Wet Speed-Mixing

WSM - Soil Mixing Procedure

Method description

WSM - a fast alternative for shoring applications

What is WSM?

WSM stands for **Wet Speed-Mixing**, a fast soil mixing procedure. The WSM is an alternative to conventional shoring and foundation methods such as king pile wall, steel sheet pile walls or the Jet Grouting walls.

The ABI MOBILRAM-System gets equipped with a MDBA auger drive and suitable mixing tool. These auger drives are build without gear mechanism so that typical negative effects as noise, wear, high maintenance and relatively low revolutions are avoided.

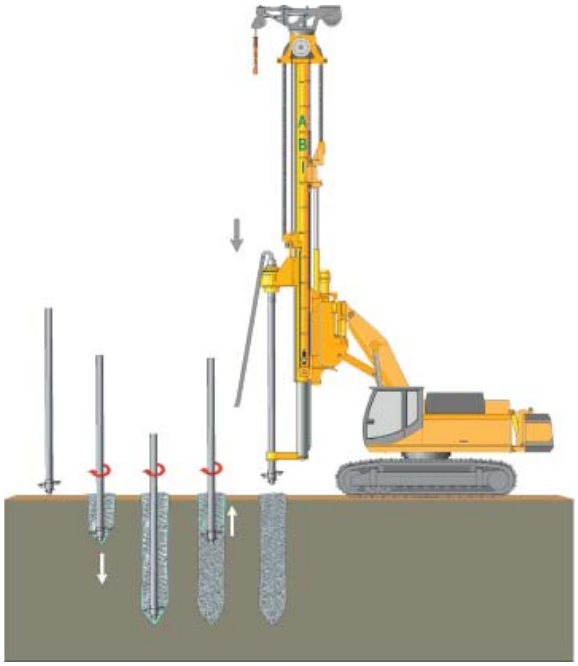
The WSM method is often combined with conventional procedures. For the primary piles the WSM process is used. The secondary piles can be installed e.g. as cast in situ concrete piles.

The advantages

- **Vibration-free** - enables working at places with high building concentration and residential areas.
- **Low noice** - due to the construction of the auger drive without gear box the noise is reduced to a minimum.
- **Productive** - the high revolutions provide above average daily performances.
- **Economically** - reduced costs due to low cement and aggregate consumption and to the not existing soil excavation.
- **Environmentally friendly** - aggregates and the soil excavation do not have to be transported to or from the building site. Contaminated soils do not have to be disposed nor treated.

The soils

Preferably in soils with equal consistence and sufficient void volume.



The typical applications

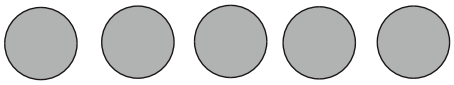
- retaining walls
- shoring
- ground consolidation/stabilisation
- cut-off walls

Shoring variations

The limited building area as well as the stability of an excavation often represent a problem. The sides of the excavation are normally vertical and the arising loads must be intercepted. The selection of the method is depending on whether the installation is set only temporarily or for a long term usage.

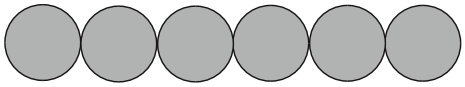
Contiguous pile wall

Contiguous pile wall is installed by positioning the piles next to each other, whereby the distance depends on the ground conditions. In firm cohesive soils the distance can be increased. As additional safety measure anchors between the pile gaps can be added.



The contiguous pile wall is an alternative to the secant or diaphragm wall. This type of wall can be used in different soils most often where dewatering is not necessary.

A special form of the contiguous pile wall is the tangential pile wall. In this variant the piles tangent each other, water tightness is not given.



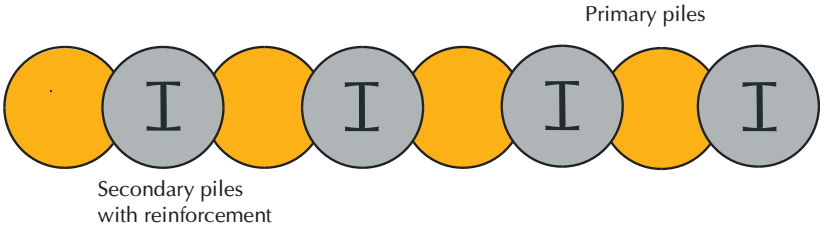
The mixing sequence for a contiguous pile wall is depending on the distances between the piles. With sufficient distances the piles can be mixed successively. By smaller distances and tangential pile walls first the piles 1 – 3 – 5 – 7 etc. are installed and about two hours later the piles 2 – 4 – 6 – 8 etc.

Secant pile wall

The secant pile wall comprises piles, which have positive overlapping with each other. In the first step the primary piles are placed. In the second step the secondary piles are mixed between the primary piles. The distance between the primary piles depends on the pile diameter and the desired overlapping. A typical overlapping amounts approx. 100 mm. These is already possible two or four hours after the primary piles were mixed. In order to reach higher bearing capacity and bending moment, the piles can be strengthened with reinforcement such as I-beam.

The use of ABI MOBILRAM-System with automatic leader mast alignment provides a high degree on vertical control and good positioning of the piles. The system is also ideal for irregular wall patterns. The secant pile wall can also be used as cut-off wall.

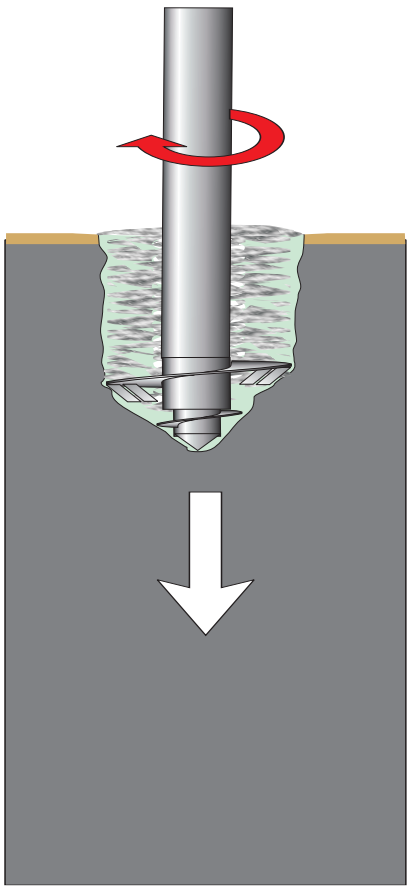
The mixing sequences can vary from the mentioned data, depending on sites conditions.



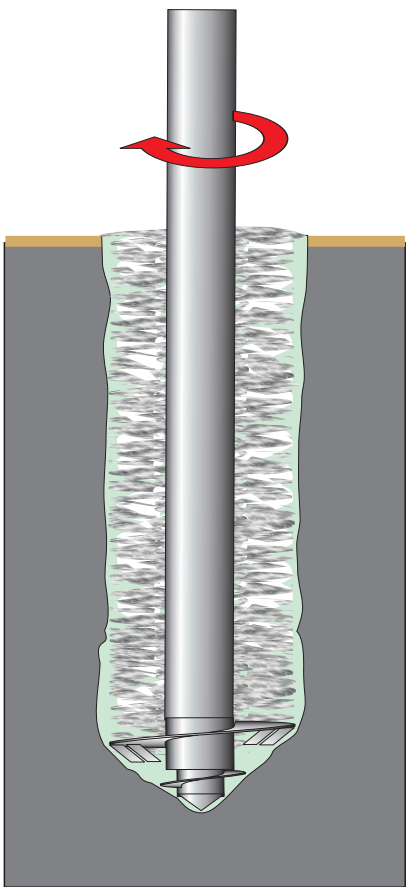
WSM-procedure

The principle

Positioning of the tooling. The mixing tool is mounted on a high revolutions ABI auger drive while the suspension supply is hooked up. (suspension= water cement mixture in various ratios)

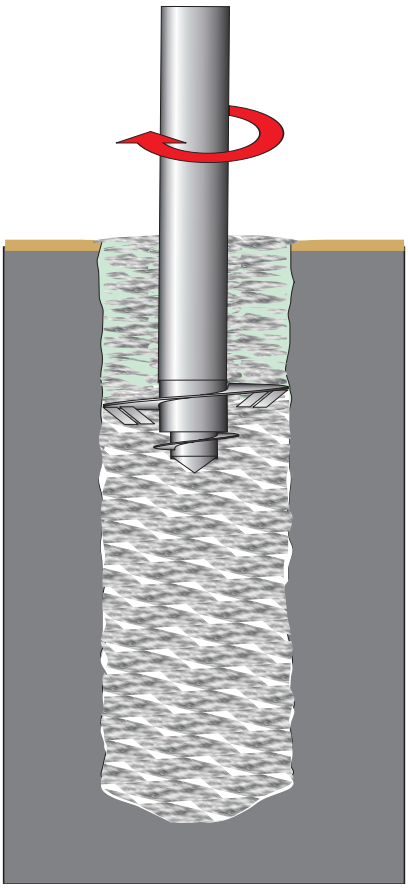


Lowering the mixing tool into the soil with 100 – 200 rpm. A substantial amount of soil gets mixed with under pressure injected suspension.

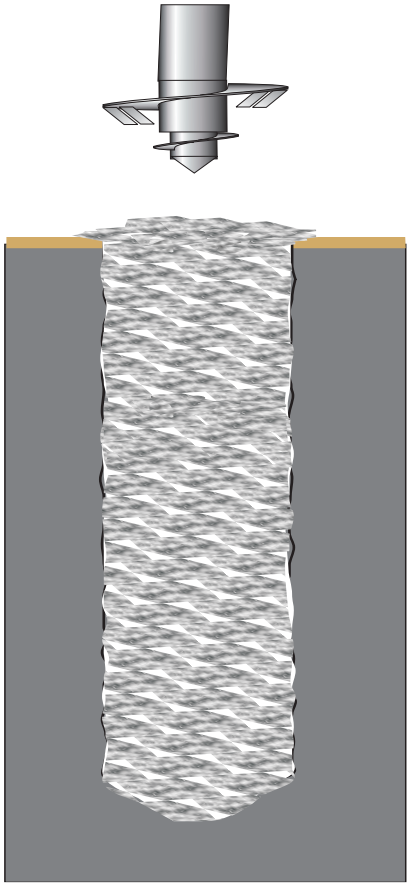


Suspension is constantly pumped to the mixing tool while lowering to the required depth.

WSM-procedure



The developed mixture from soil and suspension gets mixed again during withdrawal and suspension is continuously pumped.



The completed wet mixed pile, ready to cure.

The actual tool is a mixing head is constructed to a definite diameter and designed depending on the geology. The connection with the ABI auger drive MDBA is made by extension rods. The soil at location gets mixed with suspension. An injecting pump delivers the suspension directly through a flushing swivel of the auger drive to the hollow stem of mixing head.

Since mixing is actually achieved during lowering and withdrawing of the tooling, one speaks of a two step method. The load-bearing capacity and firmness of the column are determined by the amount of injected cement suspension and consistent stirring.

With the WSM procedure piles in diameter of 400 mm to 1200 mm and a length of max 26 m can be mixed in place. They can be carried out as a single piles, secant pile wall, block pattern or any other required pattern.

WSM-procedure

Site examples

New underground track BART in San Francisco (USA)

For trench shoring needs to construct a new underground train track in San Francisco the Speed-Mixing method was used. The mixing tool had a diameter of 750 mm and was lowered to a depth of approx. 22 m. The secondary piles were reinforced with H-beams. During the excavation works a part of the secant pile wall on the trench side was removed up to the reinforcement. The result was a Soldier beam wall with lean concrete lagging.

The installation per pile took approx. 10 minutes. Due to the high daily performances and low manual work input substantial savings were obtained particularly in the comparison to the originally required steel sheet pile wall. After the completion of the subway tunnel the H-beams could be retracted with vibrator for further usage.

River embankment refurbishment in Dessau (Germany) on the road B 185

For the embankment refurbishment in Dessau the ABI MOBILRAM was equipped with the auger drive MDBA 3500. The heaped up embankment should have been stabilized with the help of a secant pile wall. The mixed piles were 7 m long and had a diameter of 600 mm. The mixing time of a pile averaged downward approx. 7 to 8 minutes and upward approx. 2 to 3 minutes. For a even better sealance and avoidance of friction between the piles Bentonit was added to the cement mixture.

New parking garage for monastery Neuenburg (Austria)

Beside the monastery Neuenburg near Vienna a new parking garage had to be build. With the ABI MOBILRAM-System TM 16/20 and auger drive MDBA 6000 using the Speed-Mixing method soil improvement and foundation works were accomplished in a short period of time.

The heaped up soil was consolidated with the WSM procedure, in order to receive a load-bearing layer for the new base plate. Areas which must absorb high loads, groups of columns were installed in greater depths and with reinforcement. The mixing tools with a diameter of 600 and 700 mm were protected by tungsten-carbite studs due to the abrasive geology.

Twin drive in California (USA)

To achieve even greater production rates ABI custom tailored a Twin-Mix rotary. One of the characteristics of the new twin drive is the adjustable axle distance. This can be varied between 600 mm up to 1300 mm. The overlapping of the parallel mixed piles is about 100 mm and depths of 11 m can be achieved. The critical point was the parallelism and perfect guidance of the tooling during the whole mixing process.

Hospital building extension in Linz (Austria)

For the extension works on the hospital of Linz the choice of a vibration free shoring method was particularly important, because the daily hospital routine could not be disturbed. With the ABI MOBILRAM-System TM 16/20 in connection with an auger drive MDBA 3500 two walls with a total length of 40 m were installed within two days. The mixed secant pile wall was 12 m deep and the single piles had a diameter of 700 mm. The mixed wall was reinforced with strong beams, so that back anchors were not required.

ABI Gruppe

ABI · BANUT · DELMAG

For further information please contact your ABI sales assistant. Or you visit us on the Internet at www.abi-gmbh.de. Design subject to modifications. The details in this leaflet have to be regarded as approximate. The illustrations also can contain special outfits which are not part of the standard scope of supply. Not represented equipment variants can lead to modifications of the technical data.

ABI Maschinenfabrik
und Vertriebsgesellschaft mbH
Am Knückel 4
D-63843 Niedernberg
Germany

Telefon: +49 (0) 6028 123-101, -102
Telefax: +49 (0) 6028 123-109
eMail: info@abi-gmbh.de

www.abi-group.com