

Pre-Augering of Large Diameter Casings

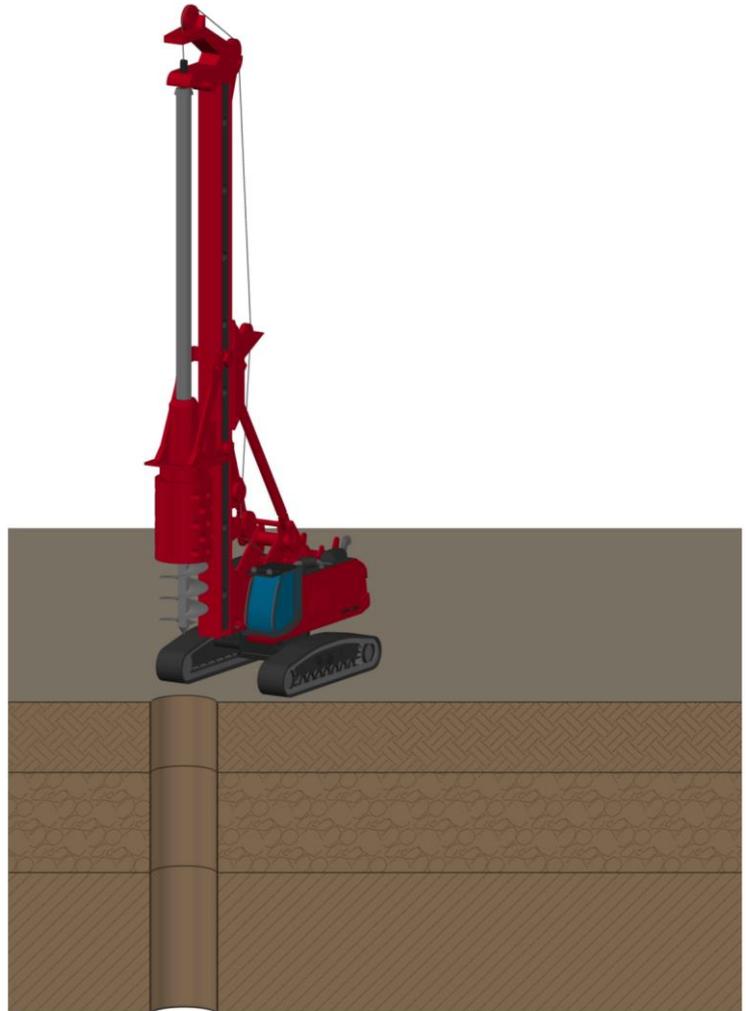
Background

Pre-augering is a common method adopted within the UK Piling industry in order to ensure the placement and advancement of the temporary casing. The practice is particularly relevant for thin wall casings which are either vibrated or twisted with a T-bar.

The risks associated with this practice are often overlooked by the site construction team and if not adequately considered could, in certain circumstances, lead to instability of the piling rig and in the worst case overturning.

The risks are exacerbated where the site teams are inadequately briefed by the supervisor and therefore routine review by the site management team is required.

This guidance note aims to highlight the main areas for consideration for the site team, FPS members and all stakeholders associated with the piling works.



Piling Rig & Driver Influence

Platform and rig instability issues often arise where the rig driver is attempting to auger an open hole beneath the piling platform with the specific purpose to attain a certain, pre-determined depth for the insertion of a temporary casing. The hole is used to hold the casing in place prior to vibrating or twisting in by the rig. This depth is driven by a few key factors, specifically the physical ability of the rig to manoeuvre into position over the newly placed casing and, after placement of the temporary casing into the open hole, subsequently to drive the thinwall / segmental casing to the required depth.

It is vital that the site team fully understand the requirements and capability of the rig as well as the potential risks should the length of casing be increased, potentially requiring the increase in pre-bore depth.

For the majority of modern large diameter piling rigs, casing lengths of up to 8.0m are not considered to be a problem as these can usually be handled by the rig safely and therefore pre-bore depths are typically minimal. The key areas of concern relate to casings of 8.0m to 14.0m in length with the risk increasing naturally with the longer casings required.

The Influence of ground conditions on pre-boring and open bore stability.

The issue is complicated further depending on the diameter being constructed and the underlying ground conditions and variability thereof. For example, under certain conditions a 750mm diameter hole will remain open to a specified depth whereas under the same conditions a 1500mm diameter hole would become unstable prior to the intended pre-bore depth being attained.

These circumstances are attributed to the natural variability of the ground conditions (piling platform included) and temporary loading exerted by the piling rig on the piling platform. Further complications arise due to the inability to accurately model these conditions in standard geotechnical software owing to the complex, time related effects of soil arching.

As a general rule, it is common practice to consider a zone of influence of 45 degrees from the edge of the nearest track to the open hole as the deepest pre-bore depth within a designed and well compacted piling platform.

The influence of loading conditions, specification requirements and the local environment

Often the design team are limited in their determination of the piling solution as a result of the loading requirements, ground conditions and environmental constraints on the project. The pile loads often determine the minimum pile diameter whereas the environmental constraints determine the requirement for screwed-in, thin wall casings rather than potentially a vibrated casing or alternative piling technique.

Therefore, under the CDM regulations, 2015, there is a duty for the piling scheme and element designers to consider the impact of their requirements on the safety and constructability of the piling solution. It is therefore vitally important that the design teams fully understand the construction implications of the solutions that they propose .

Whilst piling rig types are different in specification across all member companies it is recommended that simple guidance be put together by each stating the maximum capable pre-bore depth for each rig.

During the pre-construction stage of the project the design/estimating team must also undertake a risk assessment in regard to pre-boring, considering the risks of ground collapse during pre-boring activity and highlighting to the operational team that this activity requires a full risk assessment prior to the works starting.

Recommendations

Pre-augering as a practice is to be limited in its depth to the minimum possible value, the following recommendations are proposed in order to manage the risk of this operation.

1. At the concept stage of the project a designers risk assessment must be compiled acknowledging, eliminating or highlighting controls to manage the risk of pre-boring.
2. During the construction phase – after initially reviewing the designers risk assessment, a site specific risk assessment is to be compiled by the project management team. This must consider the influence on the stability of the pre-augered hole of the following:
 - The rig type,
 - The subgrade ground conditions,
 - The ground water table level,
 - The piling platform thickness,
 - The presence of a geogrid,
 - The maximum length of the casing that the site specific rigs can handle under the rotary/casing drive
 - The diameter of the pile and the ability of the soil to arch in the temporary condition
 - Time the hole will remain open
 - The proximity of the open hole to the nearest track, note that bearing pressures are increased where piling is taking place when working at an angle over the front tracks
3. Consideration of the site wide environment is to be given within the risk assessment. E.g. Are there areas where vibrated casings would be permissible? Equally, are there other activities on site where casing vibration could impact on the stability of pre-augered holes.
4. As general guidance pre-augering to a depth beyond a zone of influence of 45 degrees from the nearest track is not recommended unless a trial bore is undertaken.
5. Routine review of the risk assessment is to take place.
6. The practice of augering ahead of the temporary casing is also to be avoided wherever possible as this potentially leads to flouting and cavities opening up underneath the piling platform which are almost impossible to detect during pile construction activities.
7. During pre-boring activities the area is to be segregated off with adequate clearance maintained by all personnel, the banksman is to remain vigilant at all times.
8. For longer casing lengths required on very large diameters (suggested 1.2m dia or greater) consideration should be given to alternative construction methods or design modifications to the piling plant in order to ensure adequate bore stability in the temporary condition.