THE BRIDGES

METHOD STATEMENT

PILE CAP

CONTENTS

01) Scope

To document a suitable methodology for construction of pile cap for foundation in accordance with the requirements of the specifications and the lines, grades and cross sections shown in drawings or as indicated by the Employer's Representative.

This statement does not address all of the safety concerns, if any, associated with its work. Safety and health practices will be described separately.

02) References

- Contract Agreement
- IRC: 21-2000: Standard specification for codes of practice for road bridges, Section-3(Cement Concrete-Plain & reinforced)
- IRC: 78-2000: Standard specification for codes of practice for road bridges, Section-7(Foundation & Substructure).
- IRC: SP 47-1998: Guidelines on quality systems for road bridges (Plain, reinforced, pre-stressed and composite concrete).
- IS: 456-2000: Plain and reinforced concrete (code of practice).
- IS: 2502-1963: Code of practice for bending and fixing of bars for concrete reinforcement.
- IS: 1786-1985: Specification for high strength deformed steel bars and wires for concrete reinforcement.
- Indian Railway Bridge Manual

03) Roles & Responsibilities

Project Manager

1. He shall be responsible to control all the activities for the construction all works.
2. Ensures that the project works in his zone are carried out in accordance with company policies and in accordance with the requirements of the project quality plan.
3. Ensuring the full compliance of subcontractor operations with corporate quality policies and with the requirements of quality plan.
4. Make sure that all the suitable equipment requirement to execute the works according to the construction program are available, in good condition, and provide any additional equipment.
5. Coordinate with the Construction Manager, Project Engineer, Safety Engineer, for a safe and proper execution of the works.
6. To guide specific attention to all safety measures in co-ordination with the safety officer/engineer.
7. Selection of equipment's according to work condition in coordination with plant and machinery team.
8. He shall be responsible to control all the activities for the construction all works.
9. Ensures that the project works in his zone are carried out in accordance with company policies and in accordance with the requirements of the project quality plan.
10. Ensuring the full compliance of subcontractor operations with corporate quality policies and with the requirements of quality plan.
11. Make sure that all the suitable equipment requirement to execute the

works according to the construction program are available, in good condition, and provide any additional equipment.
12. Coordinate with the Construction Manager, Project Engineer, Safety
14. Selection of equipment's according to work condition in coordination with plant and machinery team.

Construction Manager

1. Report to the Project Manager
2. Ensure area is ready and safe to start the works.
3. Concrete Mix design shall be submitted to Employer's representative and take approval before use
4. Ensure reinforcement / structural steel is ready before start of work.
5. Set up necessary equipment and plant through discussion with the Project Manager and Project Engineer/Works Supervisor.
6. Ensure the works are carried out according to the specification, quality and approved shop drawings.
7. Liaise and coordinate with the project manager for the agreed sequence of works with respect to the construction methodology and program.
8. Allocation of required manpower through co-ordination with the PM.
9. Ensure the availability of the risk assessments for the works activities in hand.
10. Provide sufficient and safe access for operatives, Crain, trucks and pumps.
11. Take precautionary measures with regards to protecting works from hot weather, cold, sun and rain etc.

HSE Engineer/Officer

1. Report to the Project Manager
2. To ensure implementation of all safety measures related to the nature of works being carried out, and in accordance with the Project Safety Plan.

Engineer, for a safe and proper execution of the works.
13. To guide specific attention to all safety measures in co-ordination with the safety officer/engineer.

3. Ensure that all the persons involved in the works are aware of their responsibilities, and that they have enough understanding of the safety procedures.
4. The safety officer in co-ordination with the Project Manager will ensure that all the implemented safety measures are effective enough to maintain safe working conditions on the site.
5. To maintain continuous inspections of the site activities, advise and train persons on a daily basis to prevent accidents and personnel injury.
6. Give special concern to housekeeping, and ensure that the site is well maintained clean and tidy.
7. To ensure all the relevant safety sign boards for different works are in place.

QA/QC In-charge

1. Report to the Project Manager
2. Ensuring that Consultant/Client inspection requests are implemented.
3. Compilation of all necessary quality control checklists.
4. Assisting consultants during the Inspections.
5. Coordinating with the third party lab regarding tests and results.
6. The control of work performance by means of checking the work before consultants inspection and issuing RFIs, punch lists as necessary.
7. Completion of documentation to verify the work performed.
8. Controlling all inspection activities on site in line with ITP's.

9. Ensuring that all test equipment including surveying equipment is calibrated and is suitable for use on the project site.

Plant In-charge

1. Report to the Project Manager.
2. Analyze suitability of Plants & Machinery required to execute work, check technical specifications.
3. Ensure good working condition of all P&M.
4. Regular inspection of P&M along with safety officer to maintain good mechanical condition of P&M.
5. Ensure all Third Party Inspections of P&M as per statutory requirements.
6. Ensuring suitable and skilled technicians to keep P&M in good working condition and training to workmen using P&M.
7. Controlling minimum spares inventory at site to ensure smooth operation of P&M and to tackle breakdowns.
8. Controlling storage, allocation of diesel, monitoring consumptions to avoid misuse.
9. Monitoring performance, availability, utilization of P&M.

Project Engineer

1. Report to the Construction Manager
2. The engineer will carry out his duties in a manner that will be coordinated by the Construction manager on a daily basis, and will ensure proper distribution of the workforce and equipment at different site locations.
3. To be aware of test frequencies related to the work.
4. Control disposal of waste excavation material according to the instructions from the project manager/customer.
5. Coordinate with the Safety Officer to maintain safe working and proper housekeeping of the site. To comply with the safety measures and ensure that all the HSE team is aware of the same to prevent accident and loss.
6. Ensure reinforcement ready to working as per requirement.
7. To monitor and check all activities and ensure that works will be carried out according to specifications, quality and approved drawings.
8. To inform the QC Inspector of the areas ready for inspection.

QC Engineer

1. Report Site QA/QC In-Charge.
2. Shall be responsible for overall control and inspection of QC activities as per checklist and QAP at site during concrete work.
3. Shall be responsible for performing all checks and taking slump / temperature tests and accepting / rejecting concrete.

Surveyor

1. Co-ordinate with the Foreman /Project Engineer and Construction Manager
2. To establish benchmarks from agreed reference points, provide required setting out and level markings and follow up with regular checks.
3. Co-ordinate with the Project Engineer / Foreman and ensure the approved shop drawings/construction drawings will be implemented properly.
4. Maintain survey details and reports, periodically check the progressing works and advise the project manager of any deviation from the drawings.

HSE Engineer/Officer

1. Report to the Project Manager
2. To ensure implementation of all safety measures related to the nature of works being carried out, and in accordance with the Project Safety Plan.
3. Ensure that all the persons involved in the works are aware of their responsibilities, and that they have enough understanding of the safety procedures.

4. The safety officer in co-ordination with the Project Manager will ensure that all the implemented safety measures are effective enough to maintain safe working conditions on the site.
5. To maintain continuous inspections of the site activities, advise and train persons on a daily basis to prevent accidents and personnel injury.
6. Give special concern to housekeeping, and ensure that the site is well maintained clean and tidy.
7. To ensure all the relevant safety sign boards for different works are in place.

Foremen/ Works Supervisor

1. Report to the Project Engineer
2. Ensure the work progress inline with the targets and sequence as per the PM directions and orders.
3. Liaise with the Project / Construction Manager for the allocation of the work force, ensuring adequate manpower is available.
4. Liaise with the site manager to ensure all the plant/materials are available to perform the construction works.
5. Full time supervision to ensure the works are in accordance to specifications, quality and GFC drawings.

04) Equipment

- Total Station / Leveling Instrument
- Measuring Tape
- Excavator / JCB
- Breaker
- Generator
- Welding Machine
- Bar Cutting/Bending Machine
- Batching Plant
- Transit Mixer
- Concrete Pump
- Crane & Bucket
- Vibrators Needle/Form Vibrators

05) Methodology

Sequence of activities

- Setting out
- Excavation
- Leveling Course
- Preparation of Pile Head
- Reinforcement Cutting/Bending/Fixing
- Shuttering
- Concreting
- Curing
- Finishing
- Backfilling

5.1. Setting out

The pile cap area shall be marked on the ground after carrying out survey with reference to control points. After excavation the levels of the pit shall be checked for correctness to the drawings and recorded. Longitudinal and transverse center lines shall be marked out side the pit for reference for cross checking the pier location. After laying of PCC the layout of the pile cap shall be marked on it with reference to the reference points to facilitate tying of rebar and erection of shuttering. Excavation shall be taken up as per the approved Excavation Methodology.

5.2. Excavation

- Proper side slope or shoring shall be provided depending upon the stability of the soil & the ground water table found in the area. Shoring shall be done with the help of old steel plates & props. At road locations the pit shall be excavated to the dimensions providing working space all around the pile cap, to facilitate fixing of R/F steel & erection of shuttering as detailed in the drawings.

- The last 200mm excavation shall be carried out manually & leveling course shall be laid down. Provision for sump if necessary, shall be made at the corner of the pit to pump out underground water of about 750mm deep from PCC bottom. Also a drain shall be provided all around pile cap dimension & it shall be connected with sump to drain off excess rain water/seepage water.

- The excavated earth shall then be disposed off in covered trucks to dumping yards provided by local authorities.

5.3. Leveling Course

- The layout plan of the pile cap shall be marked on ground.
- Levels at the bottom of trench shall be checked and recorded.
- Ready mixed concrete of specified grade shall be laid to required dimensions, thickness and levels as shown in drawings.
- Placing of the concrete shall be carried through the concrete pump, chute arrangement or crane & bucket.
- Curing shall be done by conventional methods/curing compound.

5.4. Preparation of Pile Head

- After Excavation the laitance of the piles shall be removed by using Pneumatic Jack Hammers minimum seven days after casting of pile or manually minimum three days after casting of pile. The top of pile after striping shall project 50mm above PCC top level. The debris shall be removed from the pit and disposed off.

- The projected reinforcement above cut off level shall be properly cleaned and bent to the required shape and level to be anchored in to the pile cap.

5.5. Reinforcement Cutting/Bending/Fixing

- **Fabrication:** For fabrication of reinforcement, BBS shall be prepared as per the good for construction drawings and got approved from client. The Reinforcement shall be cut using cutting machines or manually as required and bent at Rebar yard. The bars touching up may be done using wire brush if required to ensure that the bars are free from dust & rust. The rebar shall be transported to location in trailer / truck to the location or manually depending upon the lead.

- **Fixing of Rebar**: The rebar shall be manually fixed into its position as shown in the good for construction drawing. Cover blocks of same grade of concrete in which it is going to be embedded shall be provided at suitable spacing to ensure uniform cover of as specified in drawing and tied together with binding wire. After fixing the pile cap rebar, pier rebar & crash barrier shall be fixed. This rebar shall be supported by erecting a suitable staging frame across the width of the pile cap. The rebar cage shall be checked by client and all the rebar, chairs, spacers & laps shall be jointly measured after completion of cage placing. Chairs and spacers shall be provided as approved by client. After getting the clearance; balance shuttering work will be taken up. Pier rebar shall be hold in position rigidly to prevent it from buckling.

5.6. Shuttering

- Required shuttering fabricated as per drawings shall be placed at locations as per the pile cap dimensions shown in the good for construction drawing and premarked (numbered) shuttering shall be placed. Before placing the shuttering, shuttering oil shall be applied on shutter face in contact with the concrete, to ensure easy removal of shuttering & proper concrete finish. After fixing of shuttering it shall be checked representative for it's alignment, location & correctness along with rebar. For preventing leakages from joints, rubber strip/foam strip shall be provided at the joints of shuttering plates.

5.7. Concreting

- Ready mixed concrete of specified grade shall be transported from the Batching Plant to site through Transit mixer.
- Placing of the concrete shall be carried through the concrete pump, chute arrangement or crane & bucket.
- Height of drop of concrete to the point of pouring shall be less than 1.50m.
- Concrete shall be placed in horizontal layers of 450mm or in 3-4 layers shall be done in continuous manner to avoid cold joints and compacted by suitable vibration. Shear keys should be located in proper location for pier areas.

5.8. Curing

- After initial set of concrete in 2-3 hours, wet Hessian cloth will be laid on the top of the surface of the pile cap and constantly watered. The concrete shall be cured by pounding method. Bunds of cement mortar of lean mix shall be built after the concrete attains final. These bunds shall be filled with water. The sides of the pile cap shall be covered with Hessian cloth till back filling is started. Further curing is ensured by keeping the backfill moist with water.

5.9. Finishing

- Immediately after removal of forms exposed bars, if any shall be cut inside the concrete member to a depth of at least 50mm below the surface of the concrete and the resulting hole shall be filled with suitable epoxy mortar.
- All construction and expansion joints in the completed work shall be left carefully tooled and free from any mortar and concrete.
- All fins caused by form joints, if any, shall be ground using electric surface grinder.

5.10. Backfilling

- Immediately after deshuttering concrete surface shall be checked jointly with client and get the approval for backfilling. The backfilling shall commence immediately after deshuttering. Before removing of the barricades, the whole area shall be cleaned after completion of work.