.
- Discuss how to adapt GPR survey parameters using appropriate antenna frequencies and follow-up tests to ensure subsurface evaluations meet project depth and detail requirements.

Duration: 05:00 (in Hrs)	Duration: 10:00 (in Hrs)
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Explain the basic principles of GPR, including the use of electromagnetic waves to detect and map subsurface features. • Discuss the relevant standards and guidelines for GPR testing in construction, such as ASTM or ISO standards. • Elucidate the legal and regulatory requirements for conducting GPR surveys on construction sites. • Describe the different applications of GPR in construction. • Discuss how to prepare the testing site, including surface conditions and environmental factors that may affect the GPR readings. • Explain how to design a survey grid for systematic data collection. • Describe the techniques for scanning surfaces, maintaining consistent speed, and ensuring comprehensive coverage. • Elucidate the dielectric properties of construction materials and how they affect GPR signal reflection. • Discuss how materials like concrete, asphalt, soil, and rebar interact with GPR signals.	• Demonstrate how to conduct a preliminary site assessment to identify specific areas for subsurface evaluation, considering site conditions and potential obstacles. • Show how to calibrate the GPR equipment according to the manufacturer's guidelines, taking into account specific site conditions such as soil type, moisture content, and expected depth of investigation. • Show how to set up barriers and signage effectively to protect the GPR equipment and maintain a safe work area. • Demonstrate the establishment of a grid or linear layout for the GPR survey, ensuring proper alignment based on the area being assessed. • Show how to mark grid points clearly on the ground to ensure consistent data collection across the survey site. • Demonstrate how to adjust GPR settings such as antenna frequency, scan rate, and depth range based on the material type and the level of detail required for the survey. • Show how to select and utilize higher frequencies for improved resolution with limited depth penetration and lower frequencies for deeper penetration with

• Explain the appropriate antenna frequency for different materials and depths.	less detail, based on the survey requirements. • Demonstrate the process of following up with additional tests as required based on the findings from the GPR survey to ensure comprehensive evaluation.
Classroom Aids	
Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop	
Tools, Equipment and Other Requirements	
Ground Penetrating Radar (GPR), PPE (hard hats, safety vests)	

Module 5: Interpreting GPR Data, Reporting, and Equipment Maintenance

Mapped to* ICE/CON/N5002*, v1.0

Terminal Outcomes:

- Explain the process of collecting GPR data, including systematic movement along grid lines, real-time anomaly monitoring, and precise geo-referenced data logging.
- Discuss how to interpret GPR data by identifying subsurface features and creating 3D models for a detailed internal view of the infrastructure.
- Describe the requirements for preparing test reports with GPR profiles, interpreted data, identified anomalies, and recommendations, emphasizing record-keeping for quality assurance.
- Elucidate the steps for maintaining GPR equipment, including cleaning, inspection, and periodic calibration for accuracy and reliability.

Duration: 05:00 (in Hrs)	Duration: 10:00 (in Hrs)
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Elucidate the different components of a GPR system, including the control unit, antenna, and data storage device. • Discuss how electromagnetic waves travel through different materials and the impact of material properties on wave behavior. • Explain how to interpret GPR data, including identifying anomalies, layers, and embedded objects. • Discuss the use of GPR software for data processing, visualization, and analysis. • Elucidate the methods for estimating the depth of features detected by GPR. • Describe how to document GPR testing procedures, data, and findings in a clear and organized manner. • Explain how to calibrate the GPR equipment for accurate measurements. • Discuss the appropriate methods to verify the accuracy of GPR data, such as using reference markers or cross-referencing with other testing methods.	• Demonstrate how to conduct the survey by systematically moving the GPR unit along pre-marked grid lines or paths to ensure comprehensive data collection. • Show how to monitor GPR data in real-time on the display unit, identifying anomalies or irregular reflections that may indicate subsurface features such as voids, cracks, or changes in material composition. • Demonstrate the accurate logging of all collected data with corresponding grid locations, including linking GPS data to each scan line for precise geo-referencing. • Analyse the recorded GPR data to identify subsurface features, recognizing different reflection patterns produced by various materials during the interpretation process. • Create 3D models of subsurface conditions as needed, providing a more comprehensive view of the infrastructure's internal state based on the GPR findings. • Generate comprehensive reports that include GPR profiles, interpreted data, identified anomalies, and recommendations based on the findings,

	highlighting areas that may require further investigation or repair. • Maintain a thorough record of all GPR surveys conducted, including raw data, calibration settings, and final reports to ensure quality assurance and facilitate future reference. • Demonstrate how to clean and inspect the GPR equipment after the survey, ensuring it is in good working condition for future use. • Show how to calibrate the GPR equipment periodically to maintain accuracy, ensuring reliable performance in subsequent surveys.
Classroom Aids	
Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop	
Tools, Equipment and Other Requirements	
Ground Penetrating Radar (GPR), Data analysis software, PPE (gloves, safety glasses)	

Module 6: Sample Preparation and Equipment Setup for Digital Concrete Testing

Mapped to* ICE/CON/N5003, *v1.0

Terminal Outcomes:

- Elucidate the procedure for collecting concrete samples from the site, adhering to guidelines, and demonstrate forming and curing samples in controlled conditions to represent structural performance.
- Explain the calibration process of the Digital Concrete Testing Machine (DCTM), verifying load cell accuracy and setting testing parameters, with checks to ensure proper machine function.
- Discuss the steps to set up the DCTM digital interface by inputting test parameters like sample size, load rate, and test type, ensuring configurations for effective concrete sample testing.

Duration: 05:00 (in Hrs)	**Duration: 10:00 (in Hrs)**
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Explain how compressive strength defines the load-bearing capacity of concrete, including factors that influence strength like curing time and mix design. • Describe the tensile and flexural strength properties to assess the concrete's ability to withstand bending and tension forces. • Discuss the effect of water permeability on the long-term performance of concrete structures. • Elucidate the proper sample preparation techniques, including curing, casting, and storing concrete samples to ensure accurate testing. • Describe the standard test methods like ASTM, BS, or IS codes that govern the procedures for various digital concrete tests. • Explain the use of different digital concrete testing equipment, such as Ultrasonic Pulse Velocity (UPV) Testers, Rebound Hammer (Schmidt Hammer), and Digital Maturity Meter. • Discuss the importance of calibrating digital testing devices to ensure they provide accurate and reliable measurements.	• Demonstrate how to collect concrete samples from the construction site following standard guidelines, ensuring that the samples accurately represent the materials used in the actual construction. • Show how to form concrete samples into cubes or cylinders according to specified dimensions and requirements, ensuring uniformity and adherence to testing standards. • Demonstrate how to cure the concrete samples in controlled conditions to simulate the actual environment in which the concrete will be used, maintaining consistent moisture and temperature levels for accurate performance representation. • Show how to calibrate the Digital Concrete Testing Machine (DCTM) by verifying the load cell and accurately setting the testing parameters to ensure reliable test results. • Demonstrate how to perform thorough checks on the DCTM to confirm that it is in proper working condition, identifying and addressing any mechanical issues that could impact test accuracy. • Show how to set up the digital interface of the DCTM by accurately inputting necessary test parameters, including

	sample size, load rate, and test type (e.g., compressive strength), to facilitate proper data collection during testing.
Classroom Aids	
Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop	
Tools, Equipment and Other Requirements	
Digital concrete testing equipment (slump test apparatus, compression testing machine), PPE (gloves, safety goggles)	

Module 7: Conducting Digital Concrete Tests, Data Analysis, and Equipment Maintenance

Mapped to* ICE/CON/N5003, *v1.0

Terminal Outcomes:

- Demonstrate conducting concrete testing by positioning the cured sample in the DCTM, applying controlled load, and monitoring deformation data to determine compressive strength, following safety guidelines and using PPE.
- Discuss how to analyse DCTM data, capturing load, displacement, and stress-strain for compressive strength calculation, and create a report with results, graphs, and observations.
- Explain essential DCTM maintenance procedures, including cleaning, inspecting, lubricating, and recalibrating, while maintaining calibration certificates and logs for accuracy and compliance.

Duration: 05:00 (in Hrs)	Duration: 10:00 (in Hrs)
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Explain how to identify and rectify issues that may arise during testing, such as equipment malfunctions or unexpected test results. • Describe how to acquire, process, and interpret data from digital testing equipment, using specialized software for analysis and reporting. • Discuss how to interpret the results obtained from digital tests, such as identification of potential issues like low strength, inconsistencies, or defects in the concrete. • Elucidate how digital test results correlate with the physical properties of concrete, helping to make informed decisions about its quality and suitability for construction. • Explain how to prepare detailed reports that summarize the findings, including graphical representations and analysis of the concrete's performance. • Discuss the regulatory standards and codes to be followed during concrete testing to ensure compliance with industry requirements. • Elucidate how to document the testing process, including recording data, test conditions, and any observations.	• Demonstrate how to position the cured concrete sample in the machine's loading frame, ensuring it is centered and aligned to prevent uneven stress distribution during testing. • Show how to apply a load to the concrete sample at a controlled rate using the Digital Concrete Testing Machine (DCTM), ensuring precise and consistent results. • Demonstrate how to monitor the applied load and deformation data during the test, effectively recording observations to evaluate the sample's performance. • Show how to check the peak load at which the concrete sample fails to accurately determine its compressive strength, ensuring adherence to testing standards. • Demonstrate how to check the machine's digital system to ensure that all relevant data is recorded, including load applied, displacement, and stress-strain relationships, for thorough analysis. • Show how to analyse the data to calculate the compressive strength of the concrete, applying appropriate formulas and methodologies to derive accurate results. • Demonstrate how to generate a report using the digital system, incorporating

	test results, graphs, and observations to provide a comprehensive overview of the test findings. • Show how to clean and inspect the equipment for signs of wear and tear, ensuring all components are in optimal condition for future use. • Demonstrate how to lubricate moving parts and identify any mechanical issues that could affect the performance of the DCTM, ensuring its reliability. • Show how to recalibrate the equipment using traceable standards to maintain accuracy and compliance with industry norms, ensuring consistent testing results. • Demonstrate how to maintain records of calibration certificates and maintenance logs, ensuring all documentation is accurate and up-to-date for quality assurance.
Classroom Aids	
Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop	
Tools, Equipment and Other Requirements	
Digital concrete testing equipment, Data analysis software, PPE (gloves, safety glasses)	

Module 8: Preparation and Setup for Ultrasonic Testing

Mapped to* ICE/CON/N5004, *v1.0

Terminal Outcomes:

- Explain how to select and calibrate the ultrasonic transducer and UT device, using a calibration block to optimize settings based on material type, thickness, and expected flaws.
- Describe the preparation of the material surface by cleaning and applying the couplant to ensure effective contact for accurate ultrasonic wave transmission during testing.

Duration: 05:00 (in Hrs)	**Duration: 10:00 (in Hrs)**
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Explain the process of selecting the appropriate ultrasonic transducer and UT device for the material under test, ensuring it matches the material's properties and testing requirements. • Describe how to calibrate the UT device, including adjusting settings like gain and range using a calibration block to ensure accurate readings based on material type and thickness. • Discuss the importance of proper surface preparation before testing, such as cleaning and applying couplant, to ensure optimal contact between the transducer and material for effective ultrasonic wave transmission. • Elucidate the role of the calibration block in setting baseline measurements and ensuring the accuracy of the UT device during the testing procedure. • Describe the different types of couplant used in ultrasonic testing and how to select the right one based on material and testing conditions. • Explain the significance of material properties such as thickness, density, and surface condition in determining the ultrasonic test setup and expected results.	• Demonstrate the selection of the appropriate ultrasonic transducer and UT device based on the specific material type, thickness, and expected flaws, ensuring optimal testing conditions. • Show how to use a calibration block with known dimensions and properties similar to the test material, to establish a baseline for accurate measurements during ultrasonic testing. • Demonstrate the calibration of the UT device by adjusting the gain, range, and other necessary settings, ensuring the device accurately reflects the known characteristics of the calibration block. • Show how to clean the surface of the material effectively to ensure proper contact between the transducer and the material, facilitating accurate ultrasonic wave transmission. • Demonstrate the application of the appropriate couplant (e.g., gel or oil) on the material's surface, ensuring optimal conditions for the transmission of ultrasonic waves between the transducer and the material.
Classroom Aids	
Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop	

Tools, Equipment and Other Requirements
Ultrasonic testing equipment, PPE (gloves, hearing protection)

Module 9: Conducting, Analyzing, and Reporting Ultrasonic Testing Results

Mapped to* ICE/CON/N5004, *v1.0

Terminal Outcomes:

- Explain how to conduct ultrasonic testing by placing the transducer on the material, generating waves, and scanning thoroughly for flaw detection.
- Describe the analysis of reflected signals on the UT device to identify flaw location, size, and type, assessing material quality against reference standards.
- Explain the documentation process for test results, recording flaw details, calibration data, and settings, and preparing a report with findings and recommendations.
- Describe post-test procedures by cleaning the transducer and UT device, and disposing of couplant and materials per regulations.

Duration: 05:00 (in Hrs)	Duration: 10:00 (in Hrs)
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Explain how ultrasonic testing is conducted by generating waves, placing the transducer on the material, and scanning for flaw detection, considering factors such as pressure and wave propagation. • Describe how reflected ultrasonic signals are analyzed to detect flaws, and how to interpret these signals based on location, size, and type of defect. • Discuss the different types of signals (A-scan, B-scan, C-scan) and how they help in identifying flaws and assessing material integrity. • Elucidate the process of comparing the test results with reference standards to evaluate whether any detected flaws are within acceptable limits. • Describe the documentation requirements for ultrasonic testing, including how to record flaw details, settings, and calibration data to ensure traceability and reporting accuracy. • Explain the post-test procedures, including how to clean equipment, dispose of materials, and ensure compliance with environmental regulations after completing the testing process.	• Demonstrate the placement of the transducer on the material's surface, ensuring firmness and even pressure to facilitate accurate ultrasonic wave transmission. • Show how to generate ultrasonic waves using the transducer, ensuring they effectively travel through the material being tested for thorough evaluation. • Demonstrate how to conduct a comprehensive scan of the area of interest by systematically moving the transducer, ensuring complete coverage to detect all possible flaws within the material. • Show how to analyse the reflected signals (A-scan, B-scan, or C-scan) displayed on the UT device's screen, demonstrating the ability to interpret data for flaw detection. • Demonstrate the identification of the location, size, and nature of flaws based on the time of flight, amplitude, and shape of the signals, ensuring accurate assessments of material integrity. • Show how to compare detected signals with reference standards to determine if any identified flaws are within acceptable

	limits, demonstrating an understanding of quality assessment. • Demonstrate the assessment of the material against required quality standards to determine whether it meets specifications or if further action, such as repair or rejection, is necessary. • Show how to record test results accurately, including the location, size, and type of any detected flaws, as well as calibration data, equipment settings, and material specifications. • Demonstrate how to prepare a detailed report summarizing the findings, including any recommendations for further action based on the analysis of the test results. • Show how to clean the transducer and UT device post-testing to ensure their proper maintenance and longevity. • Demonstrate the proper disposal of couplant and other materials used during the test in compliance with applicable regulations, ensuring environmental safety and adherence to best practices.
Classroom Aids	
Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop	
Tools, Equipment and Other Requirements	
Ultrasonic testing equipment, Data analysis software, PPE (gloves, hearing protection)	

Module 10: Perform Eddy Current Testing (ECT) on Construction Materials

Mapped to* ICE/CON/N5005, *v1.0

Terminal Outcomes:

- Explain how to select suitable conductive materials for testing and ensure cleanliness for accurate eddy current signals.
- Discuss the setup and calibration of the ECT instrument per manufacturer guidelines, selecting appropriate probes and calibration blocks.
- Explain the systematic scanning of the material surface by positioning the probe to induce consistent eddy currents.
- Describe the interpretation of signal variations to identify and assess defects by type, size, and location.

Duration: 10:00 (in Hrs)	Duration: 20:00 (in Hrs)
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Explain the various construction-related uses of ECT and its role in ensuring material quality and structural integrity. • Explain the foundational principles of ECT, including how it detects flaws and measures material properties. • Describe how variations in material properties impact the flow of eddy currents, affecting test results. • Explain the relevant standards such as ASTM, ISO, and ASME in setting up and conducting ECT. • Describe the functions of ECT probes, coils, and signal processing units in the testing process. • Explain the uses of surface probes, encircling coils, and bobbin probes based on geometry and material type. • Explain how reference standards are used to calibrate ECT instruments to ensure precise measurements. • Explain how factors like material thickness, composition, and temperature affect eddy current testing. • Describe the impact of magnetic permeability on testing, particularly in ferromagnetic materials.	• Show how to select materials suitable for ECT, ensuring conductivity for accurate results. • Show how to effectively clean the material surface, removing any dirt, grease, or coatings to avoid interference with the eddy current signal. • Show how to set up the eddy current testing instrument according to the manufacturer's guidelines to ensure optimal performance. • Show how to select the appropriate probe based on material properties and the types of defects to be inspected. • Show how to calibrate the ECT instrument using reference standards or calibration blocks with known defects for precise measurements. • Show how to properly position the ECT probe on the material surface and induce eddy currents to begin the testing process. • Show how to scan the entire material surface by moving the probe systematically to cover all areas of interest.

• Describe how roughness, coatings, and oxidation influence ECT readings and signal quality. • Explain methods to prepare material surfaces to ensure effective contact and reliable results. • Explain how scanning speed and probe orientation contribute to the accurate detection of flaws. • Describe how test frequencies are chosen to suit material properties and specific defect detection needs. • Describe types of defects such as cracks, corrosion, and inclusions that can be found in construction materials. • Explain how signal amplitude changes indicate flaws or variations in the tested material. • Describe methods for assessing flaw depth through signal attenuation and phase shifts. • Explain processes for identifying and characterizing defects using both manual analysis and software tools. • Describe how impedance plane diagrams and similar tools help distinguish between different flaw types. • Describe methods for assessing material quality based on industry standards and acceptance criteria. • Describe how to document test parameters, equipment settings, and observations for traceability. • Discuss the steps for creating reports that summarize the testing process, results, and detected defects. • Explain methods for confirming ECT findings, such as using multiple probe frequencies or other NDT methods.	• Show how to hold the probe perpendicular to the surface consistently during testing for reliable signal accuracy. • Show how to analyse signals on the instrument display, identifying variations to detect defects or inconsistencies. • Show how to interpret signal patterns to determine the type, size, and location of detected defects accurately. • Show how to document inspection results, detailing any identified defects, their locations, and severity for record-keeping. • Show how to prepare recommendations for repair, further inspection, or ongoing monitoring based on the inspection results.
Classroom Aids	
Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop	
Tools, Equipment and Other Requirements	

Eddy current testing equipment, PPE (gloves, safety glasses)

Module 11: Conduct Material Tests on Soil, Aggregate, and Bitumen

Mapped to* ICE/CON/N5006, *v1.0

Terminal Outcomes:

- Describe the moisture content test to determine water in soil samples and its importance in assessing soil suitability for construction projects.
- Discuss sieve analysis of fine aggregates, explaining how it evaluates particle size distribution for compliance with industry standards.
- Explain the penetration test on bitumen to assess consistency and hardness, highlighting its significance for asphalt application suitability.

Duration: 05:00 (in Hrs)	Duration: 25:00 (in Hrs)
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Describe the different types of soils and their engineering properties. • Explain the standard procedures for sampling and testing soil as per ASTM and AASHTO. • Discuss the use of soil testing equipment, including sieves, Proctor Molds, and CBR testing machines. • Elucidate the soil classification systems, particularly USCS and AASHTO. • Explain the procedures for calculating moisture content, density, and bearing capacity. • Discuss the characteristics of fine and coarse aggregates. • Enlist the methods for sampling and testing aggregates, referencing ASTM and IS standards. • Describe the use of equipment such as sieves, pycnometers, and abrasion testing machines. • Explain the significance of aggregate gradation and its impact on concrete and asphalt quality. • Discuss the procedures for assessing the strength, durability, and suitability of aggregates for various construction applications.	• Demonstrate how to prepare soil samples according to standard testing procedures. • Show how to conduct moisture content tests, Atterberg limits tests (liquid limit, plastic limit, and shrinkage limit) effectively. • Demonstrate how to perform Proctor compaction tests and California Bearing Ratio (CBR) tests accurately. • Show how to conduct sieve analysis and hydrometer analysis for soil classification. • Demonstrate how to record test results accurately and interpret data in line with industry standards. • Show how to conduct sieve analysis of fine and coarse aggregates to evaluate particle size distribution. • Demonstrate how to test for specific gravity, water absorption, and aggregate impact value. • Show how to perform tests for flakiness index, elongation index, and angularity number accurately. • Demonstrate how to determine the Los Angeles abrasion value for assessing aggregate durability.

• Elucidate the types and grades of bitumen used in road construction. • Explain the standard bitumen testing procedures according to ASTM, AASHTO, and IS. • Discuss the equipment used for bitumen testing, including penetrometers, ring-and-ball apparatus, and viscometers. • Elucidate the procedures for analyzing bitumen properties such as viscosity, ductility, and softening point.	• Show how to document test results and ensure compliance with technical specifications. • Demonstrate how to perform penetration, softening point, and ductility tests on bitumen accurately. • Show how to test for viscosity using viscometers and determine flash and fire points. • Demonstrate how to conduct bitumen extraction and gradation analysis of extracted aggregates effectively. • Show how to carry out the Marshall Stability test for asphalt mixes, ensuring proper evaluation of stability.
Classroom Aids	
Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop	
Tools, Equipment and Other Requirements	
Soil testing kits (Atterberg limits, compaction tests), Aggregate testing equipment (sieve shaker, aggregate impact tester), Bitumen testing equipment (penetrometer, softening point apparatus), PPE (gloves, safety goggles)	

Module 12: Conduct Tests on Steel, Construction Mixes, and NDT on Concrete

Mapped to* ICE/CON/N5006, *v1.0

Terminal Outcomes:

- Explain a tensile strength test on steel bars and rods using a UTM to assess load-bearing capacity and ensure compliance with engineering standards.
- Describe a Marshall Stability test for DBM, BC, and SMA mixes to evaluate performance under load and ensure compliance with road construction industry standards.
- Discuss an Ultrasonic Pulse Velocity (UPV) test to measure concrete uniformity and detect internal cracks, ensuring the structural integrity of concrete structures.

Duration: 05:00 (in Hrs)	**Duration: 25:00 (in Hrs)**
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Explain the types of steel used in construction, including TMT and structural steel, and their applications in various projects. • Discuss the testing standards for steel as specified by ASTM, IS, and AASHTO, highlighting their importance in ensuring material quality. • Describe the properties of steel, such as yield strength, tensile strength, and elongation, and their significance in structural applications. • Elucidate the use of testing equipment, including UTM, spectrometers, and impact testing machines, in evaluating steel properties. • Explain the procedures for recording and interpreting test data to ensure accurate assessment and reporting. • Discuss the composition and uses of various construction mixes, including Granular Sub-Base (GSB), Wet Mix Macadam (WMM), Dense Bituminous Macadam (DBM), Bituminous Concrete (BC), and Stone Matrix Asphalt (SMA). • Describe the standard testing procedures for asphalt and cement concrete mixes as outlined by ASTM and AASHTO to ensure compliance with industry standards.	• Demonstrate how to conduct a tensile strength test on steel bars and rods using a Universal Testing Machine (UTM) to determine their load-bearing capacity. • Show how to perform bend and rebound tests to assess the ductility of steel and ensure compliance with engineering standards. • Demonstrate how to test for chemical composition using a spectrometer or chemical analysis methods to verify material specifications. • Show how to conduct an impact test to measure the toughness of steel and its resistance to sudden forces. • Demonstrate how to sample and test different types of construction mixes, including granular sub-base (GSB), wet mix macadam (WMM), asphaltic concrete (DBM, BC, SMA), and cement-treated bases (CTB, CTGSB). • Show how to conduct gradation, compaction, and moisture content tests for GSB and WMM to ensure proper mix design. • Demonstrate how to perform the Marshall Stability test for DBM, BC, and SMA mixes to evaluate their performance under load.

• Explain the use of equipment for mix testing, such as compactors, Marshall apparatus, and compression machines, in assessing construction material quality. • Discuss the importance of gradation, compaction, and stability in road construction, focusing on their impact on pavement performance. • Explain the procedures for testing cement concrete, including slump tests and compressive strength tests, to evaluate workability and strength. • Elucidate the types and purposes of non-destructive tests (NDT) for concrete and their role in assessing structural integrity. • Describe the use of NDT equipment such as rebound hammers, ultrasonic pulse velocity meters, and Ground Penetrating Radar (GPR) machines in evaluating concrete conditions. • Explain the procedures for interpreting results from NDT methods to derive meaningful conclusions about concrete structures. • Discuss the factors affecting concrete integrity, including cracks, voids, and anomalies, and their implications for structural performance. • Elucidate safe practices for handling chemicals, equipment, and testing materials to mitigate risks in the testing environment. • Describe the processes involved in the recording and interpretation of test data to maintain accuracy and integrity in reporting. • Discuss the preparation of test reports, emphasizing the key elements that should be included to communicate findings effectively. • Explain the industry standards concerning quality assurance in material testing and their role in maintaining high-quality construction practices.	• Show how to test the compressive strength of cement concrete using cubes and cylinders to assess its load-bearing capability. • Demonstrate how to perform air void analysis and measure mix density for asphalt mixes to ensure quality and performance. • Demonstrate how to perform a Rebound Hammer test to assess the surface hardness of concrete and infer its compressive strength. • Show how to conduct an Ultrasonic Pulse Velocity (UPV) test to measure concrete uniformity and detect internal cracks. • Demonstrate how to use Ground Penetrating Radar (GPR) to evaluate the thickness and condition of concrete structures. • Show how to perform core cutting and extraction for in-depth analysis without damaging the structure, ensuring accurate assessment. • Demonstrate how to document NDT results and recommend further testing or corrective measures based on the findings.
Classroom Aids	

Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop
Tools, Equipment and Other Requirements
Steel testing equipment (tensile tester, hardness tester), Non-destructive testing (NDT) tools (rebound hammer, concrete scanner), PPE (gloves, safety glasses)

Module 13: Conduct Highway Testing Using FWD and Benkelman Beam

Mapped to* ICE/CON/N5007, *v1.0

Terminal Outcomes:

- Describe the process of conducting deflection tests using the Falling Weight Deflectometer (FWD), including setup, calibration, and application of dynamic loads to evaluate pavement stiffness and capacity.
- Explain the procedures for setting up and calibrating the Benkelman Beam apparatus at highway test points to ensure precise measurements of pavement rebound deflection during static loading tests.

Duration: 05:00 (in Hrs)	Duration: 10:00 (in Hrs)
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Describe the components and operation of FWD equipment, including load cells, geophones, and data acquisition systems. • Discuss the standard test procedures for FWD as per ASTM, AASHTO, or IRC guidelines. • Explain how to enlist the pavement layers and their response to dynamic loading. • Elucidate how to interpret the deflection data to identify weak areas and potential pavement failure points. • Explain the basic principles of deflection testing and the purpose of the Benkelman Beam test in assessing pavement flexibility. • Describe the use of Benkelman Beam equipment, including its calibration and use in static load tests. • Discuss the testing procedures for Benkelman Beam as per IRC or ASTM standards. • Elucidate how to interpret the pavement deflection data to evaluate its current condition and potential service life. • Explain the procedures for correlating deflection results with pavement design and performance expectations.	• Demonstrate how to set up the Falling Weight Deflectometer (FWD) at the test location according to standard procedures. • Show how to calibrate the FWD prior to testing to ensure accurate deflection measurements. • Demonstrate the procedure for conducting deflection tests by applying dynamic loads to the pavement surface and measuring the resulting deflection. • Show how to record deflection data across multiple points along the highway accurately. • Demonstrate the interpretation of deflection data to evaluate pavement stiffness and structural capacity. • Show how to document test results and recommend necessary maintenance or rehabilitation measures based on findings. • Demonstrate how to set up the Benkelman Beam at designated test points on the highway accurately. • Show how to calibrate the Benkelman Beam apparatus to ensure accurate deflection measurements before conducting tests. • Demonstrate the procedure for conducting static loading tests using a

	standard vehicle and measuring pavement rebound deflection. • Show how to record deflection values at multiple points to assess pavement flexibility and bearing capacity accurately. • Demonstrate the analysis of deflection data to determine the pavement's residual life and identify areas requiring strengthening or reconstruction. • Show how to prepare and submit detailed reports based on Benkelman Beam test results effectively.
Classroom Aids	
Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop	
Tools, Equipment and Other Requirements	
Falling Weight Deflectometer (FWD), Benkelman Beam, PPE (hard hats, safety vests)	

Module 14: Conduct Highway Surface and Geometric Testing Using NSV and Total Station

Mapped to* ICE/CON/N5007, *v1.0

Terminal Outcomes:

- Explain the procedure for preparing the Network Survey Vehicle (NSV) for highway surface assessment by ensuring all sensors and cameras are operational for measuring parameters like roughness (IRI), rutting, and cracking.
- Describe the setup and calibration of the Total Station at survey points, detailing the process for conducting a topographic survey to accurately record angles, distances, and coordinates of highway features for compliance with design parameters.

Duration: 05:00 (in Hrs)	Duration: 10:00 (in Hrs)
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Explain the working principles of the NSV and its components, such as laser profilers, GPS, and cameras. • Describe the surface condition parameters measured by NSV, including International Roughness Index (IRI), rut depth, and crack mapping. • Discuss the standard protocols for operating an NSV on highways. • Elucidate the use of appropriate data processing software to analyse NSV outputs and generate reports. • Determine how to interpret the surface condition data and understand its implications for highway maintenance and performance. • Discuss the basic principles of geometric design and the use of Total Station for surveying. • Explain the components of Total Station equipment and their calibration for accurate measurement. • Demonstrate the techniques for measuring horizontal and vertical angles, distances, and elevations using a Total Station. • Describe the use of CAD and GIS software to analyse and present survey data for highway projects.	• Demonstrate the preparation of the Network Survey Vehicle (NSV) for a highway surface assessment by ensuring all sensors and cameras are operational. • Show how to drive the NSV along the specified route while maintaining a consistent speed to capture accurate data. • Demonstrate the measurement of surface parameters such as roughness (IRI), rutting, and cracking using onboard sensors. • Show how to utilize the NSV's laser profilers to generate a detailed surface profile of the highway. • Demonstrate the process of downloading and processing data collected by the NSV for further analysis. • Show how to prepare reports based on surface condition data and recommend maintenance or surface repair activities. • Demonstrate the setup of the Total Station at predetermined survey points along the highway. • Show how to calibrate the Total Station and establish control points for accurate measurements.

• Discuss how to interpret the survey results and identify deviations from geometric design standards.	• Demonstrate the conduction of a topographic survey to measure highway elevations, gradients, and alignments. • Show how to record horizontal and vertical angles, distances, and coordinates of various highway features. • Demonstrate the use of Total Station data to verify the highway's geometric design parameters, including cross-sections and horizontal/vertical curves. • Show how to process survey data using computer-aided design (CAD) or geographic information system (GIS) software. • Demonstrate the documentation and reporting of any geometric inconsistencies that could impact highway safety and performance.
Classroom Aids	
Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop	
Tools, Equipment and Other Requirements	
Total Station, NSV (Non-Destructive Surface Testing) Equipment, PPE (hard hats, safety vests)	

Module 15: Laboratory Design and Layout Planning

Mapped to* ICE/CON/N5008, *v1.0

Terminal Outcomes:

- Explain how to develop a comprehensive lab layout plan that maximizes space utilization, ensures efficient workflow and safety compliance, and accommodates diverse testing needs with proper separation of areas, storage solutions, and environmental controls.

Duration: 05:00 (in Hrs)	**Duration: 10:00 (in Hrs)**
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Explain the principles of lab design. • Describe the spatial requirements for different types of tests and equipment. • Discuss the regulatory requirements for civil labs. • Elucidate the importance of ergonomics and space management in laboratory environments. • Determine the zoning of the lab for efficient operation, including separate areas for material storage, testing, and documentation.	• Demonstrate how to develop a lab layout plan that considers available space, types of tests, and equipment requirements. • Show how to ensure adequate separation of testing areas based on materials (soil, concrete, bitumen, etc.) and types of tests (destructive, non-destructive). • Demonstrate how to allocate appropriate space for the storage of samples, materials, and chemicals. • Show how to design the lab for efficient workflow, ensuring that sample preparation, testing, and documentation areas are logically organized. • Demonstrate how to plan for proper ventilation, lighting, and temperature control to create an optimal work environment. • Show how to ensure adherence to safety regulations and accessibility standards in the lab layout.
Classroom Aids	
Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop	
Tools, Equipment and Other Requirements	
Laboratory design tools (layout software), PPE (gloves, safety glasses)	

Module 16: Equipment and Testing Setup

Mapped to* ICE/CON/N5008, *v1.0

Terminal Outcomes:

- Explain how to prepare stable and isolated foundations to support heavy lab equipment, ensuring durability and minimizing vibration for accurate testing.
- Describe the process of constructing testing platforms that meet load-bearing and stability requirements for reliable and accurate test results.
- Discuss how to establish and maintain controlled-environment chambers for temperature and humidity-sensitive tests, ensuring consistent conditions for accuracy.
- Elucidate the steps for setting up and monitoring curing tanks to provide ideal hydration conditions for concrete specimens, supporting strength development and testing compliance.

Duration: 05:00 (in Hrs)	Duration: 10:00 (in Hrs)
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Explain the load-bearing requirements for lab equipment and the importance of stable foundations. • Describe the materials and techniques for constructing durable and vibration-resistant foundations. • Explain the specifications for isolating foundations to prevent interference with testing accuracy. • Discuss the procedures for monitoring and maintaining foundation stability over the long term. • Identify the regulations and guidelines for setting up equipment in civil labs. • Explain the importance of level and vibration-free platforms in ensuring accurate testing results. • Describe the materials and construction methods for building testing platforms that meet load-bearing and stability requirements. • Identify the specifications for designing testing platforms based on different types of equipment and tests. • Discuss the maintenance and inspection procedures for ensuring the longevity and stability of testing platforms.	• Demonstrate how to assess the weight and operational requirements of each major piece of equipment to determine foundation specifications. • Show how to prepare foundations for heavy equipment such as Universal Testing Machines (UTM), compression testing machines, and vibrating equipment. • Demonstrate the method to ensure that foundations are isolated from general lab flooring to prevent vibrations and ensure stability during testing. • Show how to install reinforcement and casting for equipment foundations to ensure durability and strength. • Demonstrate inspection and maintenance procedures for foundations to prevent settlement or cracking over time. • Demonstrate how to identify testing areas for specific material tests (concrete, soil, bitumen, steel) and design suitable platforms for testing equipment. • Show how to set up vibration-resistant platforms for precision testing equipment, such as balance scales and sieves.

• Explain the appropriate considerations when constructing and using testing platforms in the lab. • Explain the purpose and importance of test environment chambers for controlling external variables during material testing. • Identify the types of environmental chambers (temperature-controlled, humidity-controlled) and their applications in civil labs. • Describe the calibration and maintenance procedures for temperature and humidity control systems. • Explain the regulatory standards for environmental chambers used in testing construction materials. • Discuss how temperature and humidity can affect test results and the performance of construction materials. • Explain the purpose of curing tanks in ensuring proper hydration and strength development of concrete specimens. • Describe the standard requirements for curing tanks, including temperature control and water maintenance. • Identify the techniques for monitoring curing conditions, including temperature and water quality. • Discuss the industry standards for curing concrete, such as ASTM or IS codes, and the importance of consistent curing conditions for accurate test results. • Explain the maintenance and cleaning procedures for curing tanks to prevent contamination or deterioration.	• Demonstrate the method for constructing load-bearing platforms for compression testing, tensile testing, and other high-force testing machines. • Ensure that platforms are level and capable of supporting the weight and operational stresses of testing procedures. • Show how to establish platforms for sample preparation and ensure ease of access to nearby equipment and testing areas. • Demonstrate how to design and construct controlled-environment chambers for specialized tests, such as humidity, temperature, and environmental simulations. • Show how to install temperature-controlled chambers for curing concrete samples and other temperature-sensitive materials. • Demonstrate the process of ensuring proper insulation and climate control systems are in place to maintain constant environmental conditions within test chambers. • Show how to set up humidity-controlled rooms or cabinets for tests that require specific moisture conditions. • Demonstrate regular calibration and maintenance procedures to ensure accurate environmental conditions are maintained during testing. • Show how to select appropriate curing tanks based on the volume and size of concrete specimens to be cured. • Demonstrate setting up water curing tanks with proper dimensions and capacity for the specific project requirements. • Show how to install automated water temperature control systems to maintain the recommended curing temperature for concrete samples.

	• Demonstrate regular monitoring of water levels and temperature in the curing tanks. • Ensure maintenance of a clean and stable curing environment by preventing contamination of water or samples. • Record curing durations and conditions to ensure compliance with test specifications.
Classroom Aids	
Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop	
Tools, Equipment and Other Requirements	
Various testing equipment specific to the tests being conducted, PPE (gloves, safety glasses)	

Module 17: Operations of Hot Mix and Batching Plants

Mapped to* ICE/CON/N5009, *v1.0

Terminal Outcomes:

- Explain the procedures and quality standards for producing asphalt concrete in a hot mix plant, covering calibration, temperature control, and routine maintenance for consistent output.
- Discuss the processes and checks involved in batching concrete to meet project specifications, ensuring correct material proportions, quality consistency, and timely delivery through batching plant operations.

Duration: 05:00 (in Hrs)	Duration: 10:00 (in Hrs)
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Describe the hot mix production process and the role of various components in producing asphalt concrete. • Discuss the importance of temperature control and aggregate gradation in ensuring the quality of the hot mix. • Describe the basic troubleshooting skills for common issues encountered with the hot mix plant. • Describe the maintenance procedures and schedules necessary to keep the hot mix plant in optimal working condition. • Explain the principles of batching and the significance of accurate proportioning in producing high-quality concrete. • Describe the components of a batching plant and the operation of each in the production process. • Describe the safety precautions for handling cement, aggregates, and chemical additives. • Describe the troubleshooting techniques for common operational issues in a batching plant, such as inconsistent mix proportions or equipment malfunctions. • Describe the regular maintenance tasks required to ensure the batching plant operates efficiently.	• Demonstrate the ability to identify and describe the components of a hot mix plant, including aggregate feeders, dryer drum, bitumen tanks, and mixing unit. • Show how to understand the working principle of the hot mix plant, including the process of producing asphalt concrete by heating and mixing aggregates with bitumen. • Demonstrate the skills to prepare the hot mix plant for production by ensuring proper calibration of feed controls and maintaining required temperature settings. • Show how to monitor the plant's performance during production to ensure the hot mix quality meets project specifications. • Demonstrate the capability to record production data accurately and ensure the proper storage and dispatch of the hot mix material. • Show how to conduct routine maintenance checks on the hot mix plant, including cleaning filters, inspecting burners, and checking bitumen levels. • Demonstrate the ability to identify and describe the key components of a batching plant, including aggregate bins, cement silos, conveyors, mixers, and control systems.

	• Show how to understand the process of concrete production by accurately batching aggregates, cement, water, and additives as per the mix design. • Demonstrate the skills to set up the batching plant for production by calibrating the batching system and checking material levels in silos and bins. • Show how to monitor concrete production to ensure the correct proportions of materials are used and the consistency of the concrete meets project specifications. • Demonstrate the capability to record batching data and oversee output to ensure the timely delivery of ready-mix concrete to construction sites. • Show how to perform regular maintenance on the batching plant, including checking weigh scales, mixer blades, and water dosing systems.
Classroom Aids	
Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop	
Tools, Equipment and Other Requirements	
Batching plant equipment (aggregate bins, mixers, weighing scales), PPE (gloves, hard hats, safety boots)	

Module 18: Basic Operations of Road Construction Machinery

Mapped to* ICE/CON/N5009, *v1.0

Terminal Outcomes:

- Describe the key components and safe operation of a paver, focusing on screed adjustments and the process of spreading and compacting material for a uniform, smooth road surface.
- Explain the functions and operation of a grader for levelling road surfaces, including blade adjustments and techniques to achieve the required slope and finish according to design specifications.
- Discuss the operation and maintenance of a loader for material handling on construction sites, ensuring safe transport, correct bucket positioning, and adherence to daily inspection protocols.

Duration: 05:00 (in Hrs)	Duration: 10:00 (in Hrs)
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Explain the functions and operation of a paver in road construction, focusing on material laying and levelling. • Discuss the key factors affecting the quality of paving, including material temperature, screed control, and rolling patterns. • Describe the basic troubleshooting techniques to resolve common issues such as uneven laying or material segregation. • Describe the routine maintenance procedures, including screed cleaning and checking hydraulic systems. • Explain the principles of grading and the role of the grader in creating a level and smooth surface for construction. • Describe the operating procedures and controls of the grader for both fine and rough grading. • Discuss the common challenges in grading, such as achieving the correct slope and managing difficult soil conditions. • Describe the routine maintenance tasks required to ensure the grader operates efficiently, including blade sharpening and hydraulic fluid checks.	• Demonstrate the ability to identify the key components of a paver, including the screed, auger, conveyor system, and operator controls. • Show how to understand the working mechanism of the paver, which spreads, levels, and compacts asphalt or concrete mix onto the road surface. • Demonstrate the skills to operate the paver safely and efficiently to ensure a uniform layer of material is laid down, following the required thickness and width specifications. • Show how to monitor the operation of the screed and make necessary adjustments to ensure consistent mat quality and smoothness. • Demonstrate the capability to coordinate with other construction personnel to ensure the continuous supply of material to the paver. • Show how to perform daily pre-operation checks, including inspecting fluid levels, belts, and the screed condition, to avoid breakdowns. • Demonstrate the ability to identify and describe the key parts of a grader, including the blade (mouldboard), circle, scarifier, and operator controls.

• Explain the functions of a loader in moving materials on construction sites, particularly in road construction and earthmoving. • Discuss the key operational skills necessary for efficient loading and transportation of materials. • Describe the troubleshooting techniques for common issues experienced while operating loaders, such as overloading, material spillage, and tire wear. • Describe the maintenance routines, such as checking tire pressure, hydraulic fluid levels, and bucket condition to ensure long-term performance.	• Show how to understand the grader's function in levelling and smoothing the surface of a road or site, preparing it for further construction. • Demonstrate the skills to operate the grader to level and shape the sub-base or base of a road, ensuring that the required slope and gradient are achieved. • Show how to adjust the mouldboard and control the machine's speed and direction to achieve a consistent and smooth surface finish. • Demonstrate the ability to collaborate with site engineers to ensure grading accuracy according to design plans and specifications. • Show how to conduct daily inspections of the grader, checking hydraulic systems, blade condition, and tire pressure. • Demonstrate the ability to identify and describe the key parts of a loader, including the bucket, lift arms, engine, and operator controls. • Show how to understand the loader's role in moving and loading materials such as soil, aggregate, and debris at construction sites. • Demonstrate the skills to operate the loader to safely transport materials, ensuring correct bucket positioning and load balancing to prevent spillage. • Show how to coordinate with other construction personnel to ensure the timely movement of materials to or from designated areas. • Demonstrate the ability to perform daily operational checks, including inspecting the hydraulic systems, bucket condition, and tire wear. • Show how to ensure proper maintenance of the loader, including lubrication of moving parts, engine checks, and refuelling.
Classroom Aids	
Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop	

Tools, Equipment and Other Requirements
Basic road construction machinery (rollers, graders, pavers), PPE (hard hats, safety vests, gloves)

Module 19: Fundamentals of Laboratory Testing and Reporting Progress

Mapped to* ICE/CON/N5010, *v1.0

Terminal Outcomes:

- Explain how to develop a comprehensive lab layout plan that maximizes space utilization, ensures efficient workflow and safety compliance, and accommodates diverse testing requirements.

Duration: 10:00 (in Hrs)	Duration: 20:00 (in Hrs)
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Explain the principles of setting up a laboratory testing program based on project requirements, ensuring all key material tests are included. • Describe the testing standards and procedures for construction materials. • Discuss scheduling and resource management for lab personnel, equipment, and materials. • Explain the documentation protocols for test data, maintaining clear and detailed records of test results and observations. • Explain quality assurance principles to ensure accurate and reliable test results. • Describe the structure and format of a standard Daily Progress Report (DPR), including the details that need to be reported daily. • Discuss best practices for organizing and presenting test data in a clear and concise manner. • Explain coordination techniques to ensure lab progress is in sync with field activities. • Explain the importance of timely and accurate reporting to support project decision-making. • Explain the tools and software used for generating DPRs, such as spreadsheets, lab management systems, or project management tools. • Explain the structure and format of a Monthly Progress Report (MPR),	• Demonstrate how to identify project requirements, specifications, and standards for testing construction materials such as soil, aggregates, bitumen, concrete, and steel. • Show how to design a comprehensive lab testing program, including a timeline for material characterization, quality control tests, and validation of fieldwork results. • Demonstrate the process of ensuring compliance of the testing program with project specifications, quality standards (such as IS, ASTM, or relevant local standards), and timelines set by the project management team. • Show how to allocate necessary resources, including personnel, testing equipment, and materials, to facilitate the smooth execution of the lab program. • Demonstrate how to monitor the progress of lab tests, ensuring timely completion and reporting of results. • Show how to maintain flexibility in the testing program to accommodate project delays or changes in the scope of work. • Demonstrate how to collect and organize daily test data from ongoing lab tests, including observations, results, and issues encountered. • Show how to ensure the DPR includes essential details such as the type of test conducted, date and time, test results, materials tested, and any deviations from project specifications.

including comprehensive reporting of monthly lab activities. • Discuss data analysis methods to interpret test results over time and highlight trends or issues. • Describe coordination techniques for gathering data and insights from various team members, ensuring a comprehensive MPR. • Explain the Key Performance Indicators (KPIs) for lab work, such as test completion rates, efficiency, and accuracy of results. • Explain the use of appropriate software tools to generate MPRs, including project management platforms or laboratory information management systems (LIMS).	• Demonstrate how to compile a summary of the day's lab activities, highlighting significant test outcomes, issues faced, and resolutions. • Show how to coordinate with site engineers and project managers to ensure consistency between field activities and lab progress. • Demonstrate how to review and verify the accuracy of all reported data before submitting the DPR to the project management team. • Show how to submit the DPR within the specified deadline, ensuring the project team has up-to-date information on lab activities and test outcomes. • Demonstrate how to compile detailed test results and observations from the laboratory testing program for the entire month, organizing them into sections for easy review. • Show how to include a summary of key performance metrics, such as the number of tests completed, pending tests, and overall lab efficiency. • Demonstrate how to highlight critical test outcomes that affect project decisions, including major test failures, deviations from specifications, and remedial actions taken. • Show how to provide an analysis of trends in material quality over time, identifying patterns that may impact project performance (e.g., consistent strength increases in concrete, aggregate gradation trends). • Demonstrate how to coordinate with site engineers, project managers, and quality control personnel to ensure that the MPR reflects both fieldwork and lab work progress. • Show how to ensure that the MPR is reviewed by senior lab personnel for accuracy and completeness before submission. • Demonstrate how to submit the MPR by the specified deadline to inform the

	project team of overall progress and performance in relation to the testing schedule.
Classroom Aids	
Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop	
Tools, Equipment and Other Requirements	
Documentation tools (computers, printers, projectors), PPE (gloves, safety glasses)	

Module 20: Health and Safety Measures for Construction Material Testing

Mapped to* ICE/CON/N5011, *v1.0

Terminal Outcomes:

- Demonstrate safe operation and calibration of UTM, GPR, UT, and ECT equipment.
- Apply proper material handling and storage techniques in compliance with safety standards.
- Use emergency equipment effectively and participate in safety drills.

Duration: 10:00 (in Hrs)	Duration: 20:00 (in Hrs)
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Describe the safety regulations applicable to construction sites, labs, and field-testing environments, including OSHA and ISO 45001. • Explain the principles, operating mechanisms, and potential hazards of UTM, GPR, ultrasonic, ECT, and other testing equipment. • Discuss the safety precautions required to protect against electromagnetic radiation emitted by GPR and high-frequency equipment used in ECT. • Explain the calibration requirements for testing machines like UTM, GPR, and ECT to ensure accurate results and safety compliance. • Describe the preventive maintenance practices for lab and field equipment, including identifying faults and addressing them proactively. • Explain the importance of using appropriate PPE, including safety goggles, gloves, and hard hats, to ensure personal safety during testing. • Outline the safety protocols for handling hazardous chemicals, equipment, and testing materials, including aggregates, and bitumen. • Discuss the environmental regulations for the disposal of chemical waste and the implementation of sustainable practices in testing environments. • Explain the role of ergonomics in preventing injuries during material	• Show how to perform safe operation of GPR equipment by clearing obstacles, adhering to safety protocols in traffic zones, and managing electromagnetic emissions. • Demonstrate the process of verifying calibration and functionality of UTM before conducting tensile, compressive, flexural, or shear tests. • demonstrate the ultrasonic testing equipment, including transducers and couplant, and proper preparation and safe handling required for testing. • Show how to ccalibrate ECT probes and their correct handling techniques to avoid inaccuracies and ensure safety. • Demonstrate the application of applicable SOPs during tensile, compressive, and flexural tests on UTM, ensuring load limits are not exceeded. • demonstrate safe handling techniques for materials like aggregates and bitumen in a simulated environment to minimize the associated hazards. • Show proper labelling, organization and store of chemicals in ventilated cabinets segregated by reactivity type to ensure safety. • Demonstrate correct lifting techniques to handle and transport materials safely, to prevent strain injuries. • Show how to perform regular equipment maintenance, including inspecting and lubricating testing machines, and

handling, workstation setup, and equipment operation. • Discuss the fire safety protocols and techniques for suppressing electrical and chemical fires in labs and field settings. • Explain the importance of proper labelling, storage, and disposal of materials to ensure safety and prevent contamination. • Describe the process of ensuring sample integrity during collection, transport, and testing to maintain accuracy. • Explain the safety standards for using NDT methods such as rebound hammers, pulse velocity meters, and core drills. • Discuss how to outline the safety considerations when working at heights, on uneven terrain and with complex structures during construction material testing. • Discuss the key components of emergency response, including evacuation protocols, chemical spill control, and fire drills.	demonstrate lockout/tagout procedures for faulty equipment. • Demonstrate how to safely operate electrical equipment, ensuring all connections are properly grounded. • Show how to administer first aid, and use fire extinguishers, and eyewash stations effectively in simulated emergency scenarios. • Show how to sset up a clean, organized, and well-ventilated testing station, adhereng to lab safety protocols. • Demonstrate the operation of fume hoods while conducting chemical tests in a simulated scenario, demonstrating prevention of harmful vapor inhalation. • Show the safe operation of pavers, graders, and loaders in a controlled environment, along with safe load balancing and manoeuvring techniques. • Demonstrate the safe disposal of chemical and material waste, in compliance with environmental regulations and proper segregation techniques. • Detect and address malfunctions in testing machines like rebound hammers and pulse velocity meters in a simulated environment. • Demonstrate spill control measures for hazardous materials, preventing accidents and maintaining compliance with environmental standards. • Inspect and verify the functionality of fire alarms, ventilation systems, and other safety equipment in a simulated setup. • Demonstrate the process of labelling and storing the test samples securely, demonstrating methods to prevent cross-contamination or accidental spillage. • Show safe handing of hot bitumen and high-temperature equipment in a controlled environment, demonstrating adherence to safety protocols.

Classroom Aids
Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop
Tools, Equipment and Other Requirements
PPE such as gloves, goggles, hard hats, and safety boots; Emergency and safety gear, including fire extinguishers, first aid kits, and spill control kits, Ventilated chemical cabinets, and waste segregation containers

Module 21: Employability Skills (60 Hours)

Mapped to DGT/VSQ/N0102, v1.0

Duration (in hours): 60:00

Key Learning Outcomes

After completing this programme, participants will be able to:

Introduction to Employability Skills Duration: 1.5 Hours

1. Discuss the Employability Skills required for jobs in various industries
2. List different learning and employability related GOI and private portals and their usage

Constitutional values - Citizenship Duration: 1.5 Hours

3. Explain the constitutional values, including civic rights and duties, citizenship, responsibility towards society and personal values and ethics such as honesty, integrity, caring and respecting others that are required to become a responsible citizen
4. Show how to practice different environmentally sustainable practices.

Becoming a Professional in the 21st Century Duration: 2.5 Hours

5. Discuss the importance of relevant 21st-century skills.
6. Exhibit 21st-century skills like Self-Awareness, Behavior Skills, time management, critical and adaptive thinking, problem-solving, creative thinking, social and cultural awareness, emotional awareness, learning to learn etc. in personal or professional life.
7. Describe the benefits of continuous learning.

Basic English Skills Duration: 10 Hours

8. Show how to use basic English sentences for everyday conversation in different contexts, in person and over the telephone
9. Read and interpret text written in basic English
10. Write a short note/paragraph / letter/e -mail using basic English

Career Development & Goal Setting Duration: 2 Hours

11. Create a career development plan with well-defined short- and long-term goals

Communication Skills Duration: 5 Hours

12. Demonstrate how to communicate effectively using verbal and nonverbal communication etiquette.
13. Explain the importance of active listening for effective communication
14. Discuss the significance of working collaboratively with others in a team

Diversity & Inclusion Duration: 2.5 Hours

15. Demonstrate how to behave, communicate, and conduct oneself appropriately with all genders and PwD
16. Discuss the significance of escalating sexual harassment issues as per POSH act.

Financial and Legal Literacy Duration: 5 Hours

17. Outline the importance of selecting the right financial institution, product, and service

18. Demonstrate how to carry out offline and online financial transactions, safely and securely
19. List the common components of salary and compute income, expenditure, taxes, investments etc.
20. Discuss the legal rights, laws, and aids

Essential Digital Skills Duration: 10 Hours

21. Describe the role of digital technology in today's life
22. Demonstrate how to operate digital devices and use the associated applications and features, safely and securely
23. Discuss the significance of displaying responsible online behavior while browsing, using various social media platforms, e-mails, etc., safely and securely
24. Create sample word documents, excel sheets and presentations using basic features
25. utilize virtual collaboration tools to work effectively

Entrepreneurship Duration: 7 Hours

26. Explain the types of entrepreneurship and enterprises
27. Discuss how to identify opportunities for potential business, sources of funding and associated financial and legal risks with its mitigation plan
28. Describe the 4Ps of Marketing-Product, Price, Place and Promotion and apply them as per requirement
29. Create a sample business plan, for the selected business opportunity

Customer Service Duration: 5 Hours

30. Describe the significance of analyzing different types and needs of customers
31. Explain the significance of identifying customer needs and responding to them in a professional manner.
32. Discuss the significance of maintaining hygiene and dressing appropriately

Getting Ready for apprenticeship & Jobs Duration: 8 Hours

33. Create a professional Curriculum Vitae (CV)
34. Use various offline and online job search sources such as employment exchanges, recruitment agencies, and job portals respectively
35. Discuss the significance of maintaining hygiene and confidence during an interview
36. Perform a mock interview
37. List the steps for searching and registering for apprenticeship opportunities

Module 22: On-the-Job Training

Mapped to Quality Technician- Construction

Mandatory Duration (in hours): 90:00	Recommended Duration (in hours): 00:00
Location: On-Site	

Terminal Outcomes

- Demonstrate proper setup and calibration of the Universal Testing Machine (UTM) according to testing requirements.
- Conduct tensile, compressive, and bending tests using the UTM and accurately record test data.
- Set up and operate Ground Penetrating Radar (GPR) equipment for effective subsurface surveys.
- Interpret GPR data to assess subsurface conditions and compile findings in a structured report.
- Prepare concrete samples and calibrate digital testing equipment following standard procedures.
- Perform digital concrete tests and analyse the results for quality assessment.
- Set up ultrasonic testing equipment and prepare materials for testing with accuracy.
- Conduct ultrasonic tests and report results to verify material quality and integrity.
- Conduct Eddy Current Testing (ECT) on construction materials and document findings effectively.
- Perform material tests on soil, aggregate, and bitumen and interpret results for construction quality.
- Conduct Non-Destructive Testing (NDT) on concrete and tests on steel and construction mixes to assess material properties.
- Conduct highway deflection tests using the Falling Weight Deflectometer (FWD) and Benkelman Beam, and record data.
- Conduct highway surface and geometric testing using the Network Survey Vehicle (NSV) and Total Station.
- Assist in planning the layout and design of the laboratory, ensuring efficient equipment placement and workflow.
- Set up, calibrate, and maintain lab equipment for various tests, following standard operating procedures.
- Observe and assist in basic operations of Hot Mix and Batching Plants, ensuring safety and equipment functionality.
- Familiarize with road construction machinery (pavers, graders, loaders) and conduct basic operational checks and troubleshooting.
- Record findings and analyse results systematically to support quality control and construction standards.

Annexure

Trainer Requirements

Trainer Prerequisites						
Minimum Educational Qualification	**Specialization**	**Relevant Industry Experience**		**Training Experience**		**Remarks**
		Years	***Specialization***	***Years***	***Specialization***	
M.Sc./ M. Tech/ M.E.	Civil Engineering/Geotechnical Engineering/Surveying/Material Testing	2	Infrastructure or Highway construction industry	1	Quality Lab or Field Testing	
B. Tech.	Civil Engineering/Highway Engineering/Material Testing	3	Infrastructure or Highway construction industry	1	Quality Lab or Field Testing	
Diploma	Civil Engineering/Material Testing	5	Infrastructure or Highway construction industry	1	Quality Lab or Field Testing	

Trainer Certification	
Domain Certification	**Platform Certification**
Certified for Job Role "Quality Technician - Construction", mapped to NOS: "ICE/CON/Q5001, v1.0", Minimum accepted score is 80%	Recommended that the Trainer is certified for the Job Role: "Trainer (VET and Skills)", mapped to the Qualification Pack: "MEP/Q2601, v2.0". The minimum accepted score as per MEPSC guidelines is 80%.

Assessor Requirements

Assessor Prerequisites						
Minimum Educational Qualification	**Specialization**	**Relevant Industry Experience**		**Training/Assessment Experience**		**Remarks**
		Years	***Specialization***	***Years***	***Specialization***	
M.Sc./ M. Tech/ M.E.	Civil Engineering/Geotechnical Engineering/Surveying/Material Testing	1	Infrastructure or Highway construction industry	1	Quality Lab or Field Testing	
B. Tech.	Civil Engineering/Highway Engineering/Material Testing	2	Infrastructure or Highway construction industry	1	Quality Lab or Field Testing	
Diploma	Civil Engineering/Material Testing	4	Infrastructure or Highway construction industry	1	Quality Lab or Field Testing	

Assessor Certification	
Domain Certification	**Platform Certification**
Certified for Job Role "Quality Technician - Construction", mapped to NOS: "ICE/CON/Q5001", Minimum accepted score is 80%	Certified for the Job Role: "Assessor (VET and Skills)", mapped to the Qualification Pack: "MEP/Q2701, v2.0", with a minimum score of 80%.

Assessment Strategy

This section includes the processes involved in identifying, gathering, and interpreting information to evaluate the Candidate on the required competencies of the program.

1. Assessment System Overview:

- Batches assigned to the assessment agencies for conducting the assessment on SIDH
- The batch allocation Matrix prepared for each month based on previous months' performance of AAs, which determines the quantum of Assessment which can be allocated to each AA for a month
- Post allocation of assessment, Assessment agencies send the assessment confirmation to AB
- Assessment agency deploys the ToA certified Assessor for executing the assessment
- AB monitors the assessment process.

2. Testing Environment:

- A combination of Theory and practical/demonstration test is deployed to assess knowledge and Skill respectively of Learners.
- Assessment is conducted at Training center in in-person/offline mode
- For Skill assessment, environment is simulated to create a realistic Working Environment that should replicate the key features of the workplace. In job roles, where it is difficult to replicate the same, the OJT assessment is implemented.
- During the practical task, trainees are assessed on their workmanship, quality of finished product, time management, etc., based on the performance criteria (PC), knowledge and understanding and their professional and soft skills as specified in the qualification pack.
- Knowledge assessment is done through closed ended questions up to level 4 and from level 5 onwards, it is mixture of open ended and closed ended questions

3. Assessment Quality Assurance levels/Framework

- Assessment criteria is developed for each QP which acts as a guide for developing question set /banks
- Sample questions aligned with Assessment criteria for each QP are developed by AB and validated by industry
- Taking reference of Assessment criteria and Sample Questions, AAs create the question bank which is further validated by AB
- Questions are mapped to the specified assessment criteria
- It is mandatory that Assessor and Trainer must be ToA certified & ToT Certified respectively
- Continuous Monitoring through virtual and In-person mode are conducted to ensure the assessment is conducted as per stipulated process
- Process and Technical audit of assessment batches by quality team are conducted to avoid the errors in assessment process

- A well -defined comprehensive framework of NON-COMPLIANCE MATRIX is defined and implemented to identify the non-compliance made by assessor and AA and punitive actions are taken correspondingly.
- The capacity building sessions are conducted regularly for assessors and assessment agencies to update them about best practices in assessment

4. Types of evidence or evidence-gathering protocol:

- Post Assessment, the evidences are uploaded by Assessor to assessment agency and further assessment agency to AB as per stipulated TAT
- Evidences are broadly the photographic and video graphic in nature
- Assessment agencies upload the evidence on SIDH and detailed evidence on AB digital platform (ZoHO)
- Evidences are; NOS wise-Geotagged photographs and videos of Theory Test &Practical Tasks, Attendance sheet, result summary sheet, group photographs.

5. Method of verification or validation:

- The process and technical audit of assessment batches are done by AB
- Attendance of each candidate is verified and it is ensured that only those candidates are assessed by assessors who are meeting the stipulated minimum percentage of attendance
- The result of each candidate is verified, it is verified that that result on SIDH are matching with respect to summary sheet submitted by AAs
- Under detailed technical audit for sample of batches, the knowledge and skill assessment results for each candidate is checked in technical aspect.
- All the evidences of batches are preserved on server of AB digital platform

On the Job Training:

On job training (OJT), candidates undergo training and leaning at actual workplace for a fixed period of time and a certain weightage of assessment is allocated out of total skill weightage of Qualification Pack for undergoing OJT as stipulated by ICE. This OJT score and assessors' end point score are combined to arrive at final Marking/grading of trainees' skill test. The OJT score is determined by Supervisor of company under which candidates undergo on job training.

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 it 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

Term	Description
QP	Qualification Pack
NSQF	National Skills Qualification Framework
NSQC	National Skills Qualification Committee
NOS	National Occupational Standards
SSC	Skill Sectors Councils
UTM	Universal Testing Machine
NDT	Non-Destructive Testing
ASTM	American Society for Testing and Materials
ISO	International Organization for Standardization
GPR	Ground Penetrating Radar
UPV	Ultrasonic Pulse Velocity
PPE	Personal Protective Equipment
ASME	American Society of Mechanical Engineers
ECT	Eddy Current Testing
AASHTO	American Association of State Highway and Transportation Officials
USCS	Unified Soil Classification System
GSB	Granular Sub-Base
WMM	Wet Mix Macadam
DBM	Dense Bituminous Macadam
BC	Bituminous Concrete
SMA	Stone Mastic Asphalt
TMT	Thermo-Mechanically Treated
FWD	Falling Weight Deflectometer
NSV	Non-Segregated Value
CAD	Computer-Aided Design
GIS	Geographic Information System