



Rotary Core Drilling Method Statement

Site Objectives and Measures to be Taken

Occupational Health and Safety

1. A full Health and Safety File will be drawn up specifically for this site, in accordance with the most recent requirements (7 August 2014). This file will be available on site at all times. This file will include all appointments and checklists as required by the law.
2. A DSTI will be filled in daily at the commencement of each day's work to ensure that all necessary H&S requirements are being adhered to at all times by all employees on site. This DSTI will be available for client inspection at all times.
3. All daily checklists will be completed and will be available for the client to inspect
4. PPE will be worn by all workers on site and visitors to the site
5. All the necessary traffic control measures will be taken to ensure full compliance with the specification for temporary road closure.

Rotary Core Drilling to Obtain Core Samples for Quarries, Borrow Pits and Bridges

1. Upon arrival at the site the core drilling rigs shall be towed on the trailer or truck to the first borehole position.
2. Depending on the model, the rig may either be set up on the drilling trailer, or offloaded and set up on skids or offloaded with a crane. The rig or trailer is levelled, if required sleepers are placed under the skids to create a safe working base and to prevent the rig from sinking into soft surfaces during drilling.
3. In the case of a barge set up, the barge will be brought to site and assembled in the river. The drilling rig will then be placed on the barge by means of a crane truck. The rig will be welded into position onto the deck of the barge to ensure a safe working area, and to eliminate rig movement. The barge will be held in place by four spans of steel rope that will be ratcheted into place on the bank tightly.
4. The drill rods, casings and ancillary equipment will be unpacked and neatly stacked on rod racks and in ways that conform to good housekeeping practice.
5. The drill rig and the components of the derrick or mast will be inspected and then assembled. The derrick or mast will be bolted together in sections by means of the bolt holes in the flanges with nylock nuts.



6. Once the derrick is in position it will be lifted up by three to four people and walked into position till it is vertical. Locking pins or bolts will then be inserted to lock it into position.
7. The hoses and connections for the pump system will then be fitted.
8. The quill or kelly rod will be inserted into the quill shaft.
9. At this point the rig is now ready to commence drilling. Sumps must be dug or the drum sump method used and drilling water must be procured, either using a watercart or pipeline from an appropriate source.
10. Once the sumps are filled with water and a sufficient reserve is stored on site the operator adds the relevant drilling mud that is required for the site conditions until the desired viscosity is achieved. He will then attach the starting barrel, either NX or NXC size to the kelly rod.
11. The operator will open the water feeding system to allow water to flow through the kelly rod and exit the starting barrel, engage the rotation system and gradually lower the now rotating starting barrel to the start of the hole.
12. The operator will proceed to drill with the starting barrel until at least 1.5m, doing so in stages that are determined by the length of the starting barrel. In most cases this will be 600mm. As the starting barrel is filled with sample the driller will remove the barrel from the hole, empty the sample into a plastic core sleeve while taking due care to keep it as intact as possible and place it sequentially into the corebox. The coreboxes are made from rigid aluminium and a full size sticker is placed on the lid to make it clearly identifiable.
13. Once 1.5m is reached the operator will remove the starting barrel and ream NW casing to the bottom of the borehole.
14. Usually at this depth the first SPT will be done. The SPT method is read separately.
15. Once the SPT has been completed the driller will continue drilling with either NWD4 or TNW corebarrels depending on the formation being either soft and fractured or hard and unjointed. TNW will be used for Quarry drilling if the engineer requires it.
16. The NWD4 and TNW corebarrels have a core capacity of 1.6m. The driller will thus advance the hole at increments of 1.5m, usually performing an SPT at the target depth every 1.5m.
17. Each time the corebarrel has been filled or the material should plug/wedge inside the corebarrel the drill string will be removed, core removed from the corebarrel, placed in core plastic and the barrel will be tripped back into the hole. To minimise time loss during opening the corebarrel most of the



time two corebarrels are used, so that while one is being stripped, cleaned and sample removed the driller may proceed with the drilling using the second corebarrel.

18. Should the corebarrel be empty or more than 50% of core be lost then the run length will be reduced to 0.75m and an additional SPT performed at that increment to ensure representative sample.
19. While drilling through soft material or any material that has a high water loss or collapse potential the drill will advance casing after drilling 1.5m with the corebarrel. This will reduce the risk of lost holes or hole collapse on equipment whilst also conserving drilling fluid. Should water loss be encountered in hard rock and reaming casing be considered too time consuming or not cost effective other techniques might be employed to minimise water loss.
20. In the event of drilling angle holes or very hard Category D material such as Chert, Quartzite or Banded Ironstone, the rig will be cemented into place. A trench is dug around the rig and rebar is cemented into place. The rig is then attached to the rebar to ensure additional reactive force. Should the terrain not allow digging, a concrete slab will be thrown and the rebar will be inserted and cemented into place in this way.
21. Various tests may be required by the engineer at various depths. At all times the driller will keep a record of the exact depth of the borehole using the stick up method. This method requires the driller or assistant to add the total tools, rods and the length of the Kelly rod. The length of the drill string/Kelly rod that is sticking out above ground level is referred to as the stick up. This amount is subtracted from the total tooling, rods and Kelly. Thus testing takes place at the correct depth and the core samples are marked correctly from the depth at which they are taken. Should drilling need to stop at a particular depth the same method is used with the variation of calculating the projected stick up. Thus when the driller reaches the projected stick up he would stop drilling to perform the test.
22. Due care is taken by the driller at all times to keep the drill rig clean, in good working order and in a safe condition. The same can be said of the work area and the water circulatory system.
23. In most instances drum sumps are used. These are sunk into the ground wherever possible with lengths of pipe between them to facilitate water circulation. Due care is taken to avoid spills of drilling fluid. Where drum sumps cannot be sunk into the ground due to ground conditions a length of stand pipe casing is sunk into the ground at the borehole position. This length of casing will have a swage nipple welded into it to allow water to flow out through a pipe to the first settling sump.



24. Once the hole is complete the driller will wash out the hole with clean water, install whatever instrumentation or piezometers that might be required and then remove the temporary casing and backfill/grout the hole up and move the machine to the next borehole. During the move any excavations for the drum sumps are covered up, the area is checked for debris and cleared and the hole has a concrete block cast on it if required
25. A water rest level will be taken a few days after the hole is completed and the ground water has had time to settle to its natural level.
26. In the case of a barge set up, the barge will be loosened from its spans and moved to the next position by means of either man power or a crane truck, depending on the conditions. The rig will be removed from the barge once the drilling in that particular area is completed, or if the barge needs to be moved to another section of river by means of the crane.
27. The barge will be removed from the river by means of a crane after it has been disassembled.

Environmental

1. At all times, the utmost care is taken to minimise the impact drilling activities on the environment and area around the drilling. This is achieved by training and educating the team on the best ways to achieve minimal impact. The site supervisor is tasked with twice daily checks to ensure that all the environmental standards and requirements on site are adhered to at all times.
2. When accessing the site, care is taken to only drive on established roads wherever possible. If the borehole position is off the established road, the smallest area and shortest distance possible will be cleared to access the drilling position. Drivers are to only use one entry and exit point for the duration of the works at the position, these points are clearly marked. If the client requires rehabilitation of the site after the works are done, this can be arranged as long as the requirements are made clear at the start of the works. This is in the event of material that might need to be retained and replaced, or plants that need to be replaced.
3. When setting up the machine on the position, every care is taken to clear the smallest possible work space that is both safe for works and minimally impactful on the vegetation. When possible, tree branches are tied back with rope or cable, rather than being sawed off. A thick layer of plastic bunding is placed over the area that the machine will stand on, this is to catch any spills that may occur while



drilling. The same thick plastic will also line the settling sump, to prevent drilling water from running away during drilling.

4. A drip tray is set up under the drill rig to catch any fluids that might fall from the machine.
5. Plastic bunding is placed under the pump as well as the drill rig. This is to ensure that any spills from refuelling are contained. Refuelling is only carried out by competent staff who have been properly instructed on the correct methods of refuelling. Vehicles are to be refuelled offsite.
6. The drilling fluid used is a vegetable polymer and is a non-toxic, non-harmful substance that is biodegradable. Despite this fact, every care will be taken to minimise spills of drilling muds. No hydraulic oil containers will be kept on site.
7. The vehicles will be checked daily, prior to leaving the camp, for oil leaks and contamination. Any such leaks are to be reported immediately. The vehicle is to be parked on level ground wherever possible while on site.
8. A solid waste drum will be set up at the drilling position for any waste material. This drum will be clearly marked for solid waste. This will be removed from site and disposed of at an official off-site waste disposal area. We do not anticipate that any hazardous waste will be generated while on site.

Working in pits and excavations

1. In the event of working in a pit or an excavation, special instructions are included in the Risk Assessment and DSTI's to ensure worker safety. Workers are advised to stay away from side walls, and to avoid all open pools of water.
2. The area outside and around the excavation is cleared of loose rocks and any other items that might fall into the pit during works and cause injury.
3. The machine will enter the pit or excavation by means of an earthen ramp, towed by a vehicle at low speed. The ramp is inspected and measured beforehand to ensure the width and angle are suitable to a vehicle and trailer mounted rig to be brought in safely.
4. Once the rig has been towed in and the equipment off loaded inside the pit, the vehicle is driven out and does not enter the pit again until the hole is finished.
5. Once the hole is completed, the ramp is re-inspected to confirm that it is still suitable for the vehicle to use to tow the rig out. The vehicle will then drive in, hitch the trailer and tow the rig out again.



6. All equipment is loaded on the truck inside the pit, to minimise the chance of dropping equipment down the ramp and causing injury.

Other Requirements

1. In the event of drilling under a bridge, a short derrick will be used to pull rods. Should overhead clearance be too low, man power will be used to pull rods, the rods will be pulled manually from the hole.
2. All holes will be surveyed at the end of the contract by a competent surveyor and an As Built report will be submitted with XYZ coordinates for all positions. This will be done as the work is completed, so minimise waiting time.

Sub Contractors

1. Should any subcontractors be needed on site to fill items on the BOQ (such as a surveyor or TLB), a standard FIDIC subcontractor contract will be issued and all communications will be done with the engineer. The subcontractor will be made responsible to fall in line with the H&S requirements as per Earthtech's agreement with the client.

