Model Curriculum

QP Name: Roadway Surveyor

QP Code: ICE/CON/Q0201

Version: 1.0

NSQF Level: 4.5

Model Curriculum Version: 1.0

The Institution of Civil Engineers Society (ICES)
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Training Parameters

Sector	Construction		
Sub-Sector	Real Estate and Infrastructure Construction		
Occupation	Surveying		
Country	India		
NSQF Level	4.5		
Aligned to NCO/ISCO/ISIC Code	NCO-2015/2165.0200		
Minimum Educational Qualification and Experience	**S. No.**	**Academic/Skill Qualification (with Specialization - if applicable)**	**Required Experience (with Specialization - if applicable)**
	1	Completed 3-year diploma after 10th (in Civil Engineering)	
	OR		
	2	12th Grade pass	1.5 years of Relevant Industry Experience
	OR		
	3	10th Grade pass	4.5 years of Relevant Industry Experience
	OR		
	4	Previous relevant Qualification of NSQF Level 3.5	3 years of Relevant Industry Experience
	OR		
	5	Previous relevant Qualification of NSQF Level 4	1.5 years of Relevant Industry Experience
Pre-Requisite License or Training	Not Applicable		
Minimum Job Entry Age	As per Govt. Norms		
Last Reviewed On	18-02-2025		
Next Review Date	18-02-2028		
NSQC Approval Date	18-022025		
QP Version	1.0		
Model Curriculum Creation Date	18-02-2025		
Model Curriculum Valid Up to Date	18-02-2028		
Model Curriculum Version	1.0		
Minimum Duration of the Course	540 Hours		
Maximum Duration of the Course	540 Hours		

Program Overview

This section summarises the end objectives of the program along with its duration.

Training Outcomes

At the end of the program, the learner should have acquired the listed knowledge and skills to:

- Explain how to prepare for highway survey operations.
- Describe the steps to conduct field surveys for highway projects.
- Discuss how to perform analysis and interpretation of highway survey data.
- Elucidate the methods for maintaining highway survey tools and equipment.
- Explain the measures necessary to ensure health and safety during roadway survey operations.
- Discuss the importance of employability skills.

Compulsory Modules

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

NOS and Module Details	Theory Duration	Practical Duration	On-the-Job Training Duration (Mandatory)	On-the-Job Training Duration (Recommended)	Total Duration
ICE/CON/N0203: Site Preparation and Field survey NOS Version- 1.0 NSQF Level- 4.5	**30:00**	**90:00**	**30:00**	**00:00**	**150:00**
Module 1: Introduction to the Construction Industry and the job role of a Roadway Surveyor	05:00	00:00	00:00	00:00	05:00
Module 2: Survey Planning and Site Preparation	15:00	60:00	15:00	00:00	90:00
Module 3: Stakeholder Coordination and Risk Management	10:00	30:00	15:00	00:00	55:00
ICE/CON/N0205: Conduct field surveys for highway projects and mega projects NOS Version- 1.0 NSQF Level- 4.5	**30:00**	**90:00**	**30:00**	**00:00**	**150:00**

Module 4: Conducting Field Surveys	30:00	90:00	30:00	00:00	150:00
ICE/CON/N0204: Perform analysis and interpretation of highway survey data NOS Version- 1.0 NSQF Level- 4.5	**30:00**	**30:00**	**30:00**	**00:00**	**90:00**
Module 5: Analysing the Highway Survey Data	10:00	20:00	15:00	00:00	45:00
Module 6: Interpreting the Highway Survey Data	10:00	20:00	15:00	00:00	45:00
ICE/CON/N0201: Maintain the highway survey tools and equipment NOS Version- 1.0 NSQF Level- 4.5	**15:00**	**15:00**	**30:00**	**00:00**	**60:00**
Module 7: Maintenance, Calibration, and Safe Storage of Highway Survey Tools and Equipment	15:00	15:00	30:00	00:00	60:00
ICE/CON/N0202: Ensure health and safety in roadway survey operations NOS Version- 1.0 NSQF Level- 4.5	**15:00**	**15:00**	**00:00**	**00:00**	**30:00**
Module 8: Health and Safety in Roadway Survey Operations	15:00	15:00	00:00	00:00	40:00
DGT/VSQ/N0102: Employability Skills (60 Hours) NOS Version No.: 1.0 NSQF Level: 4.0	**60:00**	**00:00**	**00:00**	**00:00**	**60:00**
Module 9: Employability Skills	60:00	00:00	00:00	00:00	60:00
Total Duration	**180:00**	**240:00**	**120:00**	**00:00**	**540:00**

Module Details

Module 1: Introduction to the Construction Industry and the job role of a Roadway Surveyor

Mapped to ICE/CON/N0203, v1.0

Terminal Outcomes:

- Explain the importance of Construction Industry.
- Discuss the roles and responsibilities of a Roadway Surveyor.

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

Module 2: Survey Planning and Site Preparation

Mapped to ICE/VON/N0203, v1.0

Terminal Outcomes:

- Define the objectives and scope of a survey, explaining how these elements shape the survey's purpose and outcomes.
- Discuss the importance of reviewing existing information before conducting a survey and how it impacts the survey design.
- Explain how to select an appropriate survey methodology and tools to ensure data reliability and relevance.
- Describe the key elements in developing a survey plan, including timeline, resources, and target audience.

Duration: 15:00	**Duration: 60:00**
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Define the types of surveys (e.g., topographic, alignment, cross-section) and their applications. • Describe site preparation procedures, including clearing, grubbing, and staking out. • Identify common survey terminologies and units of measurement. • Describe the principles of levelling, contouring, and triangulation. • Explain the use and working principles of levelling instruments like Auto Level, Dumpy Level, and Tilting Level.	• Demonstrate how to determine of survey objectives, identifying specific data requirements such as topographic mapping, environmental features, or land use. • Demonstrate site preparation activities on a simulated field, including clearing debris and staking out key survey points. • Show the steps involved in defining the geographic boundaries of a survey area, including marking points of interest or key landmarks like intersections of roads, bridges, or drainage systems. • Show how to establish accuracy requirements for survey data to guide equipment and method selection. • Show in a simulated scenario how to determine which method is more suitable for different terrain and obstacles. • Demonstrate the process of calibrating survey instruments to prepare them for use. • Show how to perform basic maintenance of survey equipment, including cleaning lenses and inspecting instrument alignment.

	• Demonstrate the working of each instrument, including setting up and sighting. • Demonstrate the collection and review of existing maps, aerial imagery, previous survey data records, and design plans related to a survey project. • Show the review of legal and regulatory requirements for a survey, including identifying permits, access conditions, environmental regulations, and safety standards. • Demonstrate how to plan and execute data collection, including the placement of survey control points, and the spacing of GPR scans. • Show the development of a comprehensive survey timeline, detailing start and end dates, key milestones, and deadlines for data collection and reporting. • Demonstrate the allocation of survey teams and equipment, ensuring tasks are assigned efficiently and resources are well-distributed. • Show how to plan survey logistics, including access routes, equipment transportation, and accommodation for survey teams. • Demonstrate the organization of the survey site, including setting up access routes, equipment staging areas, and designated safety zones.
Classroom Aids:	
Training Kit (Trainer Guide, Presentations), Whiteboard, Marker, Projector, Laptop	
Tools, Equipment and Other Requirements:	
Surveying Tripod, Total Station, GPS Receiver, Levelling Instrument, Measuring Tape, Safety Helmets, High-Visibility Vests, Safety Goggles, Ear Protection (Earplugs or Earmuffs), Steel-Toe Boots, Gloves, First Aid Kit, Traffic Cones and Barriers, Reflective Tape, Microfiber Cloths, Lens Cleaning Solution, Tool Oil or Lubricants, Surface Cleaner	

Module 3: Stakeholder Coordination and Risk Management

Mapped to ICE/CON/N0203, v1.0

Terminal Outcomes:

- Explain how to coordinate effectively with stakeholders throughout the survey process.
- Describe the steps involved in conducting a risk assessment and planning for risk mitigation in survey implementation.
- Discuss the importance of preparing thorough survey documentation and the key components it should include.
- Determine the purpose of a pre-survey review and how it contributes to survey quality and accuracy.

Duration: 10:00	**Duration: 30:00**
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Describe the legal aspects of land acquisition, including right-of-way (ROW) guidelines and easement considerations. • Differentiate between land ownership issues and boundary disputes in legal contexts. • Explain the importance of stakeholder coordination in survey operations, such as obtaining permissions from landowners and government agencies. • List potential risks in survey operations, such as weather conditions, equipment failure, or access restrictions. • Describe risk assessment methods and mitigation planning for survey activities. • Explain the role of documentation in ensuring compliance with legal and regulatory requirements. • Describe the importance of conducting safety briefings and implementing emergency procedures during survey operations.	• Demonstrate the process of identifying and marking ROWs on-site using survey maps and legal documentation. • Role-play a scenario explaining ROW and easement considerations to a stakeholder or team member during a survey briefing. • Conduct a mock analysis of property records and maps to resolve a simulated boundary dispute. • Present a case study showing how to handle land ownership conflicts during survey operations. • Demonstrate drafting and delivering a formal request letter or agreement to a landowner or government agency for survey permissions. • Simulate a stakeholder meeting to address concerns and negotiate terms for access to the survey area. • Perform a site inspection and identify potential risks using a checklist, documenting findings with photos or notes. • Conduct a team brainstorming session to prioritize and rank risks based on likelihood and impact. • Create and present a risk assessment matrix for a specific survey project, outlining identified risks and mitigation strategies.

	• Simulate the application of mitigation measures, such as setting up backup equipment or defining alternative routes. • Demonstrate the preparation and filing of survey documentation, such as legal descriptions, maps, and permission letters. • Conduct a walkthrough of an audit checklist to ensure all required documentation is compliant and complete. • Lead a mock safety briefing for a survey team, covering PPE requirements, site-specific hazards, and emergency protocols. • Execute a simulated emergency response drill, such as a medical evacuation or communication breakdown scenario, to practice readiness.
Classroom Aids	
Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop	
Tools, Equipment and Other Requirements	
Surveying Tripod, Total Station, GPS Receiver, Levelling Instrument, Measuring Tape, Safety Helmets, High-Visibility Vests, Safety Goggles, Ear Protection (Earplugs or Earmuffs), Steel-Toe Boots, Gloves, First Aid Kit, Traffic Cones and Barriers, Reflective Tape, Microfiber Cloths, Lens Cleaning Solution, Tool Oil or Lubricants, Surface Cleaner	

Module 4: Conducting Field Surveys

Mapped to ICE/CON/N0205, v1.0

Terminal Outcomes:

- Explain how to conduct a topographic survey using Total Stations and GPS for accurate mapping.
- Describe the process of conducting drone surveys using LiDAR and photogrammetry for data collection.
- Discuss the applications of AI-assisted geotechnical and hydrological surveys in enhancing data analysis and accuracy.

Duration: 30:00	**Duration: 90:00**
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Describe the properties of road materials, soil mechanics, and pavement structures. • Explain the basic concepts of topographic surveying, including elevation, distance, and angle measurement. • Explain the process of creating sample accurate contour maps, cross-sections, and profiles of terrain involving detailed survey process that collects elevation data and visually represents the land profile. • Differentiate between geodetic and plane surveying, including their applications. • Differentiate between prism-based and reflector-less measurements and their applications. • List the working principles and uses of survey instruments like Total Station, GPS, and Theodolites. • Explain calibration and basic maintenance requirements for survey instruments. • Identify survey tools and equipment (e.g., measuring tapes, ranging rods, tripods, prisms) and their roles in Field surveys. • Describe the process of reading and interpreting topographic and cadastral maps.	• Conduct a field demonstration of soil compaction tests and pavement thickness measurements. • Set up and operate a level instrument to measure elevation differences between two points. • Use a measuring tape and total station to determine distances and angles, recording data in a field notebook. • Conduct a detailed terrain survey using a total station and create contour maps with software like AutoCAD or GIS tools. • Prepare cross-sections and profiles from collected data and present them in a report format. • Compare and contrast plane and geodetic surveying methods by executing a small-scale survey with a total station (plane) and GPS (geodetic). • Present a case study showing the application of each method in real-world projects. • Perform the complete setup of a total station on a survey tripod, demonstrating levelling, Centering, and aligning procedures. • Simulate troubleshooting calibration issues and resolving misalignment.

• Explain Geographic Information Systems (GIS) and remote sensing techniques in survey planning. • Explain basic forward and backward surveying techniques, including loop closure and consistency checks. • Describe how to use a theodolite to measure horizontal and vertical angles. • Explain GPS principles, including how satellite signals determine positions. • Describe GPS surveying techniques like static, kinematic, and RTK surveying. • Identify GPS equipment used in highway surveys, including receivers and antennas. • Explain site reconnaissance methods to identify obstacles and establish survey strategies. • Identify sources of error in total station, theodolite and GPS surveys and strategies to mitigate them. • Explain methods for verifying measurement accuracy, such as reoccupying control points.	• Set up a theodolite in the field and measure horizontal and vertical angles to designated targets. • Record and interpret angle measurements to determine azimuths and inclinations. • Demonstrate the usage and calibration of instruments like Auto Level, Dumpy Level, and Tilting Level. • Show how to conduct benchmark surveys using backward and forward levelling methods. • Show how to perform benchmark surveying to establish permanent or temporary benchmarks and measure elevations relative to a reference point. • Use a handheld GPS receiver to locate a point on the ground, explaining satellite triangulation during the process. • Perform a live demonstration of GPS signal acquisition and coordinate generation. • Conduct a static GPS survey at a fixed location and process the data for high-precision results. • Demonstrate real-time kinematic (RTK) GPS surveying to mark precise points on the ground. • Identify and demonstrate the use of different types of GPS receivers and antennas in a highway survey scenario. • Show how to assemble and disassemble the equipment for safe transport and storage. • Conduct a mock site reconnaissance walk-through, noting potential obstacles and recording observations in a survey plan. • Develop a site strategy using visual markers and pre-identified landmarks. • Simulate a survey and deliberately introduce errors (e.g., mis-levelling) to identify their impact on measurements.

	• Demonstrate corrective actions, such as re-levelling equipment or recalibrating instruments. • Reoccupy a known control point during a survey session and compare results with previously recorded coordinates. • Present a practical report showcasing measurement accuracy validation and adjustments if discrepancies occur.
Classroom Aids	
Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop	
Tools, Equipment and Other Requirements	
Digital Theodolite, Data Collector, Reflectorized Targets, Handheld GPS Devices, Safety Helmets, High-Visibility Vests, Safety Goggles, Ear Protection (Earplugs or Earmuffs), Steel-Toe Boots, Gloves, First Aid Kit, Traffic Cones and Barriers, Reflective Tape, Microfiber Cloths, Lens Cleaning Solution, Tool Oil or Lubricants, Surface Cleaner	

Module 5: Analysing the Highway Survey Data

Mapped to ICE/CON/N0204, v1.0

Terminal Outcomes:

- Describe the methods used to collect and organize survey data effectively.
- Explain the process of performing data processing to ensure accuracy and reliability.
- Discuss the steps involved in analyzing the collected survey data.

Duration: 10:00	**Duration: 20:00**
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Explain how to analyse key highway design components, including horizontal and vertical alignments, cross-sections, and earthwork considerations, ensuring the design meets functional and safety standards. • Discuss the role of road materials, soil mechanics, and pavement structures in highway construction, emphasizing the importance of quality and durability in infrastructure development. • Describe the design and implementation of effective drainage systems, road signs, and safety measures to enhance highway longevity and user safety. • Describe the use of traditional (e.g., total stations) and modern tools (e.g., drones, GPS) for accurate data collection, critical for reliable highway survey analysis. • Discuss different data formats like CSV and shapefiles, techniques to manage large datasets efficiently, and methods to ensure data quality, accuracy, and reliability. • Discuss geographic coordinate systems (latitude and longitude) and projected systems, including transformations and conversions, essential for mapping and alignment studies. • Explain the use of Digital Elevation Models (DEMs) and GIS tools to analyse terrain features, supporting the planning and alignment of highways in varied topographies.	• Use CAD software to design a highway alignment, creating horizontal and vertical profiles based on real or simulated survey data. • Calculate earthwork volumes for a given highway project using contour data and demonstrate how adjustments can optimize functional and safety standards. • Conduct laboratory tests on road materials, such as compaction tests for soil and quality assessments for asphalt and aggregates. • Create a demonstration of pavement layer composition, showing how different materials contribute to durability and load-bearing capacity. • Develop a model or diagram of a highway drainage system, highlighting placement and slope considerations. • Set up a mock road section with signs and safety features, explaining their placement and purpose in maintaining highway safety. • Demonstrate the operation of a total station to measure distances and angles on-site. • Process and convert survey data into CSV and shapefiles, demonstrating their integration into GIS software for mapping. • Perform data validation and cleaning exercises to ensure accuracy and reliability in survey datasets. • Use GIS software to perform transformations between geographic (e.g.,

• Elaborate on how to leverage Geographic Information Systems (GIS) software for spatial analysis, mapping, and visualization, aiding in comprehensive highway survey data interpretation. • Explain the application of photogrammetric techniques for creating 2D and 3D models from drone images and process LiDAR data to develop accurate DEMs and surface models. • Discuss advanced technologies like drones, LiDAR sensors, and machine learning to automate data interpretation, optimize surveying processes, and enhance highway project efficiency.	WGS84) and projected systems (e.g., UTM). • Create a practical exercise to align survey data to a specific coordinate system for mapping purposes. • Generate a DEM from LiDAR data and analyse terrain features such as slopes and elevations using GIS tools. • Simulate the alignment of a highway based on terrain analysis and explain the decision-making process. • Demonstrate the creation of thematic maps in GIS, showcasing highway alignment, land use, and nearby features. • Use GIS for spatial analysis, such as buffer zones and proximity studies for highway planning. • Demonstrate the extraction of elevation data from LiDAR point clouds and the creation of a detailed DEM. • Present a case study where automated interpretation techniques were used to optimize survey results for a highway project.

Classroom Aids
Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop
Tools, Equipment and Other Requirements
Computer with Surveying Software (e.g., AutoCAD, Civil 3D), Plotter/Printer, Spreadsheet Software (e.g., Microsoft Excel), Statistical Analysis Software, Safety Helmets, High-Visibility Vests, Safety Goggles, Ear Protection (Earplugs or Earmuffs), Steel-Toe Boots, Gloves, First Aid Kit, Traffic Cones and Barriers, Reflective Tape, Microfiber Cloths, Lens Cleaning Solution, Tool Oil or Lubricants, Surface Cleaner

Module 6: Interpreting the Highway Survey Data

Mapped to ICE/CON/N0204, v1.0

Terminal Outcomes:

- Elucidate how to interpret and report survey data for clarity and precision.
- Determine how survey data assists in decision-making processes.

Duration: 10:00	Duration: 20:00
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Describe various highway survey techniques, including traffic volume studies, speed studies, origin-destination surveys, and pavement condition assessments. • Elaborate on the process of analyzing highway survey data to identify trends, patterns, and correlations critical for planning and design. • Explain how to interpret traffic flow parameters such as volume, speed, and density to assess highway performance and capacity. • Discuss how survey data contributes to designing road alignments, intersections, and other geometric features for safety and efficiency. • Describe the process of evaluating pavement condition data for maintenance prioritization and lifecycle cost analysis. • Explain how to use survey data to inform policy decisions, optimize resource allocation, and plan infrastructure improvements. • Discuss how to incorporate survey data to evaluate the environmental and societal implications of highway development projects.	• Conduct a live traffic volume survey using manual counting or video analysis tools and interpret the results. • Perform a speed study using radar guns or automated counters, demonstrating data collection and analysis methods. • Simulate an origin-destination survey by designing and analyzing a questionnaire or using GPS tracking data. • Use specialized tools to assess pavement conditions, such as measuring rut depth, cracks, and surface smoothness. • Use spreadsheet software or traffic analysis tools to process traffic volume and speed data, identifying peak hours and traffic flow trends. • Create a correlation analysis between pavement condition and traffic load using historical survey datasets. • Demonstrate the use of the Highway Capacity Manual (HCM) or similar tools to analyse traffic flow parameters. • Calculate the Level of Service (LOS) for a sample highway section based on collected traffic data. • Use collected traffic data to design an intersection layout, ensuring compliance with safety standards. • Demonstrate the alignment design process for a highway segment, incorporating survey data into CAD software. • Perform a hands-on evaluation of pavement condition indices (e.g., PCI) using collected survey data.

	• Develop a maintenance prioritization plan using a decision matrix based on pavement condition and traffic volume. • Create a presentation demonstrating how survey data supports decisions on budget allocation for road maintenance and upgrades. • Develop an infrastructure improvement proposal using case-study data to showcase effective resource optimization. • Conduct a mock environmental impact assessment using traffic and land-use survey data, highlighting key findings. • Analyse survey data to evaluate societal implications such as accessibility improvements and displacement risks, and present mitigation strategies.
Classroom Aids	
Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop	
Tools, Equipment and Other Requirements	
Computer with Surveying Software (e.g., AutoCAD, Civil 3D), Plotter/Printer, Spreadsheet Software (e.g., Microsoft Excel), Statistical Analysis Software, Safety Helmets, High-Visibility Vests, Safety Goggles, Ear Protection (Earplugs or Earmuffs), Steel-Toe Boots, Gloves, First Aid Kit, Traffic Cones and Barriers, Reflective Tape, Microfiber Cloths, Lens Cleaning Solution, Tool Oil or Lubricants, Surface Cleaner	

Module 7: Maintenance, Calibration, and Safe Storage of Highway Survey Tools and Equipment

Mapped to ICE/CON/N0201, v1.0

Terminal Outcomes:

- Explain the importance of conducting routine inspections for tools and equipment.
- Discuss the steps involved in carrying out preventive maintenance.
- Describe the process for cleaning tools and equipment to ensure optimal functionality.
- Elucidate how to calibrate and update software regularly.
- Determine best practices for maintaining battery health.
- Explain the methods for maintaining data backup and records for future reference.

Duration: 15:00	**Duration: 15:00**
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Explain how to use survey instruments like Total Stations, GPS units, theodolites, levels, and laser scanners for highway projects. • Describe the importance and procedures for calibrating instruments like Total Stations, GPS receivers, and levels to ensure accuracy. • Discuss how to conduct visual inspections of survey instruments to identify signs of wear, damage, or misalignment. • Elucidate the proper cleaning methods for lenses and electronic components using microfiber cloths and cleaning solutions. • Determine the best practices for storing survey equipment batteries to maintain charge levels and ensure longevity. • Explain the process of backing up instrument data and settings before performing software or firmware updates. • Describe the correct handling and transporting techniques to prevent damage to sensitive survey instruments. • Explain how to apply common troubleshooting methods to resolve issues like misalignment, communication errors, or software glitches.	• Conduct a demonstration of setting up and using a Total Station to measure angles and distances. • Perform a live GPS survey to collect positional data and map a predefined area. • Use a theodolite to measure horizontal and vertical angles in a simulated highway survey scenario. • Demonstrate scanning a road section using a laser scanner and processing the data for analysis. • Perform a hands-on calibration of a Total Station using manufacturer-recommended procedures. • Calibrate a GPS receiver and document the process step by step. • Demonstrate how to check and adjust levels using a levelling instrument. • Guide participants through a visual inspection of survey instruments, highlighting areas prone to wear or damage. • Use a checklist to assess the alignment and condition of Total Stations and GPS units. • Demonstrate the cleaning of instrument lenses and screens using appropriate materials and techniques.

• Discuss the importance of maintaining detailed logs of maintenance activities, such as calibration dates and repair records. • Describe safe storage solutions to protect survey instruments from environmental factors like moisture, dust, and temperature fluctuations.	• Show how to clean and maintain electronic components without causing damage. • Present a battery management plan, including optimal storage conditions and charge-maintenance techniques. • Demonstrate the correct way to store and transport survey equipment batteries. • Perform a live backup of data from a Total Station or GPS unit onto a computer or cloud storage. • Guide participants through a firmware update, emphasizing the importance of preserving data integrity. • Demonstrate proper packing and transportation techniques for survey instruments in protective cases. • Simulate a field deployment, showing how to safely set up and dismantle equipment. • Conduct a troubleshooting session to fix a misaligned Total Station or GPS communication error. • Walk through resolving software glitches by reinstalling firmware or resetting instrument settings. • Create a maintenance log for a set of survey instruments, recording calibration and repair history. • Demonstrate how to use digital tools to track and manage maintenance records efficiently. • Set up a demonstration of an ideal storage environment with controlled temperature and humidity for survey instruments. • Use protective cases and demonstrate sealing techniques to safeguard instruments from dust and moisture.
Classroom Aids	
Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop	
Tools, Equipment and Other Requirements	
Toolbox with Basic Repair Tools, Calibration Equipment, Safety Helmets, High-Visibility Vests, Safety Goggles, Ear Protection (Earplugs or Earmuffs), Steel-Toe Boots, Gloves, First Aid Kit, Traffic Cones and Barriers, Reflective Tape, Microfiber Cloths, Lens Cleaning Solution, Tool Oil or Lubricants, Surface Cleaner	

Module 8: Health and Safety in Roadway Survey Operations

Mapped to ICE/CON/N0202, v1.0

Terminal Outcomes:

- Discuss the measures necessary to ensure health and safety during roadway survey operations.

Duration: 15:00	Duration: 15:00
Theory – Key Learning Outcomes	**Practical – Key Learning Outcomes**
• Explain 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. • Describe how to troubleshoot issues experienced in the field, such as equipment malfunctions or unexpected site conditions, and adapt the survey approach to ensure safety. • Discuss the proper use and limitations of PPE during survey activities. • Elucidate how to ensure the safety of survey equipment during operations, including its handling, maintenance, and storage. • Explain the drone safety guidelines, including risk mitigation and compliance with regulations. • Discuss the emergency response protocols, including first aid and evacuation procedures during survey activities. • Describe the traffic management principles and tools, such as lane closures, diversions, and assigning spotters, to ensure safe working conditions. • Determine how to monitor weather conditions and decide when to suspend survey activities for safety. • Discuss the impact of survey activities on the environment and strategies to minimize disturbance to natural features. • Explain the importance of maintaining accurate and detailed field notes, including sketches, measurements, observations, and health and safety incidents.	• Conduct a safety drill on a simulated highway survey site, demonstrating the correct use of PPE, such as helmets, high- visibility vests, and gloves. • Set up and implement traffic management measures like cones, barricades, and warning signs to create a safe working zone. • Simulate common field issues like equipment misalignment or blocked survey points, and guide participants through troubleshooting steps. • Demonstrate adapting the survey approach, such as repositioning instruments or using alternative methods in challenging site conditions. • Demonstrate the use of various PPE, including their correct usage, limitations, and scenarios where they might not provide full protection. • Conduct a practical session where participants test the durability and functionality of different PPE in controlled scenarios. • Demonstrate the proper handling of sensitive survey equipment, including lifting and setting it up. • Conduct a maintenance session, showing how to clean and inspect instruments after use. • Set up a storage area, highlighting how to protect equipment from environmental hazards. • Organize a mock emergency scenario, practicing first aid techniques, such as treating minor injuries or CPR. • Simulate an evacuation drill, guiding participants on the quickest and safest way to leave a site under emergency conditions. • Set up a mock highway work zone with lane closures and diversions, assigning spotters to direct traffic and ensure worker safety. • Use traffic management tools like portable traffic lights and barriers, explaining their

	placement and usage. ● Demonstrate the use of weather monitoring apps or instruments to track real-time conditions. ● Simulate decision-making scenarios evaluating weather data and decide whether to continue or suspend survey operations. ● Conduct a field exercise to identify potential environmental impacts, such as soil compaction or vegetation damage. ● Demonstrate strategies to minimize disturbances, such as using eco-friendly equipment and following designated paths. ● Use a field notebook to record mock survey data, including measurements, sketches, and observations. ● Document a health and safety incident in a simulated scenario, ensuring thorough and accurate reporting.
Classroom Aids	
Training Kit (Trainer Guide, Presentations). Whiteboard, Marker, Projector, Laptop	
Tools, Equipment and Other Requirements	

Module 9: Employability Skills (60 Hours)

Mapped to DGT/VSQ/N0102, v1.0

Duration (in hours): 60:00

Key Learning Outcomes

After completing this programme, participants will be able to:

Introduction to Employability Skills Duration: 1.5 Hours

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

Constitutional values - Citizenship Duration: 1.5 Hours

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

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

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

Basic English Skills Duration: 10 Hours

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

Career Development & Goal Setting Duration: 2 Hours

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

Communication Skills Duration: 5 Hours

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

Diversity & Inclusion Duration: 2.5 Hours

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

Financial and Legal Literacy Duration: 5 Hours

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

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

Essential Digital Skills Duration: 10 Hours

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

Entrepreneurship Duration: 7 Hours

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

Customer Service Duration: 5 Hours

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

Getting Ready for apprenticeship & Jobs Duration: 8 Hours

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

On-the-Job Training

Mapped to Roadway Surveyor, v 1.0

Mandatory Duration (in hours): 120:00	Recommended Duration (in hours): 00:00
Location: On-Site	

Terminal Outcomes

- Demonstrate how to define the objectives and scope of a survey and explain their impact on the survey's purpose and outcomes.
- Show how to review existing information before conducting a survey and discuss its influence on survey design.
- Demonstrate how to select an appropriate survey methodology and tools to ensure data reliability and relevance.
- Show how to develop a survey plan by outlining key elements.
- Demonstrate how to coordinate effectively with stakeholders throughout the survey process.
- Show how to conduct a risk assessment and plan for risk mitigation in survey implementation.
- Demonstrate how to prepare thorough survey documentation.
- Show how to perform a pre-survey review and explain its contributions to survey quality and accuracy.
- Demonstrate how to conduct a topographic survey using Total Stations and GPS for accurate mapping.
- Show how to carry out drone surveys using LiDAR and photogrammetry for data collection.
- Demonstrate how to apply AI-assisted geotechnical and hydrological surveys to enhance data analysis and accuracy.
- Show how to implement appropriate safety measures during surveying activities.
- Demonstrate how to collect and organize survey data effectively.
- Show how to process data to ensure accuracy and reliability.
- Demonstrate how to analyse the collected survey data systematically.
- Show how to interpret and report survey data clearly and precisely.
- Demonstrate how to utilize survey data to assist in decision-making processes.
- Show how to conduct routine inspections of tools and equipment.
- Demonstrate how to carry out preventive maintenance effectively on survey equipment.
- Show how to clean tools and equipment to maintain their optimal functionality.
- Demonstrate how to calibrate and update software regularly for survey tools.
- Show how to maintain battery health using best practices.
- Demonstrate how to maintain data backup and records for future reference.
- Show how to ensure health and safety during roadway survey operations.

Annexure

Trainer Requirements

Minimum Educational Qualification	Specialization	Relevant Industry Experience		Training Experience		Remarks
		Years	*Specialization*	*Years*	*Specialization*	
M.Sc./ M. Tech/ M.E.	Civil Engineering/ Geotechnical Engineering/ Surveying/ Highway Engineering	2	Infrastructure or Highway construction industry	1	Roadway Surveyor	
B. Tech.	Civil Engineering/ Highway Engineering/ Surveying	3	Infrastructure or Highway construction industry	1	Roadway Surveyor	
Diploma	Civil Engineering or Surveying	5	Infrastructure or Highway construction industry	1	Roadway Surveyor	

Trainer Certification	
Domain Certification	**Platform Certification**
Recommended that the Trainer is certified for the Job Role: *"Roadway Surveyor"*, mapped to the Qualification Pack: "ICE/CON/Q0201, v 1.0". The minimum accepted score is 80%.	Recommended that the Trainer is certified for the Job Role: *"Trainer (VET and skills)"*, mapped to the Qualification Pack: "MEP/Q2601, v 3.0". The minimum accepted score is 80%.

Assessor Requirements

Minimum Educational Qualification	Specialization	Relevant Industry Experience		Training/Assessment Experience		Remarks
		Years	*Specialization*	*Years*	*Specialization*	
M.Sc./ M. Tech/ M.E.	Civil Engineering/ Geotechnical Engineering/ Surveying/ Highway Engineering	2	Infrastructure or Highway construction industry	1	Roadway Surveyor	
B. Tech.	Civil Engineering/ Highway Engineering/ Surveying	3	Infrastructure or Highway construction industry	1	Roadway Surveyor	
Diploma	Civil Engineering or Surveying	5	Infrastructure or Highway construction industry	1	Roadway Surveyor	

Assessor Certification	
Domain Certification	**Platform Certification**
Recommended that the Assessor is certified for the Job Role: *"Roadway Surveyor"*, mapped to the Qualification Pack: "ICE/CON/Q0201, v1.0". The minimum accepted score is 80%.	Recommended that the Assessor is certified for the Job Role: *"Assessor (VET and skills)"*, mapped to the Qualification Pack: "MEP/Q2701, v3.0". The minimum accepted score is 80%.

Assessment Strategy

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

1. **Assessment System Overview:**

   Assessment is done through ICES affiliated Assessment Agencies. Assessors are trained & certified by ICES after Training of Assessor (ToA) program. Assessments are conducted to gauge and assess the trainee's skill and knowledge competency in the specified areas.

   The assessment will have both theory, practical and viva components as per ratio specified in each NOS for **Roadway Surveyor** job role.

   During the practical task, trainees are assessed on their workmanship, quality of finished product and time management. They will be graded for all their assessments based on the approved assessment strategy which is signed off by ICES. The Assessor submits an assessment plan to ICES prior to assessments.

   The assessment plan contains the following information:

   - What will be assessed, i.e. the competency based on each NOS based on theory, practical and viva questions
   - How assessment will occur i.e. methods of assessment
   - When the assessment will occur
   - Duration of assessment
   - Where the assessment will take place i.e. context of the assessment (workplace/simulation)
   - The criteria for decision making i.e. those aspects that will guide judgments
   - Where appropriate, any supplementary criteria are used to make a judgment on the level of performance.

   ICES will be monitoring thoroughly the complete Assessment process.

2. **Testing Environment:**
   - Training partner shares the batch start date and end date, number of trainees and the job role.
   - Assessment will be fixed for a day after the end date of training. It could be next day or later. Assessment will be conducted at the training venue/test center only.
   - The knowledge/theory assessments are conducted with proper seating arrangements with enough space between the candidates to prevent mal practicing.
   - Question set for Theory and Practical will be distributed to each candidate by the Assessor.
     - Theory testing will include MCQ type questions, pictorial questions etc. which will test the trainee on his theoretical knowledge of the subject.
     - Practical assessments will be conducted in the approved test centers. The training provider will ensure adequate tools and materials are available to conduct the practical test.
     - Viva Testing will be conducted during or post to the practical assessment by the assessor concerned. This Viva Assessment is applicable to understand the outcomes from OJT attended by the concerned candidate.
   - One (1) Assessor is eligible to conduct assessments of a batch of maximum 30 candidates.
   - The assessment must comprise of two components, namely:
     - Knowledge assessment (Theory and Viva assessment)
     - Skill assessment (Practical / Hands-on Skill assessment)
3. **Mode of assessment**
   - Demonstration/Practical Performance /Skill Assessment

- Synoptic multiple-choice question test for Theory Assessment
- Viva for Knowledge Assessment (Applicable to note the outcomes from OJT only)

4. Performance/skill assessment:

- The performance/skill assessment will be conducted through demonstration/practical
- For the practical test trainees are assessed through a given task, which they have to complete correctly for them to be marked as passed.
- The assessment is conducted in a simulated working environment. Due to this fact, the assessors must note that the naturally occurring evidence of competence is unavailable or infrequent. Simulation must be undertaken in a Realistic Working Environment which provides an environment that replicates the key characteristics of the workplace in which the skill to be assessed is normally employed.

5. Knowledge Assessment:

- The knowledge assessments are conducted through Theory (written) Test and Viva Test
- Synoptic test is used for this. It is an MCQ (Multiple Choice Question) test which is prepared externally and externally marked, meaning by agency having no link with training partners.
- The Viva test will be conducted by the assessor in the oral mode considering the communication and domain understanding of skills of trainees.
- The assessment strategy, weightage and duration of assessment for **Roadway Surveyor** is summarized below

Assessment Type	Formative or Summative	Strategies	Weightage	Duration (hours)
Knowledge	Summative	MCQ	30	1 hour
Knowledge	Summative	Viva	20	1 hour
Skill	Summative	Structured practical Task	50	6 hours

6. Assessment Quality Assurance levels/Framework

- ICES has developed assessment criteria framework for each Qualification pack as per National Occupational Standards. The criteria framework includes weightages/marks for each criterion under knowledge and skill. The criteria ensure quality assurance as they ensure valid, consistent and fair assessments at all locations. Issued to the affiliated Assessment body. The Assessment Body develops questions based on ICES's approved assessment criteria.
- The training partner will intimate the time of arrival of the assessor and time of leaving the venue. Random spot checks/audit may be conducted by ICES to monitor assessment.
- Continuous Monitoring through virtual and In-person mode are conducted to ensure the assessment is conducted as per stipulated process
- Process and Technical audit of assessment batches by quality team are conducted to avoid errors in assessment process
- A well -defined comprehensive framework of NON-COMPLIANCE MATRIX is defined and implemented to identify the non-compliance made by assessor and AA and punitive actions are taken correspondingly.
- The capacity building sessions are conducted regularly for assessors and assessment agencies to update them about best practices in assessment

7. Types of evidence or evidence-gathering protocol:

- Evidence in the form of answer sheets in case of knowledge assessments (Theory only) is collected.

- For Practical and Viva assessments videos and photographs are prepared as evidence. These are submitted by the assessor to the assessment agency. ICES does random checks of the same with the participant/ trainee's ID and ascertains authenticity and validity of assessments.
- Post Assessment, the evidence are uploaded by Assessor to assessment agency and further assessment agency to ICES as per stipulated TAT
- Evidence are broadly photographic and video graphics in nature (Geo-Tagged)
- Results along with evidence to be submitted to ICES by the concerning Assessment Agency in the prescribed format and on Digital Format and Physical Format (As required)
- Results to be uploaded on SIDH and other relevant portals for collective data management.

8. Method of verification or validation:

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

9. On the Job:

- On job training (OJT), candidates undergo training and leaning at actual workplace for a fixed period of time and a certain weightage of assessment is allocated out of total skill weightage of Qualification Pack for undergoing OJT as stipulated by ICES. This OJT score and assessors' end point score are combined to arrive at final Marking/grading of trainees' skill test. The OJT score is determined by Supervisor / Engineer / other authorized head of departments of relevant industry under which candidates undergo on job training.
- The Assessment is subject to take place only after submission of OJT data (in case of STT only) approved by concerned industry and training provider.
- The Hard copy of the OJT report (on trainings, outcomes, exposures learnt and feedback certified by Supervisor / Engineer / other authorized head of departments of relevant industry) will be submitted to the Assessor by the concerned candidate on the Assessment date only, failing which the candidate may not be allowed for attending the Assessment.
- As OJT is mandatory for this QP, the TP should ensure the correct submission of all relevant reports pertaining to OJT of each trained candidate. The Assessment agency is responsible for collecting all the relevant information and submit the same to ICES in future (if required).

References

Glossary

Term	Description
Declarative Knowledge	Declarative knowledge refers to facts, concepts and principles that need to be known and/or understood in order to accomplish a task or to solve a problem.
Key Learning Outcome	Key learning outcome is the statement of what a learner needs to know, understand and be able to do in order to achieve the terminal outcomes. A set of key learning outcomes will make up the training outcomes. Training outcome is specified in terms of knowledge, understanding (theory) and skills (practical application).
OJT (M)	On-the-job training (Mandatory); trainees are mandated to complete specified hours of training on site
OJT (R)	On-the-job training (Recommended); trainees are recommended the specified hours of training on site
Procedural Knowledge	Procedural knowledge addresses how to do something, or how to perform a task. It is the ability to work, or produce a tangible work output by applying cognitive, affective or psychomotor skills.
Training Outcome	Training outcome is a statement of what a learner will know, understand and be able to do it upon the completion of the training.
Terminal Outcome	Terminal outcome is a statement of what a learner will know, understand and be able to do upon the completion of a module. A set of terminal outcomes help to achieve the training outcome.

Acronyms and Abbreviations

Term	Description
QP	Qualification Pack
NSQF	National Skills Qualification Framework
NSQC	National Skills Qualification Committee
NOS	National Occupational Standards
SSC	Skill Sectors Councils
PPE	Personal Protective Equipment
GPS	Global Positioning System
GNSS	Global Navigation Satellite System
GPR	Ground Penetrating Radar
LiDAR	Light Detection and Ranging
GIS	Geographic Information Systems
ROW	Right-Of-Way
GCP	Ground Control Points
DEMs	Digital Elevation Models
CAD	Computer-Aided Design
AI	Artificial Intelligence