National Occupational Standards

Introduction to Roadside Plantation and Bioengineering

Unit Code: ICE/CON/N0207

Version: 1.0

NSQF Level: 2

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Description

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.

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

Elements and Performance Criteria

Understand the concept and purpose of roadside plantation and bioengineering

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

PC1. describe the purpose of planting vegetation along roadsides

PC2. explain how vegetation helps in erosion control

PC3. identify the environmental and visual benefits of roadside plantations

PC4. define bioengineering in the context of slope and soil stabilization

PC5. differentiate between traditional and bioengineering-based retaining walls

PC6. list situations where bioengineering techniques are preferable

PC7. identify the role of natural materials in bioengineering structures

PC8. describe how these practices contribute to sustainability

PC9. 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:

PC10. explain the method of contour planting and describe its relevance for stabilizing slopes and reducing surface runoff

PC11. identify suitable vegetation types and native species that anchor soil effectively and support long-term slope stabilization

PC12. demonstrate the correct layout of plants along contours and space them based on mature size and growth habits

PC13. match selected plant species to the local soil type and climatic conditions to ensure survival

and effective erosion control

PC14. carry out roadside plantation activities following prescribed safety protocols and planting procedures, including glare screening where required

PC15. recognize and explain how root systems of plants contribute to slope stability and structural reinforcement of soil

PC16. report challenges such as unsuitable soil, mismatched species or visibility obstruction that may arise during plantation tasks

PC17. 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:

PC18. define retaining walls and their uses in road construction

PC19. describe how retaining walls prevent soil collapse

PC20. list different types of conventional retaining walls

PC21. identify materials used in conventional retaining walls

PC22. explain where retaining walls are needed

PC23. compare retaining wall types based on terrain and load

PC24. identify visual differences between conventional and green retaining walls

PC25. recognize structural and visual signs of retaining wall failure

PC26. 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:

PC27. describe brush layering, its role in slope stability and its contribution to directing surface runoff into rainwater harvesting structures

PC28. explain the use of live stakes in erosion-prone areas and how they assist in slowing water flow for improved rainwater percolation

PC29. identify the construction of fascines, their layout and their effectiveness in guiding stormwater towards recharge zones

PC30. recognize live crib wall structure, installation basics and its function in reducing runoff velocity to enhance rainwater harvesting

PC31. demonstrate placing of brush layers on a slope to control erosion and channel rainwater safely into collection or recharge systems

PC32. identify appropriate materials for bioengineering methods that also support water infiltration and storage for rainwater harvesting

PC33. distinguish between temporary and permanent vegetative solutions, highlighting their role in long-term rainwater harvesting and groundwater recharge

PC34. follow basic steps for building bioengineering retaining structures with provisions to integrate rainwater harvesting features like recharge pits and trenches

PC35. 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:

PC36. monitor plant growth and soil stability around roadside areas

PC37. water and weed plantations regularly during establishment phase

PC38. identify signs of plant stress, erosion or pest damage
PC39. maintain spacing and clear view lines near roads
PC40. replace dead or failing plants as required
PC41. reinforce bioengineering features like stakes and brush layers
PC42. maintain drainage near retaining walls

Follow safety, environmental, and reporting procedures

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

PC43. wear and use required PPE while working on slopes or roadsides
PC44. maintain safe distance from active traffic during plantation or wall work
PC45. avoid obstructing visibility or road signs during planting
PC46. dispose of plant waste and materials in eco-friendly ways
PC47. minimize soil disturbance in sensitive ecological zones
PC48. participate in safety briefings and follow instructions
PC49. identify and report environmental risks like landslides or habitat loss
PC50. record work progress in maintenance or plantation records
PC51. communicate clearly with team members during installation and maintenance

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. meaning and importance of roadside plantation in controlling soil erosion
KU2. basic functions of bioengineering in road construction and slope protection
KU3. common types of vegetation used in roadside plantation and their characteristics
KU4. role of native plant species and their suitability based on climate and soil
KU5. techniques such as contour planting, slope stabilization and glare screening
KU6. basic structure and function of conventional retaining walls (e.g., masonry, concrete)
KU7. different types of bioengineering retaining walls including brush layering, live stakes, fascines and vegetated geogrid systems
KU8. structure, benefits and use of bamboo retaining walls as an eco-friendly method for slope stabilization
KU9. tools, equipment and safety gear used in plantation and slope protection work
KU10. assist in planting and construction activities under supervision
KU11. importance of watering, maintenance and care of planted vegetation
KU12. methods for inspecting planted areas and checking slope stability after construction
KU13. environmental benefits of bioengineering methods including pollution control and habitat creation
KU14. need for teamwork and coordination while working on site
KU15. reporting issues related to plantation growth, erosion or structural damage
KU16. personal safety practices to follow during plantation and slope work
KU17. waste disposal and environmentally safe practices at plantation or bioengineering sites
KU18. read basic instructions or drawings provided by the supervisor

KU19. precautions while working near road edges and slopes
KU20. role of roadside plantation and bioengineering in sustainable road construction

Generic Skills (GS)

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

GS1. read basic instructions, signs or pictorial guides related to planting and slope work
GS2. communicate clearly with team members and supervisors about assigned tasks
GS3. follow verbal and written instructions related to plantation or retaining wall activities
GS4. record basic data such as types of plants used or work done, if required
GS5. plan work as per given instructions to complete assigned tasks on time
GS6. work with others in a team to complete plantation or slope stabilization work
GS7. identify tools, materials and safety gear used in plantation and bioengineering
GS8. select and use appropriate tools and materials as per the instructions
GS9. identify safety hazards like unstable slopes, sharp tools or road edge conditions
GS10. follow health, hygiene and safety procedures during plantation and retaining wall work
GS11. assist in checking the growth and stability of plants after plantation
GS12. report unsafe conditions, broken tools or plant failure to the supervisor
GS13. maintain cleanliness and organization at the work site to ensure safety and efficiency

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Understand the concept and purpose of roadside plantation and bioengineering	5	10	-	1
PC1. describe the purpose of planting vegetation along roadsides	-	-	-	-
PC2. explain how vegetation helps in erosion control	-	-	-	-
PC3. identify the environmental and visual benefits of roadside plantations	-	-	-	-
PC4. define bioengineering in the context of slope and soil stabilization	-	-	-	-
PC5. differentiate between traditional and bioengineering-based retaining walls	-	-	-	-
PC6. list situations where bioengineering techniques are preferable	-	-	-	-
PC7. identify the role of natural materials in bioengineering structures	-	-	-	-
PC8. describe how these practices contribute to sustainability	-	-	-	-
PC9. 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
PC10. explain the method of contour planting and describe its relevance for stabilizing slopes and reducing surface runoff	-	-	-	-
PC11. identify suitable vegetation types and native species that anchor soil effectively and support long-term slope stabilization	-	-	-	-
PC12. demonstrate the correct layout of plants along contours and space them based on mature size and growth habits	-	-	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC13. match selected plant species to the local soil type and climatic conditions to ensure survival and effective erosion control	-	-	-	-
PC14. carry out roadside plantation activities following prescribed safety protocols and planting procedures, including glare screening where required	-	-	-	-
PC15. recognize and explain how root systems of plants contribute to slope stability and structural reinforcement of soil	-	-	-	-
PC16. report challenges such as unsuitable soil, mismatched species or visibility obstruction that may arise during plantation tasks	-	-	-	-
PC17. describe the visual, ecological and functional impacts of contour planting on roadside aesthetics and environmental sustainability	-	-	-	-
Understand the purpose and types of retaining walls	5	10	-	2
PC18. define retaining walls and their uses in road construction	-	-	-	-
PC19. describe how retaining walls prevent soil collapse	-	-	-	-
PC20. list different types of conventional retaining walls	-	-	-	-
PC21. identify materials used in conventional retaining walls	-	-	-	-
PC22. explain where retaining walls are needed	-	-	-	-
PC23. compare retaining wall types based on terrain and load	-	-	-	-
PC24. identify visual differences between conventional and green retaining walls	-	-	-	-
PC25. recognize structural and visual signs of retaining wall failure	-	-	-	-

PC26. report site conditions requiring wall installation	-	-	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Apply bioengineering techniques for slope, soil stabilization and rainwater harvesting	5	10	-	2
PC27. describe brush layering, its role in slope stability and its contribution to directing surface runoff into rainwater harvesting structures	-	-	-	-
PC28. explain the use of live stakes in erosion-prone areas and how they assist in slowing water flow for improved rainwater percolation	-	-	-	-
PC29. identify the construction of fascines, their layout and their effectiveness in guiding stormwater towards recharge zones	-	-	-	-
PC30. recognize live crib wall structure, installation basics and its function in reducing runoff velocity to enhance rainwater harvesting	-	-	-	-
PC31. demonstrate placing of brush layers on a slope to control erosion and channel rainwater safely into collection or recharge systems	-	-	-	-
PC32. identify appropriate materials for bioengineering methods that also support water infiltration and storage for rainwater harvesting	-	-	-	-
PC33. distinguish between temporary and permanent vegetative solutions, highlighting their role in long-term rainwater harvesting and groundwater recharge	-	-	-	-
PC34. follow basic steps for building bioengineering retaining structures with provisions to integrate rainwater harvesting features like recharge pits and trenches	-	-	-	-
PC35. inspect for early signs of slope erosion or failure	-	-	-	-
Maintain plantation and bioengineered structures	5	10	-	2
PC36. monitor plant growth and soil stability around roadside areas	-	-	-	-
PC37. water and weed plantations regularly during establishment phase	-	-	-	-

PC38. identify signs of plant stress, erosion or pest damage	-	-	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC39. maintain spacing and clear view lines near roads	-	-	-	-
PC40. replace dead or failing plants as required	-	-	-	-
PC41. reinforce bioengineering features like stakes and brush layers	-	-	-	-
PC42. maintain drainage near retaining walls	-	-	-	-
Follow safety, environmental, and reporting procedures	5	10	-	2
PC43. wear and use required PPE while working on slopes or roadsides	-	-	-	-
PC44. maintain safe distance from active traffic during plantation or wall work	-	-	-	-
PC45. avoid obstructing visibility or road signs during planting	-	-	-	-
PC46. dispose of plant waste and materials in eco-friendly ways	-	-	-	-
PC47. minimize soil disturbance in sensitive ecological zones	-	-	-	-
PC48. participate in safety briefings and follow instructions	-	-	-	-
PC49. identify and report environmental risks like landslides or habitat loss	-	-	-	-
PC50. record work progress in maintenance or plantation records	-	-	-	-
PC51. communicate clearly with team members during installation and maintenance	-	-	-	-
NOS Total	**30**	**60**	**-**	**10**

National Occupational Standards (NOS) Parameters

NOS Code	ICE/CON/N0207
NOS Name	Introduction to Roadside Plantation and Bioengineering
Sector	Construction
Sub-Sector	
Occupation	Road and Highway Construction
NSQF Level	2
Credits	4
Minimum Job Entry Age	18
Minimum Educational Qualification & Experience	Ability to Read and Write
Version	1.0
Last Reviewed Date	07/10/2025
Next Review Date	07/10/2028
NSQC Clearance Date	07/10/2025
Reference code on NQR	NG-02-CO-046392025-V1-ICES
NQR Version	1.0
CCN Category	1