

FEDERATION OF PILING SPECIALISTS

Federation of Piling Specialists

**NOTES FOR GUIDANCE ON PUWER
(REGULATIONS 11 & 12)**

**IN RELATION TO
GUARDING AND CLEANING OF AUGERS ON PILING OPERATIONS**

Edition 3: April 2024

This document has been produced in association with the HSE



DISCLAIMER

The information contained in these Guidance Notes has been compiled by the Federation of Piling Specialists and is supplied to the recipient on the following terms:

- (1) The Federation of Piling Specialists, its employees, authors or compilers of these Guidance Notes are not responsible for the results of any actions taken on the basis of the information contained in these Guidance Notes, nor for any errors or omissions contained in these Guidance Notes.
- (2) The Federation of Piling Specialists, its employees, authors or compilers of these Guidance Notes, in providing these Guidance Notes are not engaged in rendering professional services.
- (3) The Federation of Piling Specialists, its employees, authors or compilers of these Guidance Notes shall not be liable to the recipient of these Guidance Notes in respect of anything and the consequence of anything done or omitted by the recipient of these Guidance Notes in reliance, whether whole or in part, on information contained in these Guidance Notes. The recipient acknowledges that, if expert assistance is required, the services of a competent professional person will be sought.

In this document reference is made to various National Regulations, European and British Standards and other appropriate reference documents. Some of the major aspects of these have been summarised. This is done only to assist users of these Guidance Notes by drawing their attention to these regulations and standards. It is the responsibility of those who use these Guidance Notes to make themselves thoroughly conversant with all the appropriate legislation and standards and not to rely on any reference or summary contained in this document which may be incomplete or not comprehensive. It is not intended that this document should replace any Acts, Codes of Practice, Regulations or other documents having legal or contractual standing.

HSE have published a document “The prevention of entanglement in the rotary parts of drilling and piling rigs”. This guidance summarises how inspectors should approach applying and enforcing legal requirements relating to the use of rotary drilling and piling rigs. It explains the most common rig uses, and describes the steps inspectors should expect owners, employers and operators to take to prevent people becoming entangled in the rotating parts. The guidance is not applicable to rigs where the drill string or pile does not rotate but is driven by impact, percussive, ultrasonic or hydraulic force. This document can be found with the link: <https://www.hse.gov.uk/foi/internalops/og/og-00055.htm>

Of necessity this document addresses the broad principles that should be adopted. Advice in respect of specific equipment or operations should be obtained from the appropriate body or technical reference source.

The recognition of the various and individual responsibilities of “DUTY OF CARE” are fundamental to the application of these Guidance Notes and the principle of “Identify the Hazard, Assess the Risk and Take the Appropriate Corrective Action” should always be applied.

**NOTES FOR GUIDANCE ON PUWER (REGULATIONS 11 & 12)
IN RELATION TO GUARDING AND CLEANING OF AUGERS ON PILING OPERATIONS**

INDEX

1.0 INTRODUCTION..... 4
2.0 PILING SYSTEMS 5
3.0 GENERAL REVIEW 7
4.0 CFA PILING: GUIDANCE ON GUARDING AND CLEANING..... 12
5.0 ROTARY BORED PILING: GUIDANCE ON GUARDING AND CLEANING 14
6.0 DISPLACEMENT AUGER PILING: GUIDANCE ON GUARDING AND CLEANING 15
7.0 MINI PILING: GUIDANCE ON GUARDING AND CLEANING 15
8.0 CASED PILING: GUIDANCE ON GUARDING AND CLEANING 17
9.0 REVIEW 18
APPENDIX A – PUWER REGULATIONS..... 19
APPENDIX B – LEGISLATION AND STANDARDS..... 22

**NOTES FOR GUIDANCE ON POWER (REGULATIONS 11 & 12)
IN RELATION TO GUARDING AND CLEANING OF AUGERS ON PILING OPERATIONS**

1.0 INTRODUCTION

- 1.1 The Federation of Piling Specialists (FPS) Auger Safety Working Group was formed following a meeting with the Health & Safety Executive (HSE), in April 1999. The working group included representatives from the FPS, HSE and rig manufacturers and has continued to meet from time to time since 1999 to ensure that these guidance notes remain current.
- 1.2 These guidance notes seek to identify a practical approach to The Provision and Use of Work Equipment Regulations (PUWER) 1998 as amended 2018, as they apply to rigs used in the bored piling industry.
- 1.3 The Federation of Piling Specialists (FPS) chaired a working group to consider continuous flight auger piling, rotary bored piling, displacement auger piling and limited access auger piling.
- 1.4 The British Drilling Association (BDA) chaired a second working group to consider small diameter drilling and mini-piling systems.
- 1.5 These guidance notes cover continuous flight auger, rotary bored piling, displacement auger piling and mini piling. Small diameter drilling, which is commonly used for grouting, soil nailing and ground anchoring applications, is covered elsewhere and reference should be made to the BDA Guidance Notes
- 1.6 Typically, machines with a rotary torque greater than 35 kNm are classed as Foundation Equipment and are covered by BS EN 16228 Part 4. Machines with a rotary torque of less than 35 kNm, or having a multi-directional drilling capability, which typically involves the addition of drill rods, casing or augers during the drilling process are the subject of BS EN 16228 Part 2. **Both sub-part documents contain clauses that effect the requirements for guarding stated in the common BS EN 16228 Part 1 document and must be considered as appropriate.**

**NOTES FOR GUIDANCE ON POWER (REGULATIONS 11 & 12)
IN RELATION TO GUARDING AND CLEANING OF AUGERS ON PILING OPERATIONS**

2.0 PILING SYSTEMS

2.1 Continuous Flight Auger Piling (CFA Piling)

With this type of pile the auger or digging tool extends over the full depth of the pile bore. Generally, the auger is screwed into the ground in one pass although there are some variations involving telescoping masts or locking drive bars. On completion of the boring process concrete or grout is pumped through the stem of the auger as the tool, which is loaded with spoil, is extracted.

Spoil emanates at the surface as a result of displacement during the boring process as well as during the concreting or extraction process. The spoil is removed from the proximity of the pile by some form of excavator.

2.2 Rotary Bored Piling

The primary means of excavation for this type of pile is by auger, digging bucket or barrel. The tool is rotated by a Kelly bar powered by either a mechanical or hydraulic rotary table.

The excavation cycle consists of the tool being lowered into the pile bore, rotated to load the tool and then withdrawn fully loaded. Once the tool is above the ground the rig is commonly slewed to the side of the bore and the spoil is discharged. Each digging cycle typically advances the bore up to 500mm, thus each pile consists of a number of repetitive cycles. The pile bore may need to be temporarily cased (lined) using steel casings that are installed into the ground as the pile bore depth is increased. These are usually extracted during or immediately after the bore is filled with concrete.

2.3 Displacement Auger Piling

A variety of displacement auger piles are utilised in the UK. Here the tool is designed to displace the pile spoil laterally into the ground thus either eliminating or significantly reducing the volume of spoil emanating at the surface. The tooling is similar to rotary bored piling in that a short drilling head is generally driven by a smooth shaft at a low rotational speed. Should the situation arise that instead of a smooth Kelly bar, a continuous flight auger is used to drive the drilling head, the recommendations for CFA piling should be followed.

2.4 Mini Piling

When compiling market statistics, the FPS differentiates between mini-piling and other bored piles on the basis of diameter in that 300mm and less is classified as mini-piling. However, mini piling rigs and techniques are now used to install piles of much greater diameter, often where access is limited. These rigs commonly have no cab in which the operator sits at the controls and the pile bore is advanced by extending the drill

NOTES FOR GUIDANCE ON POWER (REGULATIONS 11 & 12) IN RELATION TO GUARDING AND CLEANING OF AUGERS ON PILING OPERATIONS

string in sections. The string could comprise an auger, a casing, or a drill rod. These rigs are covered by BS EN 16228 Part 2.

The mini piles can be constructed using a wide range of techniques. These may include rotary applications using tools and casings or the CFA method. Either way the pile may be formed using concrete or grout. The recommendations in this guide relate mainly to vertical piles. The installation of raking piles in excess of 10 degrees from the vertical is covered by a separate section.

2.5 Cased Piling

Cased Secant Piling (CSP) has been developed to combine the more cost-effective CFA technique with the use of temporary casings that are traditionally used with rotary bored piling. Within the UK it is commonly referred to as 'CSP', however, depending on the equipment manufacturer, the technique is also referred to as:

- Cased Secant Piling
- Rotary Twin System

The auger and casing are both screwed into the ground at the same time using counter-rotating rotary tables (The auger is rotated clockwise, and the casing is rotated anti-clockwise). The pile is constructed in one pass and during the boring process spoil emanates from the top of the casing and is then safely discharged to ground. When the required depth is reached, concrete or grout is pumped through the hollow stem of the auger as the auger and casing is withdrawn from the ground. Once the pile has been constructed, any spoil that is left in the auger is discharged out of the bottom of the casing directly onto the ground by slewing the rig to one side and rotating the auger anti-clockwise.

NOTES FOR GUIDANCE ON PUWER (REGULATIONS 11 & 12) IN RELATION TO GUARDING AND CLEANING OF AUGERS ON PILING OPERATIONS

3.0 GENERAL REVIEW

3.1 The PUWER

These guidance notes are concerned with Regulations 11 and 12 of PUWER. An extract is appended to this document, and it is recommended that this be read in full. (There is also a listing of relevant documents in appendix B). In summary, Regulation 11 requires an employer to take measures to prevent access to any dangerous part of machinery or measures to stop the movement of any dangerous part before a person enters the danger zone. Regarding the measures to be taken there is a strict hierarchy of control measures which need to be examined in terms of their practicability. They are ranked in order of importance as follows: -

- Fixed guards
- Other guards or protection devices
- Protection appliances (unlikely to be applicable)
- Provision of information instruction, training and supervision as is necessary.

The word practicable has been defined by case law and is an extremely stringent test. It is important to note that the law does not consider cost to be a relevant factor in the determination of what is practicable.

Regulation 12 is concerned with protection against specific hazards. In this note the hazard being considered is the ejection of spoil from piling equipment. This is considered to present a particular hazard when ejection could occur at some height above the ground.

The employer must fit the guarding to comply with the highest practicable level in the hierarchy. A lower level of guarding may only be fitted if it is evident that the higher level is not practicable. It means that, for example, only if it can be demonstrated that a fixed guard is not practicable can other guarding be considered.

Notwithstanding the recommendations below, the working party and the HSE believe that training, supervision etc must be maintained at a high level on piling sites. In addition, the Management of Health and Safety Regulations require that all operations be the subject of a risk assessment.

3.2 General Principles of Machine Guarding and Use

Permanent works designers and their structural engineers should be assisting by designing pile plans that do not require placement in very tight spaces with Principal contractors assisting by sequencing work to also avoid this.

Fixed guards shall comply with EN ISO 14120:2015 and should be attached using fittings that require a tool to dismantle them, for example, spanner tight bolts/nuts.

Interlocking movable guards shall comply with EN ISO 14120:2015 and prevent access to the danger zone during any dangerous movement. Initiation of the dangerous

NOTES FOR GUIDANCE ON POWER (REGULATIONS 11 & 12) IN RELATION TO GUARDING AND CLEANING OF AUGERS ON PILING OPERATIONS

movement shall be prevented while the guard is open. The guards should be held closed by a positive interlock and must be of a type that is not easily defeated. Where the guard only needs to be opened occasionally and at a time when rotation is not needed, it may be possible to secure the guard shut using for example, a padlock or other tool tight fastening.

As a general principle opening guards with sufficient working room to be closed with a person still inside them are discouraged. This is because other industry sectors have experienced serious and fatal incidents when the machine could only be made to run with a person present to for example, clear blockages. The layout of the guard should not facilitate poor practice.

A controlled zone will also be needed around the auger and spoil discharge area and attendant plant area. This is to ensure the rig crew leave the immediate area during operations that could result in entanglement or crush injuries or impact. In many instances the edge of the control zone is best defined using pedestrian barriers or similar that are easy to move as work progresses. These act as a reminder and help with supervision. In most instances they do not need to be continuous or linked together, although this can help where the rig operator does not have a clear view of certain areas.

In all instances there will need to be an exclusion zone established around a piling rig in order to keep other trades and especially the public away from the operation. Where it is likely that people could get too close then the working area will need to be fenced off. In this situation the pedestrian barrier will usually need to be continuous or linked together. Public protection of this nature also prevents people being run over by moving plant.

3.3 Historical Context

The FPS has for many years sought to minimise accidents and incidents. It has a very active safety and training committee which enables members to share experiences and difficulties in order to achieve improvement. All members inform the FPS of events that are required to be reported to the HSE against RIDDOR 2013 on a quarterly basis and the causes and remedial measures are discussed at length. Since 1994 such reports have been related to various factors (e.g., age, time of day, etc.), and, in particular, the piling system has been recorded.

The subject of auger guarding and cleaning has been reviewed with the benefit of this information and in the context of the PUWER. The following observations are made for each of the piling systems being considered.

3.4 BS EN 16228 Parts 1–7:2014 + A1:2021

BS EN 16228-1 Section 5.23 establishes and details the extensive requirements for both the physical guarding and operational conditions for both normal operation and special case modes. This covers the general cases for all piling techniques involving rotating parts.

NOTES FOR GUIDANCE ON POWER (REGULATIONS 11 & 12) IN RELATION TO GUARDING AND CLEANING OF AUGERS ON PILING OPERATIONS

The techniques considered in this document are covered under the sub parts BS EN 16228-2:2014 + A1:2021 and BS EN 16228-4:2014 + A1:2021. Both standards have overriding additional guarding clauses, containing additional considerations for guarding requirements, operational cases and importantly exemptions and must be considered within the machine assessment.

- BS EN 16228-2:2014 + A1:2021
 - 5.5 Guards and sensitive protective devices.
 - 5.6 Supplementary trip device.
 - 5.7 Protection against moving parts on specific machine types.

- BS EN 16228-4:2014 + A1:2021
 - 5.5 Moving parts involved in the process.

BS EN 16228-1 Section 5.24 establishes and details criteria for the cleaning of drilling and foundation equipment.

3.5 Continuous Flight Auger Piling

3.5.1 Adequate protection can be achieved by extending the gate (guide) which is used to maintain the position of the augers. This is present on the majority of rigs used for CFA piling. The gate needs to be opened to allow the piling rig to achieve its full depth and to facilitate the rigging of the augers. Larger guards which could accommodate the rotary table can be considered but these will still need to be opened, or entered within, for rigging purposes.

Additionally, they do not allow work immediately adjacent to structures, especially in corners. To be acceptable, when anyone must enter the danger zone, the auger must **NOT** be rotating.

3.5.2 During the drilling process spoil rises to the surface as a result of displacement of the auger volume and bulking of the strata. The amount of spoil that arises can be quite large and normally excavators are used to remove this spoil. The bottom of the guard must be above ground level to allow spoil to exit the excavation and be removed. The height of the top of the guard shall be such as to prevent personnel coming into contact with the auger but there also needs to be due regard to the means of auger cleaning.

3.5.3 Of **equal** seriousness is the incidence of spoil either being ejected or becoming detached from augers at various heights above ground and falling. This has caused injuries to personnel adjacent to the auger. This situation **continues to be a** concern to the members of the FPS. Several **cleaning** methods and procedures have been tried with differing degrees of success.

3.5.4 There are obvious problems with manually cleaning the auger using conventional handheld tools. This method is not viable for the larger diameter of pile and for ground conditions which make the removal of spoil from the auger very difficult. This method would only be legal when the auger is not rotating.

NOTES FOR GUIDANCE ON PUWER (REGULATIONS 11 & 12) IN RELATION TO GUARDING AND CLEANING OF AUGERS ON PILING OPERATIONS

- 3.5.5 An attendant excavator can be used to remove spoil, but this generally requires the bucket to be adapted and the 'local' driver to be trained to undertake this task.
- 3.5.6 Dedicated mechanical cleaners can be classified into three groups:
- star wheel cleaners operate from the side and use the rotation of the auger to facilitate the removal of spoil,
 - bottle brush or rotating wire brush cleaners are powered brushes on a vertical shaft which sweep spoil from the auger,
 - cylinder type cleaners which rotate around the auger and are made by several manufacturers (e.g., Soilmec, Casagrande, Dawson).
- 3.5.7 It is believed that each type of mechanical cleaner can be used to effectively and safely clean augers and each has its merits in different ground conditions.
- 3.5.8 If the cleaners themselves rotate, then appropriate **additional protection** measures will be required, and the discharge of spoil must be such as to not cause a hazard.

3.6 Rotary Bored Piling

- 3.6.1 It is inadvisable to introduce guards into this process which would themselves create a greater hazard. **This has been reflected in the BS EN 16228-4:2014 + A1:2021 where most of the equipment operating this process could be covered by guarding exemptions.** However temporary casings are used to provide ground support at the surface. They also prevent personnel accidentally slipping into the bore and ensure that loose material cannot fall into the bore during the reinforcing or concreting cycles. Extending this casing to project above ground level provides some protection during most of the boring process.
- 3.6.2 In the recommendations in Section 5.0 consideration will need to be given to the hierarchy of measures detailed within PUWER, Regulation 11 as amended 2018.
- 3.6.3 The digging tools used in rotary piling vary according to the strata being excavated and include augers, digging and cleaning buckets and coring barrels. Since the buckets generally discharge directly onto the ground or spoil heap with no rotation, this guidance note only considers the cleaning of augers.

3.7 Displacement Auger Piling

- 3.7.1 The rigs used to install displacement auger piles are typically the same as those used to install CFA piles. Therefore, the measures taken to meet the PUWER, regulation 11 for CFA piling will be equally applicable to displacement auger piling. **However, many machines operating this process could be covered by guarding exemptions as detailed in BS EN 16228-4:2014 + A1:2021.**
- 3.7.2 Being displacement piles, spoil is not normally an issue for cleaning consideration.

**NOTES FOR GUIDANCE ON POWER (REGULATIONS 11 & 12)
IN RELATION TO GUARDING AND CLEANING OF AUGERS ON PILING OPERATIONS**

3.8 Mini Piling

- 3.8.1 Mini piling generally comprises smaller rigs with lower rotary head torque, (those covered by **BS EN 16228-2:2014 + A1:2021**), installing piles and achieving the required depth by means of extending the drill string or auger in sections. Short lengths of drill string (auger, casing or rod) typically 1m to 3m long are added until the required depth is reached. This is carried out either manually, with the assistance of an auxiliary winch or by using an automated feed system. In the absence of an automatic feed system, the crew require repeated access to the head of the drill string with the rotary table needing to pass up and down the full length of the mast. Some **limited** rotation of the head and drill string occurs during the addition of and removal of sections of drill string. The rotating drill string, even at relatively low speed is a source of potential danger.
- 3.8.2 On extraction, short lengths of auger, casing or rod are removed requiring repeated access by the crew to the head. **Ideally this would be completed with the use of a mechanical handling device however this is not always possible in practice. If manual handling is required, it is essential for the spoil which is generated be removed from the tooling to permit safe access and handling.**

3.9 Cased Piling

- 3.9.1 This technique combines CFA piling with the use of a casing. The casing provides the guard for the auger, **and this has been reflected in the BS EN 16228-4:2014 + A1:2021 where a guarding exemption is provided under prescribed operating conditions.**
- 3.9.2 Spoil that emanates at the top of the casing shall be safely discharged to the ground **using an appropriate spoil management system.**

**NOTES FOR GUIDANCE ON POWER (REGULATIONS 11 & 12)
IN RELATION TO GUARDING AND CLEANING OF AUGERS ON PILING OPERATIONS**

4.0 CFA PILING: GUIDANCE ON GUARDING AND CLEANING

4.1 CFA Piling: Guarding

- 4.1.1 The guard on the rig should be kept closed whenever the auger is turning, except as noted below. Should manual intervention be required then the auger must be stopped.
- 4.1.2 **As stated in BS EN 16228-4:2014 + A1:2021,**
- 4.1.2.1 **the bottom of the guard shall be no more than 750mm above ground level.**
- 4.1.2.2 **the upper level of the guard shall not be less than 1600mm from ground level.**
- 4.1.3 **Beyond the confines of BS EN 16228, this height could be dependent on the shape of the guard and an alternative argument for lower guard height would be that the guard is sufficiently offset from the auger that personnel reaching over cannot touch the auger.**
- 4.1.4 A mechanical cleaner may also be used as a guide/guard or form part of a guard. If it is to provide guarding, then it would either need to be fixed or have limited movement such as to maintain the required dimensions of guarding **as previously stated. BS EN 16228-4:2014 + A1:2021 provides an exemption from the guarding requirements if a rotating (cylinder type) auger cleaner is installed.**
- 4.1.5 It may be necessary to open the guard towards the end of the boring cycle to allow the lowering of the drill head to ground level. If such an event is necessary, then **when** the gate must be opened, no personnel should be in the area of the open gate whilst the auger is turning. Alternative guarding arrangements will also need to be made if any personnel are, or can be, within such proximity of the rotating auger as to make contact. The guard should be closed as soon as the rotary table is above the level of the guard during the extraction or concreting cycle. Alternative designs of guard which provide protection throughout the full boring cycle are to be preferred so long as the stand-off distance of the guard is not excessive.
- 4.1.6 Many rigs have fixed access ladders on the mast, which could enable personnel to come into close proximity of an unguarded auger. The auger must not be rotated when personnel are using such access, except to align auger connections **when a slow rotation or inching mode shall be engaged.** The bottom of these types of ladders shall be removed or made inaccessible whilst augering is in process.
- 4.1.7 **Where guards are power operated, they shall not be capable of causing injury, should be controlled with hold to run controls and the guard movements shall be visible from the control panel.**

**NOTES FOR GUIDANCE ON POWER (REGULATIONS 11 & 12)
IN RELATION TO GUARDING AND CLEANING OF AUGERS ON PILING OPERATIONS**

4.1.8 In all cases a robust and full risk assessment must be undertaken for each job prior to the commencement of work, which reflects the hierarchy of control and addresses the guarding and cleaning of augers. A method statement shall be prepared, and all operatives are to be briefed as to its contents and control measures.

4.2 CFA Piling: Cleaning

4.2.1 All CFA augers must be cleaned to prevent spoil being raised to such a height above ground level as to cause injury in the event of the spoil becoming dislodged. **Where guarding systems are in place, it is envisaged that cleaning could take place between 2m and 4m above ground level to avoid conflict.**

4.2.2 What is deemed to be a satisfactory level of cleaning must involve some judgement since it is not practicable to remove all material. The primary reason to remove spoil is to prevent injury and it must therefore be the responsibility of the practitioner to decide what this amount is.

4.2.3 A mechanical means of cleaning the auger should be used except where exceptional circumstances do not permit it.

4.2.4 Should any manual cleaning be required then the auger must not be rotated whilst this operation is being performed.

4.3 CFA Piling: Exception

4.3.1 In most circumstances it is practicable to fit and operate the auger guards as detailed above. However, in extreme situations where mechanical means of guarding may not be practicable, then the guidance below, assuming that it is strictly adhered to, may be adopted as an alternative approach to the guarding of CFA augers referred to under section 4.1 above.

*[HSE guidance is that the Principal Designer should be consulted, as it may be that the designer has not adequately considered the health and safety of those constructing the works in that the designer has failed to allow adequate working space for the piling rig to be operated safely.]

4.3.2 A controlled zone must be nominated at each pile position and can be defined as a zone at least 2m radius from the centre of the auger. This shall be demarcated by means of a pedestrian barrier, along with appropriate signage. A banksman with full visibility of the controlled zone will be in attendance at all times whilst the piling rig is active and will be given authority and responsibility to ensure only authorised persons are permitted within the zone. No person is permitted within the zone whilst the auger is rotating. Should any manual intervention be required the auger must be stopped. An excavator can be used within the zone for the purposes of clearing spoil, but only under the banksman's supervision.

**NOTES FOR GUIDANCE ON POWER (REGULATIONS 11 & 12)
IN RELATION TO GUARDING AND CLEANING OF AUGERS ON PILING OPERATIONS**

- 4.3.3 All persons entering the controlled zone must have received an induction from the piling contractor detailing the risks associated with CFA piling. The banksman must be trained on slinger/signaller matters and have had a minimum of the equivalent of one day's safety training in the previous 12 months. He must be identified as the banksman.

5.0 ROTARY BORED PILING: GUIDANCE ON GUARDING AND CLEANING

5.1 Rotary Bored Piling: Guarding

- 5.1.1 It is envisaged that a majority of equipment operating this technique will be exempt from the guarding requirements as detailed in **BS EN 16228-4:2014 + A1:2021 5.5.2**. However, the following could be considered as part of a best practice approach where applicable.
- 5.1.2 Temporary casings must be used on all piles and left a minimum of 960mm above the ground level to provide protection to the bore and at the area where the auger repeatedly passes below ground level. If the casing is installed below this level additional "pig-pen" or linked pedestrian fencing must be provided.
- 5.1.3 A controlled zone must be nominated at each pile location. This controlled zone will extend 2m beyond the area occupied by the rig and its slewing area, the pile bore and the discharge spoil heap. This shall be demarcated by means of a pedestrian barrier, along with appropriate signage. A rotary piling rig banksman will be at all times in attendance on the piling rig and will be given responsibility and authority to ensure only authorised persons are permitted within the zone.
- 5.1.4 All persons entering the controlled zone must have received an induction from the piling contractor detailing the risks associated with the rotary piling operation. The banksman must be trained on slinger signalling matters, have had a minimum of one day's safety training in the previous 12 months. He must be identified as the banksman.
- 5.1.5 In all cases a robust and full risk assessment must be undertaken for each job prior to the commencement of work, which reflects the hierarchy of control and addresses the guarding and cleaning of augers. A method statement shall be prepared, and all operatives are to be briefed as to its contents and control measures.

5.2 Rotary Bored Piling: Cleaning

- 5.2.1 The discharge of spoil is likely to be hazardous requiring a thorough risk assessment to be made and appropriate measures taken. The recommendations made below will minimise the risk.
- 5.2.2 The loaded auger should be carefully slewed off the pile position to the discharge point in a controlled manner.

**NOTES FOR GUIDANCE ON POWER (REGULATIONS 11 & 12)
IN RELATION TO GUARDING AND CLEANING OF AUGERS ON PILING OPERATIONS**

- 5.2.3 When the auger is being spun off it should be as close to the ground (or spoil heap) as possible to minimise the spread of spoil.
- 5.2.4 The auger spin speed should be only sufficient to empty the tool so as to minimise the spread of spoil.
- 5.2.5 In the event that it is necessary for the works to be carried out in close proximity to untrained or unaware personnel (e.g., adjacent site boundary or other operations) then suitable barriers will need to be erected or precautions taken to contain the spoil and protect any personnel (including those outside the site boundary) from debris.

6.0 DISPLACEMENT AUGER PILING: GUIDANCE ON GUARDING AND CLEANING

6.1 Displacement Auger Piling: Guarding

- 6.1.1 It is envisaged that a majority of equipment operating this technique will be exempt from the guarding requirements as detailed in BS EN 16228-4:2014 + A1:2021 5.5.2.
- 6.1.2 For such equipment that is fitted with a guide system above the displacement tool, this could be adapted to guard the displacement tool during the initial drilling process.
- 6.1.3 In situations where a continuous flight auger is used to drive the displacement tool, the recommendations on guarding for CFA piling, detailed in section 4.1, should be adopted for displacement auger piling.

6.2 Displacement Auger Piling: Cleaning

- 6.2.1 Typically, spoil is not generated by this technique therefore cleaning is not required.
- 6.2.2 In situations where a continuous flight auger is used to drive the displacement tool, the guidelines on cleaning for CFA piling, detailed in section 4.2, shall be followed.

7.0 MINI PILING: GUIDANCE ON GUARDING AND CLEANING

7.1 Mini Piling: Guarding

- 7.1.1 The guard on the rig should be kept closed whenever the auger is turning, except as noted below. Should manual intervention be required then the auger must be stopped.
- 7.1.2 As stated in BS EN 16228-2:2014 + A1:2021 guards shall comply with the following:
 - 7.1.2.1 The maximum height of the bottom edge of the guard shall be no more than 500mm from the base of the mast foot or not more than 120mm above the lowest position of the upper clamps or rod/auger guide.

**NOTES FOR GUIDANCE ON POWER (REGULATIONS 11 & 12)
IN RELATION TO GUARDING AND CLEANING OF AUGERS ON PILING OPERATIONS**

- 7.1.2.2 The upper level of the guard shall prevent unintentional access to the moving parts up to 1600mm from ground level.
- 7.1.2.3 If the drill rig is intended to operate with the mast inclined at an angle greater than 15° from vertical, the guard shall extend along the mast up to 1200mm above the upper clamps or rod/auger guide.
- 7.1.2.4 The guard shall allow manual opening in all positions of the mast or leader, or be motorised.
- 7.1.3 Trip wires should be considered as a supplementary trip device only and may be fitted in addition to the main guard system to offer additional protection. Where fitted they shall be fitted as close to the rotating drill string as possible to prevent injury from entrapment.
- 7.1.4 Where guards are power operated, they shall not be capable of causing injury, should be controlled with hold to run controls and the guard movements shall be visible from the control panel.
- 7.1.5 In all cases a robust and full risk assessment must be undertaken for each job prior to the commencement of work, which reflects the hierarchy of control and addresses the guarding and cleaning of augers. A method statement shall be prepared, and all operatives are to be briefed as to its contents and control measures.

7.2 Mini Piling: Cleaning

- 7.2.1 All mini piling augers must be cleaned to prevent spoil being raised to such a height above ground level as to cause injury in the event of the spoil becoming dislodged. Where guarding systems are in place, it is envisaged that cleaning could take place between 2m and 4m above ground level to avoid conflict.
- 7.2.2 Appropriate measures for cleaning will be required dependant on the height of the machine in question. It should be remembered though that according to BS EN 16228-1:2014 + A1:2021 5.24 the manufacturer is only required to fit a cleaning device or connections for a cleaning device if the machine is capable of using an auger: -
- greater than 350mm outside diameter,
 - with flights wider than 100mm,
 - capable of carrying material to a height of 10m or more from ground level.

7.3 Mini Piling: Exception

- 7.3.1 As with CFA Piling, in most circumstances it is practicable to fit and operate the auger guards as detailed above. However, in extreme situations where mechanical means of guarding may not be practicable, then the guidance below, assuming that it is strictly

NOTES FOR GUIDANCE ON POWER (REGULATIONS 11 & 12) IN RELATION TO GUARDING AND CLEANING OF AUGERS ON PILING OPERATIONS

adhered to, may be adopted as an alternative approach to the guarding of mini piling augers referred to under section 7.1 above.

*[HSE guidance is that the Principal Designer should be consulted, as it may be that the designer has not adequately considered the health and safety of those constructing the works in that the designer has failed to allow adequate working space for the piling rig to be operated safely.]

- 7.3.2 A controlled zone must be nominated at each pile position and can be defined as a zone at least 2m radius from the centre of the auger. This shall be demarcated by means of a pedestrian barrier, along with appropriate signage. A banksman with full visibility of the controlled zone will be in attendance at all times whilst the piling rig is active and will be given authority and responsibility to ensure only authorised persons are permitted within the zone. No person is permitted within the zone whilst the auger is rotating. Should any manual intervention be required the auger must be stopped. An excavator can be used within the zone for the purposes of clearing spoil, but only under the banksman's supervision.
- 7.3.3 All persons entering the controlled zone must have received an induction from the piling contractor detailing the risks associated with CFA piling. The banksman must be trained on slinger/signaller matters and have had a minimum of the equivalent of one day's safety training in the previous 12 months. He must be identified as the banksman.

8.0 CASED PILING: GUIDANCE ON GUARDING AND CLEANING

8.1 Cased Piling: Guarding

- 8.1.1 During normal operations, the auger is guarded by the casing.
- 8.1.2 During drilling, partial protection from the rotating casing is provided by the casing clamps. In addition, the zone directly around the casing will be barriered off by pedestrian barrier or the like.
- 8.1.3 Nevertheless, because of the entanglement and in-running nip potential outlined above, a controlled zone must be nominated at each pile position and can be defined as a zone at 2m radius from the centre of the auger. A banksman with full visibility of the controlled zone will be at all times in attendance whilst the piling rig is active and will be given authority and responsibility to ensure only authorised persons are permitted within the zone.
- 8.1.4 All persons entering the controlled zone must be properly informed and instructed on the risks associated with Cased Piling. The banksman must be trained on slinger/signaller matters and have had a minimum of the equivalent of one day's safety training in the previous 12 months. He must be identified as the banksman.

8.2 Cased Piling: Cleaning

**NOTES FOR GUIDANCE ON POWER (REGULATIONS 11 & 12)
IN RELATION TO GUARDING AND CLEANING OF AUGERS ON PILING OPERATIONS**

- 8.2.1 During the boring process, spoil 'flights' up the auger that is usually within the casing and emanates at the top of the casing, which may take place 20m - 30m above ground level. This spoil has to be safely discharged to ground level in a controlled manner, which may for example be achieved using a chute system to contain and control the fall of the spoil. The Safe Method of Work for this operation shall be fully described in the Method Statement and any risks dealt with in the Risk Assessment. In addition, where the auger and casing can be contra rotated independently, consideration must also be made to control any risk from spoil on exposed augers.
- 8.2.2 Once the pile has been constructed, any spoil that is left in the auger **must** be discharged onto the ground in a controlled manner, which is normally achieved by:
- 8.2.2.1 **Slewing the rig** to one side in a controlled manner with the casing as close as possible to the ground to minimise the spread of spoil.
- 8.2.2.2 The spoil is discharged by rotating the auger anti-clockwise. The speed of rotation should be only sufficient to empty the casing.

9.0 REVIEW

It is recognised that technology **will continue to** develop to the extent that both the systems operated in the UK and the guarding and cleaning methods referred to in this document may be superseded. This aspect is to be kept under review by the FPS Safety committee to ensure that these guidance notes are appropriate and remain valid in such circumstances. The Safety Committee is to ensure that any changes that need to be made in the light of any relevant developments are communicated to the FPS membership and other working group members as an addendum or a revision to these guidance notes.

**NOTES FOR GUIDANCE ON PUWER (REGULATIONS 11 & 12)
IN RELATION TO GUARDING AND CLEANING OF AUGERS ON PILING OPERATIONS**

APPENDIX A – PUWER REGULATIONS

The Provision and Use of Work Equipment Regulations 1998 (PUWER: 1998) as amended by the Health and Safety (Miscellaneous Amendments) Regulations 2002 are made under the Health and Safety at Work etc Act 1974 (HSW Act) and came into force on 5 December 1998.

PUWER 1998 brings into effect the non-lifting aspects of the Amending Directive to the Use of Work Equipment Directive (AUWED). The primary objective of PUWER 1998 is to ensure that work equipment should not result in health and safety risks, regardless of its age, condition or origin.

In Northern Ireland this would be the Health and safety at Work Order 1978 and PUWER (NI) 1999.

To provide guidance on the Regulations the Health & Safety Executive (HSE) has prepared an Approved Code of Practice entitled Safe Use of Work Equipment. **The current publication of this document is [L22 \(Fourth Edition\) Published 2014, with amendments made 2018](#).**

The regulations considered by this guidance note are Regulation 11 and Regulation 12 which are as follows: -

Regulation 11

- 1) Every employer shall ensure that measures are taken in accordance with paragraph (2) which are effective –
 - a) to prevent access to any dangerous part of machinery or to any rotating stock-bar; or
 - b) to stop the movement of any dangerous part of machine or rotating stock-bar before any part of a person enters a danger zone.

- 2) The measures required by paragraph (1) shall consist of –
 - a) the provision of fixed guards enclosing every dangerous part or rotating stock-bar where and to the extent that it is practicable to do so, but where or to the extent that it is not, then
 - b) the provision of other guards or protection devices where and to the extent that it is practicable to do so, but where or to the extent that it is not, then
 - c) the provision of jigs, holders, push-sticks or similar protection appliances used in conjunction with the machinery where and to the extent that it is practicable to do so, and the provision of such information, instruction, training and supervision as is necessary.

- 3) All guards and protection devices provided under sub-paragraphs (a) or (b) of paragraph (2) shall
 - a) be suitable for the purpose for which they are provided;

**NOTES FOR GUIDANCE ON PWER (REGULATIONS 11 & 12)
IN RELATION TO GUARDING AND CLEANING OF AUGERS ON PILING OPERATIONS**

- b) be of good construction, sound material and adequate strength;
 - c) be maintained in an efficient state, in efficient working order and in good repair;
 - d) not give rise to any increased risk to health or safety;
 - e) not be easily bypassed or disabled;
 - f) be situated at sufficient distance from the danger zone;
 - g) not unduly restrict the view of operating cycle of the machinery, where such a view is necessary;
 - h) be so constructed or adapted that they allow operations necessary to fit or replace parts and for maintenance work, restricting access so that it is allowed only to the area where the work is to be carried out and, if possible, without having to dismantle the guard or protection device.
- 4) All protection appliances provided under sub-paragraph (c) of paragraph (2) shall comply with sub-paragraphs (a) to (d) and (g) of paragraph (3)
- 5) In this regulation –
- “Danger zone” means any zone in or around machinery in which a person is exposed to a risk to health or safety from contact with a dangerous part of machinery or a rotating stock-bar;
- “Stock-bar” means any part of a stock-bar which projects beyond the head-stock of a lathe.

Regulation 12

- 1) Every employer shall take measures to ensure that the exposure of a person using work equipment to any risk to his health or safety from any hazard specified in paragraph (3) is either prevented, or, where that is not reasonably practicable, adequately controlled.
- 2) The measures required by paragraph (1) shall –
- a) be measures other than the provision of personal protective equipment or of information, instruction, training and supervision, so far as is reasonably practicable; and
 - b) include where appropriate, measures to minimise the effects of the hazard as well as to reduce the likelihood of the hazard occurring.
- 3) The hazards referred to in paragraph (1) are –
- a) any article or substance falling or being ejected from work equipment;

**NOTES FOR GUIDANCE ON POWER (REGULATIONS 11 & 12)
IN RELATION TO GUARDING AND CLEANING OF AUGERS ON PILING OPERATIONS**

- b) rupture or disintegration of parts of work equipment;
 - c) work equipment catching fire or overheating;

 - d) the unintended or premature discharge of any article or of any gas, dust, liquid, vapour or other substance which, in each case, is produced, used or stored in the work equipment;

 - e) the unintended or premature explosion of the work equipment or any article or substance produced, used or stored in it.
- 4) For the purposes of this regulation “adequately” means adequately having regard only to the nature of the hazard and the nature and degree of exposure to the risk.
- 5) This regulation shall not apply where any of the following Regulations apply in respect of any risk to a person’s health or safety for which such Regulations require measures to be taken to prevent or control such risk, namely –
- a) The Ionising Radiations Regulations 1985;
 - b) The Control of Asbestos Regulations 2012;
 - c) The Control of Substances Hazardous to Health Regulations 1994;
 - d) The Control of Noise at Work Regulations 2005;
 - e) The Control of Lead at Work Regulations 1998.
 - f) The Control of Vibration at Work Regulations 2005

**NOTES FOR GUIDANCE ON POWER (REGULATIONS 11 & 12)
IN RELATION TO GUARDING AND CLEANING OF AUGERS ON PILING OPERATIONS**

APPENDIX B – LEGISLATION AND STANDARDS

The following list, whilst not exhaustive, gives some of the more important legislation which may be applicable in Great Britain. In other countries, reference should be made to the appropriate national legislation.

Legislation

Health and Safety at Work Act 1974

Management of Health and Safety at Work Regulations 1999

Machinery Directive 2006/42/EC 2006

Provision and use of Work Equipment Regulations 1998

The Health and Safety (Miscellaneous Amendments) Regulations 2002

Supply of Machinery (Safety) Regulations 2008

Construction (Design and Management) Regulations 2015

Standards

BS EN 16228-1:2014+A1:2021	Drilling and Foundation Equipment – Safety Part 1: Common Requirements
BS EN 16228-2:2014+A1:2021	Drilling and Foundation Equipment – Safety Part 2: Mobile drill rigs for civil and geotechnical engineering, quarrying and mining
BS EN 16228-4:2014+A1:2021	Drilling and Foundation Equipment – Safety Part 4: Foundation equipment
ISO 12100:2010	Safety of Machinery - General principles for design - Risk assessment and risk reduction.
BS EN ISO 14120:2015	Safety of Machinery. Guards. General requirements for the design and construction of fixed and movable guards
BS EN ISO 13850:2015	Safety of Machinery – Emergency stop function. Principles for design
BS EN ISO 14119:2013	Safety of Machinery. Interlocking devices associated with guards. Principles for design and selection

**NOTES FOR GUIDANCE ON PWER (REGULATIONS 11 & 12)
IN RELATION TO GUARDING AND CLEANING OF AUGERS ON PILING OPERATIONS**

BS EN ISO 13854:2019	Safety of Machinery. Minimum gaps to avoid crushing of parts of the human body
BS EN ISO 13857:2019	Safety of Machinery - Safety distances to prevent hazard zones being reached by upper and lower limbs
PD 5304: 2019	Guidance on the Safe Use of Machinery
BS EN ISO 14120: 2015	Safety of machinery. Guards. General requirements for the design and construction of fixed and movable guards
BS EN ISO 13850: 2015	Safety of machinery. Emergency stop function. Principles for design