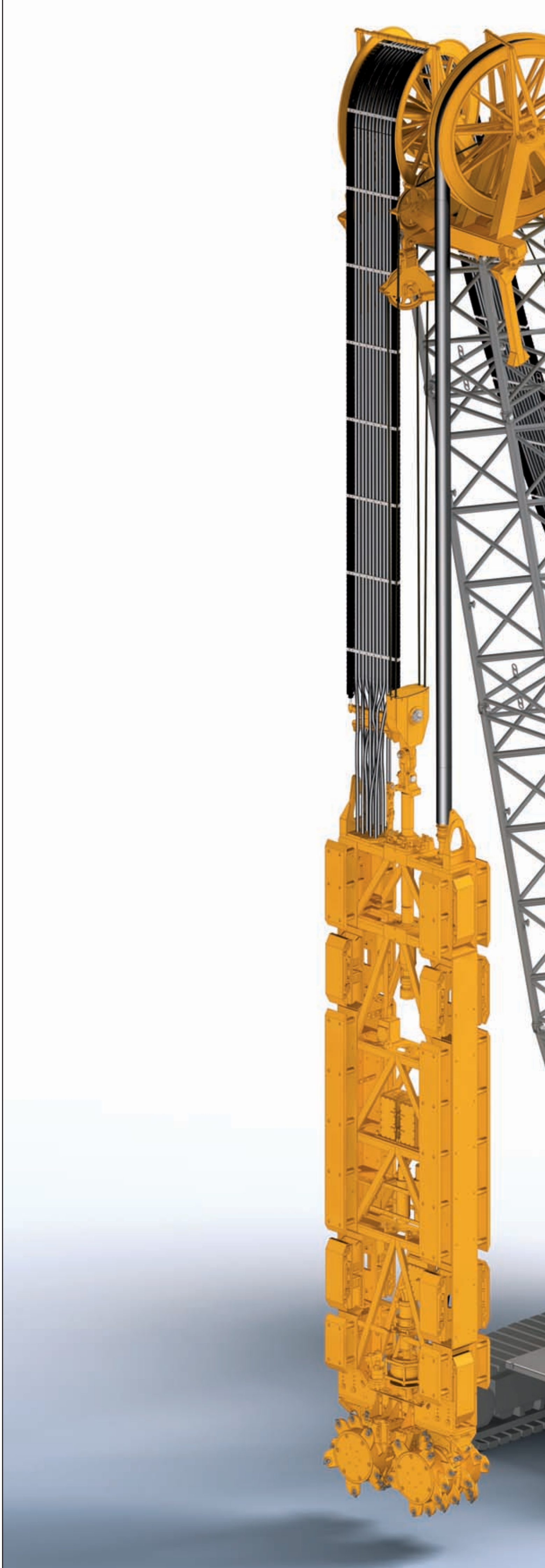
BAUER Trench Cutter Systems

BC System

BAUER

Content



BAUER trench cutters have revolutionized diaphragm wall technology for over 30 years

No other foundation engineering process has changed civil engineering more significantly since the mid-1980s than the development of the diaphragm walling technique especially with the introduction of the trench cutter technology.

In the autumn of 1984, Bauer began the first large-scale diaphragm wall project with its own diaphragm wall cutter. The use of trench cutters resulted in pushing the boundaries of this technique continuously further and further. Ever increasing wall thicknesses became possible and the technique was able to advance into ever greater depths after the long hoses had been transferred onto vertically mounted hose reels. The use of steering plates and improved measuring techniques enabled cutter verticality to be steadily improved to ever greater levels of accuracy. Since the mid-1990s, the challenge of cutting into extremely hard rock formations has been met.

Since then, cutter technology has developed rapidly. Bauer Maschinen demonstrated its creativity and strength particularly whenever trench cutters had to be adapted to specific requirements. Bauer trench cutters have repeatedly been employed on challenging projects. Typical examples are the construction of a 70 m deep cut-off wall in the Indian Himalayas, or the installation of cut-off walls to a depth of 120 m with boulders and hard rock at the Peribonka hydro-electric power plant in Canada.

Bauer trench cutters have operated in temperatures of minus 30 degrees Celsius as well as plus 40 degrees Celsius. They have been deployed successfully in remote regions near the Arctic Circle, as well as in vibrant city centers of capital cities such as Hong Kong, Tokyo, Torino or Moscow.

More than 300 BAUER trench cutters around the world demonstrate the success story of the BAUER cutter system, which began in 1984.

Milestones in the development

1984
1^{st} trench cutter BC 30
cut-off wall at Brombach
Reservoir, Germany, depth 40 m,
in medium hard sandstone

1991
Compact cutter MBC 30
in operation in Taiwan

1988
Medinah, Saudi Arabia
trench cutter constructing diaphragm
walls totalling 300,000 m^2

1993
A Bauer trench cutter is deployed
from an exploration vessel off the
coast of South Africa for the
exploration of diamond deposits
in water depth of 150 m

1985 **1990** **1995**

1986
BC 30 on site at the Louvre,
Paris (France)

1987
Diaphragm wall at the Natural
History Museum, Vienna (Austria)
with BC 30 trench cutter

1993
The steering plate system ensures
that, on a project in Japan, the
horizontal deviations at a depth of
100 m amount to just 2 cm

1994
Development of the BC
50 cutter generating a
torque of 120 kNm

2001
Cut-off wall for Diavik diamond mine near the Artic Circle in Canada using a BC 40 trench cutter

2002
BC cutter attachment on a BG 28 rotary drilling rig fitted with the new HSS Hose Synchronization System

2003
“Tunnel Cutter“ for 80 m deep cut-off wall from inside a tunnel with a clear height of just 6 m at the Yeleh Dam project in China

2004
BAUMA 2004:
Handover of the 100^{th} trench cutter to a customer

2005
BC 50: Cut-off wall under extreme geological and geometric conditions to a depth of 120 m (Peribonka in Canada)

2008
Serial number 200
Trench cutter BC 40
Diaphragm wall in Greece

2010
A BC 40 trench cutter mounted on an MC 128 base machine is constructing a shaft for recovering a tunnel boring machine in Cairo (Egypt)

2012
Serial number 300
Trench cutter BC 40
Sylvenstein Reservoir, Germany

2013
Trench cutter BC 35
Bauma Munich, Germany

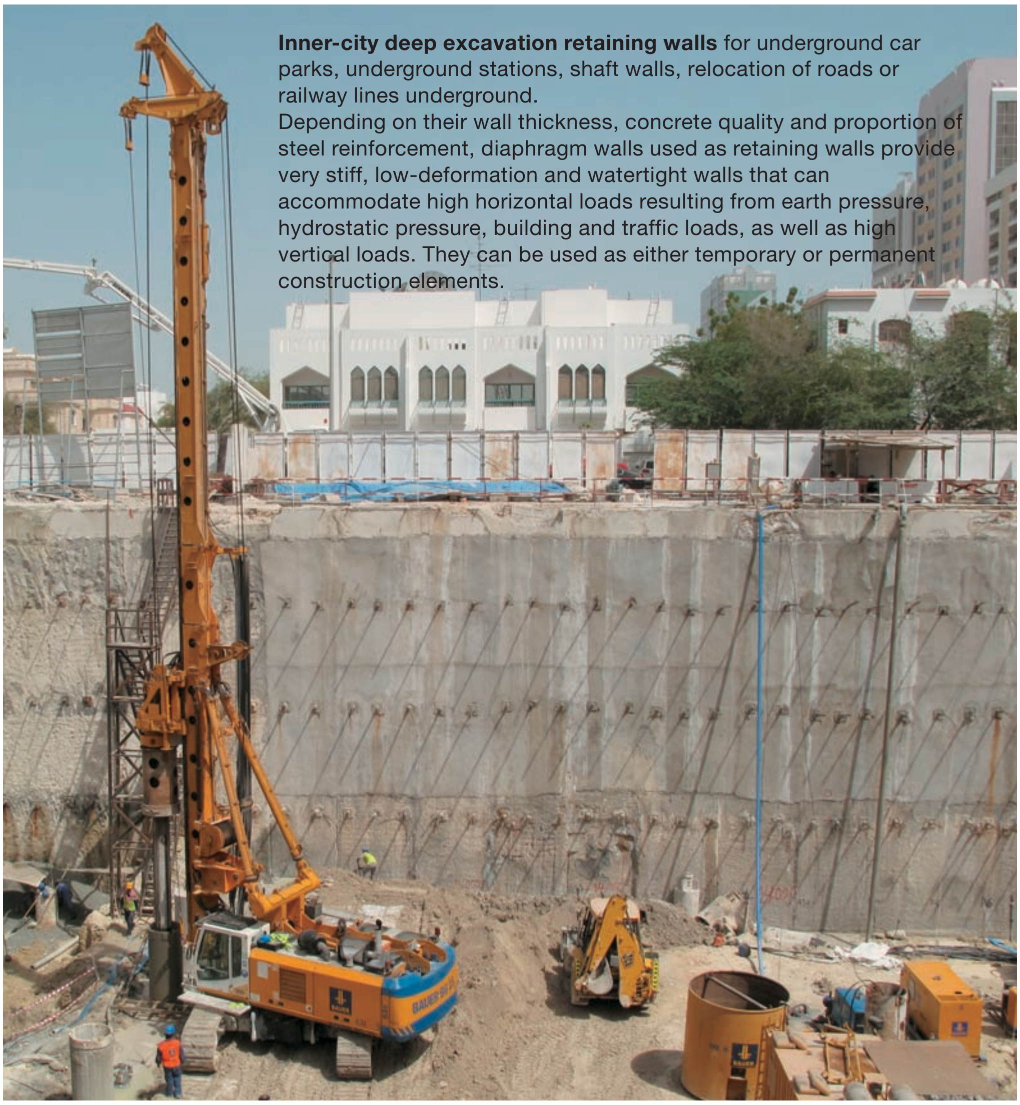
2000 **2005** **2010** **2015**

Scope of application

Diaphragm walls have become a standard specialist foundation engineering technique. The basic construction principles have remained unchanged since its industrial application approximately 60 years ago.
A continuous wall is formed by a series of individual rectangular panels. During the excavation, the open trench is stabilized and supported by a thixotropic slurry. A reinforcement cage is subsequently lowered into the open trench, if required, and concrete or a self-hardening impervious soil-bentonite mixture is placed in the trench by tremie pipe to prevent segregation of the concrete. As the concrete fills the trench from the bottom up, it displaces the lighter bentonite support slurry, which is pumped out from the top of the trench, cleaned and recycled for reuse as support slurry for a new wall panel. After the concrete has hardened in-situ, the secondary panel between two adjacent primary panels is excavated and filled with concrete. When using diaphragm wall grabs, a temporary stop end is placed at each end of the panel to form a watertight joint between adjacent panels.
The grabbing technique usually reaches its practical limitations at depths of 40 to 60 m. Additionally, when using non-steerable grabs, vertical deviations of up to 2% can be expected. Excavation in hard soil formations is difficult, whilst excavation in rock is virtually impossible.
All these restrictions have been overcome by the introduction of the trench cutter technology, resulting in a significant extension of the range of applications.

Diaphragm wall applications

The range of available cutter systems is now so varied and technically advanced that diaphragm walls can provide structurally sound and cost-effective solutions for the most diverse construction projects even in restricted site conditions, at great depths and in hard soil formations. The different applications can be summarized under two main headings:



Inner-city deep excavation retaining walls for underground car parks, underground stations, shaft walls, relocation of roads or railway lines underground.
Depending on their wall thickness, concrete quality and proportion of steel reinforcement, diaphragm walls used as retaining walls provide very stiff, low-deformation and watertight walls that can accommodate high horizontal loads resulting from earth pressure, hydrostatic pressure, building and traffic loads, as well as high vertical loads. They can be used as either temporary or permanent construction elements.

Underground sealing (cut-off walls) for water retaining structures. This reduces or eliminates seepage below dams and thus minimizes water loss and increases the stability of dams. For cut-off walls it is of paramount importance to use slurry mix designs that take account of the particular conditions of the project. Watertightness, plasticity and erosion resistance are the most important criteria. Ideally, the base of a cut-off wall should be keyed into an underlying impermeable soil or rock formation (clay layer, bedrock).

Types of wall

- **Reinforced in-situ concrete walls**
  (two-phase system)

- **Cut-off walls constructed by the single-phase process**
  In this process the support fluid, which is pumped into the trench during the excavation stage, consists of a bentonite-cement slurry that remains in the trench after completion of the excavation and forms a self-hardening barrier inside the trench.

- **Cut-off walls constructed by the two-phase process**
  For a two-phase cut-off wall, the soil material is first excavated generally under bentonite slurry. The support fluid is subsequently cleaned and then replaced in a second phase by the actual barrier material (plastic concrete, self-hardening soil-bentonite mixture) which is placed in the trench by the tremie pipe process.

- **Cutter Soil Mixing variant**
  During application of the Cutter Soil Mixing process, the soil material is first loosened during penetration of the cutter

and then mixed with cementitious slurry as the cutter head is withdrawn. If necessary, reinforcement cages can be subsequently installed using a vibrator. (For further details of this process see our brochure 905.656.1)

BAUER trench cutter system

Powerful and versatile

The construction of deep diaphragm walls using BAUER trench cutters is a technique with maximum performance even in extremely demanding conditions.
It offers significant advantages compared with conventional diaphragm wall techniques (diaphragm wall grab)

Proven technique

Applicable in all soil conditions

Cost-effective operation

Excellent trench verticality

Reliable joint construction

Low noise and vibration emission

Easy spoil handling

Operator-friendly controls

World-wide service

Efficient and reliable

Proven technique
The BAUER trench cutter technique offers a high level of reliability based on more than 30 years of experience with over 300 cutter units sold worldwide.

Applicability in all soil conditions
Various types of cutter wheels and the use of a “flipper tooth” system enable Bauer trench cutters to be deployed in all types of soil including socketing the wall into hard rock formations.

Cost-effective operation
with high and constant average production outputs, particularly for great depths and hard soils by using well-proven and tested components.

Excellent trench verticality
is ensured by the design of the cutter with its elongated steel cutter frame and by carrying out continuous real-time inclination measurements (B-Tronic) throughout the excavation process. The inclination of the cutter frame can be corrected continually by a computer-controlled steering plate system.

Reliable joint construction
Cutting into the concrete of adjacent primary panels is a proven, reliable and simple joint construction technique. “Overcut joints“ can be used for all diaphragm wall depths. The cutter system can optionally also be combined with prefabricated joint systems.

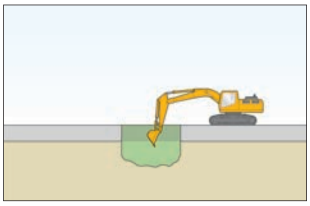
Low noise and vibration emission
The excavation of trenches in the immediate vicinity of sensitive buildings and structures is possible.

Easy spoil handling
The closed bentonite slurry circulation causes only low-level contamination during the construction process. Due to the removal of solid particles from the support fluid in the mud treatment plant, the excavated material can simply be moved off site by lorry.

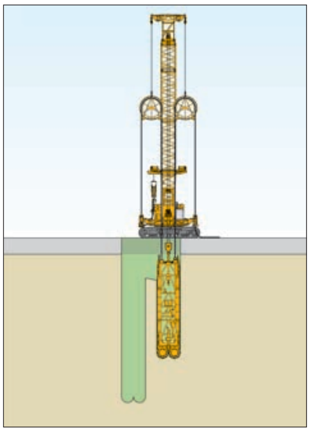
Operator-friendly controls
Ergonomically designed, sturdy and site-oriented operating controls with clear, easy to understand display.

Work sequence

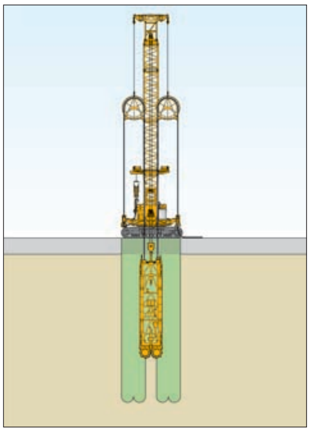
Construction of a diaphragm wall with the cutter system proceeds in a continuous work process alternating between primary panels and intermediate secondary panels.



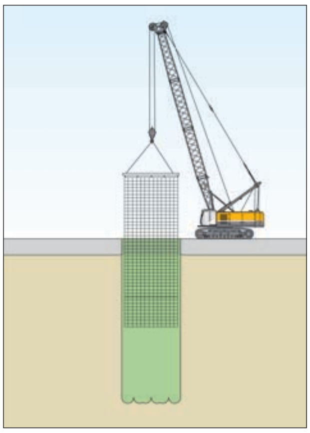
Guide wall and preexcavation



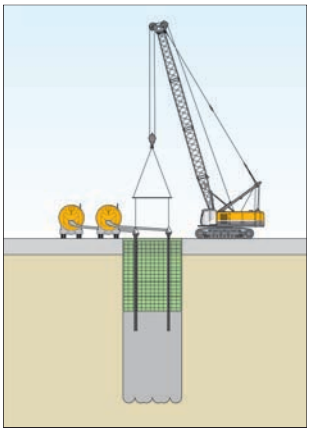
Cutting of primary panel



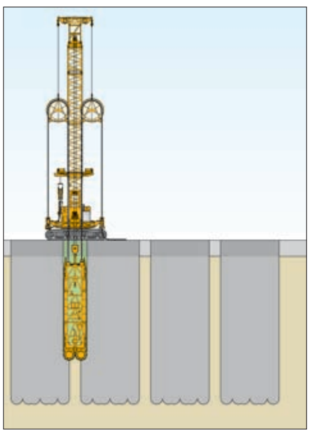
Cutting of primary panel



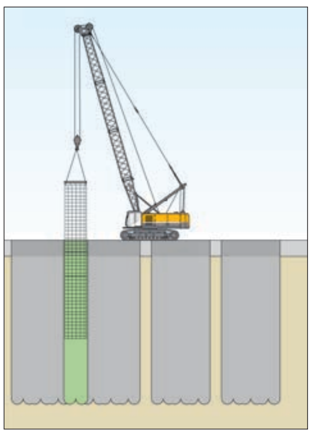
Installation of reinforcement



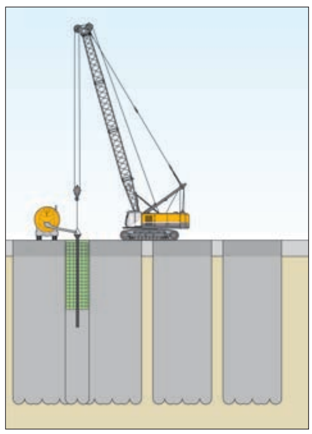
Concreting of primary panel



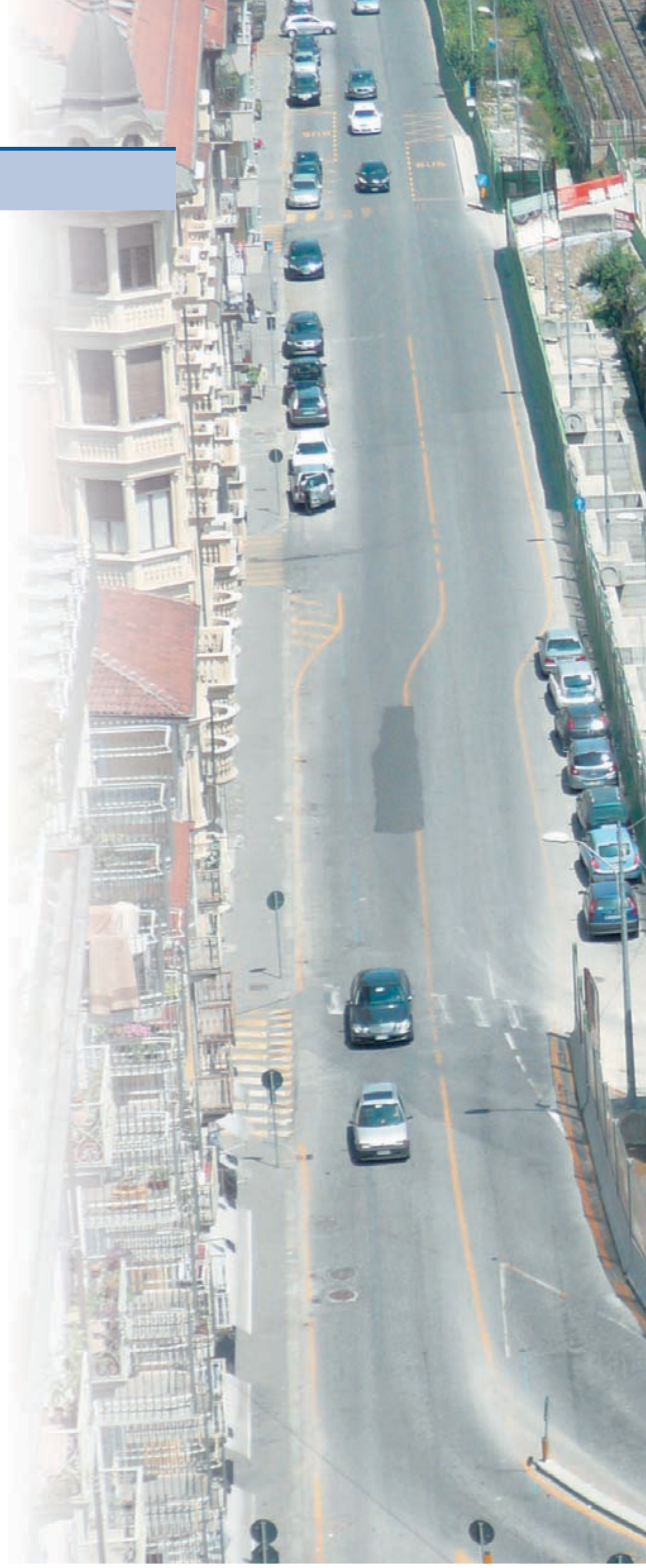
Cutting of secondary panel

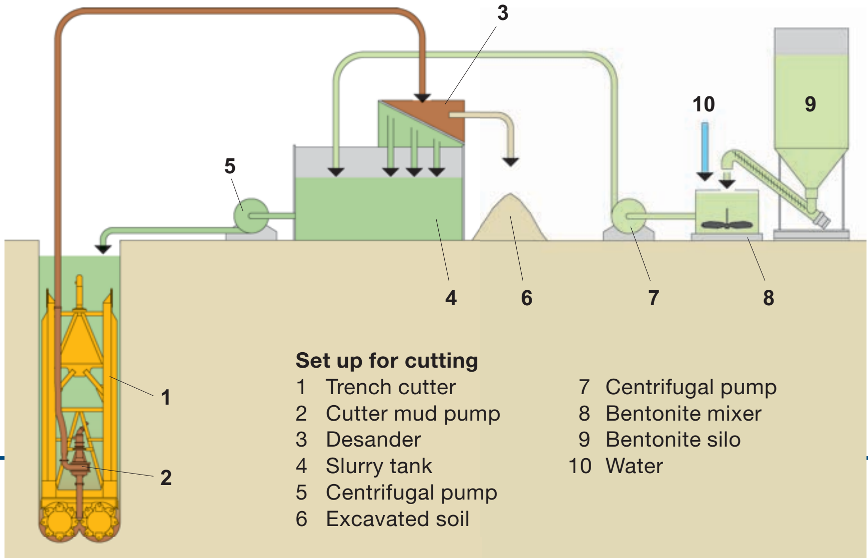


Installation of reinforcement



Concreting of secondary panel





During the cutting process, soil material is continuously loosened, broken down and mixed with the support fluid. The slurry charged with soil material and cuttings is pumped to the surface by the mud pump and conveyed to the desanding plant via a ring main. There, the slurry is cleaned and subsequently re-circulated into the trench.

Work sequence

Guide wall

Guide walls are generally constructed as in-situ concrete structures. They ensure the horizontal continuity of the diaphragm wall. In addition, they support the upper section of the trench, particularly with regard to adjacent plant and traffic loads. Guide walls are also used to absorb the weight of the reinforcement cage during installation and to place the trench cutter in its exact position with the help of the guide frame.

Pre-excavation

Before starting the cutter operation, the mud pump of the trench cutter must be fully submerged in the bentonite slurry. This requires pre-excavation of the trench by grab or long-reach hydraulic excavator.

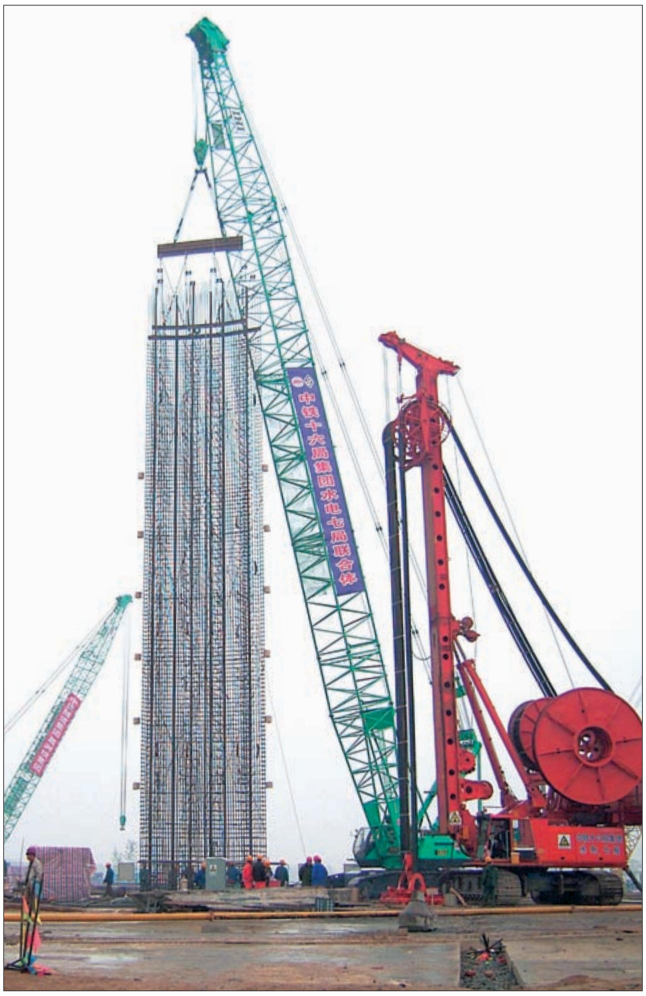
Excavation of primary panel

The minimum length of a primary panel is 2.8 m or 3.2 m depending on the type of equipment used. In sufficiently stable soils the primary panel can be constructed in multiple bites. They are constructed by first excavating two independent main bites followed by an intermediate center bite. This produces a multiple bite panel with an overall length of 6.5 m to 8.0 m.

Multiple bites are also used for constructing diaphragm wall panels for walls with complex layouts. (e.g. L-shaped corner panels or T-shaped buttress panels to increase the wall stiffness.)

Cleaning the slurry

Prior to placing concrete, the support fluid must be cleaned so that the specified parameters, such as density, sand content, viscosity and pH-value, are complied with before commencing concreting. This is achieved by circulating the slurry, which is pumped from the bottom of the trench either with the mud pump of the cutter or an external high-capacity submersible pump, through the mud regeneration plant until the specified parameters are met.
Alternatively, it is also possible to replace the charged slurry completely with fresh support fluid.



Installation of the reinforcement cage

The reinforcement cage is placed in the trench either as one complete cage – subject to the availability of adequate cranage – or in sections spliced together. The cage is suspended from the guide wall.
In addition to the main steel reinforcing bars, cages are also fitted with tie-bars to provide connection points, spreader forks, spacers, box outs for anchor installation or for wall connections, and unobstructed channels for tremie pipe installation.
During concreting, spacers made of concrete, PVC or steel ensure that the reinforcement cage stays in the correct position and that the specified minimum concrete cover is maintained.

Concreting

The concrete is placed into the trench by tremie pipes. As the concrete flows out of the bottom of the tremie pipes, it displaces the lighter bentonite slurry which is pumped out from the top of the trench and recycled for reuse in a new trench excavation.
Depending on the length of individual panels, one to three sets of tremie pipes are installed for placing concrete concurrently.

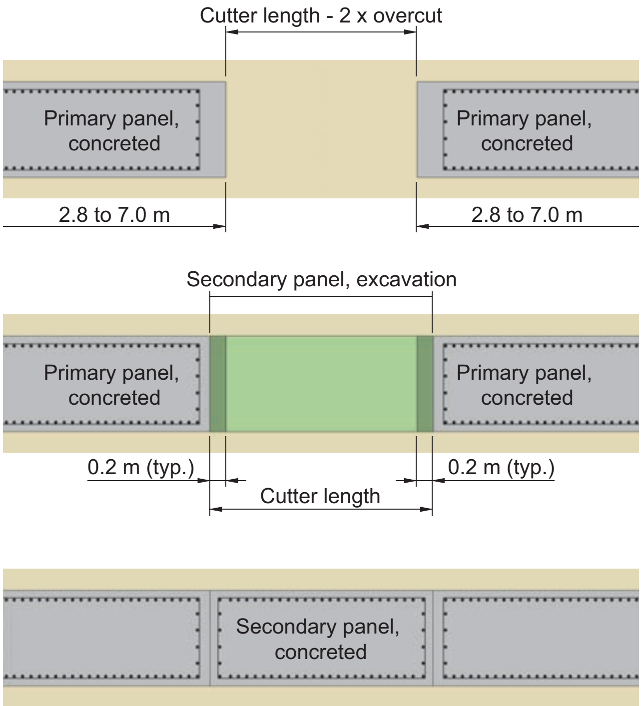
Excavation of secondary panel

A secondary panel formed between the primary panels is constructed in a single bite.
A specific characteristic feature of the cutter technology is its ability to produce a clean construction joint connection with the primary panels during excavation of the secondary panel (“overcut joint”).
After the specified depth has been reached, the bentonite slurry in the trench is regenerated, the reinforcement cage is inserted and concrete is placed into the secondary panel by tremie pipes.

Work sequence

Joints

The formation of secure and simple construction joint systems is a fundamental requirement in the construction of continuous monolithic walls. The “overcut joint“ is the standard design for construction joints when diaphragm wall cutters are employed.



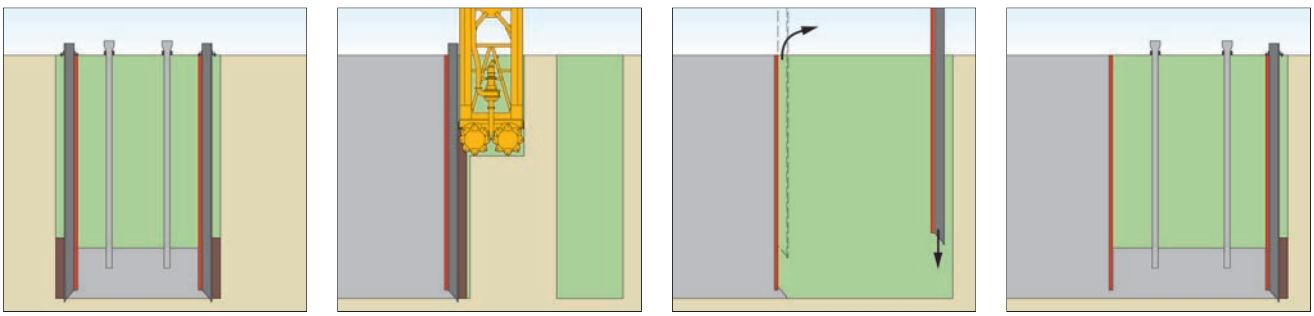
Overcut joint

Here, the concrete of the two adjacent primary panels is overcut by the cutter wheels. The depth of the overcut (overlap width) is primarily dependent on the depth of the trench. Overlap widths usually range from 150 mm to 250 mm. The result is a rough and clean contact surface. Without using artificial construction joint elements, overcutting produces high-quality joints which are capable of transmitting shear forces and are sufficiently watertight. The system can be applied safely for all trench depths.

Joint system constructed from concrete or steel

The cutter system can also be combined with prefabricated joint systems. Prefabricated reinforced concrete or steel elements are both used as construction joint elements. The elements can be linked together to form a continuous vertical string. Their watertightness can be enhanced by fitting rubber water bars into the elements.

Prefabricated elements can be used as permanent construction elements that remain in the ground as integral parts of the completed wall.
When using prefabricated joint elements, the panels are normally excavated in a consecutive sequence.
After the concrete of the previously completed panel has set sufficiently, the steel beams are extracted.

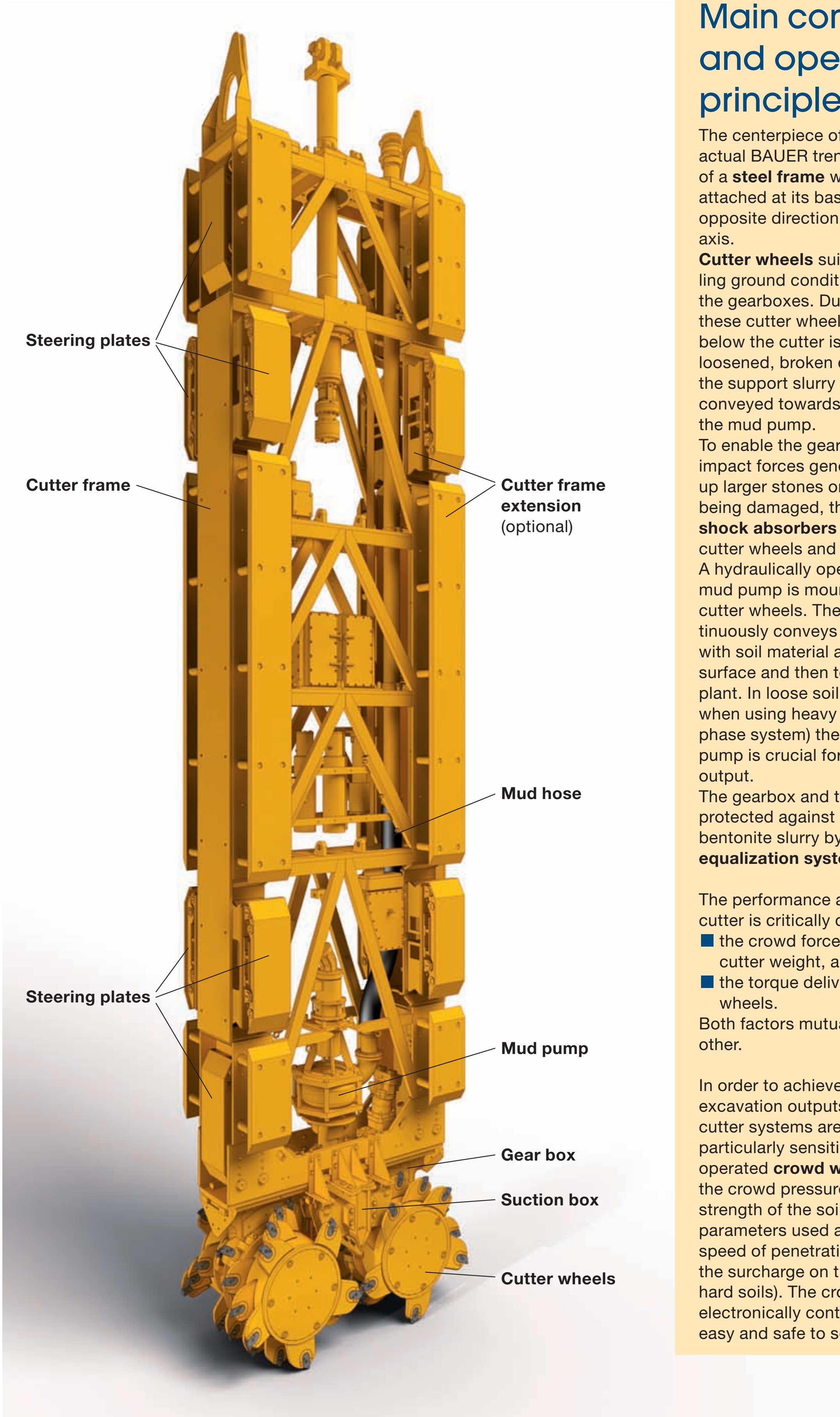


Components of the cutter system

The BAUER cutter system consists of several independent components which are matched to each other in line with the planned application, the cutting depth and the soil type.

The main components are:

Trench cutter
Cutter control
Rotation device
Hose guide system
Base Machine



Main components and operating principle

The centerpiece of the system, the actual BAUER trench cutter, consists of a **steel frame** with two **gearboxes** attached at its base, which rotate in opposite direction about a horizontal axis.
Cutter wheels suitable for the prevailing ground conditions are mounted on the gearboxes. Due to the rotation of these cutter wheels, the soil material below the cutter is continually loosened, broken down, mixed with the support slurry in the trench and conveyed towards the suction inlet of the mud pump.
To enable the gearboxes to absorb the impact forces generated by breaking up larger stones or cobbles without being damaged, they are protected by **shock absorbers** mounted between cutter wheels and gearbox.
A hydraulically operated centrifugal mud pump is mounted just above the cutter wheels. The **mud pump** continuously conveys the slurry, charged with soil material and cuttings, to the surface and then to the treatment plant. In loose soil formations and when using heavy slurries (e.g. single-phase system) the capacity of the mud pump is crucial for the excavation output.
The gearbox and the mud pump are protected against damaging ingress of bentonite slurry by a **pressure equalization system.**

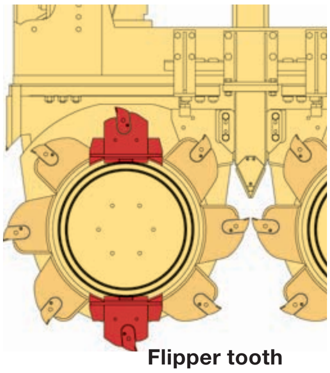
The performance and output of a cutter is critically dependent on:
- the crowd force signified by the cutter weight, and
- the torque delivered by the cutter wheels.

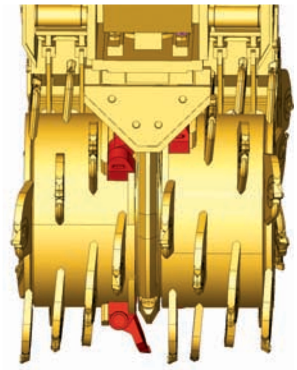
Both factors mutually influence each other.

In order to achieve optimum excavation outputs, BAUER trench cutter systems are provided with a particularly sensitive electronically operated **crowd winch** for controlling the crowd pressure. Depending on the strength of the soil, the control parameters used are either the cutter's speed of penetration (in light soils) or the surcharge on the cutter wheels (in hard soils). The crowd system is electronically controlled and therefore easy and safe to setup and adjust.

Cutter wheels

Cutter progress is heavily dependent on the soil conditions, so the selection of the most suitable type of cutter wheels is essential. On all BAUER trench cutters the ridge forming below the shields, is cut by a patented flipper tooth.
BAUER cutter wheels are available in a variety of sizes to enable cutting of different widths of trenches.
Additionally the suction box and the cutter frame have to be adapted to the required trench width.


Flipper tooth

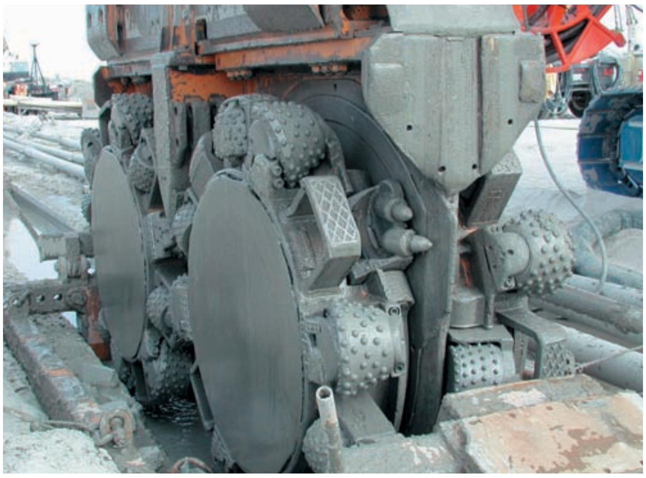


Standard cutter wheel

Standard cutter wheels are primarily used in mixed soils. They are equipped with a large number of differently shaped tungsten carbide-tipped teeth. The available selection ranges from aggressive cutter teeth through to impact teeth. Long teeth holders enable easy replacement. Reamer plates, attached to the suction box, remove any spoil between the tooth holders, particularly in cohesive soils.

Round shank chisel cutter wheel

Primarily designed for cutting cemented sands, conglomerates, cobbles and weathered rock, these cutter wheels are equipped with special round shank chisels.
The teeth arrangement on the wheel ensures cutting of the whole cross-section area to enable constant cutting progress even in challenging geotechnical conditions.



Roller bit cutter wheel

The roller bit cutter wheel has been developed for extremely hard rock formations (qu > 120 MPa).
The roller bit arrangement on the wheel ensures cutting of the whole cross-section area.
The higher necessary loads for the roller bits are generated by additional ballast fixed to the cutter frame.

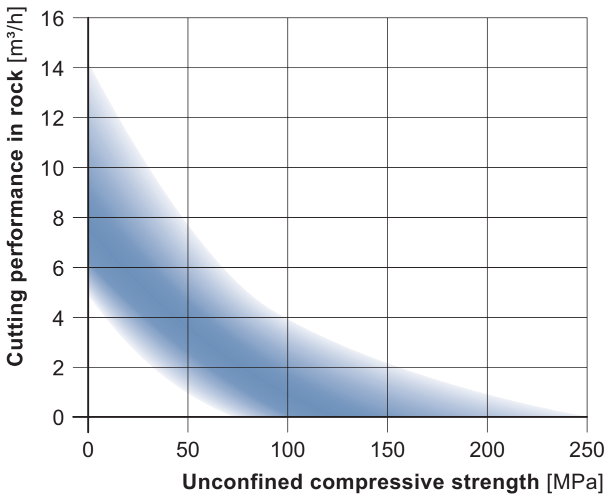
Hybrid cutter wheel

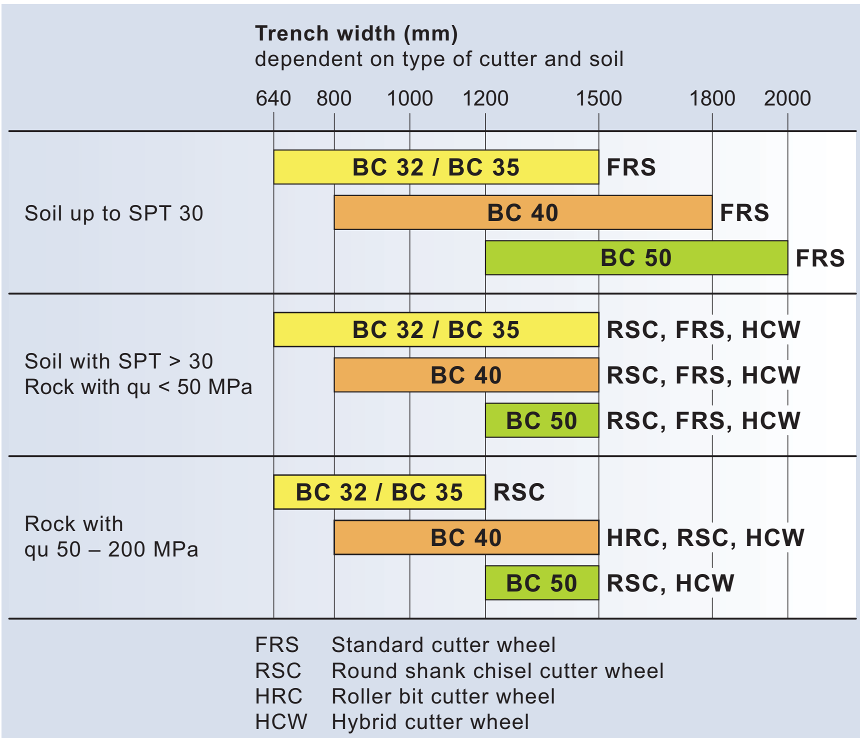
The hybrid cutter wheel is equipped with a combination of round shank chisels and flat teeth in a regular pattern. Its main use is cutting through non-cohesive or cohesive overburden soil followed by socketing into hard soil or rock.

Trench cutter types

The standard trench cutters **BC 32, BC 35, BC 40 and BC 50** are of similar construction. Their essential characteristic features are:

- Rigid main cutter frame
- Shock absorber between gearbox and cutter wheels (patented)
- Pressure equalization on all key components (patented)
- Watertight seals on all electrical boxes
- Verticality control by individually controlled steering plates (optional)
- Inclinometers for measuring the inclination in x- and y-axis
- Gyroscope for measuring the rotation about the z-axis (optional)
- High tooth forces due to the high torque generated by the gearboxes
- Crowd control by way of a separately operated winch system
- B-Tronic control and visualization system with touch-screen terminal
- B-Report evaluation software for data visualization and production of cutter reports





Disclaimer:
The diagrams are based on experience from completed construction sites. Values represent no legally binding assurance or warranty for future projects.
The final selection has to be made by the end-user, based on the type and weight of the cutter, the type of cutter wheels and above all on the detailed knowledge of ground conditions (such as grain size distribution, relative density, degree of cementation, abrasiveness, amount and distribution of fissures, compressive strength).

BC 35

BC 40

BC 50

	BC 32	BC 35	BC 40	BC 50
Gearbox	2 x BCF 8	2 x BCF 9	2 x BCF 10	2 x BCF 12
Torque max.	81 kNm	91 kNm	100 kNm	120 kNm
Speed of rotation	0 – 25 rpm	0 – 25 rpm	0 – 25 rpm	0 – 25 rpm
Cutter length	2,800 – 3,200 mm	2,800 – 3,200 mm	2,800 – 3,200 mm	2,800 mm
Cutter width	640 – 1,500 mm	640 – 1,500 mm	800 – 1,800 mm	1,200 – 2,000 mm
Overall height	9.5 m	12.6 m	12.6 m	12.7 m
Max. delivery rate, mud pump	450 m^3/h	450 m^3/h	450 m^3/h	450 m^3/h
Delivery pipe	Ø 152 mm	Ø 152 mm	Ø 152 mm	Ø 152 mm
Weight	22.5 – 34 t	27.3 – 40 t	32.5 – 41 t	≥ 48 t

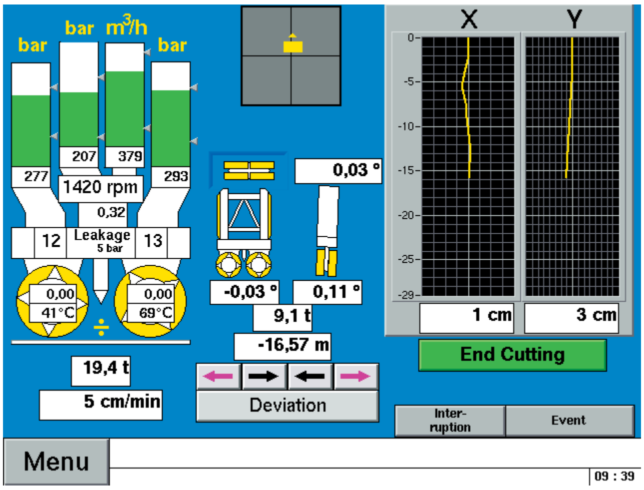
Cutter control

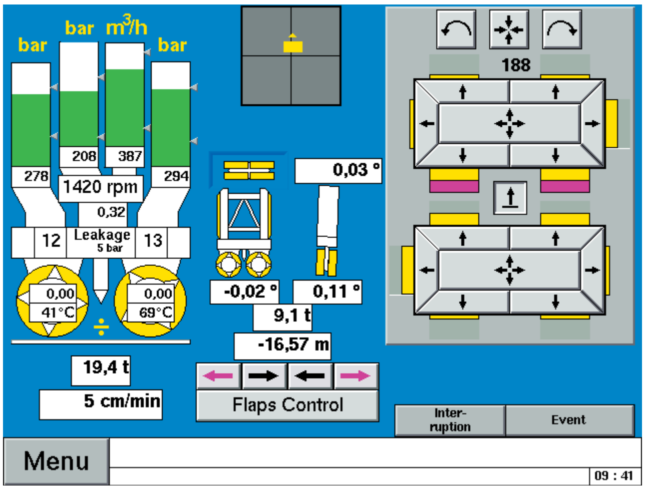
B-Tronic

The B-Tronic system developed by Bauer Maschinen is an integrated system for controlling all cutter operations and visualizing actual operating parameters in real-time on a large interactive touch-screen monitor. The following operating parameters are displayed:

- Actual cutter depth
- Speed of rotation and hydraulic oil pressure of each cutter gearbox
- Speed of rotation and hydraulic oil pressure of mud pump
- Delivery volume of mud pump
- Crowd pressure on cutter teeth
- Penetration rate
- Inclination of trench cutter and computed deviations in x- and y-axis (digital and graphic)
- Internal gearbox pressure
- Gearbox temperature
- Residual pull on crowd winch (surcharge)

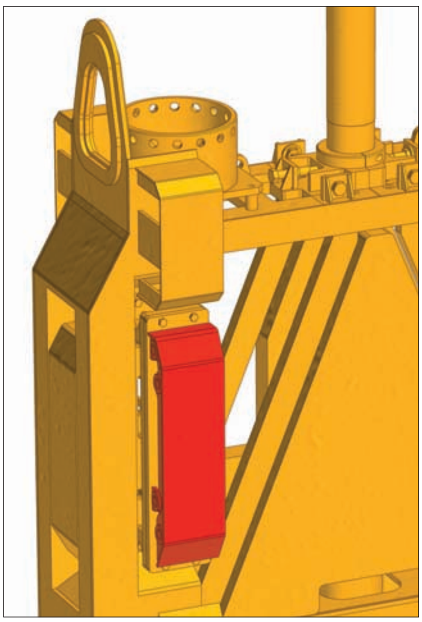
In addition to these basic operational data, general machine operating parameters (e.g. engine data) are also acquired and monitored. The display of current machine operating states and error messages is a valuable aid for targeted and effective fault finding by service personnel on site, but also by specialists based at our main factory or in subsidiaries.

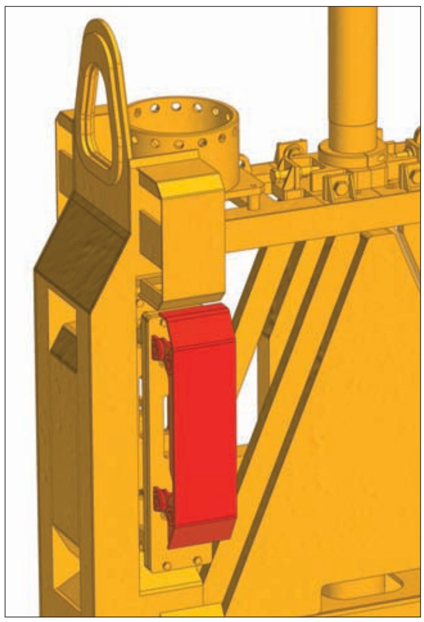




Verticality control

An inclinometer, which is integrated into the main cutter frame, measures the inclination of the cutter frame continually in both x- and y-axis. Throughout the cutting process, the inclinations are continuously displayed in degrees on the screen inside the operator cabin.
A gyroscope can also be fitted to measure the rotation of the trench cutter about its vertical axis.
If the cutter deviates from its vertical direction, then the position of the cutter can be adjusted in longitudinal and transverse direction of the trench with 12 individually controlled steering plates.
Deviations in longitudinal direction of the trench axis can be further corrected by adjusting the rotation speed of the cutter wheels.

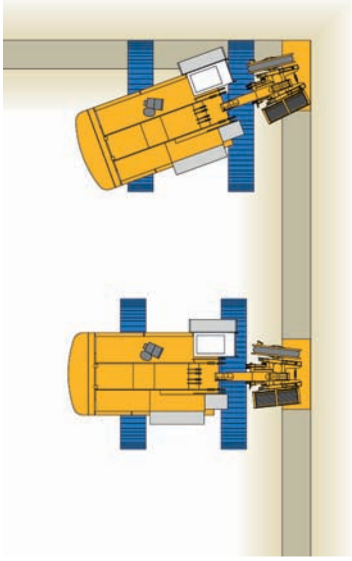




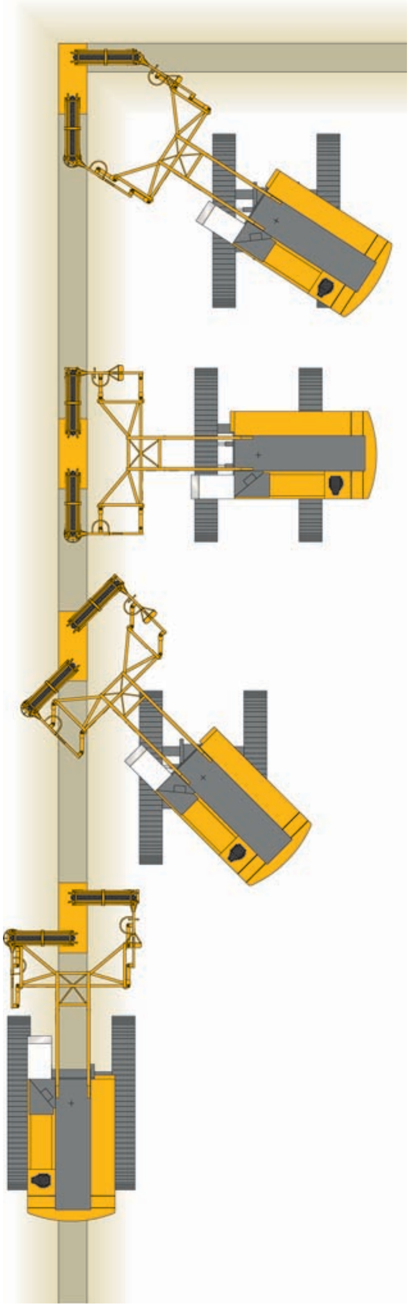
Rotation device

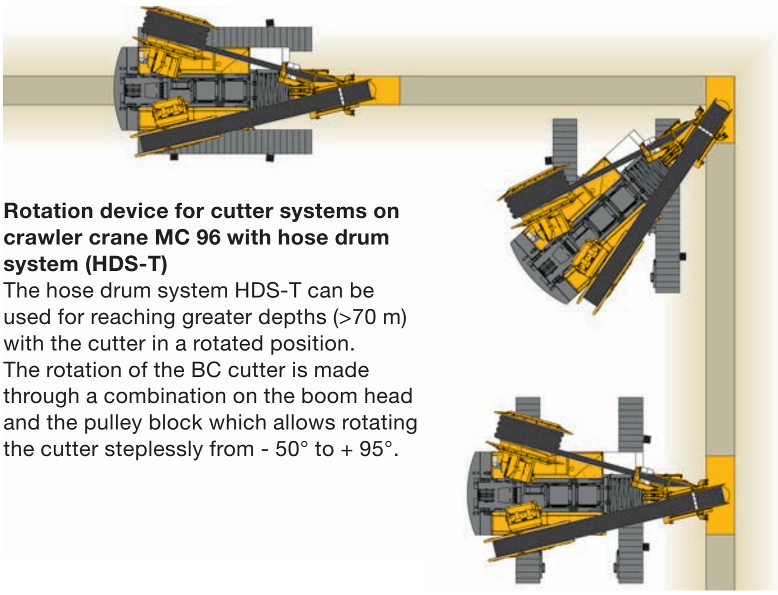
The cutter is generally aligned perpendicular to the upper carriage of the base machine. For the construction of corner wall panels for excavation pits or when operating on narrow embankments, the cutter has to be rotated and aligned with the base machine.

Rotation device for cutter systems equipped with HDS, HSS
For cutter systems equipped with drag chain hose carriers, the cutter frame is rotated in the trench relative to the hose carrier. The maximum rotation angle is dependent on the trench width and amounts to around 20° for a trench width of 1,000 mm.



Rotation device for cutter systems equipped with a single hose guide wheel system (HTS)
For cutter systems equipped with a HTS system, rotation of the hoses is achieved by parallelogram frames mounted at the boom head and the base of the boom. With this device the cutter can be rotated by up to 90°.
Additional foldable hose guide rollers attached at the guide wall can guide the hoses into the center of the trench.





Rotation device for cutter systems on crawler crane MC 96 with hose drum system (HDS-T)
The hose drum system HDS-T can be used for reaching greater depths (>70 m) with the cutter in a rotated position.
The rotation of the BC cutter is made through a combination on the boom head and the pulley block which allows rotating the cutter steplessly from - 50° to + 95°.

Hose guide systems

Both the mud hose and the hydraulic hoses must follow the cutter into the trench under constant tension. The original system of hose guide wheels and constant tension winches becomes uneconomical for greater trench depths, due to the length of the boom and the correspondingly heavy base machine. For deep trenches and for the construction of trenches in confined areas, the hoses can be coiled up. The hydraulic hoses – and for greater depths also the mud hoses – can be carried in special drag chain hose carriers for strain relief.

HTS (Hose tensioning system)

The mud hose and the hydraulic hoses are lowered into the trench by guide wheels. The guide wheels are suspended on constant-tension winches which keep the hoses uniformly tensioned. The achievable cutter depth is equivalent to twice the available travel of the guide wheels.
The required capacity of the base machine is determined by the weight of the cutter and the height of the boom.

HDS (Hose drum system)

Coiling mud and hydraulic hoses onto two large hydraulically operated hose drums reduces the boom height and thus the required capacity of the base machine. In addition, it leads to reduced dimensions of the entire unit.
Systems for cutting depths up to 150 m have already been built.
Specially modified systems can operate with the cutter in rotated position (HDS-T).

HSS (Hose synchronization system)

The HSS hose synchronization system is used when the cutter is mounted on a BG drilling rig. The guide wheels for the mud hose, the hydraulic hoses and the hoist ropes for the cutter are mounted on a special sledge. The sledge is raised and lowered along the mast by the main hoist winch of the base machine. As a result of the uniform movement of the guide wheels, the vertical movement of the hoses and the hoist ropes is mechanically synchronized.

Base machines

All trench cutters of the BC series can be mounted on a wide variety of different base machine systems. The availability of a wide range of base machines enables the complete system to be optimized to the requirements and constraints of a jobsite:

- Unlimited or limited clear operating height
- Limited plan area for the cutter system (inner-city gap sites, one lane road closures, narrow site access, limited width of dam crests)
- Required cutting depth
- Commercial considerations: a crawler crane used as base machine for cutter operations can also be used as crane for other foundation engineering applications or as a lift crane. If a Bauer BG rig is selected as base machine, not only the required operating space is smaller but the BG rig can also be readily converted into a hydraulic rotary piling rig.

MC Duty-cycle cranes

The Bauer Duty-cycle cranes MC 64, MC 96 and MC 128 are ideal base machines for BC cutters. The entire hydraulic power supply of the attached cutter is provided by the hydraulic systems of the MC crawler cranes, which have been specially designed for these applications.
The HTS hose guide system as well as the HDS hose drum system can easily be mounted on the MC crawler crane, as the upper carriage has been strengthened accordingly.

BG Rotary drilling rigs

Mounting a cutter on a BG rotary drilling rig is a relatively new concept. This system is suitable for mid-range cutting depths up to 48 m (depending on BG rig type).
The hydraulic power supply for the cutter is provided by the appropriately designed hydraulic system of the BG base machine. An important selection criterion for this equipment combination is the low space requirement of the unit.
When mounting a cutter on a BG rotary drilling rig the HSS hose synchronization system is used.
By mounting an HDS hose drum system on the upper carriage of a BG base machine, cutting depths of up to 100 m can be realized.

Specialized base carriers / compact cutter systems

MBC 30

The “BAUER Mini Cutter System“ was developed as a compact cutter with minimum dimensions for operating in 5 m headroom. The most significant features of the MBC 30 are:

- Extremely compact construction of both base machine and trench cutter
- Steering plates over the full height of the cutter frame
- Crowd winch
- Mud hoses coiled horizontally
- Powered by diesel or electric power pack
- Crawler base or rail mounted

CBC/MBC “Low-head“

This compact unit was specially designed to facilitate the construction of diaphragm walls in very restricted conditions. This includes operating inside a tunnel, but also installing diaphragm walls on linear construction sites with extremely restricted working widths. Units with an overall height of around 6 to 7 m and a minimum overall width of 3.5 m can achieve trench depths of up to 80 m.
All main components are sourced on a modular basis from the standard product range (cutter gearboxes, cutter wheels, mud pump, hose guide system, base machine).

CBC 40

The CBC 40 "SilentCutter" is a further improvement of former CBC systems. The CBC 40 can be equipped with the established BAUER trench cutters BC 35 and BC 40.
The hose handling system HDS (Hose Drum System) facilitates a cutting depth of 100 m.
One of the characteristic features is the low noise emission of the new hydraulic power pack HD 1400.
The unit is mounted on a special carrier with longitudinally arranged hydraulic power pack.
The CBC 40 unit is especially developed for constricted urban site conditions.

Cutter base system CBS

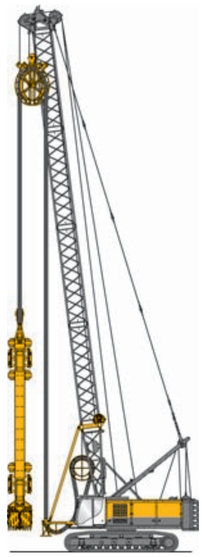
To achieve cutting depths of up to 120 m with the Bauer duty-cycle crane MC 96 or other commercially available crawler cranes of 120 t capacity, these base machines are fitted with the CBS cutter base system.
It consists of:

- HDS Hose Drum System for both mud and hydraulic hoses
- Support frame for mounting the HDS and the hydraulic power pack
- Mast and movable sledge

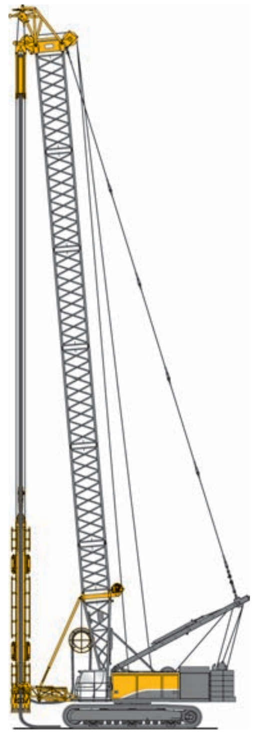
Trench cutter systems – typical combinations

Attachment to crawler crane – hose tensioning system (HTS)

Height	33 – 45 m
Cutting depth	38 – 70 m
Installed Power	570 – 709 kW
Turning device	On request



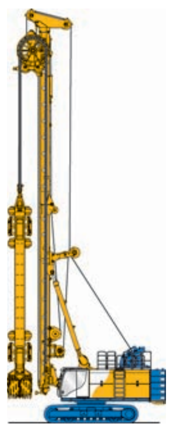
BC 35 – MC 64



BC 40 – MC 128

Attachment to BG – hose synchronizing system (HSS)

Height	25 – 32 m
Cutting depth	36 – 48 m
Installed Power	403 – 570 kW

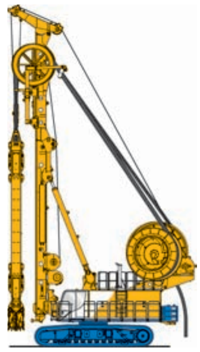


BC 35 – BG 30

BC 35 – BG 46

Attachment to crawler crane or BG –
hose drum system (HDS)

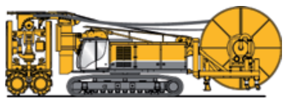
Height	24 – 26 m
Cutting depth	80 – 150 m
Installed Power	563 – 709 kW



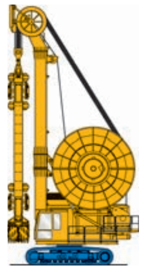
BC 35 – BG 46
(HDS 100)

BC 35 – MC 96
(HDS 100 T)

Special units –
Compact Bauer Cutter (CBC)



CBC 25 Low-headroom
HDS (Hose drum system)



CBC 40
HDS (Hose drum system)

	CBC 25 Low-headroom	CBC 40
Height	5 – 7 m	18 m
Cutting depth	60 – 80 m	100 m
Installed Power	570 kW	570 kW

	BC 32 / BC 35 with hose guide system			**BC 40** with hose guide system			**BC 50** with hose guide system			**MBC 30**
Base machine	**HTS**	**HDS**	**HSS**	**HTS**	**HDS**	**HSS**	**HTS**	**HDS**	**HSS**	**HDS**
MC 64	●	●	–	❑	●	–	–	–	–	–
MC 96	●	●	–	●	●	–	–	–	–	–
MC 128	❑	❑	–	●	●	–	●	●	–	–
BG 28	–	–	❑	–	–	–	–	–	–	–
BG 30, BG 39	–	–	●	–	–	–	–	–	–	–
BG 42, BG 46	–	●	❑	–	●	❑	–	–	–	–
BG 50	–	❑	❑	–	●	●	–	●	●	–
MT 160 (CBC 40)	–	●	–	–	●	–	–	–	–	–
MC 64 low-headroom (CBC 25)	–	–	–	–	–	–	–	–	–	●
Special base MBC 30	–	–	–	–	–	–	–	–	–	●

● recommended ❑ possible – not possible

Slurry treatment system

During the construction of a diaphragm wall the open trench is stabilized and supported by bentonite slurry. When a trench cutter is employed, the slurry also takes on the role of conveying the excavated soil material to the surface.
The charged slurry is pumped to a desanding plant. There, the solid particles are separated out from the slurry and the cleaned support fluid is then pumped back into the trench.
After the cutter itself, the mud treatment plant is the second most important component of the cutter technology. Throughput and treatment capacity have to be matched closely with the soil and the cutter performance. Mixing and desanding units, desilters and decanters, as well as pumps, silos and connecting pipe lines are the essential components of this concept. Bauer has developed a complete concept for the treatment and disposal of slurries that makes it possible to deliver and construct compatible total systems.

Mixing

During the preparation of bentonite slurry, the bentonite powder has to be mixed intensively with water. This can either be achieved by pump mixers of the BM series or colloidal mixers of the SCW/SK series. Single-phase slurry mixes for cut-off walls consisting of multiple components, such as rock powder, cement, bentonite and water, are produced by continuous mixers of the SK series with a mixing capacity of up to 50 m^3/h.

Desanding

BAUER desanding plants are developed specifically for use with trench cutters. They are characterized by the following features:

- Modular construction throughout the entire plant unit and, therefore, the ability to match treatment capacity to soil type and cutter output capacity
- Secondary circulation with desilter or centrifuge possible
- Short setting up and dismantling times
- Containerized transport dimensions

Protection of the environment and the resulting continuously increasing costs for the disposal of diaphragm wall muds play an ever increasing part in the construction of diaphragm walls.
Decanters enable fine particles to be separated out from slurries. In combination with flocking agents, complete separation of solids and water is possible.

Storing slurries

Optimum cutter operation is crucially dependent on a professionally managed bentonite slurry. Storage capacities are required for bentonite powder, fresh bentonite slurry, exchange slurry and used bentonite slurry. Depending on the geometry of the site, the necessary storage capacities can be provided by way of conventional lagoons or vertical silos.
Bauer slurry specialists can provide users with advice and support in producing space-saving configurations of rows of silos and offer standard systems for connecting individual silos effectively with pipelines and shut-off valves.

Pumping

KBKT

High-capacity pumps developed by Bauer are used to ensure the recirculation of regenerated slurry into the trench. These pumps can also be deployed as “booster” pumps whenever slurries have to be pumped over greater distances.

BP

Various pumps of the BP series are used in the slurry mixing and treatment plants.

BC System

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