METHOD STATEMENT FOR DRIVEN PCC PILE INSTALLATION

Project No:

REVISION HISTORY	ISSUE DATE	DESCRIPTION	REVIEW / STATUS
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PREPARED BY:	**REVIEWED & APPROVED BY:**
QA QC ENGINEER	PROJECT ENGINEER

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1.0. Purpose

This Method Statement (MS) relates to the installation of precast concrete piles and includes

- Pile Driving
- Measurement of Pile Set
- Restriking
- Dynamic Load Testing

2.0. Resources

2.1. Plant

- Tracked Piling Rig
- Telehandler or Forklift Truck (FLT). For convenience, this is referred to as the FLT throughout this MS

2.2. Labor

- A Foreman I Piling Rig driver
- An Operative I Forklift driver

2.3. Materials

- Precast piles up to 200mm square, in sections up to 4m long. Each section incorporates a dowel pin at one end and a socket at the other end
- Felt gaskets (temporary works material)
- Fuel and lubricants

3.0. Hazards

Driven precast concrete (PCC) pile installation is a common construction activity that involves hammering or driving precast concrete piles into the ground to create foundations or structural supports. While it is an essential technique, there are several hazards associated with driven PCC pile installation that need to be carefully managed to ensure the safety of workers and the overall success of the project. Some of the hazards include:

3.1. Struck-By Hazards:

- Struck-by hazards arise from the impact of moving or falling objects, such as the pile itself, hammers, and equipment.
- PCC piles are heavy and can cause serious injuries if they strike workers or equipment during installation.

3.2. Collapse or Tip-Over:

- During pile installation, there is a risk of piles collapsing or tipping over due to improper placement, inadequate support, or soil instability. This can result in injury to workers in the vicinity and damage to equipment.

3.3. Noise and Vibration:

- The impact of hammering PCC piles into the ground generates significant noise and vibrations. Prolonged exposure to high levels of noise and vibrations can lead to hearing loss and other health issues for workers.

3.4. Fall Hazards:

- Workers may need to access elevated areas, such as the top of piles or equipment, to guide and secure the piles during installation.
- This poses a risk of falls if proper fall protection measures are not in place.

3.5. Equipment Operation:

- The operation of pile-driving equipment involves various moving parts, hydraulics, and controls. Workers must be properly trained to operate the equipment safely and avoid pinch points.

3.6. Traffic and Site Access:

- Pile installation sites can attract a lot of traffic, including heavy machinery and delivery vehicles. Proper traffic management and safe access routes are crucial to prevent accidents involving pedestrians and vehicles.

3.7. Cave-Ins and Soil Instability:

- The installation process can disturb the soil around the pile, potentially leading to trench collapses or instability in the surrounding area.

3.8. Flying Debris and Dust:

- The impact of hammering can cause debris, rocks, and dust to be thrown into the air. Workers should wear appropriate personal protective equipment (PPE) to protect against these hazards.

3.9. Electrical Hazards:

- Pile-driving equipment often involves electrical components and power sources. It's essential to ensure proper grounding and insulation to prevent electrical shocks.

Communication and Coordination:

Effective communication among workers, equipment operators, and supervisors is crucial to prevent accidents and ensure smooth operations. To mitigate these hazards, it's important to implement proper safety measures and procedures, which may include:

- Conducting thorough site assessments and soil analyses before starting pile installation to identify potential hazards and plan accordingly.
- Ensuring all workers are properly trained on pile installation techniques, equipment operation, and safety procedures.
- Providing appropriate personal protective equipment (PPE), such as hard hats, steel-toed boots, high-visibility clothing, and hearing protection.
- Implementing fall protection measures, including guardrails, safety harnesses, and proper scaffolding for elevated work.
- Using barriers, signage, and flagging to establish safe work zones and control traffic around the installation area.
- Implementing noise and vibration monitoring to assess exposure levels and take necessary precautions.
- Having a clear emergency response plan in place in case of accidents or unexpected incidents.
- Regularly inspecting and maintaining equipment to ensure it's in safe working condition.
- Following relevant regulations, industry standards, and best practices for pile installation.

4.0. Permits

Under our subcontract conditions, our immediate client is responsible for locating services and ensuring that pile positions are free from the Statutory Undertakers utility plant. We will operate a Permit System which requires our Client to sign to confirm, before the commencement of our piling works, that the pile locations are clear of services

5.0. General Arrangements and Preparation

5.1. Mobilization / Demobilization

- Mobilization of the rig will be on a low loader, and unloading of the plant will be carried out by the machine driver.
- The rig will be tracked onto the working platform and the mast erected into its vertical working position, once vertical the hammer stop is then removed.
- When piling works have been completed the hammer stop is then fitted and the mast is lowered into its horizontal / travel position.
- Piling rig is then loaded onto the low loader and secured for transportation.

5.2. Preparation / Pile location

- Pile sections shall be delivered by articulated wagon and will be offloaded by our Operative using the FLT.
- The sections will be stored in a designated laydown area.
- Sections will be transferred daily to a temporary storage area near the pile locations
- Before the commencement of works an exclusion zone shall be applied from the rig foot.
- The length of the zone shall be 1m greater than the longest pile section to be used
- Setting out is the responsibility of our client unless stated otherwise in the Job Pack

6.0. Work Details

The piling rig shall be precisely located at the position where the pile is to be driven. The piling rig mast shall be adjusted and its verticality checked. The first pile section shall be presented horizontally to the piling rig by the FLT. The pile sections shall be positioned as close as possible to perpendicular to the direction of movement of the hammer before then being attached to the winch by means of a chain.

The Operative shall retreat to a distance of 1m behind the pile toe, in line with the direction of the pile section. Using the pile hoist rope, the pile shall be lifted into a near vertical position and the pile head located into the piling helmet. The Foreman/ Rig Driver will ensure the steady unhindered progress of the hoist through careful observation and control. During the hoist, the Operative may enter the exclusion zone but must be at least 1m away from the pile toe in the direction of the lift until the pile section is at the point of entering the helmet. At this stage, the Operative may assist in maneuvering the pile section into the helmet. If any persons enter the exclusion zone, or if the Operative moves closer than described above, or if the pile is likely to collide with any obstruction, the foreman will immediately stop the hoist and suspend works until the situation has been rectified

The pile shall be lowered and the toe of the pile shall be manually guided into the footplate of the rig. To prevent trapping accidents in the event of the pile kicking backward during this procedure, a zone of radius 2m in front of the rig must be clear of obstructions. Where less than 2m radius is available, extra care must be taken to ensure the pile does not kick out when repositioning. To minimize the risk of the pile kicking and the associated breakages, the piling rig's winch shall be used to push the pile section into the ground before the use of the hammer. This method also reduces noise and vibration
Once the first pile section is up to 1m into the ground it shall be checked for verticality and adjustments shall be made if required

6.1. Pile Driving Cycle

- To prevent damage to the pile, care must be taken to ensure the hammer blows are always square onto the pile.

- Each pile section is driven in 2 parts; firstly with the hoist rope attached, and secondly without.
- As the pile section travels down the mast, the hoist rope must be eventually removed to prevent it from becoming trapped
- The Piling Rig driver shall operate the hammer to drive the pile into the ground, parallel with the mast. At an appropriate point driving shall pause to allow the hoist rope to be removed from the pile.
- Pile driving shall recommence until the pile head is approximately 300 mm above the piling platform, at which point the driving cycle shall cease. If the pile has not reached the desired set or design length, a further pile segment must be added

6.2. Jointing pile sections

- Pile segments are jointed using a single mild steel dowel pin in the toe of the new section, located into the full depth of the pre-cast socket at the top of the driven section.
- Before insertion of the dowel pin, the socket must be checked for cleanliness.
- Epoxy resin shall be poured carefully into the open socket of the first pile section and then a felt gasket shall be positioned around the socket.
- The new section shall be lifted into position above the upstanding pile using the winch and cable, and carefully guided into position so that the dowel pin is aligned directly over the socket.
- The pile segment shall be gently winched down, the weight of the pile being sufficient to ensure full penetration of the dowel pin into the socket.
- Driving shall recommence as described above and the process repeated until the correct set I design length is achieved

6.3. Moving the Piling Rig to a new position on site

- When tracking the piling rig to a new pile location on the same site, the Foreman, assisted by the Operative shall physically check and evaluate the risks and decide whether existing precautions are adequate or whether more must be done.
- The Operative shall assist in achieving the safe movement of the rig and ensuring the segregation of pedestrians and other traffic.
- Additionally, close monitoring of the piling mat and its integrity shall be maintained whilst the rig moves to the next pile position

6.4. Taking the Pile Set

- "Set" is the common term for a measure of the dynamic resistance of the pile.
- It is defined as the distance a pile advances into the ground when subjected to a specified energy input for 10 hammer blows
- The designer will have calculated a required set, as an output from the design process.
- The Foreman shall use his experience to determine when the pile is approaching set.

- The Operative shall then measure a set by counting blows and physically measuring advance.
- The Foreman shall compare the measured set to the calculated set, and use this comparison to determine whether pile driving is complete for that pile
- The required sets and anticipated pile design lengths shall be given to the Foreman in writing before the commencement of piling construction.

Set measurement on site shall be achieved by following the steps below:

- The Foreman shall pause driving i.e. temporarily stop the hammer
- The Operative shall mark the pile, by whatever means, from the affirmed surface, such as the rig foot
- The Operative shall retire to a safe distance
- The Foreman shall recommence piling and apply the designated energy for the 10 blows
- The Foreman shall pause driving
- The Operative shall return to the pile position and physically measure the depth of penetration
- The operation shall be repeated as necessary until the desired set is achieved
- The Foreman shall record the final set on the Piling Record Sheet

Where the pile set is achieved at a pile length that varies by more than 1m from the anticipated pile design length the Site Foreman shall notify the Engineer, record the event on the piling records, and await instruction regarding the acceptability of the pile as driven

Pile Restriking

Restriking is a re-measurement of the set, applied to a specified sample of piles. Restriking shall be carried out the day after driving, unless otherwise dictated by the site programmed or physical site conditions. A minimum of 5 re-strikes per day shall be carried out

Restrikes shall be measured over 10 blows, on randomly selected piles unless otherwise specified. The restrike set shall be equal to, or less than the set at the end of the drive. Where the piles are founded on Rock (including chalk) or Dense Gravel, the number of blows can be reduced to a minimum of 5

If a pile re-strike produces a greater set (slacker) than the pile set at the end of the drive the piling Foreman shall notify the Engineer, record the event on the piling records, and await instruction

7.0. Supervision

The Foreman is our Supervisor on site and will possess the appropriate experience and knowledge to allow our work to be carried out by our Health & Safety, Quality, and Environmental Management Systems

8.0. Quality Records

The Foreman shall produce and maintain Pile Record Sheets detailing work done, including records of Set and Restrike and any non-conformances and corrective action

9.0. Non-conformance

The Foreman shall have an Inspection & Test Plan for the works. This is generally generic, and may be supplemented by contract-specific information. The Foreman shall carry out the Inspection and Tests listed in the plan. Where any non-conformance is encountered or suspected he shall cease production and investigate, liaising with Head Office as appropriate

10.0. Health & Safety Monitoring

The Foreman shall ensure adherence with the RAMS for the works. The [COMPANY] HSQE Manager shall make occasional visits to precast piling sites to gauge compliance with the [COMPANY]

11.0. Plant Inspection & Operator Training

Plant inspection and operator training are crucial components of ensuring safety and efficiency during driven precast concrete (PCC) pile installation. Here's a guide on how to conduct plant inspection and provide operator training for this process:

11.1. Plant Inspection:

11.1.1. Preparation:

Identify the key components of the plant involved in PCC pile installation, including pile-driving equipment, hammers, support structures, and any auxiliary equipment.

11.1.2. Checklist Development:

Create a comprehensive checklist that covers all critical aspects of the plant equipment. This should include safety features, maintenance records, and operational requirements.

11.1.3. Safety Features and Emergency Equipment:

Ensure that all safety features, such as emergency stop buttons, guards, and safety interlocks, are functional and well-maintained.

Verify the availability and condition of emergency equipment, such as fire extinguishers and first aid kits.

11.1.4. Operational Inspection:

Inspect the pile-driving equipment for signs of wear, damage, or leaks. Check hydraulic systems, controls, and instrumentation.

Examine the condition of the pile hammer, including impact mechanisms, damping systems, and attachments.

Evaluate the stability of support structures and ensure proper anchoring.

11.1.5. Electrical and Mechanical Systems:

Test electrical systems, including wiring, connectors, and grounding, to ensure safe operation.

Inspect mechanical components for proper lubrication, alignment, and functionality.

11.1.6. Documentation and Records:

Review maintenance and inspection records to ensure that equipment has been serviced according to recommended schedules.

Maintain a log of inspection findings, repairs, and corrective actions taken.

11.1.7. Certification and Compliance:

Ensure that all equipment and machinery are compliant with relevant safety standards and regulations.

Verify that any required certifications for the equipment are up to date.

11.2. Operator Training:

11.2.1. Basic Equipment Knowledge:

Provide operators with a thorough understanding of the pile-driving equipment, including its components, controls, and functions.

11.2.2. Safety Procedures:

Train operators on safety protocols, including the proper use of personal protective equipment (PPE), emergency shutdown procedures, and evacuation plans.

11.2.3. Operational Techniques:

Instruct operators on proper techniques for setting up and positioning the equipment, attaching the pile hammer, and aligning piles.

Equipment Operation:

Demonstrate the correct operation of the equipment, including starting, stopping, and controlling the pile-driving process.

Train operators to monitor gauges, indicators, and alarms for signs of equipment malfunction or potential hazards.

11.2.4. Maintenance and Inspections:
Educate operators on routine maintenance tasks, such as lubrication, filter changes, and visual inspections.

Explain how to identify and report any abnormalities or issues during operation.

11.2.5. Communication and Coordination:
Emphasize the importance of clear communication with other team members, including spotters, riggers, and supervisors.

Teach operators how to respond to signals and directions effectively.

11.2.6. Emergency Response:
Train operators on emergency response procedures, including shutdown protocols, evacuation routes, and first aid.

11.2.7. Hands-On Training:
Provide hands-on training sessions where operators can practice setting up equipment, attaching the pile hammer, and performing simulated pile-driving operations.

11.2.8. Evaluation and Certification:
Assess operators' skills through practical evaluations to ensure they can operate the equipment safely and effectively.

Issue certifications to operators who complete the training program.

Both plant inspection and operator training should be ongoing processes to ensure that equipment remains in good working condition and operators are equipped with the knowledge and skills necessary to carry out driven PCC pile installation safely and efficiently.

12.0. Hazardous Substances

During driven precast concrete (PCC) pile installation, there are potentially hazardous substances that could be encountered. These substances can pose health risks to workers and the environment if not properly managed. Here are some hazardous substances that might be encountered during PCC pile installation and how to manage them:

12.1. Crystalline Silica Dust:

Hazard: Grinding, cutting, or breaking concrete can generate respirable crystalline silica dust, which, when inhaled, can cause serious respiratory issues, including silicosis.

Management: Use water or dust suppression systems to control dust generation. Provide workers with proper respiratory protection, such as N95 masks. Ensure work areas are well-ventilated.

12.2. Asbestos Contaminated Soil or Materials:

Hazard: Old structures being demolished or disturbed may contain asbestos, which, if released into the air and inhaled, can lead to lung diseases and cancers.

Management: Conduct asbestos surveys before starting work. If asbestos is found, follow proper abatement procedures and ensure workers are trained to handle asbestos-containing materials safely.

12.3. Volatile Organic Compounds (VOCs):

Hazard: Some construction materials, such as adhesives and paints, contain VOCs that can evaporate into the air and lead to respiratory issues and indoor air pollution.

Management: Choose low-VOC or VOC-free products whenever possible. Ensure proper ventilation in enclosed spaces to minimize VOC exposure.

12.4. Diesel Exhaust Emissions:

Hazard: Heavy machinery and equipment used in pile installation can emit diesel exhaust fumes containing harmful pollutants that can affect respiratory health.

Management: Maintain equipment properly to reduce emissions. Use emission-reducing technologies and ensure proper ventilation in work areas.

12.5. Chemical Admixtures and Agents:

Hazard: Chemical admixtures used in concrete mixtures or agents used to accelerate or retard concrete curing can contain hazardous substances that may be harmful upon skin contact or inhalation.

Management: Follow the manufacturer's guidelines for handling and storage. Provide appropriate PPE, such as gloves and eye protection, when working with chemical agents.

12.6. Lead-Based Paint:

Hazard: Old structures being demolished or disturbed may have lead-based paint, which can cause lead poisoning if ingested or inhaled.

Management: Conduct lead paint surveys before work begins. If lead-based paint is present, follow proper containment and abatement procedures. Provide workers with lead-safe training and PPE.

12.7. Oil and Fuel Spills:

Hazard: Machinery leaks, fuel spills, or oil releases can contaminate soil and water sources, leading to environmental damage.

Management: Implement spill prevention measures and have spill response kits on site. Properly store and handle fuels and oils to prevent leaks.

12.8. Hydraulic Fluids and Lubricants:

Hazard: Heavy machinery may leak hydraulic fluids or lubricants, which can pose a slip hazard and contaminate soil and water.

Management: Regularly inspect equipment for leaks. Clean up spills immediately using absorbent materials.

To effectively manage these hazardous substances, follow these general guidelines:

Conduct thorough site assessments to identify potentially hazardous substances and plan accordingly.
Provide proper training to workers on the handling, storage, and disposal of hazardous materials.
Follow safety data sheets (SDS) and manufacturer's instructions for handling and disposing of hazardous substances.
Implement engineering controls, such as ventilation systems and dust suppression methods, to reduce exposure.
Establish designated areas for storing and handling hazardous substances.
Have appropriate spill response plans in place, and train workers on spill response procedures.
Provide necessary personal protective equipment (PPE) to workers based on the specific hazards present.

Hazardous Substances			
Substance/Product Name	Hazard Level (H, M, L) as specified on COSHH Assessment	COSHH details provided and briefed to users	Control Measures to be Used
Gas Oil	L	YES	PPE is to be worn and stored in a bunded fuel bowser
Hydraulic Oil	L	YES	PPE is to be worn and stored in the correct container
Engine Oil	L	YES	PPE is to be worn and stored in the correct container

Grease	L	YES	PPE is to be worn and stored on the side of the machine
Resin	L	YES	PPE is to be worn and stored on the side of the machine

13.0. Occupational Health

No general requirement. The [COMPANY] operates an Occupational Health Policy and will obtain specialist assistance if required

14.0. PPE

Hard hats, High Viz, Safety Boots, Gloves, and Ear Protection are to be worn at all times.

15.0. Emergency Procedures

In the event of an emergency, all plants will be made safe as soon as possible and follow the site emergency plan that was given at the site induction. Office to be contacted as soon as possible.

16.0. Safety of the Public and Occupants

Driven precast concrete (PCC) pile installation can have potential environmental impacts, especially related to noise, vibration, and the disturbance of soil and surrounding ecosystems. To minimize these impacts, it's important to implement environmental controls and best practices during the pile installation process. Here are some environmental controls to consider:

16.1. Noise Control:

Select pile-driving equipment with noise-reducing features, such as sound enclosures or mufflers.

Schedule pile-driving activities during times when noise-sensitive areas (e.g., residential neighborhoods) are less populated or during permitted hours.

Use noise barriers and sound-absorbing materials to minimize noise propagation to surrounding areas.

Regularly monitor noise levels and adjust pile-driving techniques as needed to stay within permissible limits.

16.2. Vibration Control:

Use vibration-damping materials on pile-driving equipment and adjacent structures to reduce ground-borne vibrations.

Limit the impact energy and hammer weight based on site conditions to control vibrations.

Monitor vibrations in real-time using seismographs and adjust pile-driving parameters if necessary.

Establish vibration exclusion zones in areas where sensitive structures or equipment are located.

16.3. Dust and Air Quality Control:

Implement dust suppression measures, such as water spraying or dust control agents, to minimize airborne dust during pile installation.

Use windbreaks or barriers to prevent dust from spreading to surrounding areas.

Monitor air quality to ensure that dust levels remain within acceptable limits.

16.4. Erosion and Sediment Control:

Implement erosion and sediment control measures, such as silt fences, sediment basins, and erosion-resistant ground covers, to prevent soil erosion and runoff into nearby water bodies.

Properly manage construction access roads to prevent sediment runoff onto public roads.

16.5. Soil and Vegetation Protection:

Establish buffer zones around sensitive areas like wetlands, water bodies, and existing vegetation to minimize disruption.

Consider using temporary mats or protective barriers to prevent soil compaction and damage to vegetation during equipment movement.

16.6. Spill Prevention and Management:

Store fuels, lubricants, and other hazardous materials in spill-proof containers and ensure proper containment measures are in place.

Have spill response kits readily available and train workers on spill response procedures.

16.7. Waste Management:

Properly manage waste generated during the installation process, including construction debris and excess materials.

Separate and recycle materials where feasible.

16.8. Environmental Monitoring and Reporting:

Establish a system for monitoring and documenting environmental parameters such as noise levels, vibration levels, air quality, and water quality.

Report any deviations from environmental permits or regulations to the appropriate authorities.

16.9. Site Restoration:

After pile installation is complete, restore disturbed areas by grading, re-vegetating, and stabilizing the soil to prevent erosion.

16.10. Community Communication:

Communicate with the local community about the construction activities, potential environmental impacts, and mitigation measures in place.

17.0. Public Nuisance

Driven PCC (Precast Concrete) pile installation can generate noise, vibrations, and other disturbances that may be perceived as a public nuisance, especially when construction activities are carried out near residential or sensitive areas. It's crucial to proactively address these concerns to maintain good relationships with the community and adhere to local regulations. Here are some steps you can take to mitigate public nuisance during driven PCC pile installation:

17.1. Community Engagement:

Inform nearby residents, businesses, and relevant stakeholders about the upcoming construction activities, their duration, and potential impacts.

Hold community meetings or provide informational materials to explain the necessity of the work and the steps being taken to minimize disruptions.

17.2. Noise Mitigation:

Use quieter pile-driving equipment or technologies, if available and feasible.

Implement noise barriers or sound-dampening measures around the construction site to reduce noise propagation.

Schedule pile-driving activities during daytime hours and avoid work during early mornings, evenings, and weekends when noise sensitivity may be higher.

17.3. Vibration Management:

Monitor vibration levels during pile installation and ensure they remain within permissible limits set by local regulations or industry standards.

Employ techniques such as pre-drilling or cushioning materials to reduce ground vibrations.

17.4. Traffic and Access Management:

Develop a traffic management plan to control construction-related traffic and minimize disruptions to local traffic flow.

Coordinate with local authorities to ensure construction vehicles and equipment do not cause congestion or block roads.

17.5. Visual Screening:

Use construction fencing, vegetation, or temporary structures to shield construction activities from public view, reducing visual disturbances.

17.6. Communication Channels:

Establish clear channels of communication with the public to address concerns, receive feedback, and provide updates on construction progress.

Designate a point of contact for community members to reach out to with questions or complaints.

17.7. Dust and Debris Control:

Implement dust control measures to prevent the spread of construction-related dust to nearby areas.

Regularly clean up debris and maintain a tidy construction site.

17.8. Scheduling and Phasing:

Plan construction activities to minimize their duration and consolidate noisy activities to minimize overall impact.

Consider phasing the construction work to reduce continuous disturbances over an extended period.

17.9. Mitigating Visual Impact:

Consider aesthetic improvements, such as temporary murals or artwork on construction barriers, to improve the visual appearance of the site.

17.10. Responsive Action:

Be prepared to promptly address any complaints or concerns from the public.

If specific concerns arise, work with local authorities and stakeholders to find solutions.