National Occupational Skill Standard
(NOSS)

Occupational Title : **Pile Rigger**

Level : **2**

Sector : **Construction**

Sub - Sector : **Pile Foundation**

NOSS ID/NSCO ID :

ISCO NO :

Council for Technical Education and Vocational Training

NATIONAL SKILL TESTING BOARD

Madhyapur Thimi-17, Sanothimi, Bhaktapur, Nepal

Developed: 05-10-2021 (19-06-2078)

2045

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Recommended by Construction Technical Sub Committee: 05 October 2021 (19 Asoj 2078)

1	**Occupational Title: Pile Rigger** **Level: 2**
2	**Job Description:** Pile Rigger, L-2, prepares and concretes borehole for pile foundation.
3	**UNITS OF COMPETENCY:** 1. Prepare Rig Machine bored piling 2. Prepare Truck/Tractor mounted bored piling 3. Perform Direct Mud Circulation (DMC) bored piling 4. Perform concreting on borehole 5. Perform communication 6. Develop professionalism ***Note: Units 5 and 6 are not for testing purpose.***
4	**Qualifying Notes/Prerequisites:** • Physical Requirements: Sound health • Entry Requirements: As per NSTB rules **Additional Information:** • Assessment Types: Performance test only • Assessment Duration: 4 to 5 hours (Single Competency) 8 to 10 hours (All Competency) • Recommended Group Size: 4 to 6 candidates

5	**Unit No:1** **Unit Title: Prepare Rig Machine bored piling**	**Unit code:**

Elements of competency	Performance standards
1.1 Prepare Rig machine and working platform	1.1.1 ***Personal protective equipment (PPE***) used in accordance with task requirement. 1.1.2 Worksite inspected for ***potential site hazards.*** 1.1.3 Safety symbol placed at visible place surrounding boring area. 1.1.4 ***Pre-start inspection*** performed as per manufacture's instruction. 1.1.5 Machine positioned and aligned on working platform. 1.1.6 Rigging gears, pulley and cable/wire installed to drilling mast and locked securely. 1.1.7 Rigging gears checked for smooth operation and adjusted as per manufacturer's instruction. 1.1.8 ***Required materials*** shifted and stacked at specified location as per instruction.
1.2 Set drilling tools	1.2.1 Working condition of ***drilling tools/accessories*** checked. 1.2.2 Drilling tools with the diameter less than or equal to pile diameter assembled as per manufacturer's instruction. 1.2.3 Alignment of drilling tools checked and adjusted.
1.3 Perform positioning of drilling tools	1.3.1 Machine moved to position of pile to be installed. 1.3.2 Center point of drilling tool positioned to perpendicular at the center point of the pile. 1.3.3 Machine secured and locked into its location.
1.4 Install casing	1.4.1 Hole of required diameter drilled as per ***soil strata*** in previously marked point on working platform. 1.4.2 Pre-fabricated casing lifted, shifted and positioned vertically above borehole. 1.4.3 Casing having internal diameter same as pile diameter inserted vertically into drilled hole up to ground level. 1.4.4 Verticality of casing checked and adjusted.
1.5 Drill pile borehole	1.5.1 Borehole excavated using appropriate drilling tools/accessories. 1.5.2 ***Drilling fluid*** circulated in drilled borehole and drilling fluid maintained all the times in case of fully uncased drilling.

		1.5.3 Drilling tool changed as per ***soil strata***. 1.5.4 When drilling tool filled with boring muck, it is removed and unloaded on ground at specified location. 1.5.5 Borehole drilled vertically to required depth as per drawing. 1.5.6 Verticality of borehole checked periodically during pile boring. 1.5.7 Depth of borehole measured, recorded and submitted to concerned authority.
	1.6 Perform flushing of pile borehole	1.6.1 Approval took from concerned authority for flushing of borehole. 1.6.2 Tremie pipe extended to base of borehole. 1.6.3 Hose pipe attached to the head of tremie pipe. 1.6.4 Bore flushed by bentonite drilling fluid till approval from concerned authority.
	1.7 Place reinforcement cage	1.7.1 Physical and working condition of rigging gears checked prior to lifting work. 1.7.2 Pre-fabricated reinforcement cage lifted, shifted and positioned above borehole. 1.7.3 Pre-fabricated reinforcement cage lowered into the borehole vertically.
	1.8 Perform worksite clearance	1.8.1 Drilling tools/accessories removed and cleaned. 1.8.2 Drilling accessories greased evenly and stored at designated location. 1.8.3 Operating hours recorded and submitted.
6	**Task Performance Requirements (Tools, Equipment and Materials):** • Rig machine, Auger, drilling bucket, core barrel, kelly bar, continuous flight auger (CFA), diamond bullet, casing, mud pump, generator, Bentonite/red mud slurry, hose pipe and its connection, spirit level, wrench, plier, screwdriver, multimeter, hammer, shovel, spade, wheel barrow, bailer, meter rod, meter rod lock, Trieme pipe, Trieme pipe lock, sliding plug or barrier, hopper, center gate, steel wire, locking clamp, lubricants, grease, electric wire, PVC tape, slurry tank, reinforcement cage, cleaning cloth, measuring tape, calculator, pen, paper, register, safety signs/symbols, bucket, first aid kit and personal protective equipment (PPE).	

7	**Safety and Hygiene (Occupational Health and Safety):** • Use personal protective equipment. • Safe handling of materials, tools and equipment. • Hazards involved in lifting tools, equipment and materials. • Prevent from electrical hazards. • Cover mud tank/pit and incomplete borehole.

8	Required Knowledge		
	Technical Knowledge	**Applied Calculation**	**Graphical Information**

	• Tools and equipment:
	  ○ Types
	  ○ Uses
	  ○ Safe handling
	• Introduction of piling
	• Types of piling machine
	• Borehole
	  ○ Introduction
	  ○ Method
	  ○ Dimension
	  ○ Layout
	  ○ Drilling sequence and technique
	• Rig machine
	  ○ Introduction
	  ○ Types
	  ○ Main components and their functions
	  ○ Installation technique
	  ○ Operational and warning sign
	• Pre start and post start inspection
			• Read and interpret pile drawing
			• Read and interpret approved drilling sequence
			• Read and interpret dashboard information
			• Read and interpret inclinometer reading

	• Introduction of guide hole
	• Types of drill tools and their uses
	• Types of soil strata
	• Introduction of drilling fluid
	• Borehole cleaning and flushing technique
	• Introduction of piling reinforcement cage
	• Mud pump
	  ○ Introduction
	  ○ Installation and connection technique
	• Worksite clearance
	• Waste management
	• Record keeping and documentation
	• Occupational health and safety rules and regulations
	• Importance of first aid kit		

9	**Assessment of Competency**					
	Unit: 1 **Unit Title: Prepare Rig Machine bored piling**					
	Candidate Details			**Assessors Detail**		
	Candidate's Name: Registration Number: Symbol No: Test Centre: Test Date:			Assessors' Name 1. 2. 3.		ID/License No:
Element of competency	**Performance Standards**		**Standard Met**	**Standard Not Met**	**Evidence Type**	**Comments**
1.1 Prepare Rig machine and working platform	1.1.1 ***Personal protective equipment (PPE***) used in accordance with task requirement. 1.1.2 Worksite inspected for ***potential site hazards.*** 1.1.3 Safety symbol placed at visible place surrounding boring area. 1.1.4 ***Pre-start inspection*** performed as per manufacture's instruction. 1.1.5 Machine positioned and aligned on working platform. 1.1.6 Rigging gears, pulley and cable/wire installed to drilling mast and locked securely. 1.1.7 Rigging gears checked for smooth operation and adjusted as per manufacturer's instruction. 1.1.8 ***Required materials*** shifted and stacked at specified location as per instruction.					
1.2 Set drilling tools	1.2.1 Working condition of ***drilling tools/accessories*** checked.					

	1.2.2 Drilling tools with the diameter less than or equal to pile diameter assembled as per manufacturer's instruction. 1.2.3 Alignment of drilling tools checked and adjusted.				
1.3 Perform positioning of drilling tools	1.3.1 Machine moved to position of pile to be installed. 1.3.2 Center point of drilling tool positioned to perpendicular at the center point of the pile. 1.3.3 Machine secured and locked into its location.				
1.4 Install casing	1.4.1 Hole of required diameter drilled as per ***soil strata*** in previously marked point on working platform. 1.4.2 Pre-fabricated casing lifted, shifted and positioned vertically above borehole. 1.4.3 Casing having internal diameter same as pile diameter inserted vertically into drilled hole up to ground level. 1.4.4 Verticality of casing checked and adjusted.				
1.5 Drill pile borehole	1.5.1 Borehole excavated using appropriate drilling tools/accessories. 1.5.2 ***Drilling fluid*** circulated in drilled borehole and drilling fluid maintained all the times in case of fully uncased drilling. 1.5.3 Drilling tool changed as per ***soil strata***. 1.5.4 When drilling tool filled with boring muck, it is removed and unloaded on ground at specified location. 1.5.5 Borehole drilled vertically to required depth as per drawing. 1.5.6 Verticality of borehole checked periodically during pile boring. 1.5.7 Depth of borehole measured, recorded and submitted to concerned authority.				

1.6 Perform flushing of pile borehole	1.6.1 Approval took from concerned authority for flushing of borehole. 1.6.2 Tremie pipe extended to base of borehole. 1.6.3 Hose pipe attached to the head of tremie pipe. 1.6.4 Bore flushed by bentonite drilling fluid till approval from concerned authority.				
1.7 Place reinforcement cage	1.7.1 Physical and working condition of rigging gears checked prior to lifting work. 1.7.2 Pre-fabricated reinforcement cage lifted, shifted and positioned above borehole. 1.7.3 Pre-fabricated reinforcement cage lowered into the borehole vertically.				
1.8 Perform worksite clearance	1.8.1 Drilling tools/accessories removed and cleaned. 1.8.2 Drilling accessories greased evenly and stored at designated location. 1.8.3 Operating hours recorded and submitted.				

WT- Written Test **OQ**- Oral Question **PT-** Practical Test **DO** – Direct Observation **SR**- Supervisor's report **SN**–Simulation

RP- Role Play **PG –**Photographs **VD**- Video **CT** – Certificates **TS** – Testimonials (Reward) **PP** – Product Produced

CS – Case Study

Range Statement

Variable	Range
Personal protective equipment	*May include but not limited to:* • Helmet • Hat • Mask • Apron • Goggles • Gloves • Safety shoes • Ear plug
Potential site hazard	*May include but not limited to:* • Overhead transmission lines • Underground lines • Land stability • Retaining structure • Water crossing
Pre-start inspection	*May include but not limited to:* • Engine oil level • Hydraulic oil level • Gear oil level • Fuel level • Battery voltage

	• Grease and lubricants • Leakage
Required materials	*May include but not limited to:* • Drilling fluid • Tremie pipe and accessories • Drilling tools/accessories • Reinforcement cage
Drilling tools/accessories	*May include but not limited to:* • Auger • Continuous Flight Auger (CFA) • Core barrel • Drilling bucket • Kelly bar • Diamond bullet • Casing
Soil strata	*May include but not limited to:* • Clay • Sandy • Gravel • Rock • Boulder mixed soil (BMS)
Drilling fluid	*May include but not limited to:* • Bentonite slurry • Red mud slurry

5	**Unit No:2** **Unit Title: Prepare Truck/Tractor bored piling**	**Unit code:**
	Elements of competency	**Performance standards**
	2.1 Prepare drilling machine and working platform	2.1.1 ***Personal protective equipment (PPE***) used in accordance with task requirement. 2.1.2 Worksite inspected for ***potential site hazards.*** 2.1.3 Safety symbol placed at visible place surrounding boring area. 2.1.4 ***Pre-start inspection*** performed as per manufacture's instruction. 2.1.5 Machine placed, positioned and aligned on working platform. 2.1.6 Rigging gears, pulley and cable/wire installed to drilling mast and locked securely. 2.1.7 Rigging gears checked for smooth operation and adjusted as per manufacturer's instruction. 2.1.8 Air hose pipe connected to rotary of machine from air compressor 2.1.9 ***Required materials*** shifted and stacked at specified location as per instruction.
	2.2 Set drilling tools	2.2.1 Working condition of ***drilling tools/accessories*** checked. 2.2.2 Drilling tools with the diameter less than or equal to pile diameter assembled as per manufacturer's instruction. 2.2.3 Alignment of drilling tools checked and adjusted.
	2.3 Perform positioning of drilling tools	2.3.1 Machine moved to position of pile to be installed. 2.3.2 Center point of drilling tool positioned to perpendicular at the center point of the pile. 2.3.3 Machine secured and locked into its location.
	2.4 Install casing	2.4.1 Hole of required diameter drilled as per ***soil strata*** in previously marked point on working platform. 2.4.2 Pre-fabricated casing lifted, shifted and positioned vertically above borehole. 2.4.3 Casing having internal diameter same as pile diameter inserted vertically into drilled hole up to ground level. 2.4.4 Verticality of casing checked and adjusted.

	2.5 Drill pile borehole	2.5.1 Borehole excavated using appropriate drilling tools/accessories. 2.5.2 Drilling tool changed as per soil strata. 2.5.3 Borehole drilled vertically to required depth as per drawing with continuous supply of compressed air. 2.5.4 Verticality of borehole checked periodically during pile boring. 2.5.5 Depth of borehole measured, recorded and submitted to concerned authority.
	2.6 Perform flushing of pile borehole	2.6.1 Approval took from concerned authority for flushing of borehole. 2.6.2 Borehole flushed by compressed air at least twice. 2.6.3 Flushing completed after approval from concerned authority.
	2.7 Place reinforcement cage	2.7.1 Physical and working condition of rigging gears checked prior to lifting work. 2.7.2 Pre-fabricated reinforcement cage lifted, shifted and positioned above borehole. 2.7.3 Pre-fabricated reinforcement cage lowered into the borehole vertically.
	2.8 Perform worksite clearance	2.8.1 Drilling tools/accessories removed and cleaned. 2.8.2 Drilling accessories greased evenly and stored at designated location. 2.8.3 Operating hours recorded and submitted.
6	**Task Performance Requirements (Tools, Equipment and Materials):** • Truck/tractor mounted drilling machine, air compressor, continuous flight auger(CFA), drill rods, drill bits, diamond bullet, Down the hole Hammer (DTH), casing, hose pipe and its connection, spirit level, wrench, plier, screwdriver, multimeter, hammer, shovel, spade, wheel barrow, Trieme pipe, Trieme pipe lock, sliding plug or barrier, hopper, steel wire rope, locking clamp, lubricants, grease, reinforcement cage, cleaning cloth, measuring tape, calculator, pen, paper, register, safety signs/symbols, bucket, first aid kit and personal protective equipment (PPE).	
7	**Safety and Hygiene (Occupational Health and Safety):** • Use personal protective equipment. • Safe handling of materials, tools and equipment. • Hazards involved in lifting tools, equipment and materials.	

	• Prevent from electrical hazards. • Cover mud tank/pit and incomplete borehole.

8	Required Knowledge		
	Technical Knowledge	**Applied Calculation**	**Graphical Information**

	• Tools and equipment:
	  ○ Types
	  ○ Uses
	  ○ Safe handling
	• Introduction of piling
	• Types of piling machine
	• Borehole
	  ○ Introduction
	  ○ Method
	  ○ Dimension
	  ○ Layout
	  ○ Drilling sequence and technique
	• Truck/tractor mounted drilling machine
	  ○ Introduction
	  ○ Types
	  ○ Main components and their functions
	  ○ Installation technique
	  ○ Operational and warning sign
	• Pre start and post start inspection
			• Read and interpret pile drawing
			• Read and interpret approved drilling sequence
			• Read and interpret dashboard information

	• Introduction of guide hole • Types of drilling tools and their uses • Types of soil strata • Introduction of air compressor • Borehole cleaning and flushing technique • Introduction of piling reinforcement cage • Worksite clearance • Waste management • Record keeping and documentation • Occupational health and safety rules and regulations • Importance of first aid kit		

9	Assessment of Competency					
	Unit: 2 **Unit Title: Prepare Truck/Tractor bored piling**					
	Candidate Details			**Assessors Detail**		
	Candidate's Name: Registration Number: Symbol No: Test Centre: Test Date:			Assessors' Name 1. 2. 3.		ID/License No:

Element of competency	Performance Standards	Standard Met	Standard Not Met	Evidence Type	Comments
2.1 Prepare drilling machine and working platform	2.1.1 ***Personal protective equipment (PPE***) used in accordance with task requirement. 2.1.2 Worksite inspected for ***potential site hazards.*** 2.1.3 Safety symbol placed at visible place surrounding boring area. 2.1.4 ***Pre-start inspection*** performed as per manufacture's instruction. 2.1.5 Machine placed, positioned and aligned on working platform. 2.1.6 Rigging gears, pulley and cable/wire installed to drilling mast and locked securely. 2.1.7 Rigging gears checked for smooth operation and adjusted as per manufacturer's instruction. 2.1.8 Air hose pipe connected to rotary of machine from air compressor				

	2.1.9 ***Required materials*** shifted and stacked at specified location as per instruction.				
2.2 Set drilling tools	2.2.1 Working condition of ***drilling tools/accessories*** checked. 2.2.2 Drilling tools with the diameter less than or equal to pile diameter assembled as per manufacturer's instruction. 2.2.3 Alignment of drilling tools checked and adjusted.				
2.3 Perform positioning of drilling tools	2.3.1 Machine moved to position of pile to be installed. 2.3.2 Center point of drilling tool positioned to perpendicular at the center point of the pile. 2.3.3 Machine secured and locked into its location.				
2.4 Install casing	2.4.1 Hole of required diameter drilled as per ***soil strata*** in previously marked point on working platform. 2.4.2 Pre-fabricated casing lifted, shifted and positioned vertically above borehole. 2.4.3 Casing having internal diameter same as pile diameter inserted vertically into drilled hole up to ground level. 2.4.4 Verticality of casing checked and adjusted.				
2.5 Drill pile borehole	2.5.1 Borehole excavated using appropriate drilling tools/accessories. 2.5.2 Drilling tool changed as per soil strata. 2.5.3 Borehole drilled vertically to required depth as per drawing with continuous supply of compressed air. 2.5.4 Verticality of borehole checked periodically during pile boring. 2.5.5 Depth of borehole measured, recorded and submitted to concerned authority.				
2.6 Perform flushing of pile borehole	2.6.1 Approval took from concerned authority for flushing of				

	borehole. 2.6.2 Borehole flushed by compressed air at least twice. 2.6.3 Flushing completed after approval from concerned authority.				
2.7 Place reinforcement cage	2.7.1 Physical and working condition of rigging gears checked prior to lifting work. 2.7.2 Pre-fabricated reinforcement cage lifted, shifted and positioned above borehole. 2.7.3 Pre-fabricated reinforcement cage lowered into the borehole vertically.				
2.8 Perform worksite clearance	2.8.1 Drilling tools/accessories removed and cleaned. 2.8.2 Drilling accessories greased evenly and stored at designated location. 2.8.3 Operating hours recorded and submitted.				

Range Statement

Variable	Range
Personal protective equipment	*May include but not limited to:* • Helmet • Hat • Mask • Apron • Goggles • Gloves • Safety shoes • Ear plug
Potential site hazard	*May include but not limited to:* • Overhead transmission lines • Underground lines • Land stability • Retaining structure • Water crossing
Pre-start inspection	*May include but not limited to:* • Engine oil level • Hydraulic oil level • Gear oil level • Fuel level • Battery voltage

	• Grease and lubricants • Leakage
Required materials	*May include but not limited to:* • Air compressor • Tremie pipe and accessories • Drilling tools/accessories • Reinforcement cage
Drilling tools/accessories	*May include but not limited to:* • Drill bit • Drill rod • Diamond bullet • Continuous Flight Auger (CFA) • Down the hole Hammer (DTH) • Casing
Soil strata	*May include but not limited to:* • Clay • Sandy • Gravel • Rock • Boulder mixed soil (BMS)

5	**Unit No:3** **Unit Title: Prepare Direct Mud Circulation (DMC) bored piling**	**Unit code:**

Elements of competency	Performance standards
3.1 Setup DMC machine	3.1.1 ***Personal protective equipment (PPE***) used in accordance with task requirement. 3.1.2 Worksite inspected for ***potential site hazards.*** 3.1.3 Safety symbol placed at visible place surrounding boring area. 3.1.4 DMC machine positioned on working platform. 3.1.5 Tripod assembled, setup and erected to desired height at specified location and locked securely. 3.1.6 Chisel hooked to steel wire and positioned perpendicular at the center point of the pile. 3.1.7 Another end of steel wire connected to DMC machine.
3.2 Perform electric connection	3.2.1 Functionality of generator checked and positioned on working platform. 3.2.2 Output voltage of generator checked and reported. 3.2.3 3 phase line of generator connected to starter of DMC machine. 3.2.4 Starter connected to DMC motor.
3.3 Perform mud pump operation	3.3.1 Mud pump installed in a pit/tank prepared previously. 3.3.2 Pipe from mud pump connected to nozzle fixed on chisel. 3.3.3 Mud pump operated after verification of ***drilling fluid*** on pit/tank. 3.3.4 Circulation of drilling fluid checked and adjusted.
3.4 Install casing	3.4.1 Hole of required diameter drilled as per ***soil strata*** in previously marked point on working platform. 3.4.2 Pre-fabricated casing lifted, shifted and positioned vertically above borehole. 3.4.3 Casing having internal diameter same as pile diameter inserted vertically into drilled hole up to ground level. 3.4.4 Verticality of casing checked and adjusted.
3.5 Drill pile borehole	3.5.1 Drilling fluid circulated in drilled borehole and drilling fluid maintained all the times in case of fully uncased drilling. 3.5.2 Drill pipe added gradually as the depth of borehole increases.

		3.5.3 Borehole drilled vertically to required depth as per drawing. 3.5.4 Verticality of borehole checked periodically during pile boring. 3.5.5 Depth of borehole measured, recorded and submitted to concerned authority.
	3.6 Perform flushing of pile borehole	3.6.1 Approval took from concerned authority for flushing of borehole. 3.6.2 Borehole flushed by circulating drilling fluid. 3.6.3 Flushing completed after approval from concerned authority.
	3.7 Place reinforcement cage	3.7.1 Physical and working condition of rigging gears checked prior to lifting work. 3.7.2 Pre-fabricated reinforcement cage lifted, shifted and positioned above borehole. 3.7.3 Pre-fabricated reinforcement cage lowered into the borehole vertically.
	3.8 Perform worksite clearance	3.8.1 ***Drilling tools/accessories*** removed and cleaned. 3.8.2 Grease evenly applied on greasing parts of DMC machine. 3.8.3 Operating hours recorded and submitted. 3.8.4 Machine and drilling tools/accessories stored at designated location.
6	**Task Performance Requirements (Tools, Equipment and Materials):** • DMC machine, tripod with pulley, winch machine, steel wire, chisel, casing, drill pipe, mud pump, generator, Bentonite/red mud slurry, DMC rod, hose pipe and its connection, spirit level, wrench, chain wrench, plier, phase tester, screwdriver, multimeter, hammer, shovel, spade, wheel barrow, locking clamp, grease, electric wire, PVC tape, slurry tank, reinforcement cage, drilling tools/accessories, cleaning cloth, measuring tape, calculator, pen, paper, register, safety signs/symbols, bucket, first aid kit and personal protective equipment (PPE).	
7	**Safety and Hygiene (Occupational Health and Safety):** • Use personal protective equipment. • Safe handling of materials, tools and equipment. • Hazards involved in lifting tools, equipment and materials. • Prevent from electrical hazards. • Cover mud tank/pit and incomplete borehole.	

8	Required Knowledge		
	Technical Knowledge	**Applied Calculation**	**Graphical Information**

	• Tools and equipment:
	  ○ Types
	  ○ Uses
	  ○ Safe handling
	• Introduction of piling
	• Borehole
	  ○ Introduction
	  ○ Method
	  ○ Dimension
	  ○ Layout
	  ○ Drilling sequence and technique
	• Direct Mud Circulation (DMC) Machine
	  ○ Introduction
	  ○ Types
	  ○ Main components and their functions
	  ○ Installation technique
	  ○ Operational and warning sign
	• Introduction of wash boring system
	• Introduction of guide hole
		• Calculate total length of drill rod	• Read and interpret pile drawing
			• Read and interpret approved drilling sequence
			• Read and interpret manufacturer's operational manual

	• Types of drilling tools and their uses
	• Types of soil strata
	• Introduction of drilling fluid
	• Borehole cleaning and flushing technique
	• Introduction of piling reinforcement cage
	• Mud pump
	  o Introduction
	  o Installation and connection technique
	• Introduction of generator
	• Worksite clearance
	• Waste management
	• Record keeping and documentation
	• Occupational health and safety rules and regulations
	• Importance of first aid kit		

9	**Assessment of Competency**					
	Unit: 3 **Unit Title: Prepare Direct Mud Circulation (DMC) bored piling**					
	Candidate Details			**Assessors Detail**		
	Candidate's Name: Registration Number: Symbol No: Test Centre: Test Date:			Assessors' Name 1. 2. 3.		ID/License No:

Element of competency	Performance Standards	Standard Met	Standard Not Met	Evidence Type	Comments
3.1 Setup DMC machine	3.1.1 ***Personal protective equipment (PPE***) used in accordance with task requirement. 3.1.2 Worksite inspected for ***potential site hazards.*** 3.1.3 Safety symbol placed at visible place surrounding boring area. 3.1.4 DMC machine positioned on working platform. 3.1.5 Tripod assembled, setup and erected to desired height at specified location and locked securely. 3.1.6 Chisel hooked to steel wire and positioned perpendicular at the center point of the pile. 3.1.7 Another end of steel wire connected to DMC machine.				
3.2 Perform electric connection	3.2.1 Functionality of generator checked and positioned on working platform. 3.2.2 Output voltage of generator checked and reported. 3.2.3 3 phase line of generator connected to starter of DMC				

	machine. 3.2.4 Starter connected to DMC motor.				
3.3 Perform mud pump operation	3.3.1 Mud pump installed in a pit/tank prepared previously. 3.3.2 Pipe from mud pump connected to nozzle fixed on chisel. 3.3.3 Mud pump operated after verification of ***drilling fluid*** on pit/tank. 3.3.4 Circulation of drilling fluid checked and adjusted.				
3.4 Install casing	3.4.1 Hole of required diameter drilled as per ***soil strata*** in previously marked point on working platform. 3.4.2 Pre-fabricated casing lifted, shifted and positioned vertically above borehole. 3.4.3 Casing having internal diameter same as pile diameter inserted vertically into drilled hole up to ground level. 3.4.4 Verticality of casing checked and adjusted.				
3.5 Drill pile borehole	3.5.1 Drilling fluid circulated in drilled borehole and drilling fluid maintained all the times in case of fully uncased drilling. 3.5.2 Drill pipe added gradually as the depth of borehole increases. 3.5.3 Borehole drilled vertically to required depth as per drawing. 3.5.4 Verticality of borehole checked periodically during pile boring. 3.5.5 Depth of borehole measured, recorded and submitted to concerned authority.				
3.6 Perform flushing of pile borehole	3.6.1 Approval took from concerned authority for flushing of borehole. 3.6.2 Borehole flushed by circulating drilling fluid.				

	3.6.3 Flushing completed after approval from concerned authority.				
3.7 Place reinforcement cage	3.7.1 Physical and working condition of rigging gears checked prior to lifting work. 3.7.2 Pre-fabricated reinforcement cage lifted, shifted and positioned above borehole. 3.7.3 Pre-fabricated reinforcement cage lowered into the borehole vertically.				
3.8 Perform worksite clearance	3.8.1 ***Drilling tools/accessories*** removed and cleaned. 3.8.2 Grease evenly applied on greasing parts of DMC machine. 3.8.3 Operating hours recorded and submitted. 3.8.4 Machine and drilling tools/accessories stored at designated location.				

WT- Written Test **OQ**- Oral Question **PT-** Practical Test **DO** – Direct Observation **SR**- Supervisor's report **SN**–Simulation

RP- Role Play **PG –**Photographs **VD**- Video **CT** – Certificates **TS** – Testimonials (Reward) **PP** – Product Produced

CS – Case Study

Range Statement

Variable	Range
Personal protective equipment	*May include but not limited to:* • Helmet • Hat • Mask • Apron • Goggles • Gloves • Safety shoes • Ear plug
Potential site hazard	*May include but not limited to:* • Overhead transmission lines • Underground lines • Land stability • Retaining structure • Water crossing
Drilling fluid	*May include but not limited to:* • Bentonite slurry • Red mud slurry
Soil strata	*May include but not limited to:* • Clay

	• Sandy • Gravel • Rock • Boulder mixed soil (BMS)
Drilling tools/accessories	*May include but not limited to:* • Drill rod • Chisel • Tripod • Casing • Drill bit

5	**Unit No: 4** **Unit Title: Perform concreting on borehole**	**Unit code:**
	Elements of competency	**Performance standards**
	4.1 Prepare concreting machine and working platform	4.1.1 ***Personal protective equipment (PPE)*** used in accordance with task requirement. 4.1.2 Worksite inspected for ***potential site hazards.*** 4.1.3 Safety symbol placed at visible place surrounding concreting area. 4.1.4 ***Pre-start inspection*** performed as per manufacture's instruction. 4.1.5 Grease applied evenly on gear teeth, bucket, chain and pulley. 4.1.6 Machine positioned and aligned on working platform.
	4.2 Place tremie pipe	4.2.1 Length, diameter and **p*hysical condition*** of tremie pipe checked. 4.2.2 Grease evenly applied on pipe and inserted adequately into the bed of borehole to be concreted. 4.2.3 Tremie pipe connected to hopper and locked securely. 4.2.4 Hooper hooked to ***suitable attachment.***
	4.3 Perform pile concreting	4.3.1 Borehole flushed with fresh ***drilling fluid*** before concreting. 4.3.2 Concrete poured adequately to the hopper. 4.3.3 Tremie pipe removed gradually from top as the level of concrete rises as per instruction. 4.3.4 Borehole concreted up to the required level. 4.3.5 Temporary casing extracted completely after concreting operation.
	4.4 Perform worksite clearance	4.4.1 ***Concreting tools/accessories*** removed and cleaned. 4.4.2 Grease evenly applied on greasing part and stored at designated location. 4.4.3 Operating hours recorded and submitted.
6	**Task Performance Requirements (Tools, Equipment and Materials):** • Mixture machine, ready mix concrete, concrete pump, cement, sand, aggregate, admixture, water, wheel barrow, volume box, Bentonite/Red mud slurry, tremie pipe, hopper, wrench, chain wrench, plier, screwdriver, hammer, shovel, spade, grease, cotton cloth, wire brush, measuring tape, calculator, pen, paper, register, safety signs/symbols, bucket, first aid kit and personal protective equipment (PPE).	

7	**Safety and Hygiene (Occupational Health and Safety):** • Use personal protective equipment. • Safe handling of materials, tools and equipment. • Hazards involved in lifting tools, equipment and materials. • Cover mud tank/pit and incomplete borehole.

8	Required Knowledge		
	Technical Knowledge	**Applied Calculation**	**Graphical Information**

	• Tools and equipment:
	  ○ Types
	  ○ Uses
	  ○ Safe handling
	• Mixture machine
	  ○ Introduction
	  ○ Types
	  ○ Main components and their function
	• Prestart and post start inspection
	• Concreting
	  ○ Introduction
	  ○ Mixing ratio
	  ○ Admixture (anti washout chemical, super plasticizer)
	  ○ Method (Mixture machine, Ready mix concrete)
	  ○ Workability of concrete
	  ○ Concreting technique
	• Waste management
	• Record keeping and documentation
	• Occupational health and safety rules and regulations
	• Importance of first aid kit
			• Read and interpret manufacturer's instruction
			• Read and interpret pile drawing

9	**Assessment of Competency**					
	Unit: 4 **Unit Title: Perform concreting on borehole**					
	Candidate Details			**Assessors Detail**		
	Candidate's Name: Registration Number: Symbol No: Test Centre: Test Date:			Assessors' Name 1. 2. 3.		ID/License No:

Element of competency	**Performance Standards**	**Standard Met**	**Standard Not Met**	**Evidence Type**	**Comments**
4.1 Prepare concreting machine and working platform	4.1.1 ***Personal protective equipment (PPE)*** used in accordance with task requirement. 4.1.2 Worksite inspected for ***potential site hazards.*** 4.1.3 Safety symbol placed at visible place surrounding concreting area. 4.1.4 ***Pre-start inspection*** performed as per manufacture's instruction. 4.1.5 Grease applied evenly on gear teeth, bucket, chain and pulley. 4.1.6 Machine positioned and aligned on working platform.				
4.2 Place tremie pipe	4.2.1 Length, diameter and **p*hysical condition*** of tremie pipe checked. 4.2.2 Grease evenly applied on pipe and inserted adequately into the bed of borehole to be concreted. 4.2.3 Tremie pipe connected to hopper and locked securely. 4.2.4 Hooper hooked to *suitable attachment.*				
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	per instruction. 4.3.4 Borehole concreted up to the required level. 4.3.5 Temporary casing extracted completely after concreting operation.				
4.4 Perform worksite clearance	4.4.1 ***Concreting tools/accessories*** removed and cleaned. 4.4.2 Grease evenly applied on greasing part and stored at designated location. 4.4.3 Operating hours recorded and submitted.				

WT- Written Test **OQ**- Oral Question **PT-** Practical Test **DO** – Direct Observation **SR**- Supervisor's report **SN**–Simulation

RP- Role Play **PG –**Photographs **VD**- Video **CT** – Certificates **TS** – Testimonials (Reward) **PP** – Product Produced

CS – Case Study

Range Statement

Variable	Range
Personal protective equipment	*May include but not limited to:* • Helmet • Hat • Mask • Apron • Goggles • Gloves • Safety shoes • Ear plug
Potential site hazard	*May include but not limited to:* • Overhead transmission lines • Underground lines • Land stability • Retaining structure • Water crossing
Pre-start inspection	*May include but not limited to:* • Engine oil level • Hydraulic oil level • Gear oil level • Fuel level • Battery voltage

	• Grease and lubricants • Leakage
Physical condition	*May include but not limited to:* • Thread • Rupture • Damage • Crack • Blockage
Suitable attachment	*May include but not limited to:* • Tripod • Excavator • Truck/tractor mounted machine • Rig machine
Drilling fluid	*May include but not limited to:* • Bentonite slurry • Red mud slurry
Concreating tools/accessories	*May include but not limited to:* • Tremie pipe • Hopper • Mixture machine