ABI Gruppe NEWS

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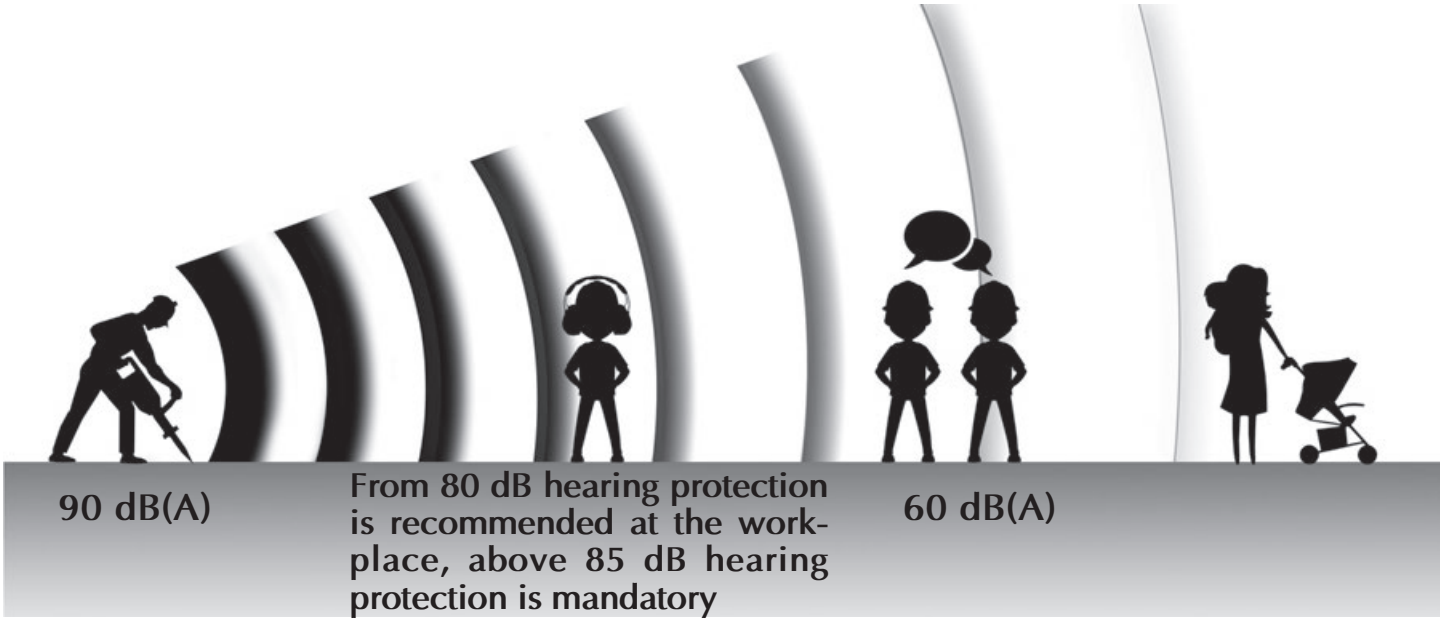
Construction equipment noise



Graphics: Principle diagram of sound spreading

Our environment is constantly changing, construction activities in the environment an everyday occurrence. Machine manufacturers strive for efficient machines and this also includes the reduction of noise emissions.

Particularly in city centres, construction noise offers enormous potential for conflict between developers and residents, especially in the „urban canyons between buildings“ where the noise cannot dissipate freely and is reflected and echoes. Therefore, it is important in the planning phase to identify possible sources of noise and to take appropriate measures for noise reduction. The noise emissions of the machines used must be taken into consideration.

For specialist civil engineering machines, the noise generated can be divided into two categories: machine noise and process-related noise. The machine manufacturers are constantly striving to reduce the noise emissions of their machines and equipment. According to Directive 2000/14/EC on the approximation of the laws of the Member States relating to the noise emission in the environment by equipment for use outdoors, special purpose civil engineering machinery shall only be placed on the market with appropriate identification and based on a defined noise measurement.

Content

What you need to know about noise:

The topic of noise and especially noise measurement is very complex. Noise is the name given to sounds that are disruptive and distracting. What is music for one person can for another be an intolerable noise.

In order to exclude the subjective perception of an individual, the description of noise is made about the sound. In this context, the terms “sound pressure” and “sound power” are used. These are often misinterpreted and used as a synonym despite the different meanings.

A characteristic of construction machinery is the sound power level. The sound power is the rate at which sound energy is emitted by a sound source per unit time. The sound power level is calculated from the sound pressure, as a direct measurement of the sound power is not possible.

Graphics: Principle diagram of addition of two equal noice sources

To determine noise exposure on the construction site, all machinery used must be taken into account. The sum of two machines with the same noise level results in (only) an increase of + 3 dB.

Sound pressure is a measure of pressure fluctuations in the air. The sound pressure generated by a construction machine can be directly perceived, e.g. in adjacent buildings from a construction site the window panes lightly vibrate. The sound pressure decreases when the distance increases to the sound source, when the distance is doubled there is a reduction of the sound pressure by approximately 6 db. For example, if you measure a sound pressure of 80 dB at a distance of 15 m from the machine, then you would only measure 74 dB at a distance of 30 m, providing there are no reflections or other interfering background noises.

The sound pressure values are measured using a calibrated measuring instrument at several points around a machine. The exact position of the measuring points depends on the size of the machine and is defined in ISO 3744. For a correct measurement result, it is important that the measuring area is free of reflecting objects and any interfering background noises, e.g. from other machines etc. For the measurements to be reproducible or comparable the machines must be operated within fixed parameters during the measurement process. Subsequently, the calculated sound power level is visibly displayed on the machine.

The determined sound power level is given in decibels, abbreviated dB. Because these are logarithmic levels the sound power level behaves differently than e. g. the units known from everyday life, such as length or weight. For clarification: halving the sound power of a machine that has 120 dB means 117 dB, i.e. a reduction of 3 dB. For subjective perception, a reduction of the sound pressure by 10 dB is perceived as „half volume“.

Noise emissions from ABI and DELMAG machines

At ABI, the reduction of noise emissions has a very high priority and we work hard for every decibel reduction. Therefore, the results of the latest measurements with the new carriers adhering to the EU Stage V exhaust emission level are all the more pleasing.

Since 2018, the „handy“ DELMAG drill rig RH 12/140 has been used on construction sites. This is installed on the carrier SR20 with 209 kW. The machine is mainly used on inner-city construction sites and according to our customer feedback it is repeatedly commented on how pleasingly quiet the machine is. The measurements of the new F-Series attest that the RH 12/140 has a sound power level L_{WAD} of **104 dB(A)**. It is the guaranteed sound power level, determined whilst taking into account the sum of the associated measurement uncertainties. The measured A-evaluated emissions sound pressure level in the driver‘s cabin L_{pA} is only **69 dB(A)**.

In addition to the machine as a source of noise, Kelly drilling involves process-induced noise peaks caused by spinning off the drilled material. Also here there are possibilities, such as soundproofing the Kelly bars to reduce the noise. ABI offers standard Kelly bars with a soundproofed design.

Launched at Bauma 2019, the RH 40 with an installed engine power of 470 kW produces a remarkably low guaranteed sound power level L_{WAD} of **108 dB(A)**.

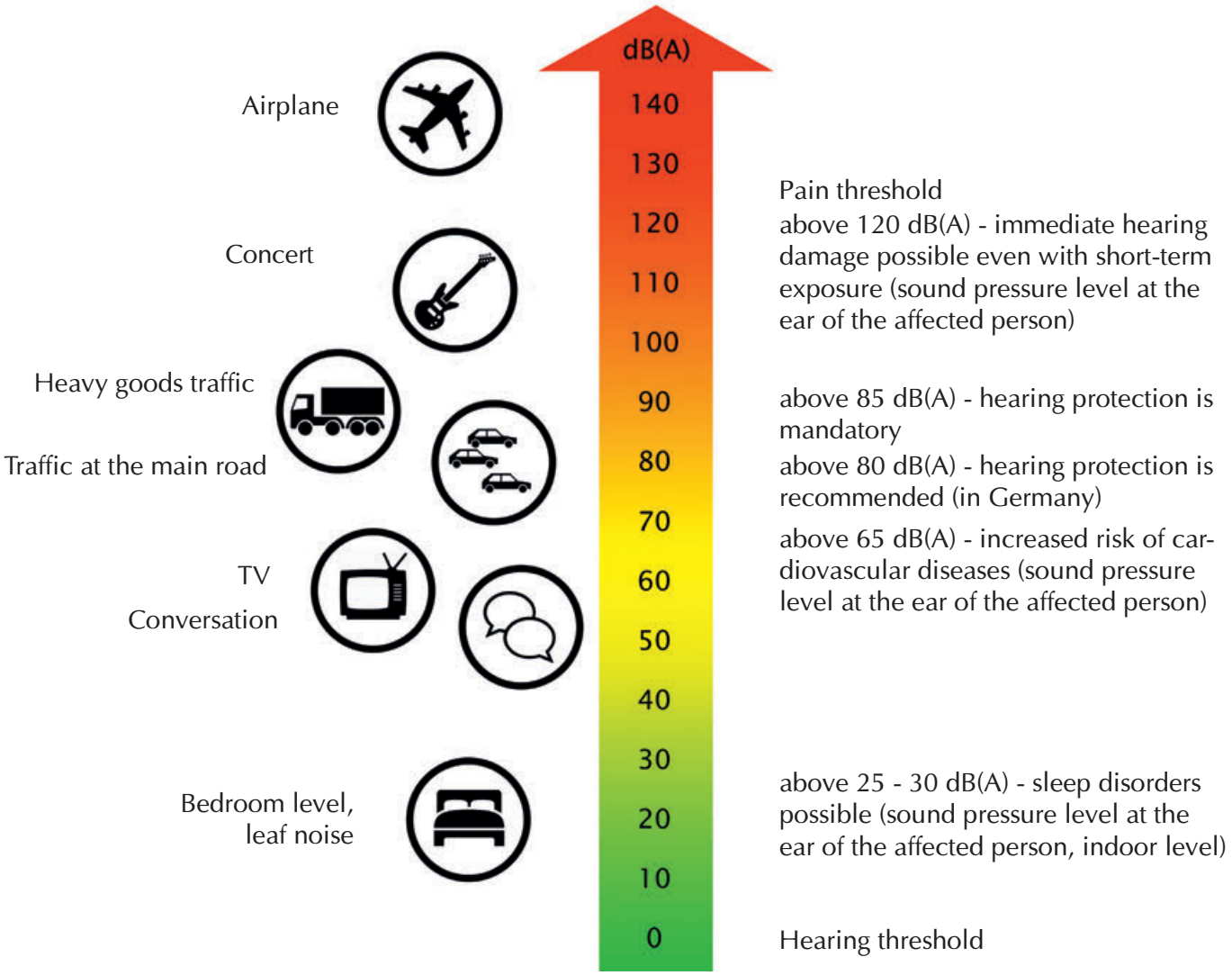
In general, piling equipment has a higher sound power level than drilling equipment, but even here noise emissions are under scrutiny. Great progress has already been achieved through the introduction of the Efficiency Drive. Efficiency Drive is an option for the ABI MOBILRAM-System to increase the energy efficiency. Customers reported that during operation there was a significant noticeable reduction in the noise level when using the Efficiency Drive.

The new ABI MOBILRAM TM 13, also installed on the carrier SR20, was measured at 117 dB(A), where the sound power level of the implement, in this case the vibrator MRZV 12VV, is relevant. The process-related noise also plays a major role in pile driving, but it is difficult to eliminate.

Significantly influencing factors include in addition to the soil quality, the particular length and type of the piling element or elements, which when vibrated act like a loudspeaker and thus resonates the sound.

When driving double profiles, a significant reduction in noise emissions can be achieved by using a double clamp assembly like the MZK, which substantially reduces the fluttering of the free ends of the driven elements. As a side effect, the uniform transmission of force significantly reduces the wandering of the profiles during driving.

The measured values and the feedback from the construction sites prove that all the efforts in the development work have paid off and produced noticeable results, in this case positive audible improvements. ■



Graphics: Examples of different noice sources

RH 40 at the Job Site

Job site:
Stationsproject Kortrijk, Belgium

Machine type:
DELMAG drill rig RH 40 of the company BWH Bohrwerkzeuge Hoffmann

Contracting partner:
Smet Group

Procedure:
Cased Kelly drilling
(without casing oscillator)

Task:
Pile installation
Diameter: 1800 mm
Depth: up to 40 m

Photos:
RH 40 at the job site in Kortrijk


RH 40

The ABI MOBILRAM-System Meets High Requirements in London

At the end of 2018, ABI Equipment Ltd rented a HPZ 635-700 Hydro-Press-System to DAWSON-WAM for the installation of steel sheet piles for the North Acton project.

The Hydro-Press-System complemented DAWSON-WAM's own ABI equipment and contributed to the smooth procedure and efficient execution of the installation work.

Urban regeneration in North Acton, a town in London's Ealing district has created a boom in the local population and increased employment figures in the area. Whilst this is good news for the local economy, it has highlighted the fact that there is a lack of suitable infrastructure for the residents. Missing is a focal point for the area, also there is poor and unsafe pedestrian access to the underground. To address these issues, Ealing Borough Council has developed an improvement plan that begins with the conversion of a former petrol station site into a public landscaped area with wide, well-lit walkways down to the station.

Given the sites proximity to an existing hotel, commercial and residential buildings, as well as the busy Central Line railway, an installation method was chosen to ensure a minimum environmental impact. Complicating matters, the existing ground at the construction site consists of overlaying stiff to very stiff London clay at a depth of one to two meters.

The shoring and ground improvement work around the construction site periphery was carried out by the specialist foundation engineering company DAWSON-WAM with one of its powerful ABI TM 22 and various ABI attachments.

The ground was initially pre-augered using an ABI VDW double auger head system. This cased CFA system uses on the inside a conventional CFA auger and outside a counter-rotating protective casing, which is fitted with a specially hardened cutting shoe.

The VDW system so to speak, provides twice the cutting force and enables a high degree of accuracy, both in terms of drilling position and verticality during the drilling process. The protective casing acts as a guide over the full drilling depth. The result was precisely pre-drilled holes into which the steel profiles were subsequently to be installed. As soon as the pre-drilling along the sheet pile axis was completed, the VDW system was exchanged for a high-performance ABI vibrator MRZV 30VV with variable static moment and variable hydraulic displacement.

Photo: ABI MOBILRAM TM 22 with VDW equipment at the job site in North Acton

Because of the unique ABI Docking-System D6 a standard component of the TM 22, the exchange process takes just a few minutes. With the vibrator attached DAWSON-WAM were then able to pitch and drive a continuous steel wall made of modular H-profiles HZ-680LT with a length of up to 14 m. Due to the sensitive conditions of the site, whilst driving the HZ-profiles DAWSON-WAM decided in addition to the MRZV 30VV to use a low-pressure water jet as a driving aid to minimize the potential disturbance to the residents. Along with the pre-drilling, this proved to be an effective combination that ensured that all profiles could be driven to full depth in the London clay.

Another part of the contract was the installation of continuous sheet pile walls at each end of the mo-

dular wall, consisting of 8 to 10 m long sheet piles AZ36-700. Again, DAWSON-WAM decided to pre-drill and then install the profiles low-noise and low-vibration using the ABI Hydro-Press-System.

The sheet pile press is a hydraulically powered press system with four-cylinders that utilizes the combined reaction mass of the 4 sections and the machine. In each case a profile is pressed up to 600 mm until all four cylinders are extended. Afterwards, the housing descends downwards. The process is repeated until the profiles one after the other reach the required depth. By using the Hydro-Press-System minimal noise and ground vibration is produced, only the engine noise of the machine is perceptible, making the Hydro-Press-System an ideal solution for the installation of sheet piles in urban areas.

Photos: ABI MOBILRAM TM 22 with vibrator MRZV 30VV (above) and with Hydro-Press-System (below)

The combination of specialised equipment and adaptability of the ABI MOBILRAM-System made it possible to master the difficult site conditions while minimizing disruption to the local community. The local council wanted to ensure that the entire project was completed as environmentally compatible as possible, in particular with regard to noise and vibration and emissions during the installation of steel profiles.

By using the ABI MOBILRAM, DAWSON-WAM were able to comply to these requirements. By combining a 470kW diesel engine with EU Stage IV and the ABI Efficiency Drive, work has been carried out in a more environmentally friendly manner with less fuel requirement. In addition, the operators of the London Underground monitored the work procedure with measurements to ensure that the ground vibrations remained within the allowable tolerance. All measures contributed to the fact that during the construction work there were no complaints about noise or vibrations.

Simon Wilson, site manager for DAWSON WAM, said: „As proponents of the ABI range we knew that the combination of these pieces of equipment would prove highly successful, and we are more than satisfied that all our requirements were met in terms of power, efficiency, ease of use and environmental factors." ■

Foundation Work with TM 20

The Company Amelie Construction installed sheet piles at a sensitive construction site of a nuclear power plant in Pennsylvania.

Amelie Construction is a valued customer of ABI's distribution partner Hammer & Steel Inc. The company is based in Pittsburgh, Pennsylvania and offers a wide range of specialist foundation engineering services. With the ABI Mobilram TM 20 they have a contract on the site of the Peach Bottom nuclear power plant in Delta Pennsylvania.

The operator of the Exelon power plant is expanding its facility for storing spent fuel ISFSI (Independent Spent Fuel Storage Installation). The spent fuel is stored in pools for a period of seven years before being transferred to dry cask storage containers and transported to a concrete storage pad onsite.

Photo: ABI MOBILRAM TM 20 while pile driving in Delta

The Peach Bottom nuclear power plant has been operating dry storage onsite since 2000. The storage capacity will be increased so that it is sufficient until 2034, the date of the current operating permit.

The general contractor Ryan & Associates from Davenport Iowa commissioned Amelie Construction to undertake the specialist foundation works. The contract included the establishment of three permanent soil nail walls of a total exposed area of approximately 2800 square meters as well as the installation of approximately 335 lineal meters of continuous sheet pile wall. For the installation of the Z-Profiles SKZ 24 with lengths up to 12.2 meters the TM 20 with the vibrator MRZV 30VV was used.

When used on sensitive construction sites the advantages of the MRZV-VV technology become apparent. The MRZV-VV vibrators can operate at speeds of up to 2600 rpm (43.3 hertz) while the available machine power is efficiently used and the ground vibration reduced to a minimum. ■

SPD Machines in Stockholm

The company Rovalin AB used two SPD machines for shoring construction works in Stockholm, Sweden.

The construction site in Hammarbyhöjden in Stockholm was practically on the doorstep for Rovalin. Rovalin is based in Nykvarn southwest of the capital. The young, ambitious company, founded in 2014 by Johan Saarela and Hans Gullström, quickly became one of the largest private companies in the specialist civil engineering sector in Sweden. Rovalin AB employs approximately 30 people and operates a fleet of 25 machines, from which 7 are from ABI and 2 from SPD. The company handles small projects ranging from small home builders to major industrial projects. Their strengths include the introduction of prefabricated piles, sheet piling installation as well as down-the-hole hammering, anchor drilling and the HDI process.

In Hammarbyhöjden, Rovalin carried out shoring construction works with two SPD machines. First, the DT145-EC300 was used to install the 15 to 16 m long steel piles for shoring using a down the hole hammer. Subsequently, steel plates were welded in place as the excavation progressed from top to bottom. In Sweden, this type of installation is called a Berlin Spont.

Photo: Drill mast DM55-EC250 of the company Rovalin while anchor drilling in Stockholm

Photo: Drill mast DM55-EC250 of the company Rovalin while anchor drilling in Stockholm

The second SPD machine, a DM55-EC250, took over the anchor drilling for the waling system, which was installed on three levels.

„For this project, the machine choice was perfect, with the DM55 you can simply drive the chassis straight ahead to approach the various drill points and then align the leader to suit the wall. A conventional anchor drill rig would need to be moved a lot more to find the drill point and set the correct angle", said Thomas Palmqvist, the equipment operator, adding: „In my opinion, it's one of the best machines we have in our fleet. The possibility to quickly switch between a down the hole hammer and a top hammer for anchor drilling is just awesome. The machine is also very stable and provides excellent reach and is also much easier to load with new piles or anchors."

Once this project is completed, the next assignment for this machine has already been planned. At Scania in Södertälje, Sweden, limited headroom drilling is being carried out in a hall.

In the near future, the DM55-EC250 drill mast with HD4010 hydraulic hammer can also be hired from ABI in Niedernberg Germany. ■

Two that Perfectly Complement Each Other

ABI delivered two machines to the company BSV-Spezialtiefbau: a TM 13 and a RH 12/140.

The company BSV-Spezialtiefbau from Hennickendorf near Berlin has specialized for many years in the preparation of construction pits for small to medium-sized construction projects, especially in the greater Berlin area.

For such projects, compact and flexible machines are required that can be quickly implemented and are ready for use after a short set-up period.

BSV was looking for a replacement for its now-ageing TM 10/12.5, which has been in use for almost 20 years. In addition to the TM 10/12.5, BSV also has a TM 11/14 in its fleet.

ABI has since the Bauma 2019 had a compact TM 13 model in the new leader range assembled on the SR20 carrier. This machine is comparable in dimensions to the older TM 10/12.5.

The Managing Director of BSV, Thomas Jander, visited the ABI factory in Niedernberg and informed himself about the new machine. The arguments for the TM 13 were convincing enough that he decided to purchase the machine. In particular, the compact dimensions and the fluid working cycles were decisive in his decision.

Job site: Berlin Moabit

Machine type:
ABI MOBILRAM TM 13 and
DELMAG drill rig RH 12/140

Procedure:
ABI TM 13 – Pre-drilling with continuous flight auger,
RH 12/140 – Kelly drilling

Task:
Berliner Verbau – Berliner Shoring
– Both machines prepared holes for installation of 10 m long H-beams HEB 400.

Challenge:
Drilling in the immediate vicinity of existing buildings.

At the time, there was also a DELMAG RH 12/140 at the factory, which was nearing completion. The drill rig is also assembled on the SR20 and can be transported incluvive attachments (rotary head and Kelly bar). The machine concept, the fast usability due to short set-up times and the likewise compact dimensions aroused the interest, so much so that BSV decided to buy both machines.

Meanwhile, both machines are in use on construction sites in and around Berlin. The TM 13 scores exceptionally high with the drivers. Thanks to the Docking-System, the attachments can be changed very quickly and also being able to use the function leader mast slew without having to additionally pin the leader mast, according to the drivers is an excellent addition. ■

Job site: Berlin Lichtenberg – Quartier 218

Machine type:
ABI MOBILRAM TM 13 and
DELMAG drill rig RH 12/140

Procedure:
ABI TM 13 – installation of beams , RH 12/140 – Kelly drilling

Task:
TM 13 vibrated 10 m long beams for Essener shoring, RH 12/140 installed 15 m deep piles with a diameter from 880 mm in Kelly drilling method for a crane foundation

Photos:
in the background the historical express train of the German National Railway also known as Vindobona

Sheet Piling Work with TM 20

The company Fleissner Rammtechnik GmbH carries out sheet piling work on the Weiz bypass in Styria, Austria.

In the town of Weiz the through traffic is to be diverted from the busy town center. The construction work for the new bypass is divided into three phases. Work is currently underway on the 1.2 km section phase 2, which includes two tunnel sections of 425 m and 274 m, amongst others.

Fleissner Rammtechnik GmbH, located in Graz, carries out extensive sheet piling work for shoring excavation pits and is on site with two ABI machines. One of the machines is the new TM 20, which was delivered in January 2019 along with two attachments, a MRZV 30VV vibrator and a VDW 10050 double auger head system. The second machine being a TM 14/17 SL. With the acquisition of the TM 20, Fleissner expands its range of services, which can now encompass pile lengths of up to 20 m.

Due to the special local soil conditions, drilling and driving takes place on the construction site. The soil is cohesive, sandy and dense and contains water-bearing layers. The entire pile axis is therefore pre-drilled overlapping using the VDW. This facilitates the pile driving and enables the 15 m long sheet pile profiles to be completely inserted to the required depth. A total of about 35000 m^2 of sheet piling are driven and extracted, approximately 1000 t of sheet piles are needed. Section 2 is to be completed in 2022. ■

Photos: ABI MOBILRAM TM 20 with VDW equipment at the job site in Weiz (above),
Finished shoring with sheet pile wall (below),
TM 20 with double auger head system VDW 10050 and TM 14/17 SL with vibrator (left)

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Phone: +49 (0) 6028/123 -101, -102
eMail: info@abi-gmbh.de

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www.abi-group.com