Qualification Pack

Roadway Surveyor

QP Code: ICE/CON/Q0201

Version: 1.0

NSQF Level: 4.5

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Qualification Pack

ICE/CON/Q0201: Roadway Surveyor

Brief Job Description

Roadway Surveyor is responsible for conducting precise surveys and measurements of land and infrastructure for highway engineering projects. This role involves the use of advanced tools and technologies such as Total Station, GPS, and AI-based technologies to ensure accuracy and efficiency in data collection and analysis. The individual plays a crucial role in supporting the design, construction, and maintenance of highways, contributing to the overall success of infrastructure projects.

Personal Attributes

A roadway surveyor in construction must be physically fit to work in diverse outdoor conditions and active construction zones. Precision and diligence are essential for accurate measurements, data validation, and compliance with project standards. They should be organized, efficient, and safety-conscious, adhering to protocols in high-risk environments. Quick decision-making and problem-solving skills are vital for addressing on-site challenges. Effective collaboration with engineers, contractors, and crews is crucial, along with proficiency in modern tools like GPS, LiDAR, and GIS. Strong communication skills are necessary for presenting findings, preparing reports, and ensuring seamless coordination across all project stakeholders.

Applicable National Occupational Standards (NOS)

Compulsory NOS:

1. ICE/CON/N0203: Site Preparation and Field survey
2. ICE/CON/N0205: Conduct field surveys for highway and mega projects
3. ICE/CON/N0204: Perform analysis and interpretation of highway survey data
4. ICE/CON/N0201: Maintain the highway survey tools and equipment
5. ICE/CON/N0202: Ensure health and safety in roadway survey operations
6. DGT/VSQ/N0102: Employability Skills (60 Hours)

Qualification Pack (QP) Parameters

Sector	Construction
Sub-Sector	Infrastructure Construction
Occupation	Surveying

Qualification Pack

Country	India
NSQF Level	4.5
Credits	18
Aligned to NCO/ISCO/ISIC Code	NCO-2015/2165.0200
Minimum Educational Qualification & Experience	Completed 3 year diploma after 10th OR 12th grade Pass with 1 Year of experience in land and topographic surveying OR 10th grade pass with 3 Years of experience in land and topographic surveying OR Previous relevant Qualification of NSQF Level (3.5) with 3 Years of experience in land and topographic surveying OR Previous relevant Qualification of NSQF Level (4) with 1-2 Years of experience in land and topographic surveying
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
Reference code on NQR	QG-4.5-CO-03457-2025-V1-TICE
NQR Version	1

Qualification Pack

ICE/CON/N0203: Site Preparation and Field survey

Description

The "Site Preparation and Field Survey in Roadway Survey" module is designed to provide learners with a comprehensive understanding of the initial stages of roadway construction. This includes preparing the site for work and conducting accurate field surveys. Learners will explore key aspects such as site assessments, clearing and grading techniques, and the use of advanced surveying tools like GPS and total stations. The course emphasizes safety, sustainability, and real-world applications through practical exercises and case studies, ensuring learners are well-prepared for professional roadway survey tasks.

Scope

The scope covers the following :

- This module focuses on teaching learners the principles and practical skills needed for site preparation and field surveys in roadway projects.
- It covers preliminary site assessments, clearing and grading, marking boundaries, and using surveying instruments like theodolites, total stations, and GPS.
- Learners will gain expertise in data collection, establishing control points, creating contour maps, and addressing safety and environmental concerns.
- Through hands-on exercises and case studies, participants will develop the skills to efficiently execute roadway surveys and solve site-specific challenges.

Elements and Performance Criteria

Define the survey objectives and scope

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

PC1. Determine the objectives of the survey, including the specific data requirements (e.g. topographic mapping, land use, environmental features).

PC2. Define the geographic boundaries of the survey area, including any specific points of interest or key landmarks, such as intersections, bridges, or drainage systems.

PC3. Define the accuracy standards needed for the survey data to assist in choosing the appropriate equipment and methods.

PC4. Identify specific survey objectives and prepare a detailed requirements checklist.

Review the existing information

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

PC5. Collect and review any available maps, aerial imagery, previous survey data, and design plans related to the survey project.

PC6. Identify any gaps in the existing data that the survey needs to address, such as changes in the landscape or new construction.

PC7. Review relevant legal and regulatory requirements, such as permits, access conditions, environmental regulations, and safety standards.

PC8. Analyze property records and legal documents to resolve boundary disputes.

Select Survey methodology and tools

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

PC9. Select the appropriate survey methods, such as terrestrial surveying, aerial LiDAR, GNSS, or Ground Penetrating Radar (GPR), based on the project requirements.

PC10. Select the specific tools and technology needed for the survey, such as Total Stations, GNSS receivers, drones (UAVs), or LiDAR systems.

PC11. Plan the data collection techniques, such as the placement of survey control points, flight paths for drones, or the spacing of GPR scans.

PC12. Select and use appropriate levelling instruments, such as Auto Level, Dumpy Level, and Tilting Level, to establish reference points and measure vertical distances with precision.

PC13. Perform basic maintenance of survey tools, including cleaning lenses and inspecting alignment.

Develop a survey plan

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

PC14. Develop a timeline for the survey operations, including start and end dates, key milestones, and deadlines for data processing and reporting.

PC15. Assign specific tasks to survey teams and equipment, ensuring that all required resources are readily available as needed.

PC16. Plan the logistics of the survey, including access to the site, transportation of equipment, and accommodation for survey teams, as necessary.

PC17. Prepare the site by removing debris, marking survey points, and establishing safety zones.

PC18. Coordinate the setup of the survey site, including the establishment of access routes, equipment staging areas, and safety zones.

Collaboration with Stakeholders

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

PC19. Communicate with key stakeholders, such as project managers, government agencies, landowners, and utility companies, to inform them of the survey plans.

PC20. Explain Right-of-Way (ROW) and easement considerations to stakeholders.

PC21. Prepare and present formal requests or agreements to secure necessary permissions for the survey.

PC22. Negotiate with relevant stakeholders to address land ownership issues, boundary disputes, and other concerns.

PC23. Identify and resolve any issues or requirements from stakeholders, such as minimizing traffic disruption or protecting sensitive environmental areas.

PC24. Coordinate survey activities with other contractors involved in the project to avoid conflicts and ensure that data collection aligns with the overall project objectives.

Conduct risk assessment and mitigation planning

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

PC25. Identify and document potential risks to the survey, such as weather conditions, equipment failure, or access restrictions.

PC26. Understand the prioritize risks based on their likelihood and impact.

PC27. explain and create a risk assessment matrix that outlines identified risks and corresponding mitigation strategies.

PC28. Develop strategies for mitigating risks, such as conducting equipment checks and preparing contingency plans for weather-related delays.

PC29. Understand plans for managing survey data, including data collection protocols, storage solutions, and backup procedures.

PC30. Ensure the safety of the survey team through training, the use of personal protective equipment (PPE), and emergency preparedness.

PC31. Implement mitigation measures, such as planning alternative routes or utilizing backup equipment.

Prepare survey documentation

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

PC32. Develop comprehensive instructions for the survey team, detailing specific tasks, required equipment, and data collection protocols to be followed.

PC33. Prepare maps and plans that define the survey area, control point locations, and other key details.

PC34. Ensure all necessary documentation is prepared to meet legal and regulatory requirements, such as permits or environmental impact assessments.

PC35. Review the documentation and address any compliance gaps.

Conduct a pre-survey review

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

PC36. Review the survey plan with the entire team to ensure everyone understands their roles, the schedule, and the objectives.

PC37. Conduct a thorough check of all equipment to confirm it is functional and properly calibrated.

PC38. Understand a safety briefing to review potential hazards, emergency procedures, and safety protocols.

PC39. Implement site-specific emergency procedures for situations like equipment failure or restricted access.

PC40. Ensure all necessary approvals and permits are obtained before starting the survey.

PC41. Verify that the required resources, including equipment and personnel, are prepared for the survey.

PC42. Conduct emergency response drills, such as medical evacuations or communication failure scenarios.

PC43. Use an audit checklist to verify that all required documentation is complete and in compliance.

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. Different types of surveys, such as topographic, alignment, and cross-section surveys, and their application in roadway projects.

KU2. How to determine survey objectives and identify the necessary data for accurate results.

KU3. Survey terminology and units of measurement used in field surveys.

KU4. Principles of leveling, contouring, and triangulation in surveying.

KU5. How to use leveling instruments, including Auto Level, Dumpy Level, and Tilting Level, for elevation measurements.

KU6. The use, operation, and maintenance of survey instruments like Total Station, GPS, and Theodolites.

KU7. How to calibrate and maintain survey instruments before use.

KU8. The difference and application of using a prism (reflector mode) versus reflector-less measurements.

KU9. he surveys accessories required for roadway projects, such as measuring tapes, ranging rods, tripods, and prisms.

KU10. The steps involved in site preparation, including clearing, grubbing, and staking out survey points.

KU11. Environmental regulations relevant to highway construction to minimize impact on sensitive areas.

KU12. Legal considerations related to land acquisition, right-of-way (ROW), and easement guidelines in roadway projects.

KU13. Risk assessment methods, safety protocols, and the importance of emergency response procedures, including PPE use.

Generic Skills (GS)

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

GS1. Follow verbal instructions and convey information clearly 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
Define the survey objectives and scope	**3**	**5**	**-**	**2**
PC1. Determine the objectives of the survey, including the specific data requirements (e.g. topographic mapping, land use, environmental features).	-	-	-	-
PC2. Define the geographic boundaries of the survey area, including any specific points of interest or key landmarks, such as intersections, bridges, or drainage systems.	-	-	-	-
PC3. Define the accuracy standards needed for the survey data to assist in choosing the appropriate equipment and methods.	-	-	-	-
PC4. Identify specific survey objectives and prepare a detailed requirements checklist.	-	-	-	-
Review the existing information	**3**	**5**	**-**	**2**
PC5. Collect and review any available maps, aerial imagery, previous survey data, and design plans related to the survey project.	-	-	-	-
PC6. Identify any gaps in the existing data that the survey needs to address, such as changes in the landscape or new construction.	-	-	-	-
PC7. Review relevant legal and regulatory requirements, such as permits, access conditions, environmental regulations, and safety standards.	-	-	-	-
PC8. Analyze property records and legal documents to resolve boundary disputes.	-	-	-	-
Select Survey methodology and tools	**6**	**10**	**-**	**4**
PC9. Select the appropriate survey methods, such as terrestrial surveying, aerial LiDAR, GNSS, or Ground Penetrating Radar (GPR), based on the project requirements.	-	-	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC10. Select the specific tools and technology needed for the survey, such as Total Stations, GNSS receivers, drones (UAVs), or LiDAR systems.	-	-	-	-
PC11. Plan the data collection techniques, such as the placement of survey control points, flight paths for drones, or the spacing of GPR scans.	-	-	-	-
PC12. Select and use appropriate levelling instruments, such as Auto Level, Dumpy Level, and Tilting Level, to establish reference points and measure vertical distances with precision.	-	-	-	-
PC13. Perform basic maintenance of survey tools, including cleaning lenses and inspecting alignment.	-	-	-	-
Develop a survey plan	**4**	**8**	**-**	**3**
PC14. Develop a timeline for the survey operations, including start and end dates, key milestones, and deadlines for data processing and reporting.	-	-	-	-
PC15. Assign specific tasks to survey teams and equipment, ensuring that all required resources are readily available as needed.	-	-	-	-
PC16. Plan the logistics of the survey, including access to the site, transportation of equipment, and accommodation for survey teams, as necessary.	-	-	-	-
PC17. Prepare the site by removing debris, marking survey points, and establishing safety zones.	-	-	-	-
PC18. Coordinate the setup of the survey site, including the establishment of access routes, equipment staging areas, and safety zones.	-	-	-	-
Collaboration with Stakeholders	**3**	**4**	**-**	**2**
PC19. Communicate with key stakeholders, such as project managers, government agencies, landowners, and utility companies, to inform them of the survey plans.	-	-	-	-
PC20. Explain Right-of-Way (ROW) and easement considerations to stakeholders.	-	-	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC21. Prepare and present formal requests or agreements to secure necessary permissions for the survey.	-	-	-	-
PC22. Negotiate with relevant stakeholders to address land ownership issues, boundary disputes, and other concerns.	-	-	-	-
PC23. Identify and resolve any issues or requirements from stakeholders, such as minimizing traffic disruption or protecting sensitive environmental areas.	-	-	-	-
PC24. Coordinate survey activities with other contractors involved in the project to avoid conflicts and ensure that data collection aligns with the overall project objectives.	-	-	-	-
Conduct risk assessment and mitigation planning	**4**	**8**	**-**	**2**
PC25. Identify and document potential risks to the survey, such as weather conditions, equipment failure, or access restrictions.	-	-	-	-
PC26. Understand the prioritize risks based on their likelihood and impact.	-	-	-	-
PC27. explain and create a risk assessment matrix that outlines identified risks and corresponding mitigation strategies.	-	-	-	-
PC28. Develop strategies for mitigating risks, such as conducting equipment checks and preparing contingency plans for weather-related delays.	-	-	-	-
PC29. Understand plans for managing survey data, including data collection protocols, storage solutions, and backup procedures.	-	-	-	-
PC30. Ensure the safety of the survey team through training, the use of personal protective equipment (PPE), and emergency preparedness.	-	-	-	-
PC31. Implement mitigation measures, such as planning alternative routes or utilizing backup equipment.	-	-	-	-
Prepare survey documentation	**3**	**5**	**-**	**2**

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC32. Develop comprehensive instructions for the survey team, detailing specific tasks, required equipment, and data collection protocols to be followed.	-	-	-	-
PC33. Prepare maps and plans that define the survey area, control point locations, and other key details.	-	-	-	-
PC34. Ensure all necessary documentation is prepared to meet legal and regulatory requirements, such as permits or environmental impact assessments.	-	-	-	-
PC35. Review the documentation and address any compliance gaps.	-	-	-	-
Conduct a pre-survey review	**4**	**5**	**-**	**3**
PC36. Review the survey plan with the entire team to ensure everyone understands their roles, the schedule, and the objectives.	-	-	-	-
PC37. Conduct a thorough check of all equipment to confirm it is functional and properly calibrated.	-	-	-	-
PC38. Understand a safety briefing to review potential hazards, emergency procedures, and safety protocols.	-	-	-	-
PC39. Implement site-specific emergency procedures for situations like equipment failure or restricted access.	-	-	-	-
PC40. Ensure all necessary approvals and permits are obtained before starting the survey.	-	-	-	-
PC41. Verify that the required resources, including equipment and personnel, are prepared for the survey.	-	-	-	-
PC42. Conduct emergency response drills, such as medical evacuations or communication failure scenarios.	-	-	-	-
PC43. Use an audit checklist to verify that all required documentation is complete and in compliance.	-	-	-	-

Qualification Pack

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
NOS Total	**30**	**50**	**-**	**20**

National Occupational Standards (NOS) Parameters

NOS Code	ICE/CON/N0203
NOS Name	Site Preparation and Field survey
Sector	Construction
Sub-Sector	
Occupation	Surveying
NSQF Level	4.5
Credits	5
Version	1.0
Last Reviewed Date	17/01/2025
Next Review Date	17/01/2030
NSQC Clearance Date	17/01/2025

ICE/CON/N0205: Conduct field surveys for highway and mega projects

Description

This unit focuses on performing accurate and precise field surveys for highway and mega projects. It involves using advanced survey techniques and equipment to collect reliable data necessary for the planning, design, and construction phases. The surveys ensure that the data is accurate, comprehensive, and compliant with project specifications and standards.

Scope

The scope covers the following :

- Conduct topographic surveys using Total Stations and GPS systems to capture terrain features and elevations.
- Perform drone surveys equipped with LiDAR and photogrammetry for efficient, high-resolution data collection.
- Implement AI-assisted technologies for conducting geotechnical and hydrological surveys, enhancing data analysis and decision-making.
- Validate survey measurements, identify any errors or discrepancies, and apply corrective actions to ensure data accuracy and reliability.

Elements and Performance Criteria

Conduct the topographic survey with Total Stations, Theodolites and GPS

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

PC1. Set up the Total Station at key control points and calibrate it to ensure precise measurements of angles and distances.

PC2. Integrate the Total Station with GPS systems for real-time data collection, when required.

PC3. Ensure the instrument is positioned at the correct height and orientation to maintain accuracy.

PC4. Use the Total Station to measure both horizontal and vertical angles, as well as distances to various points of interest.

PC5. Perform a traverse survey by moving the Total Station to different locations, establishing a network of connected control points.

PC6. Capture detailed topographic data, including terrain features, slopes, and elevations, using the Total Station.

PC7. Conduct contour surveys by measuring and recording elevation points on the ground, allowing the creation of contour maps.

PC8. Apply interpolation techniques to accurately plot contour lines between surveyed points.

PC9. Utilize both traditional tools (such as leveling instruments) and modern tools (such as Total Stations) to measure and mark contour lines.

PC10. Apply geodetic surveying techniques for large-scale projects that require accurate measurements over long distances and curved surfaces.

PC11. Set up the theodolite at a control point, ensuring it is leveled and aligned to achieve precise angle measurements.

PC12. Use the theodolite to measure exact horizontal and vertical angles, assisting in the establishment of control points and traversing.

PC13. Conduct benchmark surveys using both forward and backward leveling methods for increased accuracy.

Conduct drone surveys with LiDAR and photogrammetry

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

PC14. Plan the drone's flight path to ensure complete coverage of the survey area, including overlapping passes for thorough data collection and accuracy.

PC15. Identify and mark ground control points (GCPs) throughout the survey area for reference and data alignment.

PC16. Deploy drones equipped with HD cameras and LiDAR sensors to scan and capture the terrain.

PC17. Configure the drone's camera to take images at regular intervals, ensuring consistent coverage across the entire survey area.

PC18. Understand the high-resolution images and precise 3D data using the LiDAR sensor by flying the drone at the planned altitude and speed, ensuring accurate scanning of the terrain.

Conduct Drone and GPR-Assisted Geotechnical and Hydrological Surveys

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

PC19. Understand the use of drone-collected imagery and data, along with GPR, to analyze satellite or aerial views of the site.

PC20. Identify key features such as fault lines, water bodies, and other relevant terrain features using GPR data and drone imagery.

PC21. Analyze and test the soil properties like composition, moisture content, and load-bearing capacity using GPR data and drone survey results.

PC22. Predict water flow and drainage patterns using combined GPR and drone data, supporting the effective design of highway drainage systems.

Validate Measurements and Address Errors

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

PC23. Conduct site reconnaissance to identify potential obstacles and develop effective survey strategies.

PC24. Recognize and mitigate sources of error in Total Station, theodolite, and GPS surveys (e.g., atmospheric conditions, misalignment, and multipath effects).

PC25. Perform loop closure and consistency checks throughout surveys to ensure accuracy.

PC26. Reoccupy known control points to validate and adjust measurement precision.

PC27. Prepare cross-sections and profiles based on collected data and present them in a structured report format.

PC28. Compile a detailed report that outlines validation methods, identifies discrepancies, includes accuracy adjustments, and provides case studies of applied techniques.

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. The fundamental concepts of topographic surveying, including the measurement of elevations, distances, and angles.

KU2. How to read and interpret topographic and cadastral maps accurately.

KU3. The process of creating accurate contour maps, cross-sections, and terrain profiles, involving detailed surveys that collect elevation data and visually represent the land's features.

KU4. Key surveying terminology, such as benchmarks, contour intervals, and datum.

KU5. Highway design elements, including horizontal and vertical alignment, cross-sections, and earthwork.

KU6. Knowledge of road materials, soil mechanics, and pavement structures.

KU7. The principles of contour surveying and techniques for measuring contour lines in the field.

KU8. The distinction between geodetic surveying and plane surveying, and their respective applications in highway projects.

KU9. Various highway survey techniques, including traffic volume studies, speed studies, origin-destination surveys, and pavement condition assessments.

KU10. Forward and backward surveying techniques, including loop closure and consistency checks to ensure data accuracy.

KU11. The process of conducting traverse surveying and establishing control points.

KU12. The role of basic survey tools and equipment (e.g., measuring tapes, ranging rods, and prisms) in field surveys.

KU13. The process of setting up and operating leveling instruments for precise elevation measurements.

KU14. The working principles and procedures for setting up a total station, including leveling, centering, and alignment.

KU15. How to measure horizontal and vertical angles, as well as distances, using a total station.

KU16. The importance of regular calibration and maintenance of the total station to ensure accurate measurements.

KU17. The principles and procedures for using a theodolite to measure horizontal and vertical angles in surveying.

Generic Skills (GS)

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

GS1. Follow verbal instructions and convey information clearly 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 the topographic survey with Total Stations, Theodolites and GPS	**8**	**14**	**-**	**8**
PC1. Set up the Total Station at key control points and calibrate it to ensure precise measurements of angles and distances.	-	-	-	-
PC2. Integrate the Total Station with GPS systems for real-time data collection, when required.	-	-	-	-
PC3. Ensure the instrument is positioned at the correct height and orientation to maintain accuracy.	-	-	-	-
PC4. Use the Total Station to measure both horizontal and vertical angles, as well as distances to various points of interest.	-	-	-	-
PC5. Perform a traverse survey by moving the Total Station to different locations, establishing a network of connected control points.	-	-	-	-
PC6. Capture detailed topographic data, including terrain features, slopes, and elevations, using the Total Station.	-	-	-	-
PC7. Conduct contour surveys by measuring and recording elevation points on the ground, allowing the creation of contour maps.	-	-	-	-
PC8. Apply interpolation techniques to accurately plot contour lines between surveyed points.	-	-	-	-
PC9. Utilize both traditional tools (such as leveling instruments) and modern tools (such as Total Stations) to measure and mark contour lines.	-	-	-	-
PC10. Apply geodetic surveying techniques for large-scale projects that require accurate measurements over long distances and curved surfaces.	-	-	-	-
PC11. Set up the theodolite at a control point, ensuring it is leveled and aligned to achieve precise angle measurements.	-	-	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC12. Use the theodolite to measure exact horizontal and vertical angles, assisting in the establishment of control points and traversing.	-	-	-	-
PC13. Conduct benchmark surveys using both forward and backward leveling methods for increased accuracy.	-	-	-	-
Conduct drone surveys with LiDAR and photogrammetry	**7**	**12**	**-**	**4**
PC14. Plan the drone's flight path to ensure complete coverage of the survey area, including overlapping passes for thorough data collection and accuracy.	-	-	-	-
PC15. Identify and mark ground control points (GCPs) throughout the survey area for reference and data alignment.	-	-	-	-
PC16. Deploy drones equipped with HD cameras and LiDAR sensors to scan and capture the terrain.	-	-	-	-
PC17. Configure the drone's camera to take images at regular intervals, ensuring consistent coverage across the entire survey area.	-	-	-	-
PC18. Understand the high-resolution images and precise 3D data using the LiDAR sensor by flying the drone at the planned altitude and speed, ensuring accurate scanning of the terrain.	-	-	-	-
Conduct Drone and GPR-Assisted Geotechnical and Hydrological Surveys	**8**	**12**	**-**	**4**
PC19. Understand the use of drone-collected imagery and data, along with GPR, to analyze satellite or aerial views of the site.	-	-	-	-
PC20. Identify key features such as fault lines, water bodies, and other relevant terrain features using GPR data and drone imagery.	-	-	-	-
PC21. Analyze and test the soil properties like composition, moisture content, and load-bearing capacity using GPR data and drone survey results.	-	-	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC22. Predict water flow and drainage patterns using combined GPR and drone data, supporting the effective design of highway drainage systems.	-	-	-	-
Validate Measurements and Address Errors	**7**	**12**	**-**	**4**
PC23. Conduct site reconnaissance to identify potential obstacles and develop effective survey strategies.	-	-	-	-
PC24. Recognize and mitigate sources of error in Total Station, theodolite, and GPS surveys (e.g., atmospheric conditions, misalignment, and multipath effects).	-	-	-	-
PC25. Perform loop closure and consistency checks throughout surveys to ensure accuracy.	-	-	-	-
PC26. Reoccupy known control points to validate and adjust measurement precision.	-	-	-	-
PC27. Prepare cross-sections and profiles based on collected data and present them in a structured report format.	-	-	-	-
PC28. Compile a detailed report that outlines validation methods, identifies discrepancies, includes accuracy adjustments, and provides case studies of applied techniques.	-	-	-	-
NOS Total	**30**	**50**	**-**	**20**

National Occupational Standards (NOS) Parameters

NOS Code	ICE/CON/N0205
NOS Name	Conduct field surveys for highway and mega projects
Sector	Construction
Sub-Sector	
Occupation	Surveying
NSQF Level	4.5
Credits	5
Version	1.0
Last Reviewed Date	17/01/2025
Next Review Date	17/01/2030
NSQC Clearance Date	17/01/2025

ICE/CON/N0204: Perform analysis and interpretation of highway survey data

Description

This unit focuses on conducting thorough analysis and interpretation of highway survey data, utilizing both traditional and modern techniques. The goal is to ensure accurate assessment, providing the necessary insights and reports to support effective infrastructure planning, design, and development.

Scope

The scope covers the following :

- Collect and organize survey data from various sources, ensuring data integrity and completeness.
- Perform data processing to clean, format, and structure the data for analysis.
- Analyze the data to identify trends, patterns, and critical insights relevant to the project.
- Interpret the data accurately and present it in clear, concise reports to inform project stakeholders.
- Assist in decision-making processes by providing data-driven recommendations based on the analysis.

Elements and Performance Criteria

Collect and structure the field survey data

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

PC1. Determine the type of survey conducted, such as topographic or geotechnical surveys.

PC2. Compile the collected data into a structured format, such as digitizing paper records or uploading GPS coordinates.

PC3. Apply Machine Learning (ML) models to integrate data from multiple sources into a unified dataset for analysis-based drone survey

PC4. Use AI algorithms to automatically detect and correct errors, fill missing data, and remove outliers.

PC5. Clean and preprocess the data to ensure its accuracy and consistency.

Execute data processing tasks

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

PC6. Explain how to use specialized software such as Geographic Information Systems (GIS), Computer-Aided Design (CAD), or AI for processing survey data.

PC7. Understand the methods to convert raw data into usable formats, like transforming geographic coordinates into detailed maps.

PC8. Interpret drone-captured images to produce 2D orthomosaics and 3D terrain models through photogrammetry techniques.

PC9. Analyze LiDAR point clouds to extract elevation data and generate accurate Digital Elevation Models (DEMs).

PC10. Ensure data accuracy and reliability by validating, cleaning, and preparing datasets for analysis.

Analyze the data collected from highway surveys to identify patterns and correlations,

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

PC11. Conduct statistical analysis of roadway survey data using appropriate methods to identify trends, patterns, and correlations essential for planning and design.

PC12. Evaluate key highway design elements, such as horizontal and vertical alignments, cross-sections, and earthwork, ensuring compliance with functional and safety standards.

PC13. Integrate AI techniques within GIS systems to analyze spatial relationships where applicable.

PC14. Utilize AI to detect patterns and perform predictive modeling based on historical data.

PC15. Assess traffic flow parameters, including volume, speed, and density, to evaluate highway performance and capacity.

PC16. Analyze pavement condition data to prioritize maintenance activities and conduct lifecycle cost analysis.

PC17. Perform spatial analysis of geographic data using GIS tools, such as identifying elevation changes and determining pavement conditions.

PC18. Compare survey data against historical records, standards, or benchmarks to identify deviations, trends, or potential issues.

PC19. Apply machine learning (ML) models to forecast future conditions based on historical data.

PC20. Calculate earthwork volumes for highway projects using contour data, optimizing the design for safety and efficiency.

PC21. Conduct laboratory tests on road construction materials to evaluate quality and performance.

PC22. Develop and assess pavement layer compositions to ensure durability and load-bearing capacity.

PC23. Create thematic maps in GIS to represent highway alignments, land use, and environmental considerations.

Interpret and report the survey data

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

PC24. Evaluate the outcomes of data processing and statistical analysis, either manually or with the assistance of AI tools, to derive meaningful conclusions.

PC25. Understand and Highlight the critical insights that may influence highway design, safety measures, or maintenance planning.

PC26. Utilize Natural Language Processing (NLP) techniques to interpret textual data and correlate it with survey findings for deeper insights.

PC27. Use GIS to create visual representations and detailed reports with maps, charts, cross-sections & profile, compile and tables to summarize results.

PC28. Use AI-driven tools to generate dynamic visualizations, such as interactive 3D models of highway infrastructure using drone survey.

PC29. Provide actionable recommendations for adjustments in survey plans, design modifications, maintenance priorities, or additional studies based on the interpreted data.

Assist in decision-making

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

PC30. Explain and present the survey findings to engineers, planners, and government officials to support highway design and planning decisions.

PC31. Use interpreted survey data to guide resource allocation, optimize infrastructure planning, and support policy development for highway projects.

PC32. Integrate survey data into environmental and social impact assessments to ensure sustainable project planning.

PC33. Develop maintenance prioritization plans by analyzing pavement conditions and traffic volumes.

PC34. Perform cost-benefit analyses using survey data to evaluate project feasibility and budget planning.

PC35. Simulate highway alignments and geometric features using terrain and survey data to assist in project decision-making.

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. Use of Traditional and Modern Tools: Integrating traditional tools (e.g., Total Stations) and modern technologies (e.g., drones, GPS, LiDAR) for accurate data collection, ensuring reliable highway survey analysis.

KU2. Data Formats: Handling different data formats like CSV and shapefiles and techniques for managing large datasets efficiently.

KU3. Data Quality and Accuracy: Methods to ensure data quality, accuracy, and reliability during survey data collection and analysis.

KU4. Survey Data in Road Design: How survey data contributes to designing road alignments, intersections, and other geometric features for safety and efficiency.

KU5. Materials and Soil Mechanics: The role of road materials, soil mechanics, and pavement structures in highway construction, emphasizing quality and durability.

KU6. Environmental and Societal Impact: Incorporating survey data to evaluate the environmental and societal implications of highway development projects.

KU7. Geographic Coordinate Systems: Understanding geographic coordinate systems (latitude and longitude) and projected systems, including transformations and conversions essential for mapping and alignment studies.

KU8. Geospatial Data Interpretation: How to interpret geospatial data, including contours, elevation profiles, and terrain analysis.

KU9. Reading Maps and Survey Drawings: How to read and interpret maps, plans, and survey drawings for accurate analysis.

KU10. Digital Elevation Models (DEMs): The use of DEMs and GIS tools to analyze terrain features, supporting highway planning and alignment in varied topographies.

KU11. CAD Software for Drafting and Design: Utilizing Computer-Aided Design (CAD) software for drafting and designing highway projects.

KU12. GIS for Spatial Analysis: Using Geographic Information Systems (GIS) software for spatial analysis, mapping, and visualization to interpret highway survey data.

KU13. Specialized Highway Design Software: The use of relevant specialized software for highway design and analysis.

KU14. Drainage Systems and Safety Measures: The design and implementation of drainage systems, road signs, and safety features to enhance highway longevity and user safety.

KU15. LiDAR in Highway Design: The application of LiDAR technology in terrain analysis, obstacle detection, and creating 3D models for highway design.

KU16. AI and Machine Learning in Survey Data: Applying AI and machine learning techniques for pattern recognition, anomaly detection, and predictive modeling to enhance highway survey data analysis.

KU17. Error Checking and Data Verification: Methods for detecting, correcting errors, and cross-checking survey data against known standards to ensure accuracy.

KU18. Survey Reporting and Presentation: Compiling, documenting, and presenting survey findings clearly, including charts, graphs, and tables to summarize the data for decision-makers.

Generic Skills (GS)

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

GS1. Follow verbal instructions and convey information clearly 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. Focus on tasks and ensure accuracy in work.

GS9. Adapt to changing work environments, tasks, and processes.

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Collect and structure the field survey data	**6**	**10**	**-**	**5**
PC1. Determine the type of survey conducted, such as topographic or geotechnical surveys.	-	-	-	-
PC2. Compile the collected data into a structured format, such as digitizing paper records or uploading GPS coordinates.	-	-	-	-
PC3. Apply Machine Learning (ML) models to integrate data from multiple sources into a unified dataset for analysis-based drone survey	-	-	-	-
PC4. Use AI algorithms to automatically detect and correct errors, fill missing data, and remove outliers.	-	-	-	-
PC5. Clean and preprocess the data to ensure its accuracy and consistency.	-	-	-	-
Execute data processing tasks	**4**	**6**	**-**	**2**
PC6. Explain how to use specialized software such as Geographic Information Systems (GIS), Computer-Aided Design (CAD), or AI for processing survey data.	-	-	-	-
PC7. Understand the methods to convert raw data into usable formats, like transforming geographic coordinates into detailed maps.	-	-	-	-
PC8. Interpret drone-captured images to produce 2D orthomosaics and 3D terrain models through photogrammetry techniques.	-	-	-	-
PC9. Analyze LiDAR point clouds to extract elevation data and generate accurate Digital Elevation Models (DEMs).	-	-	-	-
PC10. Ensure data accuracy and reliability by validating, cleaning, and preparing datasets for analysis.	-	-	-	-
Analyze the data collected from highway surveys to identify patterns and correlations,	**8**	**14**	**-**	**6**

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC11. Conduct statistical analysis of roadway survey data using appropriate methods to identify trends, patterns, and correlations essential for planning and design.	-	-	-	-
PC12. Evaluate key highway design elements, such as horizontal and vertical alignments, cross-sections, and earthwork, ensuring compliance with functional and safety standards.	-	-	-	-
PC13. Integrate AI techniques within GIS systems to analyze spatial relationships where applicable.	-	-	-	-
PC14. Utilize AI to detect patterns and perform predictive modeling based on historical data.	-	-	-	-
PC15. Assess traffic flow parameters, including volume, speed, and density, to evaluate highway performance and capacity.	-	-	-	-
PC16. Analyze pavement condition data to prioritize maintenance activities and conduct lifecycle cost analysis.	-	-	-	-
PC17. Perform spatial analysis of geographic data using GIS tools, such as identifying elevation changes and determining pavement conditions.	-	-	-	-
PC18. Compare survey data against historical records, standards, or benchmarks to identify deviations, trends, or potential issues.	-	-	-	-
PC19. Apply machine learning (ML) models to forecast future conditions based on historical data.	-	-	-	-
PC20. Calculate earthwork volumes for highway projects using contour data, optimizing the design for safety and efficiency.	-	-	-	-
PC21. Conduct laboratory tests on road construction materials to evaluate quality and performance.	-	-	-	-
PC22. Develop and assess pavement layer compositions to ensure durability and load-bearing capacity.	-	-	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC23. Create thematic maps in GIS to represent highway alignments, land use, and environmental considerations.	-	-	-	-
Interpret and report the survey data	**9**	**15**	**-**	**6**
PC24. Evaluate the outcomes of data processing and statistical analysis, either manually or with the assistance of AI tools, to derive meaningful conclusions.	-	-	-	-
PC25. Understand and Highlight the critical insights that may influence highway design, safety measures, or maintenance planning.	-	-	-	-
PC26. Utilize Natural Language Processing (NLP) techniques to interpret textual data and correlate it with survey findings for deeper insights.	-	-	-	-
PC27. Use GIS to create visual representations and detailed reports with maps, charts, cross-sections & profile, compile and tables to summarize results.	-	-	-	-
PC28. Use AI-driven tools to generate dynamic visualizations, such as interactive 3D models of highway infrastructure using drone survey.	-	-	-	-
PC29. Provide actionable recommendations for adjustments in survey plans, design modifications, maintenance priorities, or additional studies based on the interpreted data.	-	-	-	-
Assist in decision-making	**3**	**5**	**-**	**1**
PC30. Explain and present the survey findings to engineers, planners, and government officials to support highway design and planning decisions.	-	-	-	-
PC31. Use interpreted survey data to guide resource allocation, optimize infrastructure planning, and support policy development for highway projects.	-	-	-	-
PC32. Integrate survey data into environmental and social impact assessments to ensure sustainable project planning.	-	-	-	-
PC33. Develop maintenance prioritization plans by analyzing pavement conditions and traffic volumes.	-	-	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC34. Perform cost-benefit analyses using survey data to evaluate project feasibility and budget planning.	-	-	-	-
PC35. Simulate highway alignments and geometric features using terrain and survey data to assist in project decision-making.	-	-	-	-
NOS Total	**30**	**50**	**-**	**20**

National Occupational Standards (NOS) Parameters

NOS Code	ICE/CON/N0204
NOS Name	Perform analysis and interpretation of highway survey data
Sector	Construction
Sub-Sector	
Occupation	Surveying
NSQF Level	4.5
Credits	3
Version	1.0
Last Reviewed Date	17/01/2025
Next Review Date	17/01/2030
NSQC Clearance Date	17/01/2025

ICE/CON/N0201: Maintain the highway survey tools and equipment

Description

This unit is about proper maintenance, calibration, and safe storage of highway survey tools and equipment to ensure their accuracy and longevity for reliable field operations

Scope

The scope covers the following :

- Conduct routine inspection
- Carry out preventive maintenance
- Clean the tools and equipment
- Calibrate and update software
- Maintain the battery
- Maintain data backup and records

Elements and Performance Criteria

Conduct routine inspection

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

PC1. inspect the physical condition of all equipment, looking for signs of wear, damage, or corrosion on tools, cables, batteries, and connectors

PC2. perform functionality checks on electronic equipment like LiDAR systems, GNSS receivers, and Total Stations to ensure they are operating correctly

PC3. use a checklist to assess the alignment and condition of Total Stations and GPS units

PC4. conduct visual inspection of survey instruments, focusing on areas prone to wear or damage

Carry out preventive maintenance

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

PC5. identify and replace the worn-out or damaged parts in the survey equipment

PC6. lubricate the moving components

PC7. check all connections to ensure they are intact and secure

PC8. protect the electronic equipment from extreme temperatures, humidity, and direct sunlight to prevent the degradation of electronic components

PC9. follow the manufacturer-recommended preventive maintenance schedule for all survey equipment

PC10. maintain a stock of essential spare parts and maintenance tools to facilitate quick repairs and minimize downtime during surveys

PC11. check and adjust levels using a leveling instrument

PC12. apply common troubleshooting methods to resolve issues like misalignment, communication errors, or software glitches

PC13. ensure proper handling and transportation of survey instruments in protective cases

Clean the tools and equipment

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

PC14. clean the tools, such as tripods, levels, and rods, using appropriate cleaning agents to remove dirt, dust, and debris

PC15. clean sensitive components like electronic components, sensors, screens, and lenses using soft and lint-free cloths

PC16. use specific cleaning kits to avoid damaging the LiDAR sensors

PC17. clean the drone's body, propellers, and sensors after every flight to prevent dust or debris from affecting performance

PC18. ensure the camera lens and sensors are free from smudges

Calibrate and update software

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

PC19. calibrate all survey equipment including Total Station, LiDAR units, drones, GPS receiver and GNSS receivers regularly, following manufacturer guidelines to ensure they provide accurate data

PC20. update the firmware and software of drones, LiDAR, and other electronic survey tools regularly to improve performance and fix bugs

Maintain the battery

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

PC21. prepare a battery management plan, including optimal storage conditions and charge-maintenance techniques

PC22. follow proper manufacturer guidelines and charging protocols for rechargeable batteries

PC23. store batteries at recommended temperatures and charge levels when not in use to extend their lifespan

PC24. inspect batteries regularly for signs of swelling, leakage, or other defects, and replace them as necessary

PC25. transport survey equipment batteries following the applicable safety protocols

Maintain data backup and records

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

PC26. back up the data collected from drones, LiDAR, Total Station and GPS unit onto a computer or cloud storage regularly to prevent data loss

PC27. ensure that data storage devices are properly maintained

PC28. check the integrity of the stored data periodically to ensure it remains accessible and uncorrupted

PC29. maintain records of all maintenance activities, including inspections, repairs, calibrations, and software updates to track equipment health and plan future maintenance

PC30. use appropriate digital tools to track and manage maintenance records efficiently

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. different survey instruments used in highway projects, such as Total Stations, GPS units, theodolites, levels, and laser scanners

KU2. the specific functions and features of each survey instrument, including their working principles and typical applications

KU3. how to conduct regular visual inspections of survey instruments for signs of wear, damage, or misalignment

KU4. the importance and procedures for calibrating instruments like Total Stations, GPS receivers, and levels to ensure accuracy

KU5. the tools and software used for calibration, such as calibration plates, EDM (Electronic Distance Measurement) calibrators, and specialized calibration software

KU6. the appropriate cleaning methods for different instruments, including the use of microfiber cloths, air blowers, and suitable cleaning solutions for lenses and electronic components

KU7. how to protect equipment from dust, moisture, and extreme temperatures during use and storage

KU8. the proper storage practices, including the use of protective cases, desiccants, and controlled environments to prevent damage during long-term storage

KU9. how to set up an ideal storage environment with controlled temperature and humidity for survey instruments

KU10. the types of batteries used in survey equipment, such as lithium-ion, nickel-metal hydride, and alkaline batteries

KU11. the correct charging protocols, including the avoidance of overcharging and deep discharging, to extend battery life

KU12. the best practices for storing batteries, such as storing them in a cool, dry place and at the appropriate charge level for long-term storage

KU13. how to update the firmware of digital survey instruments to ensure their optimal performance

KU14. the compatibility requirements between survey instruments and their associated software or mobile apps

KU15. the process of backing up data and settings before performing software or firmware updates to prevent data loss

KU16. the proper handling and transporting techniques to avoid physical damage to sensitive survey equipment

KU17. how to troubleshoot and resolve common issues that may arise with survey instruments, such as misalignment, communication errors, software glitches or power failures

KU18. how to perform minor repairs of survey equipment, such as replacing worn parts, e.g. batteries, cables, or prisms

KU19. the importance of maintaining detailed logs of maintenance activities, including calibration dates, repairs records, and any issues encountered

KU20. the safety procedures when handling electronic components, including the risks associated with batteries and electrical circuits

KU21. the latest advancements in survey equipment and maintenance techniques

Generic Skills (GS)

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

GS1. communicate information clearly and concisely to team members and supervisors

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

GS3. perform appropriate 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 routine inspection	**3**	**5**	**-**	**2**
PC1. inspect the physical condition of all equipment, looking for signs of wear, damage, or corrosion on tools, cables, batteries, and connectors	-	-	-	-
PC2. perform functionality checks on electronic equipment like LiDAR systems, GNSS receivers, and Total Stations to ensure they are operating correctly	-	-	-	-
PC3. use a checklist to assess the alignment and condition of Total Stations and GPS units	-	-	-	-
PC4. conduct visual inspection of survey instruments, focusing on areas prone to wear or damage	-	-	-	-
Carry out preventive maintenance	**7**	**13**	**-**	**6**
PC5. identify and replace the worn-out or damaged parts in the survey equipment	-	-	-	-
PC6. lubricate the moving components	-	-	-	-
PC7. check all connections to ensure they are intact and secure	-	-	-	-
PC8. protect the electronic equipment from extreme temperatures, humidity, and direct sunlight to prevent the degradation of electronic components	-	-	-	-
PC9. follow the manufacturer-recommended preventive maintenance schedule for all survey equipment	-	-	-	-
PC10. maintain a stock of essential spare parts and maintenance tools to facilitate quick repairs and minimize downtime during surveys	-	-	-	-
PC11. check and adjust levels using a leveling instrument	-	-	-	-
PC12. apply common troubleshooting methods to resolve issues like misalignment, communication errors, or software glitches	-	-	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC13. ensure proper handling and transportation of survey instruments in protective cases	-	-	-	-
Clean the tools and equipment	**6**	**11**	**-**	**5**
PC14. clean the tools, such as tripods, levels, and rods, using appropriate cleaning agents to remove dirt, dust, and debris	-	-	-	-
PC15. clean sensitive components like electronic components, sensors, screens, and lenses using soft and lint-free cloths	-	-	-	-
PC16. use specific cleaning kits to avoid damaging the LiDAR sensors	-	-	-	-
PC17. clean the drone's body, propellers, and sensors after every flight to prevent dust or debris from affecting performance	-	-	-	-
PC18. ensure the camera lens and sensors are free from smudges	-	-	-	-
Calibrate and update software	**5**	**5**	**-**	**2**
PC19. calibrate all survey equipment including Total Station, LiDAR units, drones, GPS receiver and GNSS receivers regularly, following manufacturer guidelines to ensure they provide accurate data	-	-	-	-
PC20. update the firmware and software of drones, LiDAR, and other electronic survey tools regularly to improve performance and fix bugs	-	-	-	-
Maintain the battery	**4**	**7**	**-**	**3**
PC21. prepare a battery management plan, including optimal storage conditions and charge-maintenance techniques	-	-	-	-
PC22. follow proper manufacturer guidelines and charging protocols for rechargeable batteries	-	-	-	-
PC23. store batteries at recommended temperatures and charge levels when not in use to extend their lifespan	-	-	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC24. inspect batteries regularly for signs of swelling, leakage, or other defects, and replace them as necessary	-	-	-	-
PC25. transport survey equipment batteries following the applicable safety protocols	-	-	-	-
Maintain data backup and records	**5**	**9**	**-**	**2**
PC26. back up the data collected from drones, LiDAR, Total Station and GPS unit onto a computer or cloud storage regularly to prevent data loss	-	-	-	-
PC27. ensure that data storage devices are properly maintained	-	-	-	-
PC28. check the integrity of the stored data periodically to ensure it remains accessible and uncorrupted	-	-	-	-
PC29. maintain records of all maintenance activities, including inspections, repairs, calibrations, and software updates to track equipment health and plan future maintenance	-	-	-	-
PC30. use appropriate digital tools to track and manage maintenance records efficiently	-	-	-	-
NOS Total	**30**	**50**	**-**	**20**

National Occupational Standards (NOS) Parameters

NOS Code	ICE/CON/N0201
NOS Name	Maintain the highway survey tools and equipment
Sector	Construction
Sub-Sector	
Occupation	Surveying
NSQF Level	4.5
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/N0202: Ensure health and safety in roadway survey operations

Description

This unit outlines the competencies required to ensure health and safety during all stages of roadway survey operations, encompassing planning, execution, data analysis, and equipment maintenance.

Scope

The scope covers the following :

- Follow personal safety measures.
- Ensure site safety.
- Manage survey equipment safety.
- Respond to emergencies.
- Promote environmental safety.

Elements and Performance Criteria

Follow personal safety measures

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

PC1. Use appropriate Personal Protective Equipment (PPE) such as high-visibility vests, hard hats, safety boots, gloves, and safety goggles during all survey activities.

PC2. Conduct pre-task briefings to identify potential risks and review safety protocols.

PC3. Follow ergonomically correct techniques for lifting and handling equipment to prevent injuries.

Ensure site safety

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

PC4. Identify site hazards, such as traffic, uneven terrain, and environmental conditions.

PC5. Implement traffic management measures, including lane closures, traffic cones, portable traffic lights, barriers, warning signs, and flaggers, to protect the survey team.

PC6. Establish and communicate clearly marked safety zones for survey activities.

PC7. Ensure all team members are briefed on emergency evacuation plans and assembly points.

PC8. Maintain a clean and organized work area to prevent accidents.

PC9. Monitor weather conditions and suspend activities if conditions become hazardous.

Manage survey equipment safety

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

PC10. Identify safety risks associated with survey equipment, such as Total Stations, drones, and GPS units, and implement appropriate measures to mitigate them.

PC11. Follow safe handling, maintenance, and transportation procedures for sensitive equipment used in roadway and highway surveys.

PC12. Ensure proper storage of survey tools and equipment to prevent damage and reduce safety risks during highway survey operations.

PC13. Conduct pre-flight checks for drones, assess risks, and comply with airspace regulations to ensure the safety of personnel and equipment during aerial surveys.

PC14. Perform drone emergency landing procedures in case of adverse conditions and report any incidents to the relevant authorities.

Respond to emergencies

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

PC15. Identify and respond promptly to on-site emergencies, including equipment failure, medical issues, or environmental hazards.

PC16. Administer basic first aid as needed until professional help arrives.

PC17. Notify relevant authorities and stakeholders about the emergency, and ensure proper documentation is completed.

PC18. Conduct post-emergency reviews to identify any gaps in safety protocols and implement corrective measures to improve future responses.

Promote environmental safety

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

PC19. Conduct field exercises to identify potential environmental impacts, such as soil compaction or vegetation damage.

PC20. Implement appropriate measures, such as using eco-friendly equipment and following designated paths, to minimize vegetation removal and contact with wildlife.

PC21. Dispose of waste, including electronic components, in compliance with environmental regulations.

PC22. Ensure safe handling and disposal of hazardous materials, including batteries.

PC23. Use sustainable practices, such as digital documentation, to reduce paper usage and minimize environmental impact.

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. The health and safety protocols for working on highways and conducting surveys, including the use of personal protective equipment (PPE) and traffic management measures, to ensure worker safety.

KU2. How to troubleshoot issues encountered in the field, such as equipment malfunctions or unexpected site conditions, and adjust the survey approach as needed to ensure safety.

KU3. The proper use and limitations of PPE, ensuring that all personnel are equipped with the correct protective gear for the survey environment.

KU4. How to ensure the safety of survey equipment during operations, including proper handling, regular maintenance, and secure storage to prevent accidents or damage.

KU5. The drone safety guidelines, including risk mitigation strategies and compliance with airspace regulations, to ensure safe operation during aerial surveys.

KU6. The emergency response protocols, including the procedures for first aid, evacuation, and communication during incidents.

KU7. The traffic management principles and tools, including implementing lane closures or diversions, and assigning spotters to monitor traffic for safe working conditions around survey teams.

KU8. The safe handling, maintenance, and storage of survey equipment, ensuring that equipment is properly cared for to avoid accidents and prolong its life.

KU9. How to monitor weather conditions and determine when to suspend survey activities for safety, ensuring that adverse weather does not compromise the safety of the crew.

KU10. The potential impact of survey activities on the environment and strategies to minimize disruption to natural features, wildlife, and habitats.

KU11. The importance of maintaining accurate and detailed field notes, including sketches, measurements, observations, and records of health and safety incidents, to ensure reliable data collection and adherence to safety standards.

Generic Skills (GS)

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

GS1. Follow verbal instructions and convey information clearly 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
Follow personal safety measures	**5**	**8**	**-**	**3**
PC1. Use appropriate Personal Protective Equipment (PPE) such as high-visibility vests, hard hats, safety boots, gloves, and safety goggles during all survey activities.	-	-	-	-
PC2. Conduct pre-task briefings to identify potential risks and review safety protocols.	-	-	-	-
PC3. Follow ergonomically correct techniques for lifting and handling equipment to prevent injuries.	-	-	-	-
Ensure site safety	**10**	**16**	**-**	**6**
PC4. Identify site hazards, such as traffic, uneven terrain, and environmental conditions.	-	-	-	-
PC5. Implement traffic management measures, including lane closures, traffic cones, portable traffic lights, barriers, warning signs, and flaggers, to protect the survey team.	-	-	-	-
PC6. Establish and communicate clearly marked safety zones for survey activities.	-	-	-	-
PC7. Ensure all team members are briefed on emergency evacuation plans and assembly points.	-	-	-	-
PC8. Maintain a clean and organized work area to prevent accidents.	-	-	-	-
PC9. Monitor weather conditions and suspend activities if conditions become hazardous.	-	-	-	-
Manage survey equipment safety	**5**	**8**	**-**	**3**
PC10. Identify safety risks associated with survey equipment, such as Total Stations, drones, and GPS units, and implement appropriate measures to mitigate them.	-	-	-	-
PC11. Follow safe handling, maintenance, and transportation procedures for sensitive equipment used in roadway and highway surveys.	-	-	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC12. Ensure proper storage of survey tools and equipment to prevent damage and reduce safety risks during highway survey operations.	-	-	-	-
PC13. Conduct pre-flight checks for drones, assess risks, and comply with airspace regulations to ensure the safety of personnel and equipment during aerial surveys.	-	-	-	-
PC14. Perform drone emergency landing procedures in case of adverse conditions and report any incidents to the relevant authorities.	-	-	-	-
Respond to emergencies	**5**	**10**	**-**	**4**
PC15. Identify and respond promptly to on-site emergencies, including equipment failure, medical issues, or environmental hazards.	-	-	-	-
PC16. Administer basic first aid as needed until professional help arrives.	-	-	-	-
PC17. Notify relevant authorities and stakeholders about the emergency, and ensure proper documentation is completed.	-	-	-	-
PC18. Conduct post-emergency reviews to identify any gaps in safety protocols and implement corrective measures to improve future responses.	-	-	-	-
Promote environmental safety	**5**	**8**	**-**	**4**
PC19. Conduct field exercises to identify potential environmental impacts, such as soil compaction or vegetation damage.	-	-	-	-
PC20. Implement appropriate measures, such as using eco-friendly equipment and following designated paths, to minimize vegetation removal and contact with wildlife.	-	-	-	-
PC21. Dispose of waste, including electronic components, in compliance with environmental regulations.	-	-	-	-
PC22. Ensure safe handling and disposal of hazardous materials, including batteries.	-	-	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC23. Use sustainable practices, such as digital documentation, to reduce paper usage and minimize environmental impact.	-	-	-	-
NOS Total	**30**	**50**	**-**	**20**

National Occupational Standards (NOS) Parameters

NOS Code	ICE/CON/N0202
NOS Name	Ensure health and safety in roadway survey operations
Sector	Construction
Sub-Sector	
Occupation	Surveying
NSQF Level	4.5
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	08/05/2025
Next Review Date	08/05/2028
NSQC Clearance Date	08/05/2025

Assessment Guidelines and Assessment Weightage

Assessment Guidelines

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

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

3. Individual assessment agencies will create unique question papers for the knowledge/theory part for the assessment of candidates, following the assessment criteria provided below.

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

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

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

7. The trainee will be allowed to repeat the test to correct their procedures in case of improper performance, with a deduction of marks for each iteration.

8. After a certain number of iterations, as decided by the AB, the trainee will be marked as failed, scoring zero marks for the procedure in the practical activity.

9. In case of successfully passing only a certain number of NOSs, the trainee is eligible to take subsequent assessments on the remaining NOSs to pass the Qualification Pack within the specified time frame set by the AB.

10. The minimum duration of assessment for each QP will be 4 hours per 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/N0203.Site Preparation and Field survey	30	50	0	20	100	20
ICE/CON/N0205.Conduct field surveys for highway and mega projects	30	50	0	20	100	25
ICE/CON/N0204.Perform analysis and interpretation of highway survey data	30	50	0	20	100	25
ICE/CON/N0201.Maintain the highway survey tools and equipment	30	50	0	20	100	15
ICE/CON/N0202.Ensure health and safety in roadway survey operations	30	50	0	20	100	10
DGT/VSQ/N0102.Employability Skills (60 Hours)	20	30	-	-	50	5
Total	**170**	**280**	**-**	**100**	**550**	**100**

Acronyms

NOS	National Occupational Standard(s)
NSQF	National Skills Qualifications Framework
QP	Qualifications Pack
TVET	Technical and Vocational Education and Training
GIS	Geoghraphic Information System
GPR	Ground Penetration Radar
LiDAR	Light Detection and Ranging

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.