



Piling Methodology

Objective:

The construction of piles for test piles or permanent structural foundations requires a careful choice of the piling system, depending on subsoil conditions, load characteristics, and the type of structure.

Scope:

The work shall consist of the construction of all types of piles for the structure in accordance with the details in the drawings.

Reference:

- Concession Agreement
- MoRT&H (Ministry of Road Transport & Highways)
- IS-2911 (Indian Standard Code of Practice for Design and Construction of Pile Foundations)

Responsibility:

- Bridge Engineer
- Equipment:
 - Rotary Piling Rig
 - Tools
 - Linear casing (1.5 to 3 meters long)
 - Vertical pump
 - De-watering pump (vertical)
 - Bentonite mixing equipment
 - Tremie pipe with hopper
- Crane
- JCB



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Procedure

1. Site Preparation

- **Surveying and Marking:** Conduct a detailed site survey to establish pile positions, boundaries, and levels.
- **Clearing and Grubbing:** Remove any vegetation, debris, and obstructions from the site.
- **Setting Out:** Mark the pile locations accurately according to the approved piling layout plan.

2. Pile Location

The pile shall be installed at the location as per the direction of the engineer in charge.

3. Mobilization

- **Equipment Mobilization:** Transport piling rigs, cranes, and other necessary equipment to the site.
- **Setting Up:** Assemble and position the equipment at the designated pile locations.

4. Piling Rig Setup

- **Rig Positioning:** Place the piling rig over the marked pile position.
- **Vertical Alignment:** Ensure the rig is vertically aligned to achieve the required pile inclination and depth.

5. Casing Driving

- **Linear Casing:** A casing of required diameters inner diameter with 4 to 8 mm thickness will be placed in position and pushed down using a hammer.
- **Verticality Check:** Ensure vertical alignment and continue boring.

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6. Bentonite for Piling

- **Specifications:**

- Density of mud: Not to exceed 1.05 gm/cc
- Marsh Cone Viscosity: 30-40 sec
- Swelling Index: As per IS: 6186-1986
- pH value: 9.5-12.0
- Sand content > 0.075 mm: Not more than 1%
- Liquid limit: Not less than 400%
- Preparation: Bentonite will be mixed 24 hours in advance and stored in the bentonite tank.

- **Application:** Maintain a head of at least one meter above the water table during boring. Ensure specific gravity of bentonite slurry is not more than 1.05 and less than 1.20 at the bottom of the bore before concreting.

7. Boring

- **Method:** Use a Piling rig for boring, and deploy a soil auger if required. Maintain the head of bentonite slurry by constant topping.
- **Depth Check:** Verify bore depth with a sounding chain.
- **Flushing:** Flushing will be done to remove debris using a flushing head attachment.

8. Reinforcement Cage

- **Fabrication:** Cut reinforcement using a machine or manually. Gas cutting is not permitted. Fabricate the cage as per the approved Bar Bending Schedule (BBS). Provide cover blocks at 3-meter intervals to ensure a clear cover of 75 mm.
- **Lowering:** Lower the approved cage into the bore in segments using a crane. Join segments with couplers or appropriate lapping to ensure no slippage occurs.

9. Flushing

- **Tremie Pipes:** Lower pre-assembled tremie pipes into the bore, keeping the bottom 300 mm above the founding level.
- **Continuous Flushing:** Use fresh bentonite slurry for continuous flushing until the consistency of inflowing and outflowing slurry is similar.



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10. Concreting

- **Production:** Produce concrete as per the approved design mix at a centralized batching plant. Transport using transit mixers, ensuring a slump range of 150 mm to 200 mm at the site.
- **Placement:** Place the first charge of concrete with a floating plug inside the tremie. Ensure adequate volume to prevent mixing with water or drilling mud. Maintain the tremie embedded in concrete to prevent accidental withdrawals. Regularly record concrete placement and remove the tremie as concreting progresses.
- **Testing:** Take concrete cubes as per relevant codes for testing compressive strength.

11. Pile Cap Construction

- **Excavation:** Excavate around the pile heads to the required depth for pile caps.
- **Pile Head Treatment:** Trim pile heads to the correct level and prepare them for the pile cap connection.
- **Formwork and Reinforcement:** Install formwork and reinforcement for the pile cap according to design specifications.
- **Concreting:** Pour concrete to construct the pile cap, ensuring proper compaction and curing.

12. Quality Assurance and Quality Control

- **Inspection and Monitoring:** Conduct regular inspections and monitor the piling process for compliance with design and quality standards.
- **Record Keeping:** Maintain detailed records of piling activities, test results, and any deviations or issues encountered.

13. Health, Safety, and Environment

All employees working within the project limits shall follow the guidelines, rules, and regulations as per the Safety, Health, and Environmental (SHE) Plan.