

QUALIFICATION FILE

Introduction to Roadside Plantation and Bioengineering

☒ Horizontal / Generic ☐ Vertical/Specialization

☐ Upskilling ☐ Dual/Flexi Qualification ☒ For ToT ☒ For ToA

☒ General ☐ Multi-skill (MS) ☐ Cross-Sectoral (CS) ☐ Future Skills ☐ OEM

NCrF/NSQF Level: 2

Submitted By:

Integrated Council for Entrepreneurship and Skilling

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Section 1: Basic Details

1.	NOS-Qualification Name	Introduction to Roadside Plantation and Bioengineering								
2.	Sector/s	Construction								
3.	Type of Qualification: ☒ New ☐ Revised	NQR Code & version of existing/previous qualification: NA (<i>change to previous, once approved</i>)	Qualification Name of existing/previous version: NA							
4.	National Qualification Register (NQR) Code & Version (Will be issued after NSQC approval)	NG-02-CO-046392025-V1-ICES & Version 1.0	5. NCrF/NSQF Level: 2							
6.	Brief Description of the Qualification	This NOS involves enhancing road safety, stability and environmental sustainability through the strategic planting of vegetation and application of bioengineering techniques, considering retaining walls (such as traditional and new techniques). This role focuses on using natural methods and eco-friendly practices to stabilize slopes, control erosion and improve the visual, Rainwater harvesting and ecological quality of road corridors. Professionals in this field are responsible for planning, executing and maintaining vegetation cover and bioengineering structures that integrate with the built environment to reduce maintenance costs and environmental impact.								
7.	Eligibility Criteria for Entry for Student / Trainee / Learner / Employee	a. Entry Qualification & Relevant Experience: <table border="1"> <thead> <tr> <th>S. No.</th> <th>Academic/Skill Qualification (with Specialization - if applicable)</th> <th>Required Experience (with Specialization - if applicable)</th> </tr> </thead> <tbody> <tr> <td>1.</td> <td>Ability to Read and Write</td> <td></td> </tr> </tbody> </table> b. Age: As per Govt. Norms			S. No.	Academic/Skill Qualification (with Specialization - if applicable)	Required Experience (with Specialization - if applicable)	1.	Ability to Read and Write	
S. No.	Academic/Skill Qualification (with Specialization - if applicable)	Required Experience (with Specialization - if applicable)								
1.	Ability to Read and Write									
8.	Credits Assigned to this Qualification, Subject to Assessment (<i>as per National Credit Framework (NCrF)</i>)	4	9. Common Cost Norm Category (I/II/III) (<i>wherever applicable</i>): I							

10.	Any Licensing requirements for Undertaking Training on This Qualification (wherever applicable)	Not Applicable					
11.	Training Duration by Modes of Training Delivery (Specify Total Duration as per selected training delivery modes and as per requirement of the qualification)	☒ Offline ☐ Online ☐ Blended					
		Training Delivery Modes	Theory (Hours)	Practical (Hours)	OJT Mandatory (Hours)	OJT Recommended (Hours)	Total (Hours)
		Classroom (offline)	45	55	20		120
		Online					
		(Refer Blended Learning Annexure for details)					
12.	Assessment Criteria	Theory (Marks)	Practical (Marks)	Project (Marks)	Viva (Marks)	Total (Marks)	Passing %age
		30	60		10	100	50
13.	Is the Job Role Amenable to Persons with Disability	☐ Yes ☒ No If “Yes”, specify applicable type of Disability:					
14.	Progression path after attaining the qualification (Please show Professional and Academic progression)	Pavement Layer (NSQF Level 3)					
15.	How Participation of Women will be Encouraged	To encourage the participation of women in roadside plantation and bioengineering initiatives, inclusive strategies will be adopted that recognize and leverage their unique capabilities and contributions. Training programs will be designed to be gender-sensitive, ensuring accessibility and equal opportunities for skill development in areas such as plant selection, nursery management, soil conservation techniques, Rainwater harvesting and maintenance of bioengineering structures. Community outreach efforts will focus on engaging women's self-help groups and local cooperatives to take active roles in plantation activities and environmental stewardship. Additionally, creating safe and supportive work environments, offering flexible work schedules and promoting leadership opportunities for					

		women within these projects will further empower them to contribute meaningfully to ecological restoration and sustainable infrastructure development along roadsides.	
16.	Other Indian languages in which the Qualification & Model Curriculum are being submitted	Hindi	
17.	Is similar NOS available on NQR-if yes, justification for this qualification	☐ Yes ☒ No URLs of similar Qualifications:	
18.	Name and Contact Details of Submitting / Awarding Body SPOC <i>(In case of CS or MS, provide details of both Lead AB & Supporting ABs)</i>	Name: Maya Thakur Email: ceo@iceskills.in Contact No.: +91 9717900050 Website: www.iceskills.in	
19.	Final Approval Date by NSQC: 07-10-2025	20. Validity Duration: 3 Years	21. Next Review Date: 07-10-2028

Section 2: Training Related

1.	Trainer's Qualification and experience in the relevant sector (in years) (as per NCVET guidelines)	Minimum Educational Qualification	Specialization	Relevant Industry Experience		Preferable Training Experience	
				Years	Specialization	Years	Specialization
		Graduation	Any Stream	1	Plantation and Bioengineering related activities	1	Plantation and Bioengineering related activities
2.	Master Trainer's Qualification and experience in the relevant sector (in years) (as per NCVET guidelines)	Minimum Educational Qualification	Specialization	Relevant Industry Experience		Preferable Training Experience	
				Years	Specialization	Years	Specialization
		Graduation	Any Stream	5	Plantation and Bioengineering related activities	1	Plantation and Bioengineering related activities
3.	Tools and Equipment Required for Training	☒ Yes ☐ No (If "Yes", details provided in Annexure)					
4.	In Case of Revised NOS, Details of Any Upskilling Required for Trainer	Not Applicable					

Section 3: Assessment Related

1.	Assessor's Qualification and experience in relevant sector (in years) (as per NCVET guidelines)	Minimum Educational Qualification	Specialization	Relevant Industry Experience		Preferable Training/Assessment Experience	
				Years	Specialization	Years	Specialization
		Graduation	Any Stream	1	Plantation and Bioengineering related activities	1	Plantation and Bioengineering related activities
2.	Proctor's Qualification and experience in relevant sector (in years) (as per NCVET guidelines)	Minimum Educational Qualification	Specialization	Relevant Technical Experience			
				Years		Specialization	
		Graduation	Any Stream	1		in basic computer skills, documentation, coordination etc.	
		OR					
		Diploma	In any stream	2		in basic computer skills, documentation, coordination etc.	
3.	Lead Assessor's/Proctor's Qualification and experience in relevant sector (in years) (as per NCVET guidelines)	Minimum Educational Qualification	Specialization	Relevant Industry Experience		Preferable Training/Assessment Experience	
				Years	Specialization	Years	Specialization
		Graduation	Any Stream	10	Plantation and Bioengineering related activities	2	Plantation and Bioengineering related activities
4.	Assessment Mode (Specify the assessment mode)	Offline					
5.	Tools and Equipment Required for Assessment	☑ Same as for training ☐ Yes ☐ No (details to be provided in Annexure-if it is different for Assessment)					

Section 4: Evidence of the need for Qualification

Provide Annexure/Supporting documents name.

1.	Government /Industry initiatives/ requirement (Yes/No):	Yes
2.	Number of Industry validations provided:	22
3.	Estimated nos. of people to be trained:	2,100
4.	Evidence of Concurrence/Consultation with Line/State Departments (In case of regulated sectors): (Yes/No): If “No”, why:	Yes

Section 5: Annexure & Supporting Documents Check List

Specify Annexure Name / Supporting document file name:

1.	Annexure: NCrf/NSQF level justification based on NCrf level/NSQF descriptors <i>(Mandatory)</i>	Yes
2.	Annexure: List of tools and equipment relevant for qualification <i>(Mandatory, except in case of online course)</i>	Yes
3.	Annexure: Performance and Assessment Criteria <i>(Mandatory)</i>	Yes
4.	Annexure: Assessment Strategy <i>(Mandatory)</i>	Yes
5.	Annexure: Blended Learning <i>(Mandatory, in case selected Mode of delivery is “Blended Learning”)</i>	No
6.	Annexure: Acronym and Glossary <i>(Optional)</i>	Yes
7.	Annexure/Supporting Document: Standalone NOS- Performance Criteria Details Annexure/Document with PC-wise detailing as per NOS format (Mandatory- Public view)	Yes
8.	Supporting Document: Model Curriculum (Mandatory – Public view)	Yes

Annexure: Evidence of Level

NCrF/NSQF Level Descriptors	Key requirements of the job role/ outcome of the qualification	How the job role/ outcomes relate to the NCrF/NSQF level descriptor	NCrF/NSQF Level
Professional Theoretical Knowledge/Process	Basic working/ operational knowledge in the area of work. Understand basic materials, tools, applications in a limited context. For self-help group member/ microentrepreneur basic working knowledge of business activity, raw material, finished product/ service and local market. Able to understand and perform repetitive tasks under instructions and supervision. Understand the basic quality, safety and general hygiene norms. Familiarity with environmental aspects. Fundamental knowledge Basic working/ operational knowledge in the area of work with understanding of basic materials, tools, applications in a limited context.	Demonstrates factual knowledge of road repair materials, tools and surface types. Follows routine, predictable processes under supervision.	2
Professional and Technical Skills/ Expertise/ Professional Knowledge	Limited related skills in predefined context. Performs structured tasks in a limited range of functional roles. Use known solutions to familiar problems. Skill to identify and use relevant tools and materials in a limited context of work and quality. For self-help group members, micro entrepreneurs work skills for making or manufacturing (handicraft, traditional items, etc.) service and marketing etc. Limited finite skills Performs structured tasks in a limited range of functional roles. Uses known solutions to familiar problems.	Displays limited range of practical skills like operating tools and performing minor repairs, guided by clear procedures and repetitive tasks. Operates equipment under supervision, adhering to safety protocols.	2
Employment Readiness & Entrepreneurship Skills & Mind-set/Professional Skill	Ability to read and write and do simple computational math numeracy and literacy. Receive and transmit written and oral messages/ communication clearly. Works within a team as assistant, Understanding of safety, hygiene and environment, social, political and religious diversity. Have broader but basic Employability Skills including basic self-employment/	Perform tasks using clear rules and set procedures. Shows basic decision-making in known contexts (e.g., choosing tools). Cooperates with others in a structured environment.	2

	entrepreneurial Mind set for mini businesses, have understanding of use of Financial and Digital literacy, Aadhar and Mobile, digital payments etc. Employment readiness Receive and transmit written and oral messages/ communication clearly. Having broader but basic Employability Skills including basic self-employment/ entrepreneurial Mind set for mini businesses		
Broad Learning Outcomes/Core Skill	The candidate may carry out a job requiring limited range of routine and predictable activities. Tasks are mostly performed under instructions and supervision, Focus on practice of skill and work, both predefined and new. For self-help group members, micro-entrepreneurs (JSS) end up having clear understanding of process and delivery. Understands basic safety and general hygiene norms. Carry out the Predefined tasks The candidate may carry out a job requiring limited range of routine and predictable activities. Understands basic safety and quality norms	Use basic arithmetic and communication skills. Adheres to instructions. You can read routine information such as work orders and checklists.	2
Responsibility	Works mostly under instruction and supervision. Limited responsibility for delivery and quality of work. For self-help group members, micro entrepreneurs (JSS) end to end responsibility of production and marketing in local markets. Assistant Limited responsibility for delivery and quality of work as an Assistant	Take responsibility for own work in a defined, repetitive context. Refers decisions beyond scope to supervisors.	2

Annexure: Tools and Equipment (Lab Set-Up)

List of Tools and Equipment

Batch Size: 30 Candidates

S. No.	Tool / Equipment Name	Specification	Units	Quantity for specified Batch size	Remarks
1.	Safety Helmet		Nos	15	
2.	Reflective Safety Jacket		Nos	30	
3.	Safety Shoes		Nos	30	
4.	Safety Gloves		Nos	30	
5.	Safety Goggles		Nos	30	
6.	Earmuffs		Nos	30	
7.	First aid kits		Nos	3	
8.	Caution Tape / Road Safety Barricade	For marking working zone	Nos	5	
9.	Roadside Safety Sign Boards	MEN AT WORK / SLOW / WORK IN PROGRESS	Nos	3	
10.	Spade		Nos	5	
11.	Hoe (Kodali)		Nos	5	
12.	Pickaxe		Nos	5	
13.	Hand Trowel		Nos	5	
14.	Rake		Nos	5	
15.	Garden Fork		Nos	5	
16.	Watering Can / Hose Pipe	Can (8–10 litre) OR ¾” hose pipe	Nos	5	
17.	Measuring Tape	30 m	Nos	5	
18.	GPS Mobile App		Nos	1	
19.	Wooden Stakes		Nos	5	For brush layering installation
20.	Hand Saw		Nos	5	For cutting brush material
21.	Lopping Shears		Nos	5	For pruning branches
22.	Bamboo Poles	2–3 m length	Nos	30	for retaining crib wall demo
23.	Jute Rope	10-15 mm dia	Meter	10	
24.	Saplings / Shrubs / Native Grasses		Nos	150	
25.	Organic Manure / Compost		Nos	10	
26.	Straw / leaves		Bags	10	for moisture retention
27.	Soil Marking Pegs		Nos	100	
28.	Topsoil / Sand Mix		Bags	10	

29.	Gravel / Aggregates		Bags	10	For recharge pit model
30.	PVC Pipe	50 mm dia	Meter	30	
31.	Geo-textile Filters		Meter	30	For trench installation

Classroom Aids

The aids required to conduct sessions in the classroom are:

1. Laptops
2. Whiteboards and markers
3. Projector
4. Screen
5. Chart paper
6. AV equipment
7. Stationery
8. Telephone connection

Annexure: Industry Validations Summary

Provide the summary information of all the industry validations in table. This is not required for OEM qualifications.

S. No	Organization Name	Representative Name	Designation	Contact Address	Contact Phone No	E-mail ID	LinkedIn Profile (if available)
1.	Italferr Spa	Adil Hasan Siddqi	Sr. Engineer	205, South Park, Saket, New Delhi - 110017	9919990759	jitendermuningu@gmail.com	
2.	Chetak Enterprises Limited	Amit Kumar	Asst. Quality Cum Material Engineer	B-93 2nd Floor, Vaishali Marg, Vaishali Nagar, Jaipur (Raj.) Pin 302021	8743053306	chetak_enterprises@hotmail.com	
3.	Know How Schools	Dipesh Bafna	Partner	Pune, Maharashtra	9405266123	learn@knowhowschools.com	
4.	Freelance Architect (Individual Consultant)	Garvit Sharma	Architect	Ghaziabad, UP	9971967901	grsharma97@gmail.com	
5.	Asirbadh Projects and Infrastructure Limited	Kunwar Jee / Arbind Basu	GM Projects	Ranchi, Jharkhand	7858801901	ahplmd@yahoo.com	
6.	Gangaram Pvt. Industrial Training Institute	Munendra Dhakad	President	Bypass Nahar Ke Pass, Kailaras, Dist. Morena, Madhya Pradesh - 476224	9302970717	grpiti@gmail.com	
7.	Consulting (Big is Coming)	Nirman Jain	Technical Lead	Bangalore, Karnataka	7042447336	nirmanjain777@gmail.com	
8.	Ayoleeza Consultants Pvt. Ltd.	Praveen Dubey	Deputy HR	Unit No. B-901, 9th Floor, Urbtech Trade Centre, Tower-B, Sector-132, Noida, NCR 201304	7208744092	info@ayoleeza.com	
9.	Build It Better Pvt. Ltd.	Rahul Arora	Principal Architect	Goyal Mansion, Agrasen Bhawan, Behal, Bhiwani, Haryana - 127028	9568438787	arrahul.bib@gmail.com	
10.	JMC Projects (India) Ltd.	Raju Y.	Deputy Manager – Quality	3rd & 4th Floor, Tower-3, Okaya Center, Block B, Sector 62, Noida, UP 201301	8467847383	raju.y@kalpataruprojects.com	

11.	Engineer Consultant Civil - Road Construction, Design	Rohit	Consultant Engineer	Ghaziabad	7009097811	-	
12.	KRS Buildinfra Private Limited	Rohit Verma	Bidding Manager	Faridabad	8650050133	vrohit2036@gmail.com	
13.	Formworks Architects	Shant Bhadrwaj	Principal Architect	D11 Janhitkari Apartment, Vasundhara, Ghaziabad	9958461665	foramworkarchitects.fwa@gmail.com	
14.	Shrikant Gajanan Mhatre	Shrikant Gajanan Mhatre	Consulting Engineer & Valuer	Raigad, Maharashtra - 402107	9689728209	sshri1000@gmail.com	
15.	Rajlaxami Devbuild India Private Limited	Sonu Yadav	Structure Engineer	26-1, Super Deluxe, J. K. Road, Old Minal, Bhopal, MP - 462021	9009314840	-	
16.	Senryaku	Udit Kaushik	Co-Founder	UTC031, DLF The Ultima, Sector 81, Gurugram, Haryana - 122004	9690909024	udit.kau@gmail.com	
17.	Arth Design Build	Shoba Ran	Associate Mgr - HR	301 ABK Oblee Plaza, Opp. Care Hospital, Road No.1, Banjara Hills, Hyderabad	9908291188	akanksha.y@arthdesignbuild.com	
18.	Samerka Consultants Private Limited	Laxmikant B. Umarji	Director	302, Moreswari Kripa (B) CHS Ltd., Sawarkar Marg, Bhandup (E), Mumbai - 400042	9820087948	samarkacpl@gmail.com	
19.	Jawaharlal Nehru Architecture & Fine Arts University	K. Chandra Kanth	Asst. Professor	Hyderabad	9293163582	kchandrakant.fsp@infra.org.in	
20.	Balakrishna R Kulkarni	Balkrishna R. Kulkarni	Vice President	Mumbai, Maharashtra	9819657656	brkulkarni1@gmail.com	
21.	MYC Infra Pvt. Ltd.	Deepak Yadav	Project Coordinator	S0A, PKT-B HIG Flats, Sector-105, Noida, UP 201304	9411997000	erdeepakyadav25@gmail.com	
22.	SRM Institute of Science and Technology	Dr. T. Ch. Madhavi	Professor	Ramapuram Campus, Bharathi Salai, Chennai - 600089	840954753	madhavir@srmist.edu.in	

Annexure: Training & Employment Details

Training and Employment Projections:

Year	Total Candidates	Women	People with Disability
	Estimated Training #	Estimated Training #	Estimated Training #
2025-26	700	150	As per Industry Requirement
2026-27	700	150	As per Industry Requirement
2027-28	700	150	As per Industry Requirement

Data to be provided year-wise for next 3 years

Training, Assessment, Certification and Placement Data for previous versions of Qualifications:

Qualification Version	Year	Total Candidates				Women				People with Disability			
		Trained	Assessed	Certified	Placed	Trained	Assessed	Certified	Placed	Trained	Assessed	Certified	Placed
NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Applicable for revised qualifications only, data to be provided year-wise for past 3 years.

List Schemes in which the previous version of Qualification was implemented:

1. NA

Content availability for previous versions of qualifications:

☒ Participant Handbook ☒ Facilitator Guide ☒ Digital Content ☒ Qualification Handbook ☐ Any Other:

Languages in which Content is available: English and Hindi

Annexure: Blended Learning

Blended Learning Estimated Ratio & Recommended Tools:

Refer NCVET “Guidelines for Blended Learning for Vocational Education, Training & Skilling” available on:

<https://ncvet.gov.in/sites/default/files/Guidelines%20for%20Blended%20Learning%20for%20Vocational%20Education,%20Training%20&%20Skilli ng.pdf>

S.No.	Select the Components of the NOS	List Recommended Tools – for all selected Components	Offline: Online Ratio
1.	☐ Theory/ Lectures - Imparting theoretical and conceptual knowledge	NA	NA
2.	☐ Imparting Soft Skills, Life Skills and Employability Skills / Mentorship to Learners	NA	NA
3.	☐ Showing Practical Demonstrations to the learners	NA	NA
4.	☐ Imparting Practical Hands-on Skills/ Lab Work/ workshop/ shopfloor training	NA	NA
5.	☐ Tutorials/ Assignments/ Drill/ Practice	NA	NA
6.	☐ Proctored Monitoring/ Assessment/ Evaluation/ Examinations	NA	NA
7.	☐ On the Job Training (OJT)/ Project Work Internship/ Candidate Training	NA	NA

Annexure: Standalone NOS- Performance Criteria details

1. Description:

This unit covers the fundamental knowledge and skills required to carry out roadside plantation and implement bioengineering techniques including conventional and green retaining walls such as bamboo retaining structures for stabilizing slopes, enhancing road safety, drainage pipelines, rainwater harvesting for good drain down properties and improving environmental conditions. It includes understanding the benefits of vegetation for erosion control, recognizing site conditions, selecting appropriate plants, applying plantation techniques and assisting in the construction of both hard and soft slope stabilization systems. The unit emphasizes eco-friendly practices suitable for sustainable infrastructure development.

2. Scope:

The scope covers the following:

- Understand the concept and purpose of roadside plantation and bioengineering
- Apply roadside plantation techniques and select appropriate plant species for slope stabilization and ecological impact
- Understand the purpose and types of retaining walls
- Apply bioengineering techniques for slope, soil stabilization and rainwater harvesting
- Maintain plantation and bioengineered structures
- Follow environmental, health and safety procedures

3. Elements and Performance Criteria:

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

Understand the Concept and Purpose of Roadside Plantation and Bioengineering

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

- PC 1. describe the purpose of planting vegetation along roadsides
- PC 2. explain how vegetation helps in erosion control
- PC 3. identify the environmental and visual benefits of roadside plantations
- PC 4. define bioengineering in the context of slope and soil stabilization
- PC 5. differentiate between traditional and bioengineering-based retaining walls
- PC 6. list situations where bioengineering techniques are preferable
- PC 7. identify the role of natural materials in bioengineering structures
- PC 8. describe how these practices contribute to sustainability
- PC 9. explain why plant-based solutions are often cost-effective and eco-friendly

Apply Roadside Plantation Techniques and Select Appropriate Plant Species for Slope Stabilization and Ecological Impact

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

- PC 10. explain the method of contour planting and describe its relevance for stabilizing slopes and reducing surface runoff
- PC 11. identify suitable vegetation types and native species that anchor soil effectively and support long-term slope stabilization

- PC 12. demonstrate the correct layout of plants along contours and space them based on mature size and growth habits
- PC 13. match selected plant species to the local soil type and climatic conditions to ensure survival and effective erosion control
- PC 14. carry out roadside plantation activities following prescribed safety protocols and planting procedures, including glare screening where required
- PC 15. recognize and explain how root systems of plants contribute to slope stability and structural reinforcement of soil
- PC 16. report challenges such as unsuitable soil, mismatched species or visibility obstruction that may arise during plantation tasks
- PC 17. describe the visual, ecological and functional impacts of contour planting on roadside aesthetics and environmental sustainability

Understand the Purpose and Types of Retaining Walls

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

- PC 18. define retaining walls and their uses in road construction
- PC 19. describe how retaining walls prevent soil collapse
- PC 20. list different types of conventional retaining walls
- PC 21. identify materials used in conventional retaining walls
- PC 22. explain where retaining walls are needed
- PC 23. compare retaining wall types based on terrain and load
- PC 24. identify visual differences between conventional and green retaining walls
- PC 25. recognize structural and visual signs of retaining wall failure
- PC 26. report site conditions requiring wall installation

Apply Bioengineering Techniques for Slope, Soil Stabilization and Rainwater Harvesting

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

- PC 27. describe brush layering, its role in slope stability and its contribution to directing surface runoff into rainwater harvesting structures
- PC 28. explain the use of live stakes in erosion-prone areas and how they assist in slowing water flow for improved rainwater percolation
- PC 29. identify the construction of fascines, their layout and their effectiveness in guiding stormwater towards recharge zones
- PC 30. recognize live crib wall structure, installation basics and its function in reducing runoff velocity to enhance rainwater harvesting
- PC 31. demonstrate placing of brush layers on a slope to control erosion and channel rainwater safely into collection or recharge systems
- PC 32. identify appropriate materials for bioengineering methods that also support water infiltration and storage for rainwater harvesting
- PC 33. distinguish between temporary and permanent vegetative solutions, highlighting their role in long-term rainwater harvesting and groundwater recharge
- PC 34. follow basic steps for building bioengineering retaining structures with provisions to integrate rainwater harvesting features like recharge pits and trenches
- PC 35. inspect for early signs of slope erosion or failure

Maintain Plantation and Bioengineered Structures

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

- PC 36. monitor plant growth and soil stability around roadside areas
- PC 37. water and weed plantations regularly during establishment phase
- PC 38. identify signs of plant stress, erosion or pest damage
- PC 39. maintain spacing and clear view lines near roads

- PC 40. replace dead or failing plants as required
- PC 41. reinforce bioengineering features like stakes and brush layers
- PC 42. maintain drainage near retaining walls

Follow Environmental, Health and Safety Procedures

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

- PC 43. wear and use required PPE while working on slopes or roadsides
- PC 44. maintain safe distance from active traffic during plantation or wall work
- PC 45. avoid obstructing visibility or road signs during planting
- PC 46. dispose of plant waste and materials in eco-friendly ways
- PC 47. minimize soil disturbance in sensitive ecological zones
- PC 48. participate in safety briefings and follow instructions
- PC 49. identify and report environmental risks like landslides or habitat loss
- PC 50. record work progress in maintenance or plantation records
- PC 51. communicate clearly with team members during installation and maintenance

4. Knowledge and Understanding (KU):

The individual on the job needs to know and understand:

- KU 1. meaning and importance of roadside plantation in controlling soil erosion
- KU 2. basic functions of bioengineering in road construction and slope protection
- KU 3. common types of vegetation used in roadside plantation and their characteristics
- KU 4. role of native plant species and their suitability based on climate and soil
- KU 5. techniques such as contour planting, slope stabilization and glare screening
- KU 6. basic structure and function of conventional retaining walls (e.g., masonry, concrete)
- KU 7. different types of bioengineering retaining walls including brush layering, live stakes, fascines and vegetated geogrid systems
- KU 8. structure, benefits and use of bamboo retaining walls as an eco-friendly method for slope stabilization
- KU 9. tools, equipment and safety gear used in plantation and slope protection work
- KU 10. assist in planting and construction activities under supervision
- KU 11. importance of watering, maintenance and care of planted vegetation
- KU 12. methods for inspecting planted areas and checking slope stability after construction
- KU 13. environmental benefits of bioengineering methods including pollution control and habitat creation
- KU 14. need for teamwork and coordination while working on site
- KU 15. reporting issues related to plantation growth, erosion or structural damage
- KU 16. personal safety practices to follow during plantation and slope work
- KU 17. waste disposal and environmentally safe practices at plantation or bioengineering sites
- KU 18. read basic instructions or drawings provided by the supervisor
- KU 19. precautions while working near road edges and slopes
- KU 20. role of roadside plantation and bioengineering in sustainable road construction

5. Generic Skills (GS):

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

- GS 1. read basic instructions, signs or pictorial guides related to planting and slope work
- GS 2. communicate clearly with team members and supervisors about assigned tasks
- GS 3. follow verbal and written instructions related to plantation or retaining wall activities
- GS 4. record basic data such as types of plants used or work done, if required
- GS 5. plan work as per given instructions to complete assigned tasks on time
- GS 6. work with others in a team to complete plantation or slope stabilization work
- GS 7. identify tools, materials and safety gear used in plantation and bioengineering
- GS 8. select and use appropriate tools and materials as per the instructions
- GS 9. identify safety hazards like unstable slopes, sharp tools or road edge conditions
- GS 10. follow health, hygiene and safety procedures during plantation and retaining wall work
- GS 11. assist in checking the growth and stability of plants after plantation
- GS 12. report unsafe conditions, broken tools or plant failure to the supervisor
- GS 13. maintain cleanliness and organization at the work site to ensure safety and efficiency

Annexure: Assessment Criteria

S. No.	Assessment Criteria for Performance Criteria	Theory Marks	Practical Marks	Project Marks	Viva Marks
	Understand the concept and purpose of roadside plantation and bioengineering	5	10		1

PC 1.	describe the purpose of planting vegetation along roadsides.				
PC 2.	explain how vegetation helps in erosion control.				
PC 3.	identify the environmental and visual benefits of roadside plantations.				
PC 4.	define bioengineering in the context of slope and soil stabilization.				
PC 5.	differentiate between traditional and bioengineering-based retaining walls.				
PC 6.	list situations where bioengineering techniques are preferable.				
PC 7.	identify the role of natural materials in bioengineering structures.				
PC 8.	describe how these practices contribute to sustainability.				
PC 9.	explain why plant-based solutions are often cost-effective and eco-friendly.				
Apply roadside plantation techniques and select appropriate plant species for slope stabilization and ecological impact		5	10		1
PC 10.	explain the method of contour planting and describe its relevance for stabilizing slopes and reducing surface runoff.				
PC 11.	identify suitable vegetation types and native species that anchor soil effectively and support long-term slope stabilization.				
PC 12.	demonstrate the correct layout of plants along contours and space them based on mature size and growth habits.				
PC 13.	match selected plant species to the local soil type and climatic conditions to ensure survival and effective erosion control.				
PC 14.	carry out roadside plantation activities following prescribed safety protocols and planting procedures, including glare screening where required.				
PC 15.	recognize and explain how root systems of plants contribute to slope stability and structural reinforcement of soil.				
PC 16.	report challenges such as unsuitable soil, mismatched species or visibility obstruction that may arise during plantation tasks.				

PC 17.	describe the visual, ecological and functional impacts of contour planting on roadside aesthetics and environmental sustainability.				
Understand the purpose and types of retaining walls					
PC 18.	define retaining walls and their uses in road construction.	5	10		2
PC 19.	describe how retaining walls prevent soil collapse.				
PC 20.	list different types of conventional retaining walls.				
PC 21.	identify materials used in conventional retaining walls.				
PC 22.	explain where retaining walls are needed.				
PC 23.	compare retaining wall types based on terrain and load.				
PC 24.	identify visual differences between conventional and green retaining walls.				
PC 25.	recognize structural and visual signs of retaining wall failure.				
PC 26.	report site conditions requiring wall installation				
Apply bioengineering techniques for slope, soil stabilization and rainwater harvesting					
PC 27.	describe brush layering, its role in slope stability and its contribution to directing surface runoff into rainwater harvesting structures.	5	10		2
PC 28.	explain the use of live stakes in erosion-prone areas and how they assist in slowing water flow for improved rainwater percolation.				
PC 29.	identify the construction of fascines, their layout and their effectiveness in guiding stormwater towards recharge zones.				
PC 30.	recognize live crib wall structure, installation basics and its function in reducing runoff velocity to enhance rainwater harvesting.				
PC 31.	demonstrate placing of brush layers on a slope to control erosion and channel rainwater safely into collection or recharge systems.				
PC 32.	identify appropriate materials for bioengineering methods that also support water infiltration and storage for rainwater harvesting.				
PC 33.	distinguish between temporary and permanent vegetative solutions, highlighting their role in long-term rainwater harvesting and groundwater recharge.				

PC 34.	follow basic steps for building bioengineering retaining structures with provisions to integrate rainwater harvesting features like recharge pits and trenches.				
PC 35.	inspect for early signs of slope erosion or failure				
Maintain plantation and bioengineered structures					
PC 36.	monitor plant growth and soil stability around roadside areas.				
PC 37.	water and weed plantations regularly during establishment phase.				
PC 38.	identify signs of plant stress, erosion or pest damage.	5	10		2
PC 39.	maintain spacing and clear view lines near roads.				
PC 40.	replace dead or failing plants as required.				
PC 41.	reinforce bioengineering features like stakes and brush layers.				
PC 42.	maintain drainage near retaining walls				
Follow environmental, health and safety procedures					
PC 43.	wear and use required PPE while working on slopes or roadsides.				
PC 44.	maintain safe distance from active traffic during plantation or wall work.				
PC 45.	avoid obstructing visibility or road signs during planting.	5	10		2
PC 46.	dispose of plant waste and materials in eco-friendly ways.				
PC 47.	minimize soil disturbance in sensitive ecological zones.				
PC 48.	participate in safety briefings and follow instructions.				
PC 49.	identify and report environmental risks like landslides or habitat loss.				
PC 50.	record work progress in maintenance or plantation records.				
PC 51.	communicate clearly with team members during installation and maintenance				
Total Marks		30	60		10

Annexure: 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 the Standalone NOS **Introduction to Roadside Plantation and Bioengineering**

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 candidate concerned.
- One (1) Assessor is eligible to conduct assessments of a batch of maximum 30 candidates.
- The assessment must comprise of two components, namely:
 - Knowledge and Viva assessment (Theory 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

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 **Introduction to Roadside Plantation and Bioengineering** is summarized below

Assessment Type	Formative or Summative	Strategies	Weightage	Duration (hours)
Knowledge	Summative	MCQ	45	1 hour
Knowledge	Summative	Viva	10	1 hour
Skill	Summative	Structured practical Task	45	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 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).

Annexure: Acronym and Glossary

Acronym

Acronym	Description
NOS	National Occupational Standard(s)
NSQF	National Skills Qualification Framework
QP	Qualification Pack
TVET	Technical and Vocational Education and Training
MSDE	Ministry of Skill Development and Entrepreneurship
NCVET	National Council for Vocational Education and Training
NSDC	National Skill Development Corporation
ICES	Integrated Council for Entrepreneurship and Skilling (erstwhile Integrated Council for Entrepreneurship and Skilling)
AB	Awarding Body
AA	Assessment Agency
TP	Training Partner
TC	Training Centre
ITI	Industrial Training Institute
ISCO	International Standard Classification of Occupations
NCO	National Classification of Occupations
NCrF	National Credit Framework
NEP	New Education Policy
Q-File	Qualification File
MC	Model Curriculum
PC	Performance Criteria
KU	Knowledge and Understanding
GS	Generic Skills
PMKVY	Pradhan Mantri Kaushal Vikas Yojana
DDUGKY	Deen Dayal Upadhyaya Grameen Kaushalya Yojana
STT	Short Term Training
RPL	Recognition of Prior Learning
NAPS	National Apprenticeship Promotion Scheme
NQR	National Qualification Register
OJT	On the Job Training

NSQC	National Skill Qualification Committee
IS	Indian Standard
MoRTH	Ministry of Road Transport and Highways
IRC	Indian Roads Congress
PMS	Pavement Management System
BC	Bituminous Concrete
PPE	Personal Protective Equipment
RRM	Road Repair and Maintenance

Glossary

Term	Description
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.

Annexure: Career Progression

