# Federation of Piling Specialists

# Breaking Down of Piles

Note: Although proprietary brand names are referred to in this document, the FPS does not recommend any particular method or system.

The breaking down of concrete piles is an essential part of the construction process and a subject that is often not given sufficient early thought in the planning of the piling works. The adoption of a suitable pile breaking method can result in financial and programme savings and most importantly will address and reduce potential health and safety issues in relation to this phase of the works.

Bored cast in place concrete piles should always be cast to a level above the specified cut-off such that, after trimming, a sound concrete connection with the pile can be made. Continuous flight auger piles and any other type concreted or grouted through the auger stem during extraction must always be concreted to the commencing surface level. Precast concrete piles should be driven such that the pile head level will provide sufficient reinforcement projection after trimming.

The pile casting level adopted should be within the tolerances as detailed in the latest ICE Specification for Piling and Embedded Retaining Walls (SPERW) and further guidance on this subject can be found in the SPERW document.

Breaking down of the concrete over-pour has traditionally been carried out using hand-held pneumatic breakers. This operation creates particular problems for hand arm vibration (HAVS), dust and noise. There are several viable alternatives to this procedure that remove or significantly reduce these risks. In many cases, these innovations have been fully developed and are readily available.

There are numerous methods available for the breaking down of concrete piles and this guidance note aims to cover the range of methods available, commenting on the advantages and disadvantages where appropriate.

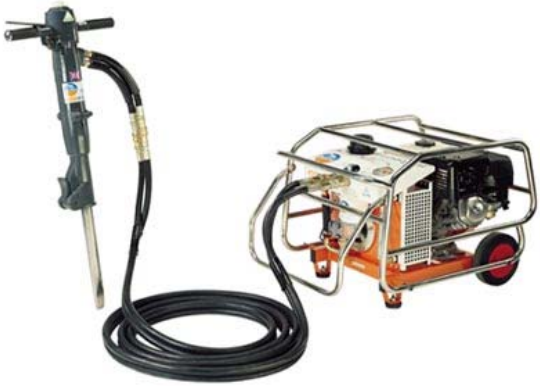
Members of the Federation of Piling Specialists cannot be responsible for specifying the method for breaking down concrete piles on a project. This decision must be made during the procurement process and form part of any risk assessment required under the Construction Design and Management Regulations (CDM) for this section of the works. The final decision as to the type of pile breaking system to adopt must also consider the potential environmental impact of the operation.

## Traditional 'Mechanical' Methods

The most basic method of breaking down piles is to utilise either hand held (Light) breakers or plant mounted pneumatic (Heavy) breakers. Whilst this method is perhaps the easiest to specify and takes no initial planning, it can produce unacceptable health and safety issues and cause unnecessary damage, particularly to small diameter piles, if not carefully controlled. This type of breaking is applicable to all types of concrete piles and the key points to consider in the implementation of this method are as follows;

- Piles should be allowed to cure for at least 5 days before excavation and trimming. For high cement replacement mixes the curing period is likely to be extended.
- Pneumatic breakers should not be used to penetrate the pile vertically as this is likely to split the pile shaft and shear the concrete below cut-off level. The tool should be worked from the pile perimeter towards the centre.

- Heavy impact breakers should not be used on small diameter and lightly reinforced piles, or on piles in soft ground.
- This type of pile breaking can increase the risk of integrity test failures.



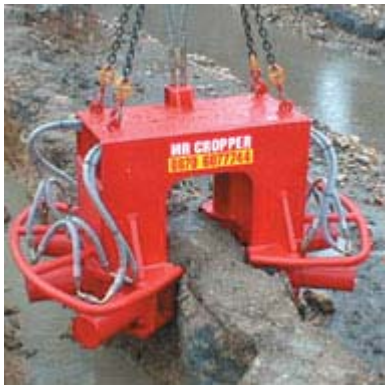
Typical 'Light' Breaker

Typical 'Heavy' Breaker

**Hydraulic Pile Breakers**

Specially designed 'Pile Breakers' are available in a range of sizes and capability. Hydraulic pile breakers are available to cater for a wide range of concrete pile shapes and sizes, both cast in place and precast, including contiguous wall piles and small secant wall piles. These systems are not appropriate for some of the larger pile diameters or for use on diaphragm walls. This equipment is readily available from a range of suppliers, examples include;

www.piletec.co.uk
www.geplanthire.com/products/piling/
www.mrcropper.co.uk




Typical Pile Breakers

Plant manufacturers and suppliers should be consulted for further details of the capability and limitations of particular pile breakers

## Integrated Pile Breaking Methods - Passive

An integrated 'passive' system relies on the installation of some form of debonding device into the pile at or close to cut-off level. Debonding foam is applied to the main reinforcing bars above cut-off level and in some cases a lateral debonding element is also included at cut-off, as in the Coredek 'Corbreak' system (www.coredek.com). The Elliot system (www.elliott-europe.com) uses oppositely acting wedges, introduced into a hole across the pile at cut-off level so that the pile is split laterally. The hole may be drilled manually or preformed by use of a lifting eye and tube, which is inserted at the same time as the pile is cast. Residual head preparation is further reduced by the use of Elliot's debonding sleeves which incorporate polystyrene tips. It is important that a suitably designed lifting eye is incorporated into the pile head when using either of these systems to allow easy and safe removal of the pile head.

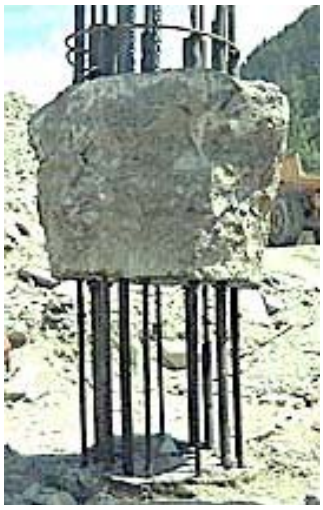
Coredek System

Elliot System

The above systems are most commonly used in large diameter cast in place concrete piles. This method can also be used for contiguous and secant wall piles and diaphragm walls.

## Integrated Pile Breaking Methods - Active

The most recent developments in pile breaking are in the form of 'integrated' active systems. In essence these rely on incorporating an active pile breaking system within the pile and once the pile has cured the system is activated remotely, breaking the pile at cut-off level. Current active breaking methods include the 'recepieux' system (www.recepieux.com) which relies on inducing a horizontal crack by introducing chemicals into the pile through carefully positioned delivery ducts to expansion chambers positioned at cut-off level. Another innovative method currently under development by Laing O'Rourke is the FAST method. This method uses water pressure to crack the pile at cut-off level using a carefully designed system of crack inducing pipes, placed in the pile at cut-off level, integral with the reinforcement cage.



Recepieux Method

FAST System

The above systems are most commonly used in large diameter cast in place concrete piles and can be used for contiguous wall piles. They are not appropriate for large secant walls and diaphragm walls.

## Hydro-demolition Methods

The use of hydro-demolition methods for the breaking down of piles is relatively rare in the UK. The system uses extremely high pressure water jets capable of removing concrete without damaging the reinforcing bars. Hand held lances are typically used, but specialist remote controlled plant has been developed utilising a ring of water jets placed around the pile connected to a small tracked base unit.


Typical Hydro-demolition Pile Breaker

This method of pile breaking can in theory be adopted for all types of bearing and wall piles and diaphragm walls.

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**Disclaimer**



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