

# PREBORE GUIDE



## Introduction

Preboring, sometimes call preaugering or predrilling, is an essential preparatory technique used in sheet piling works, particularly in complex or challenging ground conditions. It involves the use of auger drilling, or other tooling, to loosen or remove ground ahead of pile installation. At DAWSON-WAM, we have been using preboring techniques such as CFA, Cased CFA and Rotary Boring for the past 25 years, allowing us to refine the application of preboring, especially through the use of Cased Continuous Flight Auger (Cased CFA) methods, to improve the quality, accuracy, and efficiency of sheet piling operations.

## Purpose and Benefits of preboring

In sheet piling, preboring serves several critical functions:

- Reducing Driving Resistance - By breaking up dense or stiff soils in advance, preboring reduces the resistance encountered during pile driving. This minimises energy demand, wear on equipment, and potential damage to sheet piles.
- Improving Installation Accuracy - preboring enables better control over pile alignment and penetration depth, which is crucial when working in close tolerances, such as near existing structures or utilities.

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- **Mitigating Vibration and Noise** - In urban environments or sensitive areas, preboring can reduce the reliance on high-energy vibratory or percussive techniques, helping to control vibration and noise levels.
- **Managing Obstructions and Variable Ground** - In made ground, fill, or strata with obstructions (e.g., concrete, rock, debris), preboring facilitates pile installation where traditional driving methods may fail or cause deflection.

## Understanding prebore Layout

Prebore layout refers to the planning and positioning of bores in advance of installing sheet piles or other ground elements. A well-designed layout is crucial to ensure that preboring effectively supports pile installation by reducing resistance, improving alignment, and managing obstructions. Prebore position may be a little as every other sheet pile, or as much as an overlapping secant pattern which loosens the entire soil over the entire profile of the soil.

## Key Objectives of a prebore Layout

- **Alignment with Pile Line** - Bored holes must be accurately aligned with the centreline of the sheet pile wall. This ensures that each pile is installed into a properly relieved borehole, avoiding deflection or refusal.
- **Hole Spacing** - The spacing of bored holes typically corresponds to:
  - The centre-to-centre distance of individual sheet piles or
  - A continuous overlap along the pile lineFor example:
  - In dense granular soils, full preboring at every pile may be needed.
  - In medium strong rocks, continuous and overlapping bored holes may be used to ensure all resistance areas are removed.
- **Depth of Auger Holes**
  - Generally extended just below the toe level of the sheet pile to relieve driving resistance.
  - In design sensitive scenarios preboring may terminate above the pile toe (often by 1m).
  - In rocky or highly variable ground, boring may extend deeper to overcome obstructions or ensure pile penetration.
- **Bore Diameter**
  - Typically matches or slightly exceeds the sheet pile profile (often 450 to 630 mm).
  - Larger prebore or 750mm or 900mm may be used in an overlapping pattern in rock to ensure sheet pile penetration.
  - Must be carefully selected to avoid over-relieving the soil, which can compromise grip or lateral resistance.
- **Verticality and Tolerance**
  - Cased CFA enables superior control with verticality up to 1:150, which is critical when bored holes are used for interlocked systems or where groundwater cut-off is required.

## Overview of Preboring Methods

Preboring is a critical technique used to prepare the ground in advance of sheet pile installation, typically to reduce resistance, remove obstructions, and ensure accurate alignment. The method chosen depends on the ground conditions, required precision, and project constraints. The three most widely used preboring techniques are:

**Continuous Flight Auger (CFA)** involves drilling a borehole using a continuous spiral auger. The soil is brought to the surface along the flights as the auger advances. It is a common method for preboring in softer soils and loose to medium-dense materials.

### Key Features:

- Borehole is unsupported during drilling.
- Soil flights out along the auger to the surface.
- Common in sands, clays, and granular fills.

### Advantages:

- Fast and cost-effective in suitable ground.
- Simple setup and widely available equipment.

### Limitations:

- Less effective in dense, cohesive, or obstructed ground.
- Boreholes can collapse or deform before pile installation.
- Lower verticality control (typically 1:75).
- Risk of excessive spoil and instability from flighting.



Photo: CFA preboring clay

**Cased Continuous Flight Auger (Cased CFA)** is an advanced variation of CFA, where the auger operates inside a temporary casing that supports the borehole during drilling. This method is highly effective in mixed or difficult ground conditions.

### Key Features:

- Casing maintains borehole integrity throughout.
- Spoil is loosened without ground disturbance beyond the bore.
- Excellent for preboring in variable or obstructed strata.

### Advantages:

- Superior control of verticality (up to 1:150).
- Ideal for penetrating obstructions and medium-strength rock.
- Negates flighting, reducing surface spoil and instability surrounding ground.
- Allows more accurate pile positioning and toe levels.

### Limitations:

- Equipment is more complex.
- Slightly higher operational cost, offset by precision and productivity.



Photo: Cased CFA preboring in sandstone

**Rotary Bored Preboring** is a method which uses a rotating drilling tool (bucket or auger) to excavate the ground, typically with casing. It's commonly used for large-diameter, deep, or heavily obstructed bores.

### Key Features:

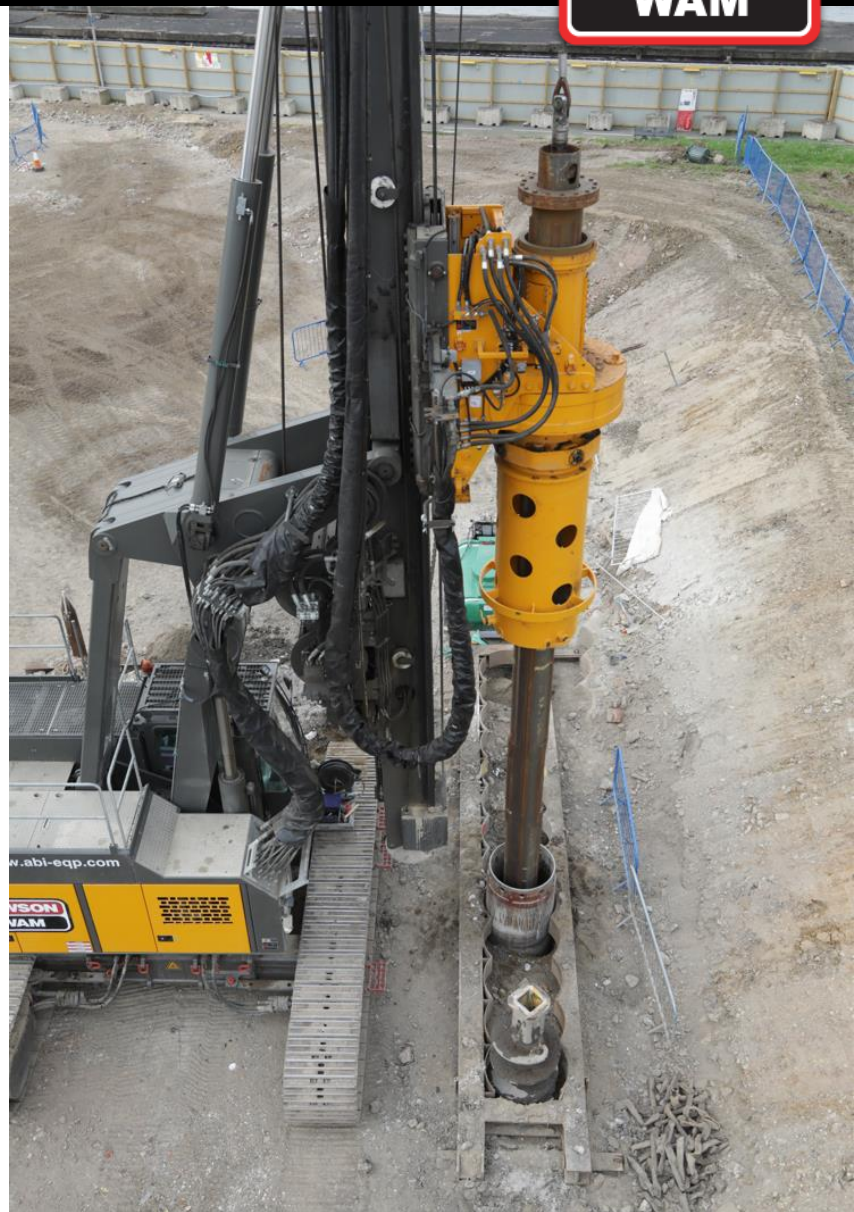
- Capable of boring through hard ground, rock, and obstructions.
- Uses temporary casing or support fluids to stabilise borehole.

### Advantages:

- Highly effective in dense strata, rock, or areas with known obstructions such as reinforced concrete or buried steel.
- Flexible tooling options for variable conditions.

### Limitations:

- Much more expensive and slower than CFA methods.
- Requires more space and larger rigs.
- Casing and tooling handling adds complexity.



*Photo: preboring man made obstructions using rotary bore techniques using a reusable secant guide frame in Woolwich London 2018 (880mm diameter at 700mm centres)*

## Summary Comparison Table

Method	Ground Suitability	Verticality Control	Out of position over 10m	Obstruction Capability	Spoil Control	Notes
<b>CFA</b>	Soft-medium soils	~1:75	133mm	Low-moderate	Poor	Fast, lower precision
<b>Cased CFA</b>	Mixed/obstructed/med strong rock	~1:150	66mm	High	Excellent	Fast and precise
<b>Rotary Bored</b>	Very dense/rocky soils/man made obstructions	~1:200	50mm	Very High	Controlled	Slower, highest precision

## Preboring Considerations for Design

Preboring is a valuable technique in sheet piling design, especially in conditions where ground disturbance, installation resistance, or environmental sensitivity must be carefully managed. Drawing from industry literature and DAWSON-WAM's practical experience, several key design considerations apply:

- **Limiting Ground Disturbance** - Preboring significantly reduces ground movement by loosening soil ahead of sheet pile installation. Studies show the zone of disturbance is generally confined to the diameter of the bored hole, with minimal influence beyond (typically within 0.7 times pile width or <1.5m vertically from pile head). This control is crucial near sensitive structures, services, or archaeological deposits.
- **Improving Driveability and Alignment** - Boring relieves dense, stiff, or obstructed soils, reducing driving resistance and minimising pile deflection or refusal. This improves verticality and installation accuracy, both critical for watertight or interlocked sheet pile walls.
- **Tool and Technique Selection** - Tooling diameter should match or slightly exceed the sheet pile width to sufficiently relieve soil while maintaining ground stability. The Cased CFA method is preferred where high vertical accuracy, minimal spoil disturbance, and control through variable ground is required. Auger withdrawal should be done in reverse rotation to prevent soil removal, ensuring loosened soil remains in place.
- **Environmental and Heritage Sensitivity** - Historic England and Environment Agency guidance recommends preboring for minimising disturbance in sensitive or protected sites. Case studies confirm that archaeological layers remain largely undisturbed if preboring is carried out to a depth beneath them before sheet pile driving.
- **Risk and Settlement Management** - Instrumented field trials confirm preboring reduces the likelihood of ground heave, settlement, or lateral displacement during pile driving. This makes it suitable for use near basements, retaining walls, and existing foundations.
- **Design Integration** - preboring should be incorporated into piling layouts, with consideration for bore spacing, depth, and pile sequence.

Preboring is best applied immediately before pile installation to avoid bore collapse or ground relaxation.

## Conclusion

For sheet piling, preboring is a proven, low-risk method to enhance pile installation while limiting ground disturbance. It is especially advantageous in dense or sensitive ground, urban settings, and where precision is critical. When correctly designed and executed—especially using Cased CFA techniques—preboring supports structural integrity, reduces environmental impact, and improves constructability.