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BAUER Spezialtiefbau GmbH, a member company of the BAUER Group international construction, machinery and resources concern based in Schrobenhausen, Germany, carries out underground works all over the world, executing all established methods and techniques of construction in the field. The innovative strength of the BAUER Group's parent company has been a driving force in the specialist foundation engineering sector for over 50 years.
The BAUER Group

BAUER AG, founded in 1994, is the holding company of the BAUER Group, and provides in-house services in the fields of human resources, accounting, IT, facility management, legal affairs and training. The Bauer share has been listed on the stock market since 2006.

The parent company in the specialist foundation engineering sector, BAUER Spezialtiefbau GmbH, constructs building foundations, excavation pits and cut-off walls, as well as carrying out ground improvement, all over the world. Its main specialities include all kinds of bored piles, anchors, diaphragm- and cut-off walls, as well as jet grouting and vibratory techniques.

The Resources segment, established in mid-2007, focuses on products and services in the fields of water, energy, mineral resources and the environment. BAUER Resources GmbH is the segment’s parent company, overseeing three operating divisions: Materials Division, Exploration and Mining Services Division and Environment Division.

Bauer’s Equipment segment offers an extensive range of machinery and tools for specialist foundation engineering applications and for the mining industry. Specialist foundation engineering machinery from Bauer has been a byword for top performance and quality and for continuous innovation in the field of specialist foundation engineering equipment since the late 1960s.

BAUER Spezialtiefbau GmbH is a member company of the BAUER Group, based in Schrobenhausen, Germany. The holding company BAUER Aktiengesellschaft is the parent of more than 100 subsidiary businesses in three segments: Construction, Equipment and Resources. Bauer Spezialtiefbau carries out underground works all over the world, implementing all the established methods and techniques in the field, primarily in the construction of excavation pits, building foundations and cut-off walls, as well as ground improvement.

Bauer Spezialtiefbau operates on the basis of intensive collaboration with its more than 50 subsidiaries and branch offices. Regional networks all over the world allow the company to deploy machinery, manpower and know-how rapidly and flexibly to always offer optimum solutions both technically and economically. Its customers also profit enormously from the innovative strength of the BAUER Group as a whole, which has played a major part in driving forward the underground engineering sector since the middle of the last century. Bauer Spezialtiefbau’s engineers are well aware of their responsibilities to their customers and to the environment: “Dealing with the urgent social and ecological issues of our age, using scarce resources in a conscientious manner, is a challenge to our skills and know-how on a daily basis. We meet those challenges all over the world, working in tight city centre environments, realising visionary infrastructure projects, and putting progressive environmental policies into practice. In doing so, we are able to call upon a wealth of experience, wide-ranging specialist knowledge, state-of-the-art technical equipment, and a healthy dose of creativity.”

SCHACHTBAU NORDHAUSEN GmbH is a specialist business with a tradition stretching back more than 110 years. It offers expert mining and underground engineering services founded on know-how in traditional techniques allied to the implementation of state-of-the-art modern construction engineering methods, all from a single source.
Milestones in the Company’s History

1790  Sebastian Bauer acquires a coppersmith’s shop in the centre of the town of Schrobenhausen

1840  Copper cladding of the tower of St. Jakob’s church

1870  Artesian well for the new Schrobenhausen railway station, start of piling work

1928  Dipl.-Ing. Karl Bauer (1894 - 1956) constructs the central water supply system for the town of Schrobenhausen; construction of wells and water pipes for municipalities and industrial firms in Bavaria

1948  Construction of a new operations centre at the site of the current head office

1956  Dr.-Ing. Karlheinz Bauer (born 1928) becomes sole managing director; company focuses its operations on specialist foundation engineering

1958  Invention of the injection anchor on the construction site of the Bayerischer Rundfunk (Bavarian Broadcasting Corporation) building in Munich; registration of patent and international marketing

1959  First construction site outside Germany, in Switzerland

1967  New hall for the workshops

1970  Design and manufacture of the first anchor drilling rig UBW 01; start of machinery manufacture

1972  Construction of the new head office administration building

1975  Contracts in Libya, Saudi Arabia, UAE

1976  First heavy-duty rotary drilling rig BG 7

1980  First international branch office opened in Saudi Arabia

1984  Opening of works complex West in Schrobenhausen; start of aggressive marketing of equipment

1986  Trench cutter to seal the Brombachsee lake

1986  Professor Thomas Bauer (born 1955) becomes sole managing director; internationalisation of the BAUER Group

1990  Founding of BAUER und MOURIK Umwelttechnik GmbH & Co

1992  Acquisition of SCHACHTBAU NORDHAUSEN GmbH

1994  Founding of BAUER Aktiengesellschaft as the Group’s holding company

2001  BAUER Spezialtiefbau GmbH is demerged from the equipment manufacturing business to become the central construction company within the BAUER Group, carrying out projects all over the world through its network of subsidiaries and branches

2006  BAUER AG is listed on the stock market, Chairman of the Management Board Professor Thomas Bauer

2007  Founding of BAUER Resources GmbH, entailing a restructuring of the mining and environmental business; market launch of the three new segments: Construction, Equipment and Resources

2009  The BAUER Group concludes the largest capital investment programme in its history; inauguration of the new head office administration building in Schrobenhausen and a new plant in Edelshausen; opening of the machinery manufacturing plant in Conroe, Texas, USA

2011  The first deep drilling rig is sold to South America; construction of an underwater drilling rig and successful deployment of it for a tidal turbine off the coast of Scotland
The Diversity of Specialist Foundation Engineering
available worldwide, at home in Bavaria
Buildings throughout the world are becoming not only ever taller, but also increasingly complex. Whether for gigantic towers in tight mega-city environments or contributing to futuristic infrastructure projects on a previously undreamt-of scale – the demands placed on foundation engineering specialists are increasing continuously. As a leading innovator in the development of underground engineering techniques, Bauer Spezialtiefbau is able to apply and market its skills and strengths worldwide. An extensive global network, coordinated from Group headquarters in Schrobenhausen, enables Bauer’s specialist know-how to be deployed in all four corners of the earth. As a result, Bauer customers around the globe profit from the company’s excellent local knowledge, from the close availability of highly qualified partners, from rapid availability of equipment and from comprehensive expertise in all areas of foundation engineering.
Buildings

From museums to skyscrapers – many public and private buildings all over the world are assured of a long life resting on our foundations. We meet the challenges of urban planning and construction, such as tight city centre space, close adjoining structures and stringent ecological requirements, with tailored design concepts for foundations and excavation pits.

Infrastructure

Large-scale excavation pits for railway stations, onshore and offshore foundation works, piled walls for harbour installations and much more – the ambitious infrastructure projects of the modern era demand ever more complex specialist foundation engineering solutions. We have the right equipment and know-how. Even in the hardest rock or in soft soil, our long-standing experience and broad-based expertise always meet the challenge.

Market Segments

We offer our customers worldwide customized, creative and cost-effective specialist foundation engineering solutions for construction engineering projects of a demanding nature. From planning through to execution – working together with our partners, we carry out top-quality excavation pits, building foundations, cut-off walls and ground improvement works for a wide variety of applications.
**Water / Energy**

Rising energy demand means there is an increasing need for the construction, extension, renovation and remediation of power stations, wind turbines and hydro plants, as well as dams and locks. We carry out foundation works for major power station construction and extension projects. In constructing or remediating dams and dykes, we employ specialist foundation engineering equipment which is unique of its kind in the world, enabling us to install the necessary cut-off wall systems even down to extreme depths and in hard rock.

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**Industry**

All industrial construction projects – whether a paper mill, a steelworks or a petrochemicals plant – pose different demands specific to the site. With specially tailored foundation and ground improvement works, we create the conditions enabling industrial installations to be set up even on the most difficult ground.
City centre land is scarce and expensive. Developers need to make the fullest use of all available space – including underground installations – for services and parking facilities. Space-saving retaining structures for excavations make that feasible. Bauer Spezialtiefbau offers individually tailored and optimized solutions for excavation pit retaining walls, where necessary also incorporating tie-back anchors or struts. Water ingress from below can be restricted by jet grouting or grouted sealing blankets. On request, Bauer Spezialtiefbau can provide turnkey solutions including all excavation and groundwater control works.
Versatile: For the Pasing Arcaden in Munich, Bauer Spezialtiefbau constructed a complex excavation pit covering an area of 13,000 m². In just seven months, Bauer Spezialtiefbau created a system comprising Mixed-in-Place (MIP) retaining- and cut-off walls, soldier pile and secant bored pile walls, where necessary with tie-back anchoring.

Three techniques in one: At Frankfurt Airport’s Terminal 1 a new pier is being added. Bauer Spezialtiefbau constructed a 790 m long and up to 12 m deep excavation pit with soldier pile-, bored pile- and Mixed-in-Place walls, supported with tie-back anchors or propped with struts.

Three floors below ground: For the excavation pit and foundations of the 23-storey Abu Dhabi Capital Hotel complex, Bauer Spezialtiefbau installed 500 running metres of bored pile wall and 534 foundation piles.

Accurate and water-tight: For a large-scale sewage treatment plant between the Buda and Pest districts of the city of Budapest, Bauer Spezialtiefbau constructed four water-tight circular shafts as the start and end locations for tunnel bore machines.
Excavation pit and foundations:  
For the four underground levels of the 25-storey Crystal Tower in Dubai, Bauer Spezialtiefbau constructed a bored pile wall supported with tie-back anchors and installed foundation piles.

16 m below sea level: In the Central District of Beirut, Bauer Lebanon constructed the excavation pit for a highrise tower close to the sea. Protected by the pile wall – which was supported with tie-back anchors – and sealed with a grout blanket, the excavation works were executed to a depth of 21 m accompanied by dewatering. The surface of the secant pile wall was cleaned and joints between piles were filled by shotcrete.
The weight of new building structures is becoming ever greater, and more and more often such buildings are being constructed on quite unstable ground. With pile foundations down to great depths even high loads can be transferred safely into the bearing stratum. Bauer Spezialtiefbau installs bored piles down to depths well in excess of 100 m and in diameters of more than 2 m – where required also with base and shaft grouting or with bell-outs. Diaphragm wall panels or Mixed-in-Place elements offer further appropriate and cost-effective options to carry structural loads. Bauer Spezialtiefbau can provide the optimum foundation solution for any building, bridge or transport infrastructure constructions.
Foundations - References

Full scale tested quality: For the “Pfeilerbahn”, an elevated railway in Hamburg, Bauer Spezialtiefbau executed 40,000 running metres of Bauer Full Displacement Piles (FDP), with lengths of up to 16 m, in just 12 weeks. In advance of the works, three large-scale field tests were set up and intensively monitored.

Bridge foundations: On the 420 km eastern section of the East-West Highway, an Algerian segment of the future motorway between Morocco and Egypt, Bauer Fondations Spéciales Algeria installed the pile foundations for all 35 bridges.

Foundations for wind plants: For the foundations of nine wind power plants, Bauer Spezialtiefbau executed 26 piles in 750 mm diameter and at depths down to 27 m for each.
Our Expertise

Precisely to customer specification: For the “Wedding Tower” in Moscow with a height of 250 m and featuring storeys wrapped around the stairwell core, the customer planned foundation piles with two concentric reinforcement cages. Bauer Technologie Russia met the challenge, constructing 130 cased piles in 1,500 mm diameter at a depth of 30 m in just five months.

An extraordinary project – an extraordinary effort: The “Exzenterhaus” in Bochum will become the city’s new landmark. Inside the high-rise block – a former wartime bunker – a Bauer BG rig was deployed to install foundation piles in order to discharge the high building loads.

In mid-river: Near the Macken Street Bridge in Dublin, a drilling rig installed piles for pylon foundations in a sheet pile wall supported pit 10 m below the river level.
Cut-off Walls

Water - the base of all life on earth and as such a resource which needs to be preserved and protected. Its elemental force is well known, whether as a flowing course or standing mass, or in the form of groundwater. Cut-off walls are installed to seal up dams and dykes of water courses, or to encapsulate polluted groundwater under waste disposal sites, tank farms or other industrial installations. As required, they protect the structure itself, the surrounding area, or indeed the entire region. Bored, grab-excavated or trench cutter excavated walls effectively preserve the stability of dams and dykes.
To reduce the flow through the ground under the Merowe Dam in Sudan, Bauer Spezialtiefbau installed 8,000 m² of bored pile wall and 5,000 m² of diaphragm cut-off wall. The 1.20 m thick cut-off wall sockets several metres into ultra-hard rock.

Dyke sealing by the Cutter-Soil-Mixing (CSM) system:
The remediation of the approx. 230 km long Herbert Hoover Dike around Lake Okeechobee in Florida demands the use of high-tech expertise. Despite layers of rock and embedded clay strata, Bauer Foundations USA is constructing a CSM cut-off wall at an average depth of 25 m.

Innovative measurement: The dam at the Sösetal drinking water reservoir was showing signs of leakage at high water. A 9 m deep jet grouted continuous wall was installed along a length of 330 m. The verticality of each bore hole was verified by a technique developed in-house by Bauer.
Our Expertise

Double capacity: The capacity of the Hinze dam reservoir near Brisbane was more than doubled to around 300 million m³. Bauer Foundations Australia executed the dam sealing works in the form of a 840 mm thick and down to 50 m deep two-phase cut-off wall. above

Protection against oil: In the Canadian province of Alberta, oil sands are being mined over a vast area. To protect an adjacent river, Bauer Foundations Canada excavated a 2.6 km long cut-off wall down to a depth of 50 m.

At the limits of technical feasibility: For the Peribonka dam project north-east of Montreal, Bauer Spezialtiefbau executed 85,000 m² of vibro-compaction, contact-, curtain- and stabilization grouting as well as 23,500 m² of trench cutter cut-off wall to a maximum depth of 120 m in ultra-hard granite.
Intensive building activities in the metropolitan areas in most of the industrialized countries are causing real estate prices to rise continuously. As a consequence, even sites on difficult ground, with low load-bearing capacity, are becoming more and more interesting to developers. Bauer Spezialtiefbau enables such sites to be built on. Ground improvement techniques such as vibro-compaction-, vibro-displacement densification and vibro-cast-in-place- or soil stabilization columns are efficient and cost-effective solutions where structural loads need to be transferred over a wide area or slopes need to be stabilized and secured.
**Bypass:** On the B180 trunk road near Waldenburg in Saxony, Bauer Spezialtiefbau executed 31,000 m of soil stabilization columns, 1,100 soil nails and 5,600 m² of protective steel wire mesh.

**Perlen, Switzerland:** The construction of a logistics centre called for the installation of 225,000 running metres of plastic drains down to a depth of 25 m and 29,000 running metres of vibro-displacement densification. Despite the difficult ground conditions, the works were completed in 25 weeks.

**While the hospital worked:** For a hospital extension in Fulda, Bauer Spezialtiefbau executed 6,000 m of vibro-displacement densification. The hospital had to be able to keep working while the work was being carried out.

**Uniform end-bearing capacity:** In Germersheim on the Rhine, Bauer Spezialtiefbau compacted the sand and gravel backfill of a former harbour basin. After the installation of 23,400 running metres of vibro-compaction densification down to a depth of 13.5 m, the area can be utilized as a container terminal.
Large-scale deep vibration: In the port of Balboa on the Pacific coast of Panama, Bauer Fundaciones Panama compacted some 15 hectares of newly reclaimed land down to a depth of 22 m. The improved ground is being utilized to extend the second largest container terminal in Latin America and will in future be capable of withstanding all kinds of loads that such use demands.

Foundations vibrated: At Estinnes in Belgium, vibro-displacement densification was deployed to construct the foundations for several wind turbines. Owing to the hard intermediate layers, each vibro-displacement column had to be pre-drilled with a BAUER BG 9.
Bored piles are cylindrical bodies made of concrete (with or without reinforcement) which are installed in the ground by a variety of methods. They transmit high structural loads into lower, load-bearing soils. When installed in rows or in secant configuration they can form a supporting wall for an excavation pit or cut in the terrain, or block off groundwater. The length, diameter, material, shape and layout of the piles can be varied according to their intended use.

**Methods**

**Kelly Pile**
The kelly-method is used to produce uncased, partially or fully cased or slurry-supported bored piles. The soil is excavated by a drilling tool mounted at the tip of a telescopic kelly bar. When the fully cased pile technique is used, the insection of the full depth casing is simultaneous to the excavation, until the final depth is reached.

**Double Rotary System (DRS)**
The DRS links the CFA-method with the kelly casing method. The result is a fully cased bore, produced by a continuous flight auger (DRS 620, 880 mm). This method is particularly advantageous where the groundwater level is high with the risk of soil collapse.

**Continuous Flight Auger (CFA) Pile**
The CFA-method is a rotary drilling method which permits high drilling performance (CFA 630, 750, 880 mm). This method employs a continuous flight auger as the drilling tool. When the final depth is reached, concrete is pumped from bottom to top through the hollow stem auger. The reinforcement is installed subsequently, where necessary assisted by vibration.

**Full Displacement Pile (FDP)**
The FDP-system has a key advantage over the CFA-method in that it transports virtually no drilling spoil to the surface. It is suitable in displaceable soils. The drill rod has an auger as starter, followed by the displacement body and an extension casing. During drilling and extraction, the surrounding soil is displaced. Concreting and reinforcement is executed as in the case of the CFA-pile.
Diaphragm Wall

Diaphragm walls have a static and / or sealing function and can serve as cut-off walls for dams or excavation pits, as foundations or as enclosures of structures. They are executed as concrete or steel-reinforced concrete walls, built from ground level. They are considered very resistant to deformation and virtually water-impermeable. They are excavated in sections by crawler cranes using suitable diaphragm wall grabs or cutters, with the aid of a stabilizing fluid, between previously fabricated guide walls, which serve primarily to guide the excavator, allow fluctuations in level of the stabilizing fluid and carry temporary loads from the reinforcement or stop end elements. When the final depth is reached, temporary or permanent stop ends are installed in the trench, the stabilizing fluid is desanded and reinforcement cages are installed. Then the concreting is carried out. In the course of excavating the adjoining panel, temporary stop ends are removed for re-use.

Methods

Diaphragm Wall (grabbed)
Two different grab systems, suitable for wall thicknesses of 600 mm to 1500 mm, are available for trench excavation. The grab is lowered into the trench and the soil is discontinuously transported. Larger blocks or sections of rock are punched through, excavated or displaced using modified grabs or heavy-duty chisels. Measuring systems can be installed to verify verticality.

On mechanical grabs, a roller system operates the jaws. To increase the closure force, the closing cable is reeved five to six times.

Hydraulic grabs work with a hydraulic cylinder. They have very high closure forces and work with lower noise and less vibrations than mechanical grabs.

Diaphragm Wall (cut)
Trench cutters are used to produce diaphragm walls in thicknesses of 500 mm to 3200 mm. As they transport the spoil continuously, they are particularly suitable for depths of more than 40 m. Trench cutters operate with two opposite-running cutter wheels which, depending on configuration, are suitable for a wide variety of strata, including even ultra-hard rock. The soil material is cut by the rotation of the wheels, crushed, mixed with slurry and transported to the surface by a suction pump. Hydraulic steering flaps control the cutter in both horizontal directions. The penetration depth and speed are regulated by controlled activation of the cutter weight.
The idea of installing retaining systems without tie-back anchoring is almost inconceivable nowadays. Bauer revolutionized the special geotechnical works with its invention of the ground anchor in 1958. Excavation pits with no obstructive strutting have been the standard ever since. Today ground anchors are used to secure pile walls, sheet piles, Mixed-in-Place walls or diaphragm walls, as well as steep slopes, support embankments and quay walls. Installing ground anchors is a technically elegant, cost-effective and, above all, operationally efficient solution for many construction projects. Whether for temporary or permanent use, in single-rod or strand anchor configuration, in the dry or protecting against pressing groundwater, the Bauer ground anchor is usable in all kinds of soil and in rock. Experienced, continuously trained drilling crews, high-performance special equipment and comprehensive quality control ensure rapid, technically fault-free execution of Bauer ground anchors.

Methods

Temporary anchors, in single-rod or strand anchor configuration, which can be removed fully or partially, are used to secure retaining walls for a maximum of two years. They are quick to install and highly cost-effective. The load-bearing behaviour of each anchor is tested and logged during the acceptance procedure. Strand anchors are delivered to the site in coils, which means they can also be used in tight operating environments.

Permanent anchors are ground anchors usable for longer than two years, and thus part of a permanent structure. Permanent anchors are executed as strand anchors, single-rod corrugated tube anchors or single-rod pressure tube anchors. The steel tendon and anchor head are protected against corrosion by special measures. Each hollow space in the anchor head is filled in with permanently plastic corrosion-proof compound.
Mixed-in-Place and Cutter-Soil-Mixing

Why haul away soil and bring in new materials when the soil can be used for construction? The Mixed-in-Place (MIP)- and Cutter-Soil-Mixing (CSM)-methods developed by the BAUER Group avoid the need for labour-intensive transport coordination, cut costs, reduce emissions and so relieve the strain on residents in the neighbourhood. Both methods offer efficient, cost-effective and environmentally friendly alternatives in the appropriate ground.

Methods

The MIP-method is particularly suitable in non-cohesive soils for the construction of cut-off walls as groundwater or pollution control, for remediating dykes and dams, or for the installation of structural retaining structures to secure terraces in the ground and excavation pits. In the MIP-method, the surrounding soil is broken up with a single or triple auger, turned over and the pores filled in with binder suspension. The individual units are combined to form walls by the step back method. In this, it is the size of the auger(s) which ultimately dictates the unit size. Reinforcing elements can be installed in the fresh MIP-mix for structural strengthening.

The CSM-method combines features of the diaphragm wall technique (page 29) and the MIP-method, as well as offering some additional benefits: the use of modified, high-performance cutters means soil mixing is possible even at very great depths and in very densely packed soils. The method also enables even greater wall thicknesses and higher levels of reinforcement to be attained. Accordingly, in addition to the applications described for the MIP-method, the CSM-method is suitable in particular for securing very deep excavation pits or for reinforcing high dams and dykes.
Continually rising real estate prices mean that even ground with less than adequate load-bearing capacity is becoming ever more attractive to developers. Ground improvement can be achieved by the highly productive methods of vibro-compaction-, vibro-displacement densification, vibro-cast-in-place- or soil stabilization columns. Selection of the most suitable method depends primarily on the ground at the site and on the loads to be carried.

Methods

Vibro-Compaction Densification (VCD)
Granular or weakly cohesive sediments such as gravel and sand often have very uneven layer densities in their natural state. With VCD this can be increased to around 80%. In the process, the soil is “floated” by a water or air flush, the vibrator sinks and a settlement depression is formed at ground level. This is filled with added material. By extracting the vibrator in stages, a compacted zone 2 to 4 m in diameter is created.

Vibro-Displacement Densification (VDD)
In cohesive soils it is not possible to rearrange the grains. In the VDD, the added material is transported directly to the vibrator tip, compacted by multiple displacement stages and pressed into the surrounding soil. This creates a crushed rock or gravel column which improves the surrounding cohesive soil due to the greater rigidity of the installed added material.

Vibro-Cast-in-Place Columns (VCIPC)
The VCIPC-method is efficient and cost-effective in primarily cohesive, and also organic ground with very low load-bearing capacity. Thanks to the use of high-grade pumped concrete, the VCIPC have a high internal strength, regardless of the surrounding ground. VCIPC are classified according to DIN 1054 as unreinforced piles for the transmission of structural loads into deeper ground.

Soil Stabilization Columns
Soil stabilization columns are slim load-bearing elements with a minimum diameter of 15 or 18 cm. A lance is vibrated into the load-bearing horizon or to the pre-determined depth and extracted again. While this is happening, mortar is pumped into the soil under pressure. The soil stabilization columns combine load discharge transfer via skin friction and end-bearing with the effect of additional ground improvement by the full displacement method.
There is a considerable potential for producing energy such as wind, wave and tidal current in the world’s oceans. The forces necessary for anchoring the rotors or turbines have to be transferred safely into the sea bed. Especially when producing energy from tidal current, innovative concepts for drilled pile foundations are called for. But also in the field of wind power, the presently common driven foundation structures are more and more replaced by low-vibration, considerably more silent bored pile foundations, mainly to protect the environment. Particularly for rocky subsoil and high current velocity Bauer has developed a new type of subsea drilling technique and deployed it for the first time when making the foundation for a hydro turbine off the Scottish coast.

**Technique**

The foundation structure consists of a mono pile made of steel with large diameter which is installed by rock drilling and fixed with high-strength mortar. The conditions at offshore sites for tidal power have extreme side conditions. Wind and waves, very strong current of up to 5 m/s whereupon the direction changes periodically, are added by water depths of up to 60 m and rocky sea bed. The underwater drilling rig BSD 3000 is operated from a work boat which is kept into position via a control mode run by GPS. Rotary drilling is applied with full face roller bit and heavy weights with air flush, which hardly affects the surroundings.
Grouting

Grouting is used in specialist foundation engineering to introduce the grout material (water with hydraulic binders and possibly additives) and solutions (soft gel, silicate gel) into the soil. A basic distinction is made between displacement grouting (compaction grouting, hydraulic fracturing) and grouting without displacement of the host material not involving ground displacement (permeation, fissure grouting, bulk-filling).

Methods

Compensation Grouting
Suitable drilling rigs are used to execute spread bores from shafts beneath buildings, fill them with a sleeve grout and install the tubes-à-manchettes. By targeted injection of grout material into the tubes-à-manchette the soil is broken up and pretensioned. Controlled multiple grouting operations, with electronic uplift monitoring of the buildings compensate for settlement.

Compaction Grouting
In the compaction grouting process a comparatively stiff, special mortar is pumped in stages from bottom to top into the mostly loose ground in order to compact it without breaking it up. Probes verify the success of the compaction grouting.

Permeation Grouting
Permeation grouting enables deep-level sealing blankets to be produced in sand and gravel. Single sleeve pipes are vibrated into the ground or installed in bores in a preset grid configuration. Through the valve the grout is injected. In the vicinity of the valves spherical or elliptical grout bodies are created which form a continuous, tight blanket.

High Pressure Injection (HPI)
In order to produce HPI structures a drill string is lowered into the soil. After having reached the necessary depth, an energy-rich liquid jet – water or binding agent suspension – is spread from a horizontal nozzle at the lower end of the drill string. By simultaneously raising and rotating the drill string the liquid jet erodes the soil, thus flushing out part of it. The injected binding agent strengthens the remaining soil. A cylindrical soil-concrete structure is formed.
Micropiles

Micropiles serve to introduce compression loads into the ground or to transfer tensile forces (such as created by uplift). They can be installed in any soil types as well as in rock and transmit the force into the soil by skin friction and/or end-bearing. Commonly applied execution methods are drilling and driving with percussion or vibration, if necessary using ultra-compact equipment which permits working in tight spaces. This means micropiles can also be installed within existing buildings.

Method

Depending on requirements, micropiles are deployed as single piles, pile groups or walls on new-build, renovation or building reconstruction projects. Bauer produces micropiles with diameter from 114 mm to 300 mm, using cased or uncased drilling techniques. The pile shaft is made of cement slurry, mortar or concrete. The external load-bearing capacity can be increased by single or repeated multiple grouting. Internal load-bearing capacity is safeguarded by means of bearing elements comprising single rods, rod groups, casings, profiles or reinforcement cages.
Carefully thought-out planning is essential to cost-effective construction. The Design Department of BAUER Spezialtiefbau GmbH carries out all necessary steps, from the initial draft through to highly complex geotechnical site surveys and provides state-of-the-art design software and useful databases. Whether at head office or in the planning offices of the company’s subsidiaries, the Design Department offers a package of design services all from a single source, in the form of feasibility studies, preliminary designs, advance surveys, alternative concepts, or complete execution planning. All its services are based on extensive specialist foundation engineering know-how and long experience in the execution of foundations and excavation pits.
Passion for progress is the Bauer slogan – and the Technical Services Department of BAUER Spezialtiefbau GmbH is a living example of this spirit. As an in-house service provider, the department supports the branch offices and subsidiaries in all geotechnical, measurement and building materials technology matters, especially when innovative solutions are called for. Highly qualified technicians and engineers analyze building materials and conduct quality and suitability testing or quality control of concrete, suspensions or other materials. Its work incorporates loading tests of a wide variety of kinds, such as pile- and anchor tests, as well as geotechnical or geodetic surveys carried out under the toughest conditions. It carries out intensive research and development in cooperation with leading universities, institutes and consulting engineers in order to ensure a constant flow of new developments and to continually optimize existing products and techniques.
Health and Safety
Safety on construction sites is vital in order to maintain high levels of concentration and efficiency. Bauer Spezialtiefbau staff is highly trained, undergo regular refresher courses to keep their skills and know-how up to date and use thoroughly serviced equipment. The health and safety management system employed by Bauer Spezialtiefbau is routinely certified to OHSAS standard.

Quality Management
Specialist foundation engineering products play a key role, but are for the most part hidden away. The certified quality management system of the BAUER Group ensures that clearly defined yet highly flexible processes are implemented globally throughout the Group – from order acquisition and processing through to after-sales. This learning, continuously improving system guarantees the customers of the BAUER Group absolute top quality.

Environmental Management
The construction industry inevitably has an impact on the environment. The challenge faced by all construction companies is to keep any such impact to a minimum. BAUER Spezialtiefbau GmbH operates an EMAS-certified environmental management system and submits itself to environmental auditing procedures. Bauer Spezialtiefbau is also committed to collaborative, efficient working practices in the execution of its projects, which further helps to conserve resources.

Ethical Management
BAUER Spezialtiefbau GmbH has established a binding programme of values. As a founding member of the German construction industry’s ethical management association EMB Wertemanagement Bau e.V., it requires its employees to act in a manner conforming to the highest ethical standards. The ethical management practices of BAUER Spezialtiefbau GmbH are routinely audited and regularly recertified.