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GOVERNMENT OF INDIA
MINISTRY OF SKILL DEVELOPMENT & ENTREPRENEURSHIP

NCVET
कौशल गुणवत्ता प्रगति

N·S·D·C
RE IMAGINE FUTURE

Qualification Pack

Quality Technician -

QP Code: ICE/CON/Q5001

Version: 1.0

NSQF Level: 4

THE INSTITUTION OF CIVIL ENGINEERS SOCIETY || 533-R
Model Town Ludhiana || email:cmswami@ice.net.in

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ICE/CON/Q5001: Quality Technician - Construction

Brief Job Description

A Quality Technician - Construction is responsible for conducting tests on materials used in highway and infrastructure projects, including soil, aggregate, bitumen, steel, and concrete mixes like GSB, WMM, DBM, and BC. The role involves using equipment such as the Universal Testing Machine (UTM) for strength assessments and conducting non-destructive testing (NDT) on concrete. The technician also performs specialized tests like FWD and NSV and is involved in setting up project labs, including lab layout, equipment foundations, and testing platforms. Additionally, the technician prepares lab programs and reports, including DPR and MPR.

Personal Attributes

The individual should be physically fir to work in varied conditions for long duration. The person should have attention to detail, technical proficiency, analytical thinking and problem solving skills. The individual should be adaptable and safety conscious with good verbal and written communication skills.

Applicable National Occupational Standards (NOS)

Compulsory NOS:

1. ICE/CON/N5001: Conduct construction material testing using the Universal Testing Machine (UTM)
2. ICE/CON/N5002: Conduct Ground Penetrating Radar (GPR) testing
3. ICE/CON/N5003: Carry out Digital Concrete Testing
4. ICE/CON/N5004: Carry out Ultrasonic Testing (UT) of construction materials
5. ICE/CON/N5005: Carry out Eddy Current Testing (ECT) of construction materials
6. ICE/CON/N5006: Conduct tests on soil, aggregate, bitumen, steel, different construction mixes, and NDT on concrete
7. ICE/CON/N5007: Carry out Highway Testing through FWD, NSV, Benkelman Beam, and Total Station
8. ICE/CON/N5008: Set up the project civil lab
9. ICE/CON/N5009: Basics of plants and machinery (Hot Mix Plant, Batching Plant, Paver, Grader, Loader)
10. ICE/CON/N5010: Basics of preparation of lab program and reporting daily progress report and monthly progress report
11. ICE/CON/N5011: Follow health, safety, and environmental standards in construction material

testing

12. DGT/VSQ/N0102: Employability Skills (60 Hours)

Qualification Pack (QP) Parameters

Sector	Construction
Sub-Sector	Real Estate and Infrastructure Construction
Occupation	Quality Assurance and Quality Control
Country	India
NSQF Level	4
Credits	18
Aligned to NCO/ISCO/ISIC Code	NCO-2015/3112.9900
Minimum Educational Qualification & 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 construction
Minimum Level of Education for Training in School	Not Applicable
Pre-Requisite License or Training	NA
Minimum Job Entry Age	18 Years
Last Reviewed On	NA
Next Review Date	17/01/2030
NSQC Approval Date	17/01/2025
Version	1.0

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Reference code on NQR	QG-04-CO-03456-2025-V1-TICE
NQR Version	1

ICE/CON/N5001: Conduct construction material testing using the Universal Testing Machine (UTM)

Description

This unit covers the skills and knowledge required to perform tensile, compressive, flexural, and shear strength tests using a UTM to ensure material compliance with industry standards.

Scope

The scope covers the following :

- Set up the UTM for use
- Prepare the sample
- Conduct tests on samples
- Analyze the test results
- Prepare the test results report

Elements and Performance Criteria

Set up the UTM for use

To be competent, the user/individual on the job must be able to:

PC1. set up the UTM according to the test requirements, ensuring it is calibrated correctly.

PC2. select and install the appropriate fixtures or grips based on the type of test, i.e. tensile, compressive, flexural, or shear

PC3. secure the material with no obstructions around the machine.

Prepare the sample

To be competent, the user/individual on the job must be able to:

PC4. select a representative sample of the construction material to be tested

PC5. prepare the test specimens according to the dimensions and shape specified in the relevant standards

PC6. inspect the sample for any defects or irregularities that could affect the test results

PC7. condition the specimen to ensure it's at a specific temperature or humidity before testing, as required

PC8. ensure the samples are free from defects and within the tolerance limits for the specific test

Conduct tests on samples

To be competent, the user/individual on the job must be able to:

PC9. perform tensile test by placing the sample in the tensile grips and gradually applying the load

PC10. maintain the record of elongation and ultimate tensile strength

PC11. perform compressive test by positioning the sample between the compression plates and applying the load

PC12. measure the compressive strength and deformation during the compressive test

PC13. conduct the flexural test by supporting the sample on two points and applying the load at the center

PC14. record the flexural strength and deflection

PC15. conduct the shear test by securing the sample and applying the load perpendicular to the axis to measure the shear strength

PC16. use the UTM's software or data acquisition system to capture the load, displacement, and stress-strain data accurately

PC17. monitor the test progress, ensuring it aligns with the expected results

Analyze the test results

To be competent, the user/individual on the job must be able to:

PC18. analyze the collected data to determine the material's mechanical properties, such as yield strength, ultimate strength, modulus of elasticity, and shear modulus

PC19. compare the results against the industry standards to assess material compliance

PC20. identify any anomalies or deviations in the test results and determine possible causes, such as machine calibration issues, sample defects, or incorrect test execution

Prepare the test results report

To be competent, the user/individual on the job must be able to:

PC21. prepare the test report including the methodology, test conditions, observed data, and analysis results

PC22. ensure the report is clear, concise, and follows the format required by industry standards or organizational protocols

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. Different materials, such as steel, concrete, and composite materials commonly used in construction

KU2. The mechanical properties such as tensile strength, compressive strength, elasticity, and ductility of different construction materials

KU3. Different components of a Universal Testing Machine (UTM) such as load cells, grips, crosshead, and control panels

KU4. The calibration procedures for a UTM to ensure accurate measurements

KU5. The safety protocols to be followed when operating the UTM to prevent accidents

KU6. The process of conducting tensile testing using a UTM to determine the tensile strength and elongation of a material

KU7. The process of conducting compressive testing using a UTM to determine the compressive strength of a material

KU8. The process of conducting bending tests using a UTM to measure the flexural strength of material

KU9. The process of conducting shear testing to measure a material's resistance to shear forces

KU10. How to interpret stress-strain curves and other graphical data generated by the UTM

KU11. How to analyze test results from a UTM to determine if the material meets the required standards and specifications

KU12. The relevant industry standards, such as ASTM and ISO, that govern construction material testing

KU13. The importance of adhering to the industry standards and testing procedures for material testing

KU14. The importance and process of documenting material testing procedures, observations, and results accurately

KU15. The importance of recording data systematically for future reference and quality control

KU16. How to identify and troubleshoot common issues with the UTM, such as misalignment or load cell errors

KU17. The importance of following appropriate corrective actions during troubleshooting to ensure the accuracy and reliability of test results

Generic Skills (GS)

User/individual on the job needs to know how to:

GS1. Follow verbal instructions, convey information clearly and concisely to team members and supervisors

GS2. Read, interpret, and write simple instructions, reports, and documentation

GS3. Perform basic arithmetic operations such as addition, subtraction, multiplication, and division

GS4. Work effectively in a team, supporting colleagues and contributing to team goals

GS5. Assist others, share knowledge, and seek help, when necessary

GS6. Manage time effectively and prioritize tasks to meet deadlines

GS7. Adapt to changing work environments, tasks, and processes

GS8. Focus on tasks and ensure accuracy in work

GS9. Assess situations, consider potential solutions, and implement the best course of action

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Set up the UTM for use	4	6	-	2
PC1. set up the UTM according to the test requirements, ensuring it is calibrated correctly.	-	-	-	-
PC2. select and install the appropriate fixtures or grips based on the type of test, i.e. tensile, compressive, flexural, or shear	-	-	-	-
PC3. secure the material with no obstructions around the machine.	-	-	-	-
Prepare the sample	7	10	-	5
PC4. select a representative sample of the construction material to be tested	-	-	-	-
PC5. prepare the test specimens according to the dimensions and shape specified in the relevant standards	-	-	-	-
PC6. inspect the sample for any defects or irregularities that could affect the test results	-	-	-	-
PC7. condition the specimen to ensure it's at a specific temperature or humidity before testing, as required	-	-	-	-
PC8. ensure the samples are free from defects and within the tolerance limits for the specific test	-	-	-	-
Conduct tests on samples	12	24	-	9
PC9. perform tensile test by placing the sample in the tensile grips and gradually applying the load	-	-	-	-
PC10. maintain the record of elongation and ultimate tensile strength	-	-	-	-
PC11. perform compressive test by positioning the sample between the compression plates and applying the load	-	-	-	-
PC12. measure the compressive strength and deformation during the compressive test	-	-	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC13. conduct the flexural test by supporting the sample on two points and applying the load at the center	-	-	-	-
PC14. record the flexural strength and deflection	-	-	-	-
PC15. conduct the shear test by securing the sample and applying the load perpendicular to the axis to measure the shear strength	-	-	-	-
PC16. use the UTM's software or data acquisition system to capture the load, displacement, and stress-strain data accurately	-	-	-	-
PC17. monitor the test progress, ensuring it aligns with the expected results	-	-	-	-
Analyze the test results	4	6	-	3
PC18. analyze the collected data to determine the material's mechanical properties, such as yield strength, ultimate strength, modulus of elasticity, and shear modulus	-	-	-	-
PC19. compare the results against the industry standards to assess material compliance	-	-	-	-
PC20. identify any anomalies or deviations in the test results and determine possible causes, such as machine calibration issues, sample defects, or incorrect test execution	-	-	-	-
Prepare the test results report	3	4	-	1
PC21. prepare the test report including the methodology, test conditions, observed data, and analysis results	-	-	-	-
PC22. ensure the report is clear, concise, and follows the format required by industry standards or organizational protocols	-	-	-	-
NOS Total	**30**	**50**	**-**	**20**

National Occupational Standards (NOS) Parameters

NOS Code	ICE/CON/N5001
NOS Name	Conduct construction material testing using the Universal Testing Machine (UTM)
Sector	Construction
Sub-Sector	
Occupation	Quality Assurance and Quality Control
NSQF Level	4
Credits	2
Version	1.0
Last Reviewed Date	17/01/2025
Next Review Date	17/01/2030
NSQC Clearance Date	17/01/2025

ICE/CON/N5002: Conduct Ground Penetrating Radar (GPR) testing

Description

This unit covers the use of non-invasive radar technology to detect and analyze subsurface features in construction materials, enabling the identification of structures, voids, and potential hazards without the need for excavation or drilling.

Scope

The scope covers the following :

- Plan and prepare for GPR testing
- Conduct survey design
- Collect the data
- Interpret the data
- Prepare the test reports
- Maintain the GPR equipment

Elements and Performance Criteria

Plan and prepare for GPR testing

To be competent, the user/individual on the job must be able to:

PC1. Conduct a preliminary site assessment to identify the specific areas for subsurface evaluation

PC2. Calibrate the GPR equipment according to the manufacturer's guidelines, considering the specific site conditions, such as soil type, moisture content, and expected depth of investigation

PC3. Set up barriers and signage to protect the GPR equipment

Conduct survey design

To be competent, the user/individual on the job must be able to:

PC4. Establish a grid or linear layout for the GPR survey, depending on the area being assessed

PC5. Mark the grid points clearly on the ground to ensure consistent data collection across the site

PC6. Adjust the GPR settings such as antenna frequency, scan rate, and depth range based on the material type and the level of detail required

PC7. use higher frequencies for better resolution with less depth penetration, and lower frequencies for deeper penetration and less detail

PC8. follow up with additional tests, as required, based on the GPR findings

Collect the data

To be competent, the user/individual on the job must be able to:

PC9. conduct the survey by moving the GPR unit systematically along the pre-marked grid lines or paths

PC10. monitor the GPR data in real-time on the display unit, looking for anomalies or irregular reflections that might indicate subsurface features such as voids, cracks, or changes in material composition

PC11. ensure all the collected data is accurately logged with corresponding grid locations for later analysis, e.g. linking GPS data to each scan line for precise geo-referencing

Interpret the data

To be competent, the user/individual on the job must be able to:

PC12. analyze the recorded GPR data to identify subsurface features, identifying different reflection patterns produced by different materials

PC13. create 3D models of the subsurface conditions, as required to get a more comprehensive view of the infrastructure's internal state

Prepare the test reports

To be competent, the user/individual on the job must be able to:

PC14. generate reports including GPR profiles, interpreted data, identified anomalies and recommendations based on the findings, such as areas that may require further investigation or repair

PC15. maintain a record of all GPR surveys conducted, including raw data, calibration settings, and final reports for quality assurance and future reference

Maintain the GPR equipment

To be competent, the user/individual on the job must be able to:

PC16. clean and inspect the GPR equipment after the survey, ensuring it is in good working condition for future use

PC17. calibrate the equipment periodically to maintain accuracy

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. the basic principles of GPR, including the use of electromagnetic waves to detect and map subsurface features

KU2. how electromagnetic waves travel through different materials and the impact of material properties on wave behavior

KU3. the relevant standards and guidelines for GPR testing in construction, such as ASTM or ISO standards

KU4. the legal and regulatory requirements for conducting GPR surveys on construction sites

KU5. different applications of GPR in construction

KU6. different components of a GPR system, including the control unit, antenna, and data storage device

KU7. how to calibrate the GPR equipment for accurate measurements

KU8. the appropriate antenna frequency for different materials and depths

KU9. how to prepare the testing site, including surface conditions and environmental factors that may affect the GPR readings

KU10. how to design a survey grid for systematic data collection

KU11. the techniques for scanning surfaces, maintaining consistent speed, and ensuring comprehensive coverage

KU12. the dielectric properties of construction materials and how they affect GPR signal reflection

KU13. how materials like concrete, asphalt, soil, and rebar interact with GPR signals

KU14. how to interpret GPR data, including identifying anomalies, layers, and embedded objects

KU15. the use of GPR software for data processing, visualization, and analysis

KU16. the methods for estimating the depth of features detected by GPR

KU17. the safety precautions to protect against the electromagnetic radiation emitted by GPR equipment

KU18. the safety procedures for working on construction sites

KU19. the appropriate methods to verify the accuracy of GPR data, such as using reference markers or cross-referencing with other testing methods

KU20. how to document GPR testing procedures, data, and findings in a clear and organized manner

Generic Skills (GS)

User/individual on the job needs to know how to:

GS1. Follow verbal instructions, convey information clearly and concisely to team members and supervisors

GS2. Read, interpret, and write simple instructions, reports, and documentation

GS3. Perform basic arithmetic operations such as addition, subtraction, multiplication, and division

GS4. Use basic IT tools and applications for effective data management

GS5. Work effectively in a team, supporting colleagues and contributing to team goals

GS6. Assist others, share knowledge, and seek help, when necessary

GS7. Manage time effectively and prioritize tasks to meet deadlines

GS8. Adapt to changing work environments, tasks, and processes

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Plan and prepare for GPR testing	7	10	-	4
PC1. Conduct a preliminary site assessment to identify the specific areas for subsurface evaluation	-	-	-	-
PC2. Calibrate the GPR equipment according to the manufacturer's guidelines, considering the specific site conditions, such as soil type, moisture content, and expected depth of investigation	-	-	-	-
PC3. Set up barriers and signage to protect the GPR equipment	-	-	-	-
Conduct survey design	9	15	-	6
PC4. Establish a grid or linear layout for the GPR survey, depending on the area being assessed	-	-	-	-
PC5. Mark the grid points clearly on the ground to ensure consistent data collection across the site	-	-	-	-
PC6. Adjust the GPR settings such as antenna frequency, scan rate, and depth range based on the material type and the level of detail required	-	-	-	-
PC7. use higher frequencies for better resolution with less depth penetration, and lower frequencies for deeper penetration and less detail	-	-	-	-
PC8. follow up with additional tests, as required, based on the GPR findings	-	-	-	-
Collect the data	5	9	-	4
PC9. conduct the survey by moving the GPR unit systematically along the pre-marked grid lines or paths	-	-	-	-
PC10. monitor the GPR data in real-time on the display unit, looking for anomalies or irregular reflections that might indicate subsurface features such as voids, cracks, or changes in material composition	-	-	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC11. ensure all the collected data is accurately logged with corresponding grid locations for later analysis, e.g. linking GPS data to each scan line for precise geo-referencing	-	-	-	-
Interpret the data	3	6	-	2
PC12. analyze the recorded GPR data to identify subsurface features, identifying different reflection patterns produced by different materials	-	-	-	-
PC13. create 3D models of the subsurface conditions, as required to get a more comprehensive view of the infrastructure's internal state	-	-	-	-
Prepare the test reports	3	6	-	2
PC14. generate reports including GPR profiles, interpreted data, identified anomalies and recommendations based on the findings, such as areas that may require further investigation or repair	-	-	-	-
PC15. maintain a record of all GPR surveys conducted, including raw data, calibration settings, and final reports for quality assurance and future reference	-	-	-	-
Maintain the GPR equipment	3	4	-	2
PC16. clean and inspect the GPR equipment after the survey, ensuring it is in good working condition for future use	-	-	-	-
PC17. calibrate the equipment periodically to maintain accuracy	-	-	-	-
NOS Total	**30**	**50**	**-**	**20**

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National Occupational Standards (NOS) Parameters

NOS Code	ICE/CON/N5002
NOS Name	Conduct Ground Penetrating Radar (GPR) testing
Sector	Construction
Sub-Sector	
Occupation	Quality Assurance and Quality Control
NSQF Level	4
Credits	2
Version	1.0
Last Reviewed Date	17/01/2025
Next Review Date	17/01/2030
NSQC Clearance Date	17/01/2025

ICE/CON/N5003: Carry out Digital Concrete Testing

Description

This unit covers the use of advanced digital tools and sensors to assess the strength, durability, and overall quality of concrete, ensuring compliance with construction standards and optimizing material performance.

Scope

The scope covers the following :

- Prepare the sample
- Set up the equipment
- Conduct the test
- Conduct data analysis
- Maintain the equipment

Elements and Performance Criteria

Prepare the sample

To be competent, the user/individual on the job must be able to:

PC1. collect concrete samples from the construction site according to standard guidelines

PC2. form the samples into cubes or cylinders, as required

PC3. cure the samples in controlled conditions to ensure they represent the actual performance of the concrete in the structure

Set up the equipment

To be competent, the user/individual on the job must be able to:

PC4. calibrate the Digital Concrete Testing Machine (DCTM) to ensure accuracy, verifying the load cell, setting up the testing parameter

PC5. perform appropriate checks to ensure DCTM is in proper working condition

PC6. set up the digital interface by inputting the necessary test parameters such as sample size, load rate, and test type (e.g., compressive strength)

Conduct the test

To be competent, the user/individual on the job must be able to:

PC7. position the cured concrete sample in the machine's loading frame, ensuring it is centered and aligned to avoid uneven stress distribution

PC8. apply a load to the sample at a controlled rate using DCTM

PC9. monitor the applied load and deformation data during the test

PC10. check the peak load at which the concrete sample fails to determine the compressive strength of the concrete

PC11. follow the applicable safety guidelines, including the use of personal protective equipment (PPE) such as safety goggles, gloves, and hard hats

Conduct data analysis

To be competent, the user/individual on the job must be able to:

PC12. check the machine's digital system to ensure the relevant data is recorded, e.g. load applied, displacement, and stress-strain relationships

PC13. analyze the data to calculate the compressive strength of the concrete

PC14. generate a report using the digital system, including the test results, graphs, and any observations

Maintain the equipment

To be competent, the user/individual on the job must be able to:

PC15. clean and inspect the equipment for wear and tear

PC16. lubricate moving parts and check for any mechanical issues that could affect performance

PC17. recalibrate the equipment using traceable standards to ensure continued accuracy and maintain compliance with industry norms

PC18. maintain records of calibration certificates and maintenance logs

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. how compressive strength defines the load-bearing capacity of concrete, including factors that influence strength like curing time and mix design

KU2. the tensile and flexural strength properties to assess the concrete's ability to withstand bending and tension forces

KU3. the effect of water permeability on the long-term performance of concrete structures

KU4. the proper sample preparation techniques, including curing, casting, and storing concrete samples to ensure accurate testing

KU5. the standard test methods like ASTM, BS, or IS codes that govern the procedures for various digital concrete tests

KU6. the use of different digital concrete testing equipment, such as Ultrasonic Pulse Velocity (UPV) Testers, Rebound Hammer (Schmidt Hammer) and Digital Maturity Meter

KU7. the importance of calibrating digital testing devices to ensure they provide accurate and reliable measurements

KU8. how to identify and rectify issues that may arise during testing, such as equipment malfunctions or unexpected test results

KU9. how to acquire, process, and interpret data from digital testing equipment, using specialized software for analysis and reporting

KU10. how to interpret the results obtained from digital tests, such as identification of potential issues like low strength, inconsistencies, or defects in the concrete

KU11. how digital test results correlate with the physical properties of concrete, helping to make informed decisions about its quality and suitability for construction

KU12. the safety procedures for handling and operating digital testing equipment

KU13. the regulatory standards and codes to be followed during concrete testing to ensure compliance with industry requirements

KU14. how to document the testing process, including recording data, test conditions, and any observations

KU15. how to prepare detailed reports that summarize the findings, including graphical representations and analysis of the concrete's performance

Generic Skills (GS)

User/individual on the job needs to know how to:

GS1. follow verbal instructions, convey information clearly and concisely to team members and supervisors
GS2. read, interpret, and write simple instructions, reports, and documentation
GS3. perform basic arithmetic operations such as addition, subtraction, multiplication, and division
GS4. use basic IT tools and applications for effective data management
GS5. work effectively in a team, supporting colleagues and contributing to team goals
GS6. assist others, share knowledge, and seek help, when necessary
GS7. manage time effectively and prioritize tasks to meet deadlines
GS8. adapt to changing work environments, tasks, and processes
GS9. focus on tasks and ensure accuracy in work

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Prepare the sample	5	8	-	3
PC1. collect concrete samples from the construction site according to standard guidelines	-	-	-	-
PC2. form the samples into cubes or cylinders, as required	-	-	-	-
PC3. cure the samples in controlled conditions to ensure they represent the actual performance of the concrete in the structure	-	-	-	-
Set up the equipment	6	8	-	4
PC4. calibrate the Digital Concrete Testing Machine (DCTM) to ensure accuracy, verifying the load cell, setting up the testing parameter	-	-	-	-
PC5. perform appropriate checks to ensure DCTM is in proper working condition	-	-	-	-
PC6. set up the digital interface by inputting the necessary test parameters such as sample size, load rate, and test type (e.g., compressive strength)	-	-	-	-
Conduct the test	9	15	-	6
PC7. position the cured concrete sample in the machine's loading frame, ensuring it is centered and aligned to avoid uneven stress distribution	-	-	-	-
PC8. apply a load to the sample at a controlled rate using DCTM	-	-	-	-
PC9. monitor the applied load and deformation data during the test	-	-	-	-
PC10. check the peak load at which the concrete sample fails to determine the compressive strength of the concrete	-	-	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC11. follow the applicable safety guidelines, including the use of personal protective equipment (PPE) such as safety goggles, gloves, and hard hats	-	-	-	-
Conduct data analysis	4	9	-	3
PC12. check the machine's digital system to ensure the relevant data is recorded, e.g. load applied, displacement, and stress-strain relationships	-	-	-	-
PC13. analyze the data to calculate the compressive strength of the concrete	-	-	-	-
PC14. generate a report using the digital system, including the test results, graphs, and any observations	-	-	-	-
Maintain the equipment	6	10	-	4
PC15. clean and inspect the equipment for wear and tear	-	-	-	-
PC16. lubricate moving parts and check for any mechanical issues that could affect performance	-	-	-	-
PC17. recalibrate the equipment using traceable standards to ensure continued accuracy and maintain compliance with industry norms	-	-	-	-
PC18. maintain records of calibration certificates and maintenance logs	-	-	-	-
NOS Total	**30**	**50**	**-**	**20**

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National Occupational Standards (NOS) Parameters

NOS Code	ICE/CON/N5003
NOS Name	Carry out Digital Concrete Testing
Sector	Construction
Sub-Sector	
Occupation	Quality Assurance and Quality Control
NSQF Level	4
Credits	2
Version	1.0
Last Reviewed Date	17/01/2025
Next Review Date	17/01/2030
NSQC Clearance Date	17/01/2025

ICE/CON/N5004: Carry out Ultrasonic Testing (UT) of construction materials

Description

This unit covers the use of high-frequency sound waves to evaluate the integrity, thickness, and internal structure of construction materials, enabling the detection of defects such as cracks, voids, and inclusions without causing damage to the material.

Scope

The scope covers the following :

- Set up the UT equipment for use
- Prepare the surface
- Conduct ultrasonic testing
- Analyze the signal for flaw detection
- Document and report test results
- Carry out post-test procedures

Elements and Performance Criteria

Set up the UT equipment for use

To be competent, the user/individual on the job must be able to:

PC1. select the appropriate ultrasonic transducer and UT device based on the material type, thickness, and the type of flaw expected

PC2. use a calibration block with known dimensions and properties similar to the test material

PC3. calibrate the UT device by adjusting the gain, range, and other settings to match the known characteristics of the calibration block

Prepare the surface

To be competent, the user/individual on the job must be able to:

PC4. clean the surface of the material to ensure proper contact between the transducer and the material

PC5. apply the appropriate couplant, e.g. gel and oil, to the surface of the material to facilitate the transmission of ultrasonic waves between the transducer and the material

Conduct ultrasonic testing

To be competent, the user/individual on the job must be able to:

PC6. place the transducer on the material's surface, ensuring firmness and even pressure

PC7. generate ultrasonic waves using the transducer to travel through the material being tested

PC8. scan the entire area of interest by moving the transducer to ensure complete coverage to detect all possible flaws

Analyze the signal for flaw detection

To be competent, the user/individual on the job must be able to:

PC9. analyze the reflected signals (A-scan, B-scan, or C-scan) on the UT device's screen

PC10. identify the location, size, and nature of flaws based on the time of flight, amplitude, and shape of the signals

PC11. compare the detected signals with the reference standards to determine if the flaws are within acceptable limits

PC12. assess whether the material meets the required quality standards or if further action is needed, such as repair or rejection of the material

Document and report test results

To be competent, the user/individual on the job must be able to:

PC13. record the results, including the location, size, and type of any detected flaws, including the calibration data, equipment settings, and material specifications also

PC14. prepare a detailed report summarizing the findings, including any recommendations for further action

Carry out post-test procedures

To be competent, the user/individual on the job must be able to:

PC15. clean the transducer and UT device

PC16. dispose of the couplant and other materials used during the test following the applicable regulations

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. the basic principles of ultrasonic testing, including how high-frequency sound waves are used to detect internal flaws, measure thickness, and characterize materials

KU2. how ultrasonic waves propagate through different materials and how they are affected by interfaces, defects, and material boundaries

KU3. different applications of ultrasonic testing in construction

KU4. the ultrasonic testing equipment, including transducers, probes, and couplants, as well as the function of each component in the testing process

KU5. how to calibrate ultrasonic testing equipment using reference standards to ensure accurate readings

KU6. the digital display, data acquisition, and analysis software used with ultrasonic testing equipment

KU7. how to prepare the surface of construction materials to ensure proper contact and signal transmission, including the application of couplants

KU8. various scan techniques, such as A-scan, B-scan, and C-scan, and when to use each method depending on the material and type of test

KU9. how to interpret the echoes or signals received during ultrasonic testing to identify defects, discontinuities, or material thickness

KU10. the acoustic properties of different construction materials and how these properties affect ultrasonic wave behaviour

KU11. the common defects in construction materials, such as cracks, voids, inclusions, and delaminations, and how they appear in ultrasonic test results

KU12. how to analyze the ultrasonic signals, including amplitude, frequency, and time of flight, to determine the presence, size, and location of defects

KU13. how to measure the thickness of materials using ultrasonic testing and how to interpret the results to assess material integrity

KU14. the use of appropriate software tools to process and visualize UT data

KU15. the safety protocols for operating ultrasonic testing equipment, including proper handling of probes and protection against potential hazards

KU16. the relevant industry standards and codes for ultrasonic testing, such as ASTM, ISO, or ASME, and how to apply them in practice

KU17. how to accurately record test results, including documenting the testing conditions, equipment settings, and observations

KU18. how to generate detailed reports that summarize the findings of the ultrasonic test, including visual aids such as graphs or cross-sectional images

KU19. the importance and process of verifying and validating the accuracy of ultrasonic testing results through comparison with other testing methods or by using known standards

Generic Skills (GS)

User/individual on the job needs to know how to:

GS1. follow verbal instructions, convey information clearly and concisely to team members and supervisors

GS2. read, interpret, and write simple instructions, reports, and documentation

GS3. perform basic arithmetic operations such as addition, subtraction, multiplication, and division

GS4. use basic IT tools and applications for effective data management

GS5. work effectively in a team, supporting colleagues and contributing to team goals

GS6. assist others, share knowledge, and seek help, when necessary

GS7. manage time effectively and prioritize tasks to meet deadlines

GS8. adapt to changing work environments, tasks, and processes

GS9. focus on tasks and ensure accuracy in work

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Set up the UT equipment for use	6	9	-	3
PC1. select the appropriate ultrasonic transducer and UT device based on the material type, thickness, and the type of flaw expected	-	-	-	-
PC2. use a calibration block with known dimensions and properties similar to the test material	-	-	-	-
PC3. calibrate the UT device by adjusting the gain, range, and other settings to match the known characteristics of the calibration block	-	-	-	-
Prepare the surface	4	6	-	2
PC4. clean the surface of the material to ensure proper contact between the transducer and the material	-	-	-	-
PC5. apply the appropriate couplant, e.g. gel and oil, to the surface of the material to facilitate the transmission of ultrasonic waves between the transducer and the material	-	-	-	-
Conduct ultrasonic testing	6	10	-	5
PC6. place the transducer on the material's surface, ensuring firmness and even pressure	-	-	-	-
PC7. generate ultrasonic waves using the transducer to travel through the material being tested	-	-	-	-
PC8. scan the entire area of interest by moving the transducer to ensure complete coverage to detect all possible flaws	-	-	-	-
Analyze the signal for flaw detection	8	13	-	6
PC9. analyze the reflected signals (A-scan, B-scan, or C-scan) on the UT device's screen	-	-	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC10. identify the location, size, and nature of flaws based on the time of flight, amplitude, and shape of the signals	-	-	-	-
PC11. compare the detected signals with the reference standards to determine if the flaws are within acceptable limits	-	-	-	-
PC12. assess whether the material meets the required quality standards or if further action is needed, such as repair or rejection of the material	-	-	-	-
Document and report test results	3	6	-	2
PC13. record the results, including the location, size, and type of any detected flaws, including the calibration data, equipment settings, and material specifications also	-	-	-	-
PC14. prepare a detailed report summarizing the findings, including any recommendations for further action	-	-	-	-
Carry out post-test procedures	3	6	-	2
PC15. clean the transducer and UT device	-	-	-	-
PC16. dispose of the couplant and other materials used during the test following the applicable regulations	-	-	-	-
NOS Total	**30**	**50**	**-**	**20**

Qualification Pack

National Occupational Standards (NOS) Parameters

NOS Code	ICE/CON/N5004
NOS Name	Carry out Ultrasonic Testing (UT) of construction materials
Sector	Construction
Sub-Sector	
Occupation	Quality Assurance and Quality Control
NSQF Level	4
Credits	2
Version	1.0
Last Reviewed Date	17/01/2025
Next Review Date	17/01/2030
NSQC Clearance Date	17/01/2025

ICE/CON/N5005: Carry out Eddy Current Testing (ECT) of construction materials

Description

This unit involves employing electromagnetic induction to identify surface and near-surface flaws, evaluate material thickness, and assess conductivity, ensuring the structural integrity and quality of construction materials.

Scope

The scope covers the following :

- Prepare for ECT
- Conduct ECT
- Document and report ECT result

Elements and Performance Criteria

Prepare for ECT

To be competent, the user/individual on the job must be able to:

PC1. select appropriate material for testing, ensuring it is conductive

PC2. clean the material surface to remove any dirt, grease, or coatings that might interfere with the eddy current signal

PC3. set up the eddy current testing instrument for use as per the manufacturer's guidelines

PC4. select the appropriate probe based on the material's properties and the type of defects being inspected

PC5. calibrate the instrument using reference standards or calibration blocks with known defects to ensure accuracy

Conduct ECT

To be competent, the user/individual on the job must be able to:

PC6. position the ECT probe on the surface of the material and induce eddy currents in the conductive material

PC7. scan the entire surface of the material, moving the probe over the surface of the material in a systematic manner

PC8. maintain the probe in a perpendicular position to the surface for consistent results

PC9. analyze the signals displayed on the instrument, and check for variations in the signal to identify the presence of defects or inconsistencies in the material

PC10. determine the type, size, and location of the defect based on the signal patterns

Document and report ECT result

To be competent, the user/individual on the job must be able to:

PC11. record the results of the inspection, including any identified defects, their locations, and severity

PC12. provide recommendations for repair, further inspection, or monitoring based on the findings

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. different applications of ECT in construction

KU2. the principles of eddy current testing

KU3. electromagnetic induction and how variations in material properties affect the flow of eddy currents

KU4. the industry standards and codes relevant to ECT, such as ASTM, ISO, or ASME, and how to apply them in testing practices

KU5. the use of different ECT instruments, including probes, coils, and signal processing units

KU6. different types of probes used in ECT, e.g. surface probes, encircling coils, bobbin probes, and their applications based on the geometry and material being tested

KU7. how to calibrate ECT equipment using reference standards to ensure accurate and reliable measurements

KU8. how material conductivity influences eddy current response, including the effect of material thickness, composition, and temperature on test results

KU9. the concept of magnetic permeability and its impact on eddy current testing, particularly in ferromagnetic materials

KU10. how surface conditions (e.g., roughness, coating, oxidation) affect the eddy current signal

KU11. the proper surface preparation techniques to ensure accurate contact between the probe and the material surface

KU12. the scanning techniques to detect surface and subsurface defects, including the appropriate speed and orientation of probe movement

KU13. the selection of appropriate test frequencies based on material properties and the type of defects being sought

KU14. the common defects detectable by ECT in construction materials, such as cracks, corrosion, wear, and inclusions

KU15. how to interpret ECT signals, including the amplitude changes that indicate the presence of flaws or variations in material properties

KU16. how to estimate the depth of flaws based on signal attenuation and phase shift

KU17. the process of analyzing eddy current signals using both manual and software-assisted methods to identify and characterize defects

KU18. how to use graphical displays, e.g. impedance plane diagrams, to visualize eddy current data and distinguish between different types of flaws

KU19. how to compare test results against industry standards and acceptance criteria to assess material quality

KU20. the safety procedures for conducting ECT, including safe handling of electrical equipment and awareness of potential hazards

KU21. how to accurately record test data, including test parameters, equipment settings, and observations

KU22. how to generate comprehensive reports detailing the testing process, results, and any identified defects, supported by graphical data representations

KU23. the methods for verifying the accuracy of ECT results, such as using multiple probe frequencies or cross-referencing with other non-destructive testing (NDT) methods

Generic Skills (GS)

User/individual on the job needs to know how to:

GS1. follow verbal instructions, convey information clearly and concisely to team members and supervisors
GS2. read, interpret, and write simple instructions, reports, and documentation
GS3. perform basic arithmetic operations such as addition, subtraction, multiplication, and division
GS4. use basic IT tools and applications for effective data management
GS5. work effectively in a team, supporting colleagues and contributing to team goals
GS6. assist others, share knowledge, and seek help, when necessary
GS7. manage time effectively and prioritize tasks to meet deadlines
GS8. adapt to changing work environments, tasks, and processes
GS9. focus on tasks and ensure accuracy in work

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Prepare for ECT	13	22	-	8
PC1. select appropriate material for testing, ensuring it is conductive	-	-	-	-
PC2. clean the material surface to remove any dirt, grease, or coatings that might interfere with the eddy current signal	-	-	-	-
PC3. set up the eddy current testing instrument for use as per the manufacturer's guidelines	-	-	-	-
PC4. select the appropriate probe based on the material's properties and the type of defects being inspected	-	-	-	-
PC5. calibrate the instrument using reference standards or calibration blocks with known defects to ensure accuracy	-	-	-	-
Conduct ECT	13	22	-	9
PC6. position the ECT probe on the surface of the material and induce eddy currents in the conductive material	-	-	-	-
PC7. scan the entire surface of the material, moving the probe over the surface of the material in a systematic manner	-	-	-	-
PC8. maintain the probe in a perpendicular position to the surface for consistent results	-	-	-	-
PC9. analyze the signals displayed on the instrument, and check for variations in the signal to identify the presence of defects or inconsistencies in the material	-	-	-	-
PC10. determine the type, size, and location of the defect based on the signal patterns	-	-	-	-
Document and report ECT result	4	6	-	3

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC11. record the results of the inspection, including any identified defects, their locations, and severity	-	-	-	-
PC12. provide recommendations for repair, further inspection, or monitoring based on the findings	-	-	-	-
NOS Total	**30**	**50**	**-**	**20**

Qualification Pack

National Occupational Standards (NOS) Parameters

NOS Code	ICE/CON/N5005
NOS Name	Carry out Eddy Current Testing (ECT) of construction materials
Sector	Construction
Sub-Sector	
Occupation	Quality Assurance and Quality Control
NSQF Level	4
Credits	1
Version	1.0
Last Reviewed Date	17/01/2025
Next Review Date	17/01/2030
NSQC Clearance Date	17/01/2025

ICE/CON/N5006: Conduct tests on soil, aggregate, bitumen, steel, different construction mixes, and NDT on concrete

Description

This unit outlines the standards for conducting various material tests on soil, aggregate, bitumen, steel, different types of construction mixes, and performing non-destructive testing (NDT) on concrete.

Scope

The scope covers the following :

- Conduct soil tests
- Conduct aggregate tests
- Conduct bitumen tests
- Conduct steel tests
- Test GSB, WMM, AIL, CTB, CTGSB, DBM, BC, SMA, and cement concrete mixes
- Conduct Non-Destructive Testing (NDT) on concrete

Elements and Performance Criteria

Conduct soil tests

To be competent, the user/individual on the job must be able to:

PC1. prepare soil samples as per standard testing procedures

PC2. conduct moisture content test, Atterberg limits test (liquid limit, plastic limit, and shrinkage limit)

PC3. perform Proctor compaction test and California Bearing Ratio (CBR) test

PC4. conduct sieve analysis and hydrometer analysis for soil classification

PC5. record test results accurately and interpret data in line with industry standard

Conduct aggregate tests

To be competent, the user/individual on the job must be able to:

PC6. conduct sieve analysis of fine and coarse aggregates

PC7. test for specific gravity, water absorption, and aggregate impact value

PC8. perform tests for flakiness index, elongation index, and angularity number

PC9. determine the Los Angeles abrasion value for aggregate durability

PC10. document test results and ensure compliance with technical specifications

Conduct bitumen tests

To be competent, the user/individual on the job must be able to:

PC11. perform penetration, softening point, and ductility tests on bitumen

PC12. test for viscosity using viscometers and determine flash and fire points

PC13. conduct bitumen extraction and gradation analysis of extracted aggregates

PC14. carry out Marshall Stability test for asphalt mixes

PC15. ensure correct handling of hot bitumen

Conduct steel tests

To be competent, the user/individual on the job must be able to:

PC16. conduct tensile strength test on steel bars and rods using Universal Testing Machine (UTM)

PC17. perform bend and rebend tests to determine the ductility of steel

PC18. test for chemical composition using spectrometer or chemical analysis methods

PC19. conduct impact test to measure toughness of steel

Test GSB, WMM, AIL, CTB, CTGSB, DBM, BC, SMA, and cement concrete mixes

To be competent, the user/individual on the job must be able to:

PC20. sample and test different types of construction mixes like granular sub-base (GSB), wet mix macadam (WMM), asphaltic concrete (DBM, BC, SMA), and cement-treated bases (CTB, CTGSB)

PC21. conduct gradation, compaction, and moisture content tests for GSB and WMM

PC22. perform Marshall Stability test for DBM, BC, and SMA mixes

PC23. test the compressive strength of cement concrete using cubes and cylinders

PC24. perform air void analysis and measure mix density for asphalt mixes

Conduct Non-Destructive Testing (NDT) on concrete

To be competent, the user/individual on the job must be able to:

PC25. perform Rebound Hammer test to assess surface hardness of concrete

PC26. conduct Ultrasonic Pulse Velocity (UPV) test to measure concrete uniformity and detect cracks

PC27. use Ground Penetrating Radar (GPR) to evaluate thickness and condition of concrete structures

PC28. perform core cutting and extraction for in-depth analysis without damaging the structure

PC29. document NDT results and recommend further testing or corrective measures if required

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. different types of soils and their engineering properties

KU2. standard procedures for sampling and testing soil (ASTM, AASHTO)

KU3. use of soil testing equipment such as sieves, Proctor molds, and CBR testing machines

KU4. the soil classification systems (USCS, AASHTO)

KU5. the procedures for calculating moisture content, density, and bearing capacity

KU6. the characteristics of fine and coarse aggregates

KU7. the methods for sampling and testing aggregates, e.g. ASTM, IS standards, etc.

KU8. the use of equipment such as sieves, pycnometers, and abrasion testing machines

KU9. the significance of aggregate gradation and its impact on concrete and asphalt quality

KU10. the procedures for assessing the strength, durability, and suitability of aggregates for various construction applications

KU11. the types and grades of bitumen used in road construction

KU12. the standard bitumen testing procedures, e.g. ASTM, AASHTO and IS

KU13. the equipment used for bitumen testing like penetrometers, ring-and-ball apparatus, and viscometers

KU14. the procedures for analyzing bitumen properties such as viscosity, ductility, and softening point

KU15. the safety procedures for working with hot bitumen

KU16. the types of steel used in construction, e.g. TMT and structural steel

KU17. the testing standards for steel, e.g. ASTM, IS and AASHTO

KU18. the properties of steel such as yield strength, tensile strength, and elongation

KU19. the use of UTM, spectrometers, and impact testing machines

KU20. the procedures for recording and interpreting test data

KU21. the composition and uses of various construction mixes (GSB, WMM, DBM, BC, SMA)

KU22. the standard testing procedures for asphalt and cement concrete mixes (ASTM, AASHTO)

KU23. the use of equipment for mix testing such as compactors, Marshall apparatus, and compression machines

KU24. the importance of gradation, compaction, and stability in road construction

KU25. the procedures for testing cement concrete, including slump tests and compressive strength tests

KU26. the types and purposes of non-destructive tests for concrete

KU27. the use of NDT equipment like rebound hammers, ultrasonic pulse velocity meters, and GPR machines

KU28. the procedures for interpreting results from NDT methods

KU29. the factors affecting concrete integrity (cracks, voids, and anomalies)

KU30. the safety measures to be taken during NDT, especially when working at heights or with complex structures

KU31. the safe practices for handling chemicals, equipment, and testing materials

KU32. the use of appropriate Personal Protective Equipment (PPE)

KU33. the applicable environmental regulations

KU34. the recording and interpretation of test data

KU35. the preparation of test reports

KU36. the industry standards concerning quality assurance in material testing

Generic Skills (GS)

User/individual on the job needs to know how to:

GS1. follow verbal instructions, convey information clearly and concisely to team members and supervisors

GS2. read, interpret, and write simple instructions, reports, and documentation

GS3. perform basic arithmetic operations such as addition, subtraction, multiplication, and division

GS4. use basic IT tools and applications for effective data management

GS5. work effectively in a team, supporting colleagues and contributing to team goals

GS6. assist others, share knowledge, and seek help, when necessary

GS7. manage time effectively and prioritize tasks to meet deadlines
GS8. adapt to changing work environments, tasks, and processes
GS9. focus on tasks and ensure accuracy in work

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Conduct soil tests	5	9	-	3
PC1. prepare soil samples as per standard testing procedures	-	-	-	-
PC2. conduct moisture content test, Atterberg limits test (liquid limit, plastic limit, and shrinkage limit)	-	-	-	-
PC3. perform Proctor compaction test and California Bearing Ratio (CBR) test	-	-	-	-
PC4. conduct sieve analysis and hydrometer analysis for soil classification	-	-	-	-
PC5. record test results accurately and interpret data in line with industry standard	-	-	-	-
Conduct aggregate tests	5	9	-	4
PC6. conduct sieve analysis of fine and coarse aggregates	-	-	-	-
PC7. test for specific gravity, water absorption, and aggregate impact value	-	-	-	-
PC8. perform tests for flakiness index, elongation index, and angularity number	-	-	-	-
PC9. determine the Los Angeles abrasion value for aggregate durability	-	-	-	-
PC10. document test results and ensure compliance with technical specifications	-	-	-	-
Conduct bitumen tests	5	10	-	4
PC11. perform penetration, softening point, and ductility tests on bitumen	-	-	-	-
PC12. test for viscosity using viscometers and determine flash and fire points	-	-	-	-
PC13. conduct bitumen extraction and gradation analysis of extracted aggregates	-	-	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC14. carry out Marshall Stability test for asphalt mixes	-	-	-	-
PC15. ensure correct handling of hot bitumen	-	-	-	-
Conduct steel tests	4	7	-	3
PC16. conduct tensile strength test on steel bars and rods using Universal Testing Machine (UTM)	-	-	-	-
PC17. perform bend and rebend tests to determine the ductility of steel	-	-	-	-
PC18. test for chemical composition using spectrometer or chemical analysis methods	-	-	-	-
PC19. conduct impact test to measure toughness of steel	-	-	-	-
Test GSB, WMM, AIL, CTB, CTGSB, DBM, BC, SMA, and cement concrete mixes	6	9	-	3
PC20. sample and test different types of construction mixes like granular sub-base (GSB), wet mix macadam (WMM), asphaltic concrete (DBM, BC, SMA), and cement-treated bases (CTB, CTGSB)	-	-	-	-
PC21. conduct gradation, compaction, and moisture content tests for GSB and WMM	-	-	-	-
PC22. perform Marshall Stability test for DBM, BC, and SMA mixes	-	-	-	-
PC23. test the compressive strength of cement concrete using cubes and cylinders	-	-	-	-
PC24. perform air void analysis and measure mix density for asphalt mixes	-	-	-	-
Conduct Non-Destructive Testing (NDT) on concrete	5	6	-	3
PC25. perform Rebound Hammer test to assess surface hardness of concrete	-	-	-	-
PC26. conduct Ultrasonic Pulse Velocity (UPV) test to measure concrete uniformity and detect cracks	-	-	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC27. use Ground Penetrating Radar (GPR) to evaluate thickness and condition of concrete structures	-	-	-	-
PC28. perform core cutting and extraction for in-depth analysis without damaging the structure	-	-	-	-
PC29. document NDT results and recommend further testing or corrective measures if required	-	-	-	-
NOS Total	**30**	**50**	**-**	**20**

Qualification Pack

National Occupational Standards (NOS) Parameters

NOS Code	ICE/CON/N5006
NOS Name	Conduct tests on soil, aggregate, bitumen, steel, different construction mixes, and NDT on concrete
Sector	Construction
Sub-Sector	
Occupation	Quality Assurance and Quality Control
NSQF Level	4
Credits	2
Version	1.0
Last Reviewed Date	17/01/2025
Next Review Date	17/01/2030
NSQC Clearance Date	17/01/2025

ICE/CON/N5007: Carry out Highway Testing through FWD, NSV, Benkelman Beam, and Total Station

Description

This unit is about conducting various highway testing techniques using Falling Weight Deflectometer (FWD), Network Survey Vehicle (NSV), Benkelman Beam, and Total Station to assess the structural capacity, surface characteristics, and geometric accuracy of highways.

Scope

The scope covers the following :

- Highway testing using Falling Weight Deflectometer (FWD)
- Highway surface assessment using Network Survey Vehicle (NSV)
- Highway testing using Benkelman Beam
- Highway geometric testing using Total Station

Elements and Performance Criteria

Highway testing using Falling Weight Deflectometer (FWD)

To be competent, the user/individual on the job must be able to:

PC1. set up the Falling Weight Deflectometer (FWD) on the test location as per standard procedures

PC2. calibrate the FWD before the test to ensure accurate measurements

PC3. conduct deflection tests by applying dynamic loads to the pavement surface and measure the resulting deflection

PC4. record deflection data across multiple points along the highway

PC5. interpret deflection data to evaluate pavement stiffness and structural capacity

PC6. document test results and suggest necessary maintenance or rehabilitation measures based on findings

Highway surface assessment using Network Survey Vehicle (NSV)

To be competent, the user/individual on the job must be able to:

PC7. prepare the Network Survey Vehicle (NSV) for a highway surface assessment, ensuring all sensors and cameras are operational

PC8. drive the NSV along the specified route while maintaining a consistent speed to capture accurate data

PC9. measure surface parameters like roughness (IRI), rutting, and cracking using on-board sensors

PC10. use the NSV's laser profilers to generate a detailed surface profile of the highway

PC11. download and process data collected by the NSV for further analysis

PC12. prepare reports based on surface condition data and recommend maintenance or surface repair activities

Highway testing using Benkelman Beam

To be competent, the user/individual on the job must be able to:

PC13. set up the Benkelman Beam at the designated test points on the highway

PC14. calibrate the Benkelman Beam apparatus to ensure accurate deflection measurements

PC15. conduct static loading tests using a standard vehicle and measure pavement rebound deflection

PC16. record deflection values at multiple points to assess pavement flexibility and bearing capacity

PC17. analyze deflection data to determine the pavement's residual life and identify areas requiring strengthening or reconstruction

PC18. prepare and submit detailed reports based on Benkelman Beam test results

Highway geometric testing using Total Station

To be competent, the user/individual on the job must be able to:

PC19. set up the Total Station at pre-determined survey points along the highway

PC20. calibrate the Total Station and establish control points for accurate measurements

PC21. conduct a topographic survey to measure highway elevations, gradients, and alignments

PC22. record horizontal and vertical angles, distances, and coordinates of various highway features

PC23. use the Total Station data to verify the highway's geometric design parameters, including cross-sections and horizontal/vertical curves

PC24. process survey data using computer-aided design (CAD) or geographic information system (GIS) software

PC25. document and report any geometric inconsistencies that could impact highway safety and performance

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. the principles of pavement deflection and how FWD assesses pavement structural integrity

KU2. the components and operation of FWD equipment, including load cells, geophones, and data acquisition systems

KU3. the standard test procedures for FWD as per ASTM, AASHTO, or IRC guidelines

KU4. pavement layers and their response to dynamic loading

KU5. how to interpret the deflection data to identify weak areas and potential pavement failure points

KU6. the-working principles of the NSV and its components, such as laser profilers, GPS, and cameras

KU7. the surface condition parameters measured by NSV, including International Roughness Index (IRI), rut depth, and crack mapping

KU8. the standard protocols for operating an NSV on highways

KU9. the use of appropriate data processing software to analyze NSV outputs and generate reports

KU10. how to interpret the surface condition data and understand its implications for highway maintenance and performance

KU11. the basic principles of deflection testing and the purpose of the Benkelman Beam test in assessing pavement flexibility

KU12. • the use of Benkelman Beam equipment, including its calibration and use in static load tests
• the testing procedures for Benkelman Beam as per IRC or ASTM standards

KU13. how to interpret the pavement deflection data to evaluate its current condition and potential service life

KU14. the procedures for correlating deflection results with pavement design and performance expectations

KU15. the basic principles of geometric design and the use of Total Station for surveying

KU16. the components of Total Station equipment and their calibration for accurate measurement

KU17. the techniques for measuring horizontal and vertical angles, distances, and elevations using a Total Station

KU18. the use of CAD and GIS software to analyze and present survey data for highway projects

KU19. how to interpret the survey results and identify deviations from geometric design standards

Generic Skills (GS)

User/individual on the job needs to know how to:

GS1. follow verbal instructions, convey information clearly and concisely to team members and supervisors

GS2. read, interpret, and write simple instructions, reports, and documentation

GS3. perform basic arithmetic operations such as addition, subtraction, multiplication, and division

GS4. use basic IT tools and applications for effective data management

GS5. work effectively in a team, supporting colleagues and contributing to team goals

GS6. assist others, share knowledge, and seek help, when necessary

GS7. manage time effectively and prioritize tasks to meet deadlines

GS8. adapt to changing work environments, tasks, and processes

GS9. focus on tasks and ensure accuracy in work

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Highway testing using Falling Weight Deflectometer (FWD)	7	12	-	5
PC1. set up the Falling Weight Deflectometer (FWD) on the test location as per standard procedures	-	-	-	-
PC2. calibrate the FWD before the test to ensure accurate measurements	-	-	-	-
PC3. conduct deflection tests by applying dynamic loads to the pavement surface and measure the resulting deflection	-	-	-	-
PC4. record deflection data across multiple points along the highway	-	-	-	-
PC5. interpret deflection data to evaluate pavement stiffness and structural capacity	-	-	-	-
PC6. document test results and suggest necessary maintenance or rehabilitation measures based on findings	-	-	-	-
Highway surface assessment using Network Survey Vehicle (NSV)	7	12	-	5
PC7. prepare the Network Survey Vehicle (NSV) for a highway surface assessment, ensuring all sensors and cameras are operational	-	-	-	-
PC8. drive the NSV along the specified route while maintaining a consistent speed to capture accurate data	-	-	-	-
PC9. measure surface parameters like roughness (IRI), rutting, and cracking using on-board sensors	-	-	-	-
PC10. use the NSV's laser profilers to generate a detailed surface profile of the highway	-	-	-	-
PC11. download and process data collected by the NSV for further analysis	-	-	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC12. prepare reports based on surface condition data and recommend maintenance or surface repair activities	-	-	-	-
Highway testing using Benkelman Beam	7	12	-	5
PC13. set up the Benkelman Beam at the designated test points on the highway	-	-	-	-
PC14. calibrate the Benkelman Beam apparatus to ensure accurate deflection measurements	-	-	-	-
PC15. conduct static loading tests using a standard vehicle and measure pavement rebound deflection	-	-	-	-
PC16. record deflection values at multiple points to assess pavement flexibility and bearing capacity	-	-	-	-
PC17. analyze deflection data to determine the pavement's residual life and identify areas requiring strengthening or reconstruction	-	-	-	-
PC18. prepare and submit detailed reports based on Benkelman Beam test results	-	-	-	-
Highway geometric testing using Total Station	9	14	-	5
PC19. set up the Total Station at pre-determined survey points along the highway	-	-	-	-
PC20. calibrate the Total Station and establish control points for accurate measurements	-	-	-	-
PC21. conduct a topographic survey to measure highway elevations, gradients, and alignments	-	-	-	-
PC22. record horizontal and vertical angles, distances, and coordinates of various highway features	-	-	-	-
PC23. use the Total Station data to verify the highway's geometric design parameters, including cross-sections and horizontal/vertical curves	-	-	-	-
PC24. process survey data using computer-aided design (CAD) or geographic information system (GIS) software	-	-	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC25. document and report any geometric inconsistencies that could impact highway safety and performance	-	-	-	-
NOS Total	**30**	**50**	**-**	**20**

Qualification Pack

National Occupational Standards (NOS) Parameters

NOS Code	ICE/CON/N5007
NOS Name	Carry out Highway Testing through FWD, NSV, Benkelman Beam, and Total Station
Sector	Construction
Sub-Sector	
Occupation	Quality Assurance and Quality Control
NSQF Level	4
Credits	1
Version	1.0
Last Reviewed Date	17/01/2025
Next Review Date	17/01/2030
NSQC Clearance Date	17/01/2025

ICE/CON/N5008: Set up the project civil lab

Description

This unit is about setting up a civil laboratory for construction and infrastructure projects. It covers the essentials of lab layout, equipment foundations, testing platforms, test environment chambers, and curing tanks.

Scope

The scope covers the following :

- Plan and design the lab layout
- Set up the equipment foundations
- Install testing platforms
- Set up test environment chambers
- Set up curing tanks

Elements and Performance Criteria

Plan and design the lab layout

To be competent, the user/individual on the job must be able to:

PC1. develop a lab layout plan considering available space, type of tests, and equipment requirements

PC2. ensure adequate separation of testing areas based on materials (soil, concrete, bitumen, etc.) and types of tests (destructive, non-destructive)

PC3. allocate space for storage of samples, materials, and chemicals

PC4. design the lab for efficient workflow, ensuring that sample preparation, testing, and documentation areas are logically organized

PC5. plan for proper ventilation, lighting, and temperature control to ensure an optimal work environment

PC6. ensure adherence to safety regulations and accessibility standards in the lab layout

Set up the equipment foundations

To be competent, the user/individual on the job must be able to:

PC7. assess the weight and operational requirements of each major piece of equipment to determine foundation specifications

PC8. prepare foundations for heavy equipment such as Universal Testing Machines (UTM), compression testing machines, and vibrating equipment

PC9. ensure that foundations are isolated from general lab flooring to prevent vibrations and ensure stability during testing

PC10. install reinforcement and casting for equipment foundations to ensure durability and strength

PC11. inspect and maintain foundations to prevent settlement or cracking over time

Install testing platforms

To be competent, the user/individual on the job must be able to:

PC12. identify testing areas for specific material tests (concrete, soil, bitumen, steel) and design suitable platforms for testing equipment

PC13. set up vibration-resistant platforms for precision testing equipment, such as balance scales and sieves

PC14. construct load-bearing platforms for compression testing, tensile testing, and other high-force testing machines

PC15. ensure platforms are level and capable of supporting the weight and operational stresses of testing procedures

PC16. establish platforms for sample preparation and ensure ease of access to nearby equipment and testing areas

Set up test environment chambers

To be competent, the user/individual on the job must be able to:

PC17. design and construct controlled-environment chambers for specialized tests, such as humidity, temperature, and environmental simulations

PC18. install temperature-controlled chambers for curing concrete samples and other temperature-sensitive materials

PC19. ensure proper insulation and climate control systems are in place to maintain constant environmental conditions within test chambers

PC20. set up humidity-controlled rooms or cabinets for tests that require specific moisture conditions

PC21. regularly calibrate and maintain chambers to ensure accurate environmental conditions are maintained during testing

Set up curing tanks

To be competent, the user/individual on the job must be able to:

PC22. select appropriate curing tanks based on the volume and size of concrete specimens to be cured

PC23. set up water curing tanks with proper dimensions and capacity for the specific project requirements

PC24. install automated water temperature control systems to maintain the recommended curing temperature for concrete samples

PC25. ensure regular monitoring of water levels and temperature in the curing tanks

PC26. maintain a clean and stable curing environment by preventing contamination of water or samples

PC27. record curing durations and conditions to ensure compliance with test specifications

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. the principles of lab design, focusing on functionality

KU2. the spatial requirements for different types of tests and equipment

KU3. the regulatory requirements for civil labs

KU4. ergonomics and space management in laboratory environments

KU5. zoning of the lab for efficient operation, including separate areas for material storage, testing, and documentation

KU6. the load-bearing requirements for lab equipment and the importance of stable foundations

KU7. the materials and techniques for constructing durable and vibration-resistant foundations

KU8. the specifications for isolating foundations to prevent interference with testing accuracy

KU9. the procedures for monitoring and maintaining foundation stability over the long term

KU10. the regulations and guidelines for setting up equipment in civil labs

KU11. the importance of level and vibration-free platforms in ensuring accurate testing results

KU12. the materials and construction methods for building testing platforms that meet load-bearing and stability requirements

KU13. the appropriate considerations when constructing and using testing platforms in the lab

KU14. the purpose and importance of test environment chambers for controlling external variables during material testing

KU15. the types of environmental chambers (temperature-controlled, humidity-controlled) and their applications in civil labs

KU16. the calibration and maintenance procedures for temperature and humidity control systems

KU17. the regulatory standards for environmental chambers used in testing construction materials

KU18. how temperature and humidity can affect test results and the performance of construction materials

KU19. the purpose of curing tanks in ensuring proper hydration and strength development of concrete specimens

KU20. the standard requirements for curing tanks, including temperature control and water maintenance

KU21. the techniques for monitoring curing conditions, including temperature and water quality

KU22. the industry standards for curing concrete, such as ASTM or IS codes, and the importance of consistent curing conditions for accurate test results

KU23. the maintenance and cleaning procedures for curing tanks to prevent contamination or deterioration

Generic Skills (GS)

User/individual on the job needs to know how to:

GS1. follow verbal instructions, convey information clearly and concisely to team members and supervisors

GS2. read, interpret, and write simple instructions, reports, and documentation

GS3. perform basic arithmetic operations such as addition, subtraction, multiplication, and division

GS4. use basic IT tools and applications for effective data management

GS5. assist others, share knowledge, and seek help, when necessary

GS6. work effectively in a team, supporting colleagues and contributing to team goals

GS7. manage time effectively and prioritize tasks to meet deadlines

GS8. adapt to changing work environments, tasks, and processes

GS9. focus on tasks and ensure accuracy in work

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Plan and design the lab layout	7	12	-	5
PC1. develop a lab layout plan considering available space, type of tests, and equipment requirements	-	-	-	-
PC2. ensure adequate separation of testing areas based on materials (soil, concrete, bitumen, etc.) and types of tests (destructive, non-destructive)	-	-	-	-
PC3. allocate space for storage of samples, materials, and chemicals	-	-	-	-
PC4. design the lab for efficient workflow, ensuring that sample preparation, testing, and documentation areas are logically organized	-	-	-	-
PC5. plan for proper ventilation, lighting, and temperature control to ensure an optimal work environment	-	-	-	-
PC6. ensure adherence to safety regulations and accessibility standards in the lab layout	-	-	-	-
Set up the equipment foundations	5	9	-	4
PC7. assess the weight and operational requirements of each major piece of equipment to determine foundation specifications	-	-	-	-
PC8. prepare foundations for heavy equipment such as Universal Testing Machines (UTM), compression testing machines, and vibrating equipment	-	-	-	-
PC9. ensure that foundations are isolated from general lab flooring to prevent vibrations and ensure stability during testing	-	-	-	-
PC10. install reinforcement and casting for equipment foundations to ensure durability and strength	-	-	-	-
PC11. inspect and maintain foundations to prevent settlement or cracking over time	-	-	-	-
Install testing platforms	5	9	-	4

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC12. identify testing areas for specific material tests (concrete, soil, bitumen, steel) and design suitable platforms for testing equipment	-	-	-	-
PC13. set up vibration-resistant platforms for precision testing equipment, such as balance scales and sieves	-	-	-	-
PC14. construct load-bearing platforms for compression testing, tensile testing, and other high-force testing machines	-	-	-	-
PC15. ensure platforms are level and capable of supporting the weight and operational stresses of testing procedures	-	-	-	-
PC16. establish platforms for sample preparation and ensure ease of access to nearby equipment and testing areas	-	-	-	-
Set up test environment chambers	6	10	-	3
PC17. design and construct controlled-environment chambers for specialized tests, such as humidity, temperature, and environmental simulations	-	-	-	-
PC18. install temperature-controlled chambers for curing concrete samples and other temperature-sensitive materials	-	-	-	-
PC19. ensure proper insulation and climate control systems are in place to maintain constant environmental conditions within test chambers	-	-	-	-
PC20. set up humidity-controlled rooms or cabinets for tests that require specific moisture conditions	-	-	-	-
PC21. regularly calibrate and maintain chambers to ensure accurate environmental conditions are maintained during testing	-	-	-	-
Set up curing tanks	7	10	-	4
PC22. select appropriate curing tanks based on the volume and size of concrete specimens to be cured	-	-	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC23. set up water curing tanks with proper dimensions and capacity for the specific project requirements	-	-	-	-
PC24. install automated water temperature control systems to maintain the recommended curing temperature for concrete samples	-	-	-	-
PC25. ensure regular monitoring of water levels and temperature in the curing tanks	-	-	-	-
PC26. maintain a clean and stable curing environment by preventing contamination of water or samples	-	-	-	-
PC27. record curing durations and conditions to ensure compliance with test specifications	-	-	-	-
NOS Total	**30**	**50**	**-**	**20**

Qualification Pack

National Occupational Standards (NOS) Parameters

NOS Code	ICE/CON/N5008
NOS Name	Set up the project civil lab
Sector	Construction
Sub-Sector	
Occupation	Quality Assurance and Quality Control
NSQF Level	4
Credits	1
Version	1.0
Last Reviewed Date	17/01/2025
Next Review Date	17/01/2030
NSQC Clearance Date	17/01/2025

ICE/CON/N5009: Basics of plants and machinery (Hot Mix Plant, Batching Plant, Paver, Grader, Loader)

Description

This unit outlines the competencies required to understand and operate basic construction plants and machinery used in road construction and civil infrastructure projects. It covers the fundamental knowledge and basic operations of the hot mix plant, batching plant, paver, grader, and loader.

Scope

The scope covers the following :

- Hot mix plant operations
- Batching plant operations
- Basic operation of paver
- Basic operation of grader
- Basic operation of loader

Elements and Performance Criteria

Hot mix plant operations

To be competent, the user/individual on the job must be able to:

PC1. identify and describe the components of a hot mix plant, including aggregate feeders, dryer drum, bitumen tanks, and mixing unit

PC2. understand the working principle of the hot mix plant, which produces asphalt concrete by heating and mixing aggregates with bitumen

PC3. prepare the plant for production by ensuring proper calibration of feed controls and maintaining the required temperature settings

PC4. monitor the plant's performance during production, ensuring the quality of the hot mix is consistent with project specifications

PC5. record production data and ensure proper storage and dispatch of the hot mix material

PC6. conduct routine maintenance checks on the plant, including cleaning filters, inspecting burners, and checking bitumen levels

Batching plant operations

To be competent, the user/individual on the job must be able to:

PC7. identify and describe the key components of a batching plant, including aggregate bins, cement silos, conveyors, mixers, and control systems

PC8. understand the process of producing concrete by accurately batching aggregates, cement, water, and additives as per mix design

PC9. set up the plant for production by calibrating the batching system and checking material levels in the silos and bins

PC10. monitor concrete production to ensure that the correct proportions of materials are used, and the consistency of the concrete meets project specifications

PC11. record batching data and monitor the output to ensure the timely delivery of ready-mix concrete to construction sites

PC12. perform regular maintenance on the batching plant, including checking weigh scales, mixer blades, and water dosing systems

Basic operation of paver

To be competent, the user/individual on the job must be able to:

PC13. identify the key components of a paver, including the screed, auger, conveyor system, and operator controls

PC14. understand the working mechanism of the paver, which spreads, levels, and compacts asphalt or concrete mix onto the road surface

PC15. operate the paver safely and efficiently to ensure a uniform layer of material is laid down, following the required thickness and width specifications

PC16. monitor the operation of the screed and make necessary adjustments to ensure consistent mat quality and smoothness

PC17. coordinate with other construction personnel to ensure the continuous supply of material to the paver

PC18. perform daily pre-operation checks, including inspecting fluid levels, belts, and the screed condition, to avoid breakdowns

Basic operation of grader

To be competent, the user/individual on the job must be able to:

PC19. identify and describe the key parts of a Grader, including the blade (moldboard), circle, scarifier, and operator controls

PC20. understand the Grader's function in leveling and smoothing the surface of a road or site, preparing it for further construction

PC21. operate the Grader to level and shape the sub-base or base of a road, ensuring that the required slope and gradient are achieved

PC22. adjust the moldboard and control the machine's speed and direction to achieve a consistent and smooth surface finish

PC23. collaborate with site engineers to ensure grading accuracy according to design plans and specifications

PC24. conduct daily inspections of the Grader, checking hydraulic systems, blade condition, and tire pressure

Basic operation of loader

To be competent, the user/individual on the job must be able to:

PC25. identify and describe the key parts of a Loader, including the bucket, lift arms, engine, and operator controls

PC26. understand the Loader's role in moving and loading materials such as soil, aggregate, and debris at construction sites

PC27. operate the Loader to safely transport materials, ensuring correct bucket positioning and load balancing to prevent spillage

PC28. coordinate with other construction personnel to ensure the timely movement of materials to or from designated areas

PC29. perform daily operational checks, including inspecting the hydraulic systems, bucket condition, and tire wear

PC30. ensure proper maintenance of the Loader, including lubrication of moving parts, engine checks, and refueling

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. the principles of pavement deflection and how FWD assesses pavement structural integrity
KU2. the basic understanding of the hot mix production process and the role of various components in producing asphalt concrete
KU3. the importance of temperature control and aggregate gradation in the quality of the hot mix
KU4. the safety protocols for handling hot bitumen and high-temperature equipment
KU5. the basic troubleshooting skills for common issues with the Hot Mix Plant
KU6. the maintenance procedures and schedules to keep the plant in optimal working condition
KU7. the principles of batching and the importance of accurate proportioning in producing high-quality concrete
KU8. the components and operation of a batching plant and the role each plays in the production process
KU9. the safety precautions for handling cement, aggregates, and chemical additives
KU10. the troubleshooting for common operational issues in a batching plant, such as inconsistent mix proportions or equipment malfunctions
KU11. the regular maintenance tasks to keep the batching plant running efficiently
KU12. the functions and operation of a paver in road construction, with respect to material laying and levelling
KU13. the key factors affecting the quality of paving, such as material temperature, screed control, and rolling patterns
KU14. the safety protocols for operating pavers, especially when working on active construction sites
KU15. the basic troubleshooting techniques to resolve common issues like uneven laying or material segregation
KU16. routine maintenance procedures, including screed cleaning and checking hydraulic systems
KU17. the principles of grading and the role of the Grader in creating a level and smooth surface for construction
KU18. the operating procedures and controls of the Grader for both fine and rough grading
KU19. the safety measures when operating Graders, including working on uneven terrain and near other heavy machinery
KU20. the common challenges in grading, such as achieving the correct slope and dealing with difficult soil conditions
KU21. the routine maintenance tasks to ensure the Grader operates efficiently, including blade sharpening and hydraulic fluid checks
KU22. the functions of a Loader in moving materials on construction sites, particularly in road construction and earthmoving
KU23. the safety protocols for operating Loaders, including load balancing, correct use of operator controls, and safe maneuvering

KU24. the key operational skills for efficient loading and transportation of materials

KU25. the troubleshooting for common issues experienced while operating Loaders, such as overloading, material spillage, and tire wear

KU26. the maintenance routines, such as checking tire pressure, hydraulic fluid levels, and bucket condition to ensure long-term performance

Generic Skills (GS)

User/individual on the job needs to know how to:

GS1. follow verbal instructions, convey information clearly and concisely to team members and supervisors

GS2. read, interpret, and write simple instructions, reports, and documentation

GS3. perform basic arithmetic operations such as addition, subtraction, multiplication, and division

GS4. use basic IT tools and applications for effective data management

GS5. work effectively in a team, supporting colleagues and contributing to team goals

GS6. assist others, share knowledge, and seek help, when necessary

GS7. manage time effectively and prioritize tasks to meet deadlines

GS8. adapt to changing work environments, tasks, and processes

GS9. focus on tasks and ensure accuracy in work

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Hot mix plant operations	6	10	-	4
PC1. identify and describe the components of a hot mix plant, including aggregate feeders, dryer drum, bitumen tanks, and mixing unit	-	-	-	-
PC2. understand the working principle of the hot mix plant, which produces asphalt concrete by heating and mixing aggregates with bitumen	-	-	-	-
PC3. prepare the plant for production by ensuring proper calibration of feed controls and maintaining the required temperature settings	-	-	-	-
PC4. monitor the plant's performance during production, ensuring the quality of the hot mix is consistent with project specifications	-	-	-	-
PC5. record production data and ensure proper storage and dispatch of the hot mix material	-	-	-	-
PC6. conduct routine maintenance checks on the plant, including cleaning filters, inspecting burners, and checking bitumen levels	-	-	-	-
Batching plant operations	6	10	-	4
PC7. identify and describe the key components of a batching plant, including aggregate bins, cement silos, conveyors, mixers, and control systems	-	-	-	-
PC8. understand the process of producing concrete by accurately batching aggregates, cement, water, and additives as per mix design	-	-	-	-
PC9. set up the plant for production by calibrating the batching system and checking material levels in the silos and bins	-	-	-	-
PC10. monitor concrete production to ensure that the correct proportions of materials are used, and the consistency of the concrete meets project specifications	-	-	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC11. record batching data and monitor the output to ensure the timely delivery of ready-mix concrete to construction sites	-	-	-	-
PC12. perform regular maintenance on the batching plant, including checking weigh scales, mixer blades, and water dosing systems	-	-	-	-
Basic operation of paver	6	10	-	4
PC13. identify the key components of a paver, including the screed, auger, conveyor system, and operator controls	-	-	-	-
PC14. understand the working mechanism of the paver, which spreads, levels, and compacts asphalt or concrete mix onto the road surface	-	-	-	-
PC15. operate the paver safely and efficiently to ensure a uniform layer of material is laid down, following the required thickness and width specifications	-	-	-	-
PC16. monitor the operation of the screed and make necessary adjustments to ensure consistent mat quality and smoothness	-	-	-	-
PC17. coordinate with other construction personnel to ensure the continuous supply of material to the paver	-	-	-	-
PC18. perform daily pre-operation checks, including inspecting fluid levels, belts, and the screed condition, to avoid breakdowns	-	-	-	-
Basic operation of grader	6	10	-	4
PC19. identify and describe the key parts of a Grader, including the blade (moldboard), circle, scarifier, and operator controls	-	-	-	-
PC20. understand the Grader's function in leveling and smoothing the surface of a road or site, preparing it for further construction	-	-	-	-
PC21. operate the Grader to level and shape the sub-base or base of a road, ensuring that the required slope and gradient are achieved	-	-	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC22. adjust the moldboard and control the machine's speed and direction to achieve a consistent and smooth surface finish	-	-	-	-
PC23. collaborate with site engineers to ensure grading accuracy according to design plans and specifications	-	-	-	-
PC24. conduct daily inspections of the Grader, checking hydraulic systems, blade condition, and tire pressure	-	-	-	-
Basic operation of loader	6	10	-	4
PC25. identify and describe the key parts of a Loader, including the bucket, lift arms, engine, and operator controls	-	-	-	-
PC26. understand the Loader's role in moving and loading materials such as soil, aggregate, and debris at construction sites	-	-	-	-
PC27. operate the Loader to safely transport materials, ensuring correct bucket positioning and load balancing to prevent spillage	-	-	-	-
PC28. coordinate with other construction personnel to ensure the timely movement of materials to or from designated areas	-	-	-	-
PC29. perform daily operational checks, including inspecting the hydraulic systems, bucket condition, and tire wear	-	-	-	-
PC30. ensure proper maintenance of the Loader, including lubrication of moving parts, engine checks, and refueling	-	-	-	-
NOS Total	**30**	**50**	**-**	**20**

Qualification Pack

National Occupational Standards (NOS) Parameters

NOS Code	ICE/CON/N5009
NOS Name	Basics of plants and machinery (Hot Mix Plant, Batching Plant, Paver, Grader, Loader)
Sector	Construction
Sub-Sector	
Occupation	Quality Assurance and Quality Control
NSQF Level	4
Credits	1
Version	1.0
Last Reviewed Date	17/01/2025
Next Review Date	17/01/2030
NSQC Clearance Date	17/01/2025

ICE/CON/N5010: Basics of preparation of lab program and reporting daily progress report and monthly progress report

Description

This unit outlines the competencies required to design and implement a laboratory testing program and report the results and progress in the form of Daily Progress Reports (DPR) and Monthly Progress Reports (MPR). It covers setting up lab schedules, conducting tests, and systematically reporting project progress in construction, infrastructure, and civil engineering projects

Scope

The scope covers the following :

- Preparation of lab testing program
- Preparation of Daily Progress Report (DPR)
- Preparation of Monthly Progress Report (MPR

Elements and Performance Criteria

Preparation of lab testing program

To be competent, the user/individual on the job must be able to:

PC1. identify project requirements, specifications, and standards for testing construction materials such as soil, aggregates, bitumen, concrete, steel, etc.

PC2. design a comprehensive lab testing program, including a timeline for tests such as material characterization, quality control tests, and validation of fieldwork results

PC3. ensure that the testing program complies with project specifications, quality standards (such as IS, ASTM, or relevant local standards), and the timelines set by the project management team

PC4. allocate resources, including personnel, testing equipment, and materials, to ensure the smooth execution of the lab program

PC5. monitor the progress of the lab tests, ensuring timely completion and reporting of results

PC6. maintain flexibility in the testing program to accommodate project delays or changes in the scope of work

Preparation of Daily Progress Report (DPR)

To be competent, the user/individual on the job must be able to:

PC7. collect and organize daily test data from ongoing lab tests, including observations, results, and any issues encountered

PC8. ensure that the DPR includes details such as the type of test conducted, date and time, test results, materials tested, and any deviations from project specifications

PC9. compile a summary of the day's lab activities, highlighting significant test outcomes, issues faced, and resolutions

PC10. coordinate with site engineers and project managers to ensure consistency between field activities and lab progress

PC11. review and verify the accuracy of all reported data before submitting the DPR to the project management team

PC12. submit the DPR within the specified deadline, ensuring the project team has up-to-date information on lab activities and test outcomes

Preparation of Monthly Progress Report (MPR)

To be competent, the user/individual on the job must be able to:

PC13. compile detailed test results and observations from the laboratory testing program for the entire month, organizing them into sections for easy review

PC14. include a summary of key performance metrics, such as the number of tests completed, pending tests, and overall lab efficiency

PC15. highlight critical test outcomes that affect project decisions, including major test failures, deviations from specifications, and remedial actions taken

PC16. 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)

PC17. coordinate with site engineers, project managers, and quality control personnel to ensure that the MPR reflects both fieldwork and lab work progress

PC18. ensure that the MPR is reviewed by senior lab personnel for accuracy and completeness before submission

PC19. submit the MPR by the specified deadline to inform the project team of overall progress and performance in relation to the testing schedule

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. the principles of setting up a laboratory testing program based on project requirements, ensuring all key material tests are included

KU2. the testing standards and procedures for construction materials

KU3. scheduling and resource management for lab personnel, equipment, and materials

KU4. the documentation protocols for test data, maintaining clear and detailed records of test results and observations

KU5. quality assurance principles to ensure accurate and reliable test results

KU6. structure and format of a standard DPR, including what details need to be reported daily

KU7. the best practices for organizing and presenting test data in a clear and concise manner

KU8. the coordination techniques to ensure lab progress is in sync with field activities

KU9. the importance of timely and accurate reporting to support project decision-making

KU10. the tools and software used for generating DPRs, such as spreadsheets, lab management systems, or project management tools

KU11. the structure and format of an MPR, including comprehensive reporting of monthly lab activities

KU12. data analysis methods to interpret test results over time and highlight trends or issues

KU13. the coordination techniques for gathering data and insights from various team members, ensuring a comprehensive MPR

KU14. Key Performance Indicators (KPIs) for lab work, such as test completion rates, efficiency, and accuracy of results

KU15. use of appropriate software tools to generate MPRs, including project management platforms or laboratory information management systems (LIMS)

Generic Skills (GS)

User/individual on the job needs to know how to:

GS1. follow verbal instructions, convey information clearly and concisely to team members and supervisors

GS2. read, interpret, and write simple instructions, reports, and documentation

GS3. perform basic arithmetic operations such as addition, subtraction, multiplication, and division

GS4. use basic IT tools and applications for effective data management

GS5. work effectively in a team, supporting colleagues and contributing to team goals

GS6. assist others, share knowledge, and seek help, when necessary

GS7. manage time effectively and prioritize tasks to meet deadlines

GS8. adapt to changing work environments, tasks, and processes

GS9. focus on tasks and ensure accuracy in work

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Preparation of lab testing program	10	16	-	6
PC1. identify project requirements, specifications, and standards for testing construction materials such as soil, aggregates, bitumen, concrete, steel, etc.	-	-	-	-
PC2. design a comprehensive lab testing program, including a timeline for tests such as material characterization, quality control tests, and validation of fieldwork results	-	-	-	-
PC3. ensure that the testing program complies with project specifications, quality standards (such as IS, ASTM, or relevant local standards), and the timelines set by the project management team	-	-	-	-
PC4. allocate resources, including personnel, testing equipment, and materials, to ensure the smooth execution of the lab program	-	-	-	-
PC5. monitor the progress of the lab tests, ensuring timely completion and reporting of results	-	-	-	-
PC6. maintain flexibility in the testing program to accommodate project delays or changes in the scope of work	-	-	-	-
Preparation of Daily Progress Report (DPR)	10	17	-	6
PC7. collect and organize daily test data from ongoing lab tests, including observations, results, and any issues encountered	-	-	-	-
PC8. ensure that the DPR includes details such as the type of test conducted, date and time, test results, materials tested, and any deviations from project specifications	-	-	-	-
PC9. compile a summary of the day's lab activities, highlighting significant test outcomes, issues faced, and resolutions	-	-	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC10. coordinate with site engineers and project managers to ensure consistency between field activities and lab progress	-	-	-	-
PC11. review and verify the accuracy of all reported data before submitting the DPR to the project management team	-	-	-	-
PC12. submit the DPR within the specified deadline, ensuring the project team has up-to-date information on lab activities and test outcomes	-	-	-	-
Preparation of Monthly Progress Report (MPR)	10	17	-	8
PC13. compile detailed test results and observations from the laboratory testing program for the entire month, organizing them into sections for easy review	-	-	-	-
PC14. include a summary of key performance metrics, such as the number of tests completed, pending tests, and overall lab efficiency	-	-	-	-
PC15. highlight critical test outcomes that affect project decisions, including major test failures, deviations from specifications, and remedial actions taken	-	-	-	-
PC16. 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)	-	-	-	-
PC17. coordinate with site engineers, project managers, and quality control personnel to ensure that the MPR reflects both fieldwork and lab work progress	-	-	-	-
PC18. ensure that the MPR is reviewed by senior lab personnel for accuracy and completeness before submission	-	-	-	-
PC19. submit the MPR by the specified deadline to inform the project team of overall progress and performance in relation to the testing schedule	-	-	-	-
NOS Total	**30**	**50**	**-**	**20**

Qualification Pack

National Occupational Standards (NOS) Parameters

NOS Code	ICE/CON/N5010
NOS Name	Basics of preparation of lab program and reporting daily progress report and monthly progress report
Sector	Construction
Sub-Sector	
Occupation	Quality Assurance and Quality Control
NSQF Level	4
Credits	1
Version	1.0
Last Reviewed Date	17/01/2025
Next Review Date	17/01/2030
NSQC Clearance Date	17/01/2025

ICE/CON/N5011: Follow health, safety, and environmental standards in construction material testing

Description

This unit outlines the health, safety, and environmental standards required for conducting construction material testing in labs and field environments. It ensures adherence to safety protocols for equipment handling, material storage, and testing procedures while fostering a culture of safety awareness.

Scope

The scope covers the following :

- Ensure safety during UTM testing
- Ensure safety during GPR testing
- Ensure safety during ultrasonic testing
- Ensure safety during ECT
- Ensure safety during NDT
- Follow material handling and storage protocols
- Maintain equipment safety
- Follow emergency and environmental compliance standards
- Adhere to lab safety procedures

Elements and Performance Criteria

Ensure safety during UTM testing

To be competent, the user/individual on the job must be able to:

PC1. verify calibration and functionality of UTM before use

PC2. use appropriate guards and barriers to prevent accidental contact

PC3. follow SOPs for tensile, compressive, flexural, and shear tests, ensuring load limits are not exceeded

Ensure safety during GPR testing

To be competent, the user/individual on the job must be able to:

PC4. use GPR in areas cleared of obstacles to prevent tripping

PC5. ensure all safety protocols are in place, especially in active construction or traffic zones

PC6. ensure the equipment's electromagnetic emissions meet regulatory standards

Ensure safety during ultrasonic testing

To be competent, the user/individual on the job must be able to:

PC7. use couplants as per guidelines and avoid spillage to prevent slips

PC8. inspect transducers and ensure proper insulation of cables

Ensure safety during ECT

To be competent, the user/individual on the job must be able to:

PC9. calibrate ECT probes to avoid inaccuracies

PC10. follow precautions to handle high-frequency equipment safely

Ensure safety during NDT

To be competent, the user/individual on the job must be able to:

PC11. adhere to safety standards for rebound hammers, pulse velocity meters, and core drills

PC12. ensure operators are trained to detect equipment malfunctions during use

Follow material handling and storage protocols

To be competent, the user/individual on the job must be able to:

PC13. identify hazards associated with materials like aggregates, bitumen, and chemicals

PC14. store chemicals in labeled, ventilated cabinets, segregated by reactivity type

PC15. handle and transport materials using appropriate lifting techniques to prevent strain injuries

PC16. dispose of material waste, including hazardous chemicals, as per environmental regulations

Maintain equipment safety

To be competent, the user/individual on the job must be able to:

PC17. perform regular maintenance and inspections of testing machines to ensure their safe operation

PC18. use lockout/tagout procedures to deactivate faulty machines during repairs

PC19. prevent electrical hazards by ensuring grounded connections for powered equipment

Follow emergency and environmental compliance standards

To be competent, the user/individual on the job must be able to:

PC20. familiarize with fire safety protocols and emergency exits in the lab

PC21. ensure availability and proper use of first aid kits, fire extinguishers, and eyewash stations

PC22. participate in periodic drills for fire, chemical spills, and evacuation scenarios

PC23. follow spill control measures and waste segregation systems for sustainability

Adhere to lab safety procedures

To be competent, the user/individual on the job must be able to:

PC24. ensure testing stations are clean, organized, and free of clutter

PC25. use fume hoods during chemical tests to prevent inhalation of harmful vapors

PC26. label and store samples securely to prevent contamination or spillage

PC27. maintain proper ventilation and lighting in the lab to ensure a conducive working environment

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. the applicable health and safety regulations (e.g., OSHA, ISO 45001)

KU2. the safety procedures for working on construction sites

KU3. the use of relevant Personal Protective Equipment (PPE) such as safety goggles, gloves, and hard hats

KU4. the safe handling techniques for chemicals and construction materials

KU5. the first aid measures for injuries related to burns, cuts, or chemical exposure

KU6. the environmental regulations for waste disposal and energy-efficient operations

KU7. the operating principles and hazards of testing machines such as UTM, GPR, and ECT

KU8. the safety protocols to be followed when operating the UTM to prevent accidents

KU9. the safety precautions to protect against the electromagnetic radiation emitted by GPR equipment

KU10. the safety procedures for handling and operating digital testing equipment

KU11. the safety protocols for operating ultrasonic testing equipment, including proper handling of probes and protection against potential hazards

KU12. the safety procedures for conducting ECT, including safe handling of electrical equipment and awareness of potential hazards

KU13. the safety procedures for working with hot bitumen

KU14. the safety measures to be taken during NDT, especially when working at heights or with complex structures

KU15. the importance of focusing on functionality, workflow optimization, safety, ventilation, and fire safety in lab operations

KU16. the calibration requirements and safety features for mechanical and NDT tools

KU17. the preventive maintenance practices for lab and field equipment

KU18. the characteristics of materials such as bitumen, steel, and aggregates

KU19. the chemical reactivity and compatibility for safe storage and handling

KU20. the fire suppression techniques for electrical and chemical fires

KU21. the evacuation protocols for lab and field settings

KU22. the ergonomics for workstation setup and material lifting

KU23. the best practices for sample preservation and testing accuracy

KU24. the safety protocols for handling hot bitumen and high-temperature equipment

KU25. the safety precautions for handling cement, aggregates, and chemical additives

KU26. the safety protocols for operating pavers, especially when working on active construction sites

KU27. the safety measures when operating Graders, including working on uneven terrain and near other heavy machinery

KU28. the safety protocols for operating Loaders, including load balancing, correct use of operator controls, and safe maneuvering

Generic Skills (GS)

User/individual on the job needs to know how to:

GS1. follow verbal instructions, convey information clearly and concisely to team members and supervisors

GS2. read, interpret, and write simple instructions, reports, and documentation

GS3. perform basic arithmetic operations such as addition, subtraction, multiplication, and division

GS4. use basic IT tools and applications for effective data management

GS5. work effectively in a team, supporting colleagues and contributing to team goals

GS6. assist others, share knowledge, and seek help, when necessary

GS7. manage time effectively and prioritize tasks to meet deadlines

GS8. adapt to changing work environments, tasks, and processes

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Ensure safety during UTM testing	4	8	-	2
PC1. verify calibration and functionality of UTM before use	-	-	-	-
PC2. use appropriate guards and barriers to prevent accidental contact	-	-	-	-
PC3. follow SOPs for tensile, compressive, flexural, and shear tests, ensuring load limits are not exceeded	-	-	-	-
Ensure safety during GPR testing	4	8	-	2
PC4. use GPR in areas cleared of obstacles to prevent tripping	-	-	-	-
PC5. ensure all safety protocols are in place, especially in active construction or traffic zones	-	-	-	-
PC6. ensure the equipment's electromagnetic emissions meet regulatory standards	-	-	-	-
Ensure safety during ultrasonic testing	2	5	-	2
PC7. use couplants as per guidelines and avoid spillage to prevent slips	-	-	-	-
PC8. inspect transducers and ensure proper insulation of cables	-	-	-	-
Ensure safety during ECT	2	5	-	1
PC9. calibrate ECT probes to avoid inaccuracies	-	-	-	-
PC10. follow precautions to handle high-frequency equipment safely	-	-	-	-
Ensure safety during NDT	2	5	-	1
PC11. adhere to safety standards for rebound hammers, pulse velocity meters, and core drills	-	-	-	-
PC12. ensure operators are trained to detect equipment malfunctions during use	-	-	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Follow material handling and storage protocols	4	6	-	3
PC13. identify hazards associated with materials like aggregates, bitumen, and chemicals	-	-	-	-
PC14. store chemicals in labeled, ventilated cabinets, segregated by reactivity type	-	-	-	-
PC15. handle and transport materials using appropriate lifting techniques to prevent strain injuries	-	-	-	-
PC16. dispose of material waste, including hazardous chemicals, as per environmental regulations	-	-	-	-
Maintain equipment safety	3	4	-	3
PC17. perform regular maintenance and inspections of testing machines to ensure their safe operation	-	-	-	-
PC18. use lockout/tagout procedures to deactivate faulty machines during repairs	-	-	-	-
PC19. prevent electrical hazards by ensuring grounded connections for powered equipment	-	-	-	-
Follow emergency and environmental compliance standards	4	6	-	3
PC20. familiarize with fire safety protocols and emergency exits in the lab	-	-	-	-
PC21. ensure availability and proper use of first aid kits, fire extinguishers, and eyewash stations	-	-	-	-
PC22. participate in periodic drills for fire, chemical spills, and evacuation scenarios	-	-	-	-
PC23. follow spill control measures and waste segregation systems for sustainability	-	-	-	-
Adhere to lab safety procedures	5	3	-	3
PC24. ensure testing stations are clean, organized, and free of clutter	-	-	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC25. use fume hoods during chemical tests to prevent inhalation of harmful vapors	-	-	-	-
PC26. label and store samples securely to prevent contamination or spillage	-	-	-	-
PC27. maintain proper ventilation and lighting in the lab to ensure a conducive working environment	-	-	-	-
NOS Total	**30**	**50**	**-**	**20**

Qualification Pack

National Occupational Standards (NOS) Parameters

NOS Code	ICE/CON/N5011
NOS Name	Follow health, safety, and environmental standards in construction material testing
Sector	Construction
Sub-Sector	
Occupation	Quality Assurance and Quality Control
NSQF Level	4
Credits	1
Version	1.0
Last Reviewed Date	17/01/2025
Next Review Date	17/01/2030
NSQC Clearance Date	17/01/2025

DGT/VSQ/N0102: Employability Skills (60 Hours)

Description

This unit is about employability skills, Constitutional values, becoming a professional in the 21st Century, digital, financial, and legal literacy, diversity and Inclusion, English and communication skills, customer service, entrepreneurship, and apprenticeship, getting ready for jobs and career development.

Scope

The scope covers the following :

- Introduction to Employability Skills
- Constitutional values - Citizenship
- Becoming a Professional in the 21st Century
- Basic English Skills
- Career Development & Goal Setting
- Communication Skills
- Diversity & Inclusion
- Financial and Legal Literacy
- Essential Digital Skills
- Entrepreneurship
- Customer Service
- Getting ready for Apprenticeship & Jobs

Elements and Performance Criteria

Introduction to Employability Skills

To be competent, the user/individual on the job must be able to:

PC1. identify employability skills required for jobs in various industries

PC2. identify and explore learning and employability portals

Constitutional values - Citizenship

To be competent, the user/individual on the job must be able to:

PC3. recognize the significance of constitutional values, including civic rights and duties, citizenship, responsibility towards society etc. and personal values and ethics such as honesty, integrity, caring and respecting others, etc.

PC4. follow environmentally sustainable practices

Becoming a Professional in the 21st Century

To be competent, the user/individual on the job must be able to:

PC5. recognize the significance of 21st Century Skills for employment

PC6. practice the 21st Century Skills such as Self-Awareness, Behaviour Skills, time management, critical and adaptive thinking, problem-solving, creative thinking, social and cultural awareness, emotional awareness, learning to learn for continuous learning etc. in personal and professional life

Basic English Skills

To be competent, the user/individual on the job must be able to:

PC7. use basic English for everyday conversation in different contexts, in person and over the telephone

PC8. read and understand routine information, notes, instructions, mails, letters etc. written in English

PC9. write short messages, notes, letters, e-mails etc. in English

Career Development & Goal Setting

To be competent, the user/individual on the job must be able to:

PC10. understand the difference between job and career

PC11. prepare a career development plan with short- and long-term goals, based on aptitude

Communication Skills

To be competent, the user/individual on the job must be able to:

PC12. follow verbal and non-verbal communication etiquette and active listening techniques in various settings

PC13. work collaboratively with others in a team

Diversity & Inclusion

To be competent, the user/individual on the job must be able to:

PC14. communicate and behave appropriately with all genders and PwD

PC15. escalate any issues related to sexual harassment at workplace according to POSH Act

Financial and Legal Literacy

To be competent, the user/individual on the job must be able to:

PC16. select financial institutions, products and services as per requirement

PC17. carry out offline and online financial transactions, safely and securely

PC18. identify common components of salary and compute income, expenses, taxes, investments etc

PC19. identify relevant rights and laws and use legal aids to fight against legal exploitation

Essential Digital Skills

To be competent, the user/individual on the job must be able to:

PC20. operate digital devices and carry out basic internet operations securely and safely

PC21. use e- mail and social media platforms and virtual collaboration tools to work effectively

PC22. use basic features of word processor, spreadsheets, and presentations

Entrepreneurship

To be competent, the user/individual on the job must be able to:

PC23. identify different types of Entrepreneurship and Enterprises and assess opportunities for potential business through research

PC24. develop a business plan and a work model, considering the 4Ps of Marketing Product, Price, Place and Promotion

PC25. identify sources of funding, anticipate, and mitigate any financial/ legal hurdles for the potential business opportunity

Customer Service

To be competent, the user/individual on the job must be able to:

PC26. identify different types of customers

PC27. identify and respond to customer requests and needs in a professional manner.

PC28. follow appropriate hygiene and grooming standards

Getting ready for apprenticeship & Jobs

To be competent, the user/individual on the job must be able to:

PC29. create a professional Curriculum vitae (Résumé)

PC30. search for suitable jobs using reliable offline and online sources such as Employment exchange, recruitment agencies, newspapers etc. and job portals, respectively

PC31. apply to identified job openings using offline /online methods as per requirement

PC32. answer questions politely, with clarity and confidence, during recruitment and selection

PC33. identify apprenticeship opportunities and register for it as per guidelines and requirements

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. need for employability skills and different learning and employability related portals

KU2. various constitutional and personal values

KU3. different environmentally sustainable practices and their importance

KU4. Twenty first (21st) century skills and their importance

KU5. how to use English language for effective verbal (face to face and telephonic) and written communication in formal and informal set up

KU6. importance of career development and setting long- and short-term goals

KU7. about effective communication

KU8. POSH Act

KU9. Gender sensitivity and inclusivity

KU10. different types of financial institutes, products, and services

KU11. how to compute income and expenditure

KU12. importance of maintaining safety and security in offline and online financial transactions

KU13. different legal rights and laws

KU14. different types of digital devices and the procedure to operate them safely and securely

KU15. how to create and operate an e- mail account and use applications such as word processors, spreadsheets etc.

KU16. how to identify business opportunities

KU17. types and needs of customers

KU18. how to apply for a job and prepare for an interview

KU19. apprenticeship scheme and the process of registering on apprenticeship portal

Generic Skills (GS)

User/individual on the job needs to know how to:

GS1. read and write different types of documents/instructions/correspondence

GS2. communicate effectively using appropriate language in formal and informal settings

GS3. behave politely and appropriately with all
GS4. how to work in a virtual mode
GS5. perform calculations efficiently
GS6. solve problems effectively
GS7. pay attention to details
GS8. manage time efficiently
GS9. maintain hygiene and sanitization to avoid infection

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Introduction to Employability Skills	1	1	-	-
PC1. identify employability skills required for jobs in various industries	-	-	-	-
PC2. identify and explore learning and employability portals	-	-	-	-
Constitutional values - Citizenship	1	1	-	-
PC3. recognize the significance of constitutional values, including civic rights and duties, citizenship, responsibility towards society etc. and personal values and ethics such as honesty, integrity, caring and respecting others, etc.	-	-	-	-
PC4. follow environmentally sustainable practices	-	-	-	-
Becoming a Professional in the 21st Century	2	4	-	-
PC5. recognize the significance of 21st Century Skills for employment	-	-	-	-
PC6. practice the 21st Century Skills such as Self-Awareness, Behaviour Skills, time management, critical and adaptive thinking, problem-solving, creative thinking, social and cultural awareness, emotional awareness, learning to learn for continuous learning etc. in personal and professional life	-	-	-	-
Basic English Skills	2	3	-	-
PC7. use basic English for everyday conversation in different contexts, in person and over the telephone	-	-	-	-
PC8. read and understand routine information, notes, instructions, mails, letters etc. written in English	-	-	-	-
PC9. write short messages, notes, letters, e-mails etc. in English	-	-	-	-
Career Development & Goal Setting	1	2	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC10. understand the difference between job and career	-	-	-	-
PC11. prepare a career development plan with short- and long-term goals, based on aptitude	-	-	-	-
Communication Skills	2	2	-	-
PC12. follow verbal and non-verbal communication etiquette and active listening techniques in various settings	-	-	-	-
PC13. work collaboratively with others in a team	-	-	-	-
Diversity & Inclusion	1	2	-	-
PC14. communicate and behave appropriately with all genders and PwD	-	-	-	-
PC15. escalate any issues related to sexual harassment at workplace according to POSH Act	-	-	-	-
Financial and Legal Literacy	2	3	-	-
PC16. select financial institutions, products and services as per requirement	-	-	-	-
PC17. carry out offline and online financial transactions, safely and securely	-	-	-	-
PC18. identify common components of salary and compute income, expenses, taxes, investments etc	-	-	-	-
PC19. identify relevant rights and laws and use legal aids to fight against legal exploitation	-	-	-	-
Essential Digital Skills	3	4	-	-
PC20. operate digital devices and carry out basic internet operations securely and safely	-	-	-	-
PC21. use e- mail and social media platforms and virtual collaboration tools to work effectively	-	-	-	-
PC22. use basic features of word processor, spreadsheets, and presentations	-	-	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Entrepreneurship	2	3	-	-
PC23. identify different types of Entrepreneurship and Enterprises and assess opportunities for potential business through research	-	-	-	-
PC24. develop a business plan and a work model, considering the 4Ps of Marketing Product, Price, Place and Promotion	-	-	-	-
PC25. identify sources of funding, anticipate, and mitigate any financial/ legal hurdles for the potential business opportunity	-	-	-	-
Customer Service	1	2	-	-
PC26. identify different types of customers	-	-	-	-
PC27. identify and respond to customer requests and needs in a professional manner.	-	-	-	-
PC28. follow appropriate hygiene and grooming standards	-	-	-	-
Getting ready for apprenticeship & Jobs	2	3	-	-
PC29. create a professional Curriculum vitae (Résumé)	-	-	-	-
PC30. search for suitable jobs using reliable offline and online sources such as Employment exchange, recruitment agencies, newspapers etc. and job portals, respectively	-	-	-	-
PC31. apply to identified job openings using offline /online methods as per requirement	-	-	-	-
PC32. answer questions politely, with clarity and confidence, during recruitment and selection	-	-	-	-
PC33. identify apprenticeship opportunities and register for it as per guidelines and requirements	-	-	-	-
NOS Total	**20**	**30**	**-**	**-**

National Occupational Standards (NOS) Parameters

NOS Code	DGT/VSQ/N0102
NOS Name	Employability Skills (60 Hours)
Sector	Cross Sectoral
Sub-Sector	Professional Skills
Occupation	Employability
NSQF Level	4
Credits	2
Version	1.0
Last Reviewed Date	17/01/2025
Next Review Date	17/01/2030
NSQC Clearance Date	17/01/2025

Assessment Guidelines and Assessment Weightage

Assessment Guidelines

1. Criteria for assessment for each Qualification Pack will be created by the Awarding Body. Each Performance Criteria (PC)/ Element will be assigned marks proportional to its importance in NOS. AB will also lay down proportion of marks for Theory and Skills Practical for each PC/ Element.

2. The assessment for the knowledge part will be based on knowledge bank of questions created by Assessment Bodies subject to approval by AB

3. Individual assessment agencies will create unique question papers for knowledge/theory part for assessment of candidates as per assessment criteria given below

4. Individual assessment agencies will create unique evaluations for skill practical for every student at each examination/training center based on assessment criteria.

5. The passing percentage for each QP will be 70%. To pass the Qualification Pack, every trainee should score a minimum of 70% individually in each NOS.

6. The Assessor shall check the final outcome of the practices while evaluating the steps performed to achieve the final outcome.

7. The trainee shall be provided with a chance to repeat the test to correct his procedures in case of improper performance, with a deduction of marks for each iteration.

8. After the certain number of iterations as decided by AB the trainee is marked as fail, scoring zero marks for the procedure for the practical activity.

9. In case of successfully passing only certain number of NOS's, the trainee is eligible to take subsequent assessment on the balance NOS's to pass the Qualification Pack within the specified time frame set by AB.

10. Minimum duration of Assessment of each QP shall be of 4hrs/trainee

Minimum Aggregate Passing % at QP Level : 70

(**Please note**: Every Trainee should score a minimum aggregate passing percentage as specified above, to successfully clear the Qualification Pack assessment.)

Assessment Weightage

Compulsory NOS

National Occupational Standards	Theory Marks	Practical Marks	Project Marks	Viva Marks	Total Marks	Weightage
ICE/CON/N5001.Conduct construction material testing using the Universal Testing Machine (UTM)	30	50	-	20	100	10
ICE/CON/N5002.Conduct Ground Penetrating Radar (GPR) testing	30	50	-	20	100	8
ICE/CON/N5003.Carry out Digital Concrete Testing	30	50	-	20	100	7
ICE/CON/N5004.Carry out Ultrasonic Testing (UT) of construction materials	30	50	-	20	100	8
ICE/CON/N5005.Carry out Eddy Current Testing (ECT) of construction materials	30	50	-	20	100	7

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MINISTRY OF SKILL DEVELOPMENT & ENTREPRENEURSHIP

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Qualification Pack

National Occupational Standards	Theory Marks	Practical Marks	Project Marks	Viva Marks	Total Marks	Weightage
ICE/CON/N5006.Conduct tests on soil, aggregate, bitumen, steel, different construction mixes, and NDT on concrete	30	50	-	20	100	10
ICE/CON/N5007.Carry out Highway Testing through FWD, NSV, Benkelman Beam, and Total Station	30	50	-	20	100	8
ICE/CON/N5008.Set up the project civil lab	30	50	-	20	100	10
ICE/CON/N5009.Basics of plants and machinery (Hot Mix Plant, Batching Plant, Paver, Grader, Loader)	30	50	-	20	100	10
ICE/CON/N5010.Basics of preparation of lab program and reporting daily progress report and monthly progress report	30	50	-	20	100	10
ICE/CON/N5011.Follow health, safety, and environmental standards in construction material testing	30	50	-	20	100	7
DGT/VSQ/N0102.Employability Skills (60 Hours)	20	30	-	-	50	5
Total	**350**	**580**	**-**	**220**	**1150**	**100**

Acronyms

NOS	National Occupational Standard(s)
NSQF	National Skills Qualifications Framework
QP	Qualifications Pack
TVET	Technical and Vocational Education and Training

Glossary

Sector	Sector is a conglomeration of different business operations having similar business and interests. It may also be defined as a distinct subset of the economy whose components share similar characteristics and interests.
Sub-sector	Sub-sector is derived from a further breakdown based on the characteristics and interests of its components.
Occupation	Occupation is a set of job roles, which perform similar/ related set of functions in an industry.
Job role	Job role defines a unique set of functions that together form a unique employment opportunity in an organisation.
Occupational Standards (OS)	OS specify the standards of performance an individual must achieve when carrying out a function in the workplace, together with the Knowledge and Understanding (KU) they need to meet that standard consistently. Occupational Standards are applicable both in the Indian and global contexts.
Performance Criteria (PC)	Performance Criteria (PC) are statements that together specify the standard of performance required when carrying out a task.
National Occupational Standards (NOS)	NOS are occupational standards which apply uniquely in the Indian context.
Qualifications Pack (QP)	QP comprises the set of OS, together with the educational, training and other criteria required to perform a job role. A QP is assigned a unique qualifications pack code.
Unit Code	Unit code is a unique identifier for an Occupational Standard, which is denoted by an 'N'
Unit Title	Unit title gives a clear overall statement about what the incumbent should be able to do.
Description	Description gives a short summary of the unit content. This would be helpful to anyone searching on a database to verify that this is the appropriate OS they are looking for.
Scope	Scope is a set of statements specifying the range of variables that an individual may have to deal with in carrying out the function which have a critical impact on quality of performance required.

Knowledge and Understanding (KU)	Knowledge and Understanding (KU) are statements which together specify the technical, generic, professional and organisational specific knowledge that an individual needs in order to perform to the required standard.
Organisational Context	Organisational context includes the way the organisation is structured and how it operates, including the extent of operative knowledge managers have of their relevant areas of responsibility.
Technical Knowledge	Technical knowledge is the specific knowledge needed to accomplish specific designated responsibilities.
Core Skills/ Generic Skills (GS)	Core skills or Generic Skills (GS) are a group of skills that are the key to learning and working in today's world. These skills are typically needed in any work environment in today's world. These skills are typically needed in any work environment. In the context of the OS, these include communication related skills that are applicable to most job roles.
Electives	Electives are NOS/set of NOS that are identified by the sector as contributive to specialization in a job role. There may be multiple electives within a QP for each specialized job role. Trainees must select at least one elective for the successful completion of a QP with Electives.
Options	Options are NOS/set of NOS that are identified by the sector as additional skills. There may be multiple options within a QP. It is not mandatory to select any of the options to complete a QP with Options.