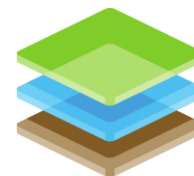


Instructions for use

KRINGS trench boxes

Date: April 2022



terra
infrastructure

Information about the instructions for use

These instructions enable the safe and efficient use of KRINGS trench boxes. The instructions are part of the systems and shall be kept in close proximity of the shoring site, accessible to the personnel at all times.

The personnel must read and understand these instructions thoroughly before starting to work. Prerequisite for safe work is observance of all safety precautions and work instructions specified in these instructions.

In addition, the local occupational health and safety regulations and general safety regulations for the area of application apply.

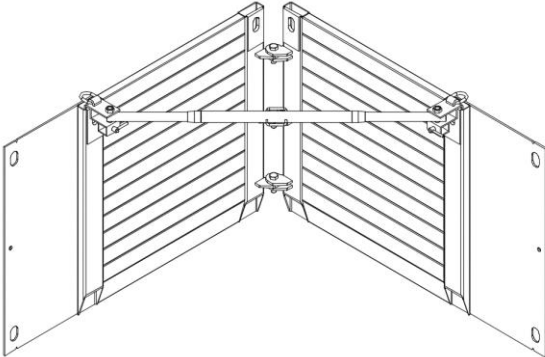
All safety-related dimensions conform with German safety and accident prevention regulations and German standards. The respective state-specific regulations are to be checked and applied before the works start.

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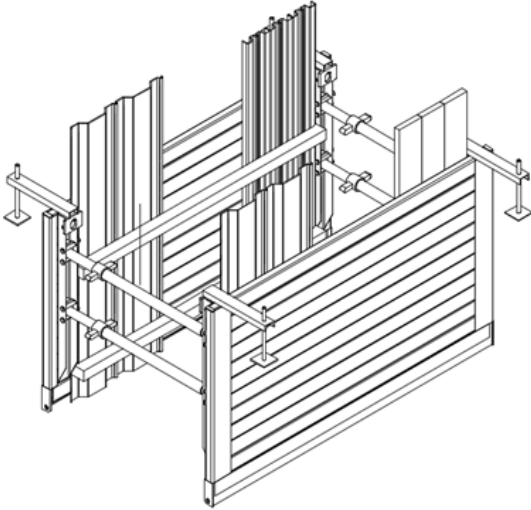
1 System overview

KRINGS shoring corner



Shoring width	0.50 m – 2.50 m
Height base unit	1.50 m – 2.35 m

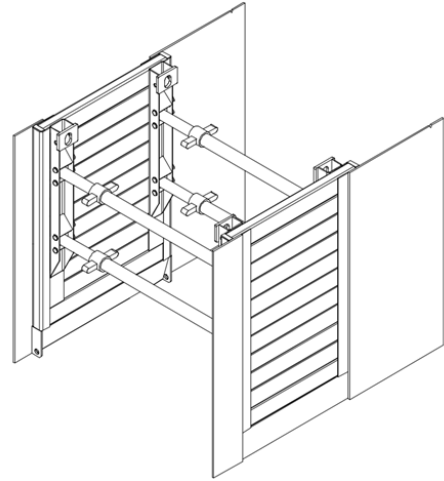
KRINGS piling frame shoring



Shoring length	2.00 m – 3.00 m
Height base unit	1.00 m – 2.00 m
Pipe culvert height	0.30 m – 0.98 m

Designation for basic module B according to EN 13331-1:
 e. g.: GV-B-SV-XX-0.50/2.00x0.6-varia

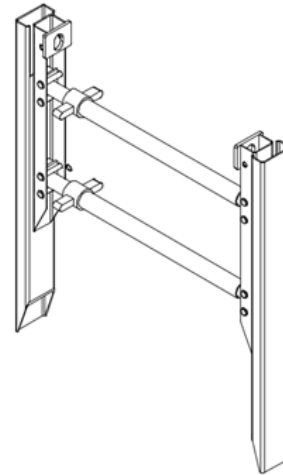
KRINGS length compensation



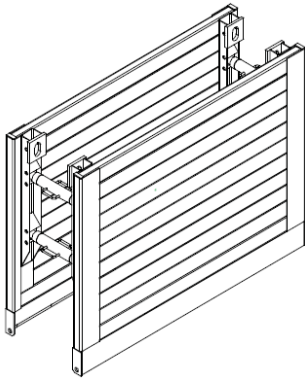
Shoring length	1.30 m – 2.15 m
Height base unit	1.50 m – 2.35 m
Pipe culvert height	0.72 m – 1.40 m

Designation for basic module B according to EN 13331-1:
 e. g.: ES-B-SV-CXX-1.30/2.15-1.50/2.35-0.47/1.89

KRINGS movable strut crossbar

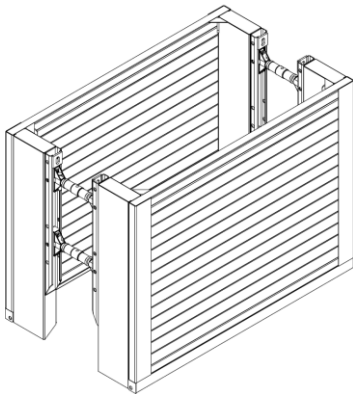


Traverse height	1.00 m – 2.20 m
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KVL

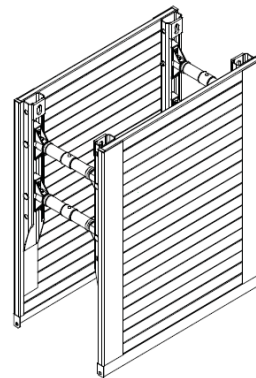
Shoring length	2.00 m – 3.50 m
Height base unit	1.50 m / 2.00 m / 2.40 m
Height top unit	0.50 m / 1.00 m
Pipe culvert height	0.72 m / 0.98 m / 1.30 m
Weight	527 kg – 1,123 kg

Designation for basic module B according to EN 13331-1:
 ES – B – SV – C – XX – 2.00 / 3.50 x 1.50 / 2.40 x 0.06
 – 0.47 / 1.89 – 0.72 / 1.30 – 18.6 / 27.9 – 0.53 / 1.12

KS 60 Eck

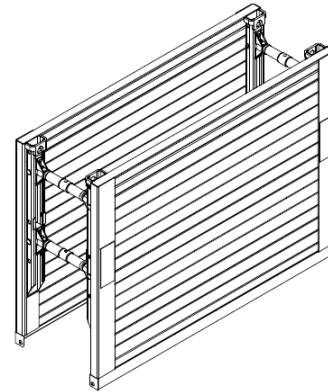
Shoring length	2.00 m – 4.00 m
Height base unit	2.00 m – 2.40 m
Height top unit	1.00 m – 1.30 m
Pipe culvert height	1.00 m – 1.36 m
Weight	1,415 kg – 2,035 kg

Designation for basic module B according to EN 13331-1:
 ES – B – SV – C – XX – 2.00 / 4.00 x 2.00 / 2.40 x 0.06
 – 0.81 / 4.81 – 0.95 / 1.35 – 24.7 / 37.5 – 1.42 / 2.04

KS 60

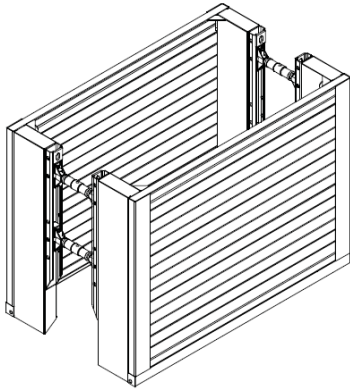
Shoring length	2.00 m – 4.00 m
Height base unit	2.00 m – 2.40 m
Height top unit	1.00 m – 1.30 m
Pipe culvert height	1.00 m – 1.36 m
Weight	965 kg – 1,565 kg

Designation for basic module B according to EN 13331-1:
 ES – B – SV – C – XX – 2.00 / 4.00 x 2.00 / 2.40 x 0.06
 – 0.81 / 4.81 – 0.95 / 1.35 – 24.7 / 37.5 – 0.97 / 1.57

KS 100

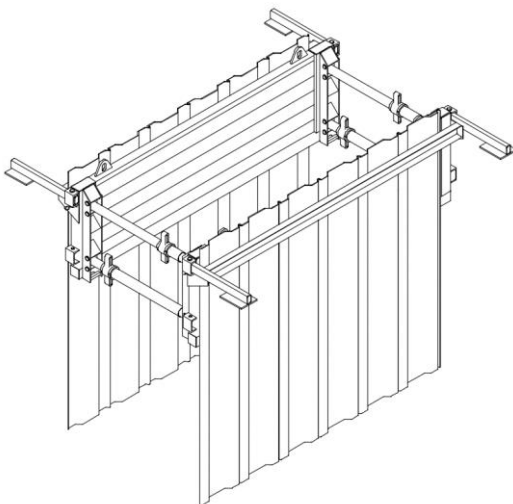
Shoring length	2.00 m – 4.50 m
Height base unit	2.40 m / 2.60 m
Height top unit	1.30 m
Pipe culvert height	1.52 m / 1.56 m
Weight	1,399 kg – 2,715 kg

Designation for basic module B according to EN 13331-1:
 ES – B – SV – C – XX – 2.00 / 4.50 x 2.40 / 2.60 x 0.10
 – 0.81 / 4.81 – 1.52 / 1.56 – 33.02 / 77.15 – 1.40 / 2.72

KS 100 Eck

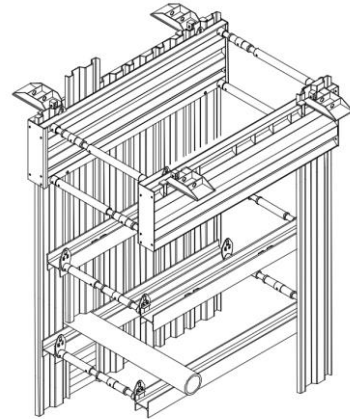
Shoring length	2.50 m – 4.50 m
Height base unit	2.40 m / 2.60 m
Height top unit	1.40 m
Pipe culvert height	1.50 m / 1.55 m
Weight	1,799 kg – 2,945 kg

Designation for basic module B according to EN 13331-1:
 ES – B – SV – C – XX – 2.50 / 4.50 x 2.40 / 2.60 x 0.10
 – 1.82 / 5.82 – 1.50 / 1.55 – 44.12 / 61.61 – 1.80 / 2.95

Piling frame element BLU

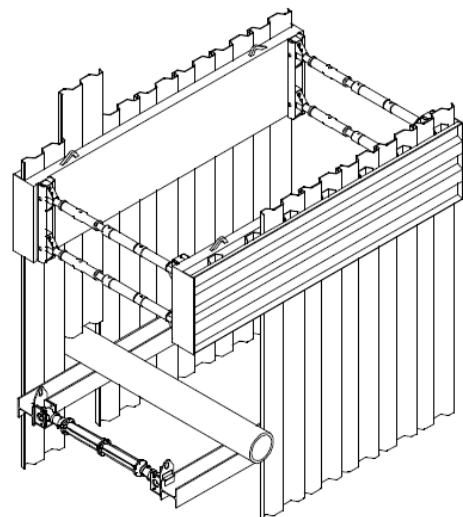
Shoring length	2.41 m
Height piling frame element	0.72 m
Pipe culvert height	variable
Weight	465 kg

Designation for basic module B according to EN 13331-1:
 GV – B – SV – C – XX – 2.41 x 0.72 x 0.21 / 0.31 – 0.77 / 4.81 –
 variable – 17.5 / 46.2 / 56.1 – 0.47

Piling frame element universal DKU

Shoring length	2.27 m / 3.81 m
Height piling frame element	1.00 m
Pipe culvert height	variable
Weight	1,320 kg – 1,870 kg

Designation for basic module B according to EN 13331-1:
 GV – B – SV – C – XX – 2.27 / 3.81 x 1.00 x 0.31 – 1.27 / max. –
 1.32 / 1.87

Sheet pile element KKP

Shoring length	2.84 m / 4.07 m
Height piling frame element	0.48 m / 1.00 m
Pipe culvert height	variable
Weight	293 kg – 1,020 kg

Designation for basic module B according to EN 13331-1:
 GV – B – SV – C – XX – 2.84 / 4.07 x 0.48 / 1.00 x 0.21 / 0.31 –
 0.77 / 4.81 – variable – 17.5 / 46.2 / 56.1 – 0.29 / 1.02

2 Occupational safety and general information in accordance with DIN EN 13331-1/-2

2.1 Symbols in these instructions

Safety information

The following occupational safety symbols are on all occupational safety information which indicates a danger to the life and limb of personnel and are identified by a pictogram, a signal word and a signal color.

You can find explanations of the dangerous situations at the relevant points in the documentation.

Observe this information at all times!

Observe the applicable local safety and accident prevention regulations at all times!

All the following dimensions conform with German safety regulations.

DANGER



Type and source of danger

This symbol warns of an immediate danger to the life and health of personnel.

Failure to observe these warnings results in serious repercussions for health, culminating in life-threatening injuries and extensive property damage.

Action which must be refrained from so that the danger does not occur

WARNING



Type and source of danger

This symbol warns of an imminent danger to the life and health of personnel, and of environmental and property damage.

Failure to observe these warnings may result in serious repercussions for health, culminating in life-threatening injuries and/or extensive environmental and property damage.

Action which must be refrained from so that the danger does not occur

CAUTION



Type and source of danger

This symbol warns of an imminent danger to the health of personnel and of environmental and property damage.

Failure to observe these warnings may result in moderate or slight repercussions for health, culminating in injuries and/or extensive environmental and property damage.

Action which must be refrained from so that the danger does not occur

NOTE



Type and source of machine and/or system damage

This symbol warns of a dangerous situation and serves to indicate a note on the handling of the trench shoring.

Failure to observe these warnings may result in extensive property damage.

Action which must be refrained from so that the damage does not occur

Tips and recommendations



This symbol highlights useful tips and recommendations, as well as information for efficient and fault-free operation. Action which must be refrained from so that the danger does not occur

Other markings

The following markings are used to highlight instructions, results, lists, references and other elements in these instructions:

Marking	Explanation
1., 2., 3. ...	Step-by-step instructions
	Results of actions
•	Lists with no fixed order

2.2 Dangers

When working on and in excavations and trenches, the following dangers with the potential to cause serious injuries or death arise, among others:

- Being buried under volumes of soil or gravel which slip
- Being buried as a result of failure of the shoring
- Personnel falling
- Being affected by falling or tipping parts
- Tripping, slipping, falling
- Forced postures in confined working spaces
- Crushing of hand and feet during loading and unloading, transportation, assembly and disassembly, and installation and removal of the shoring elements

2.3 General safety information and measures for reduction of risks

Please note that an appropriate risk assessment must be generated for the specified work step before assembly, installation and removal and disassembly of the shoring system.

Compliance with the technical specifications and safety information in these use instructions is required at all times.

DANGER



Risk of death or injury owing to insufficient safety measures on the construction site and for adjacent installations / trades!

Insufficient safety measures on the construction site and for adjacent installations / trades result in a risk of death or injury, as well as a risk of property damage to the shoring!

- Attention must be paid to overhead lines during transportation and during installation and removal of the shoring.
- On sloping or uneven ground, the shoring must set up at as close to a right angle to the slope as possible.
- The use instructions must be present of the construction site.
- When using the shoring system, the maximum permitted loads as specified in these use instructions may not be exceeded.
- Shoring systems may only be used in ground which is not susceptible to slippage; water table drawdown measures must be taken where applicable.
- The stability of the shoring must be ensured in all installation and removal, assembly and disassembly states.
- The shoring must be installed in a horizontal position.
- Only put up shoring units on solid and even surfaces and secure against falling where applicable – possible factors which may affect stability, e.g. site incline, wind loads, vibrations from traffic loads and/or work tools, soil condition, etc., must be taken into account.
- Take traffic safety measures us trenches are established in the vicinity of public roads or if the establishment affects traffic. Consult with the relevant authorities.
- The shoring must reach to the bottom of the trench. In minimum stiff, cohesive soils, the shoring for construction operations which will be finished in a few days may end up to 0.50 m above the bottom of the trench if there are no exceptional influences and no earth pressure is to be absorbed from building loads.
- Throughout the construction phase, the front area must be secured through frictional connection and/or battered in accordance with the national regulations.
- Shoring elements placed on top of one another must be frictionally connected to one another at all points provided for in the design.
- Cavities should be filled immediately in a force-fitting manner.
- In order to ensure the safe execution of works, material transportation, and in particular the rescue of injured personnel, minimum working area widths in accordance with DIN 4124 must be complied with (minimum working area width for excavations/trenches ≥ 0.6 m); the appropriate national regulations must be applied where applicable.
- All parts of the shoring must always be inspected after heavy rainfall, in the event of significant changes to the loading, at the onset of a thaw, after a long interruption in the works, after extraordinary stresses (e.g. owing to impacts or vibrations) or after blasts.
- Removal of the shoring must be done in conjunction with backfilling.

TIP

- The safety of vehicles and persons on site must be ensured by means of cones, warning tape or security personnel specially deployed for this purpose.
- The construction site must be sufficiently marked as such using warning signs, for example.

2.4 Protection against falls and falling parts

⚠ DANGER**Risk of death or injury owing to falls or falling parts!**

Falls or falling parts result in a risk of death or injury, as well as a risk of property damage to the machine and/or system! The following measures must be implemented, depending on the construction site.

- Transitions are required for trenches with a width of > 0.80 m; the transitions must be at least 0.50 m wide.
- At a trench depth of > 1.00 m, the transitions must be equipped with a three-part side guard on both sides to protect against falling.
- At a trench depth of > 1.25 m, steps or ladders must be used for access.
- In order to protect against falling parts or against excavated soil slipping back in, the shoring must have an overhang over the top edge of the trench – at trench depths of 2.0 m this must be min. 5 cm, at trench depths of greater than 2.0 m it must be min. 10 cm.
- The front sides of the trenches or excavations must either be secured using appropriate shoring systems or, depending on the soil condition, battered accordingly.
- At the top edge, a protective strip which is at least 0.60 m wide must be kept free from loads and in particular from construction machinery and vehicles.
- Fall protection systems must be installed in excavations and trenches with a possible fall height of greater than 2 m.
- For activities for which the installation of effective fall protection is generally not possible (e.g. during installation of the shoring, during excavation, during cable laying or during backfilling), this must be reviewed and justified within the risk assessment.

2.5 Storage, transportation and lifting operations

Storage**⚠ DANGER****Risk of death or injury owing to incorrect storage!**

Incorrect storage results in a risk of death or injury, as well as a risk of property damage to the machine and/or system!

- The shoring elements may only be stored on solid, even ground.
- In the event that shoring panels are stored in stacks, the maximum permitted stack height must be observed – rule of thumb: max. stack height [m] = 4 x width of the narrow side [m].
- Care must be taken to ensure that the shoring panels are aligned perpendicular with one another during storage and transportation; support staves and non-slip mats or similar must be used where applicable in order to ensure safe storage and safe transportation.
- The prescribed safety distances from trench and excavation walls (see 2.3) must always be complied with for storage.

Transportation and lifting operations

DANGER



Risk of death or injury owing to suspended, hauled or towed loads!

Loads may swing out and fall during lifting operations. Hauled or towed loads may tip over. There is a risk of death or injury, as well as a risk of property damage to the shoring!

- Assembly of the guide frame may only be done in a horizontal position. Assembly in vertical alignment is EXPRESSLY prohibited!
- For transportation, the use of cranes or hydraulic excavators using hoisting operation is preferred; during transportation with forklifts, attention must be paid to the fact that the ground on a construction site is frequently uneven. This may lead to the load slipping or falling – additional safety measures are required where applicable for transportation with forklifts.
- Hydraulic excavators using hoisting operation must be equipped with an overload warning system and a line-break safety device; the overload warning system must be switched on in hoisting operation.
- The lifting gear, load handling attachment and sling must be chosen according to the load; the dynamic loads, e.g. when pulling boxes (removal), must also be taken into account here in addition to the static loads.
- All lifting gear, load-handling attachments and slings must be tested and approved.
- Do not pull shoring elements through the trench (exception: dragboxes).
- When using slings, the use of edge protection is required if the sling is routed against sharp edges.
- Only load hooks with safety catches may be used in order to prevent unintentional unhooking of the load during lifting, pulling or transportation; in the event that the safety catch does close owing to the design, the use of hackles or round slings as connectors is required.
- The shoring elements may only be attached and transported using the intended attachment points.
- The loads must be attached such that the shoring elements are in a horizontal position; pendulum movements must be reduced to a minimum during transportation; diagonal pulls are not permitted.
- The angle of inclination between the sling and the notional vertical at the attachment point may not exceed 60°.
- Transportation must be done as close to the ground as possible.
- Never carry the load over personnel.
- Attached loads must be guided with guide lines/guide rods; always walk behind the load and do not walk backwards.
- The accompanying persons for guiding the load and slingers must always remain within the machine operator's field of vision off the track and outside the danger area.
- Accompanying persons for guiding the load and slingers must have safe footing; never stand between a suspended load and a fixed abutment (risk of crushing!).
- Care must be taken to ensure that fingers are always free during lifting, guiding and set down; never guide loads using the sling.
- The applicable national rules and regulations must be observed and complied with.

2.6 Criteria for the inspection, repair and withdrawal of worn or damaged components

- Shoring elements must be subjected to functional testing and a visual inspection for obvious defects, e.g. on struts, top layers of the panels, welding seams, stabilizers, attachment points, by supervisors before each use.
- If defects which reduce the load capacity are found, in particular damaged struts, cracked welding seams or excessively deformed, cracked or worn out attachment points, the shoring elements may only be used again after professional repairs by the manufacturer.
- Furthermore, missing parts such as nuts, screws, connectors, bolts and stabilizers, or broken parts such as spindles, bolts and spreader systems result in withdrawal of individual system elements.
- Defecting parts must be replaced or repaired before use. The elements may only be used again after approval by the manufacturer.
- In the event of significantly deformed or warped parts or in the event of holes, e.g. in the panel body, the manufacturer must always be consulted before the shoring element is used.

- Small repairs may be carried out by the user himself where applicable – however this may only be done in consultation with the manufacturer.
- Only original parts from the manufacturer may be used.
- The manufacturer provides no warranty for repairs which are improperly performed and for the use of parts which are not original parts.
- Before each (repeated) use and after reassembly of the shoring elements or after exceptional disturbances (see chapter 2.2), the tightness of all screw connections must be checked and they must be tightened where necessary.
- If there is any doubt about the usability of the shoring elements, and in the event of defects and damage, the manufacturer must be contacted.
- Soil which has adhered to the shoring elements must be cleaned off after use.
- In order to increase the service life, regular renewal of the paint (rust protection, top coat) is recommended.

2.7 The following, as amended, apply in particular:

Regulations issued by the BG [German Employers' Liability Insurance Association] – Civil Engineering Technical Committee

- DIN 4124 "Excavations and trenches"
- DIN EN 13331 Part 1 – Product specifications, Part 2 – Assessment by calculation or test
- General safety information and the Industrial Safety Regulation

Our products bear the "tested for safety" GS mark.

2.8 Personal protective equipment (PPE)

Personal protective equipment serves to protect personnel against health and safety risk while working.

In principle, the necessary personal protective equipment for the activities is the result of your risk assessment.

We recommend the following PPE for loading and unloading activities, assembly and disassembly, transportation/lifting operations, maintenance and repair, and for activities in the area with shoring:

PROTECTIVE CLOTHING



Protective clothing is tight-fitting workwear which tears easily, with tight sleeves and with no protruding parts.

SAFETY HELMET



Safety helmets protect the head against falling objects, swinging loads and impacts against fixed objects.

PROTECTIVE GLOVES



Protective gloves protect the hands against friction, abrasions, deeper injuries.

SAFETY SHOES



Safety shoes protect the feet against crushing, falling parts and slipping on slippery surfaces. Furthermore, S3 safety shoes are puncture-resistant and thus protect against injuries to the feet resulting from nails, metal chips, etc.

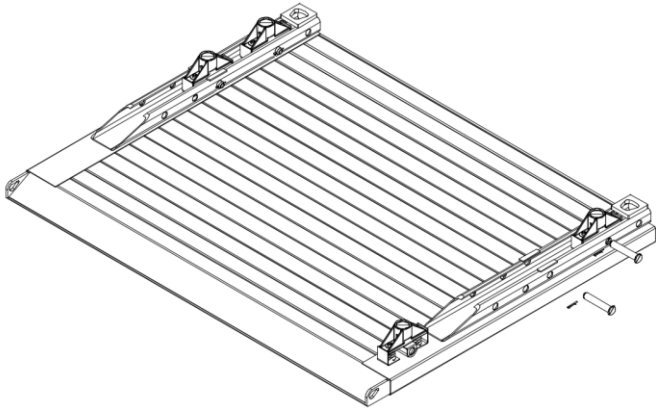
2.9 Technical data of the shoring elements

The technical data of the shoring elements used can be found in the current version of the technical manual. The technical manual is available at <https://www.terra-infrastructure.com>

3 Installation instructions for edge-supported shoring systems KRINGS

Before starting the work, it is obligatory to observe all safety precautions from section "Occupational health and safety and general remarks according to DIN EN 13331-1/-2" (see section 2 Occupational health and safety and general remarks according to DIN EN 13331-1/-2 from page 3)!

1. Positioning the panel half on the ground

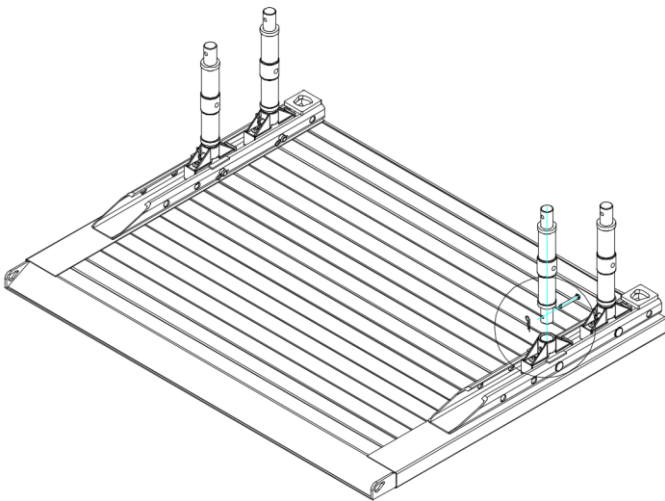


Place the first panel half on level ground with the guide frame facing upwards.

Insert the pretensioned spring mushrooms into the guide frame, insert the corresponding locking pins into the provided locating holes of the guide post and the spring mushroom and secure by means of spring cotters.

Release the spring mushroom by loosening the nuts.

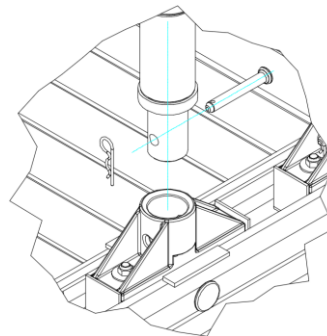
2. Inserting spindles



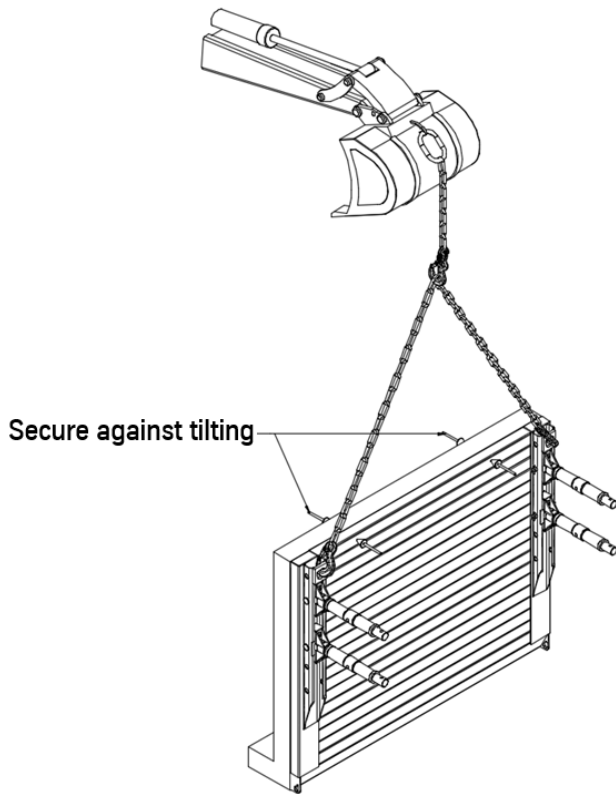
Insert struts into the spring mushrooms, insert locking pins and secure with spring cotters (see detail X).

If required, i. e. according to the trench width, a maximum of 7 intermediate pipes can be used per strut unit. These are placed on the struts, alternately offset for static reasons, fixed with socket pins and secured with spring cotters.

X



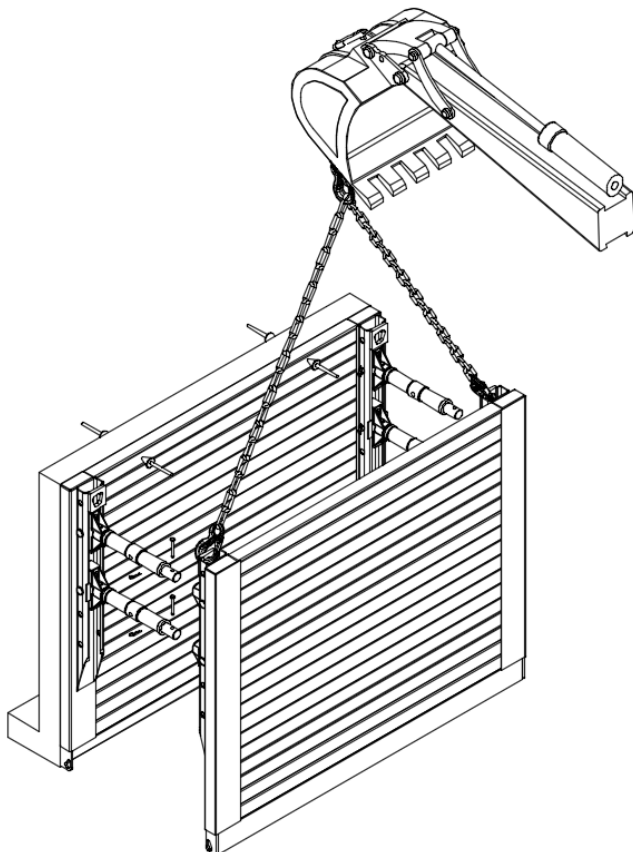
3. Setting up panel half



The pre-assembled first panel half is set up and secured against tipping over.

The second panel half is to be mounted in lying position in the same way as the first half of the plate. The spring mushrooms must be inserted and secured.

4. Assembly of the shoring box



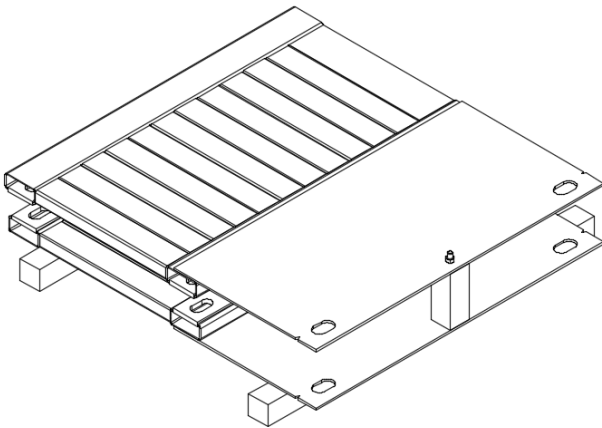
The second basic module, which is equipped with spring mushrooms, is swiveled towards the first basic module.

The spring mushrooms are bolted to the struts / intermediate pipes of the first basic module and secured with spring cotters.

3.1 Installation instructions KRINGS shoring corner

Before starting the work, it is obligatory to observe all “Occupational health and safety and general remarks according to DIN EN 13331-1/-2” safety precautions (see Section 2 Occupational health and safety and general remarks according to DIN EN 13331-1/-2 on page 3).

1. Delivery

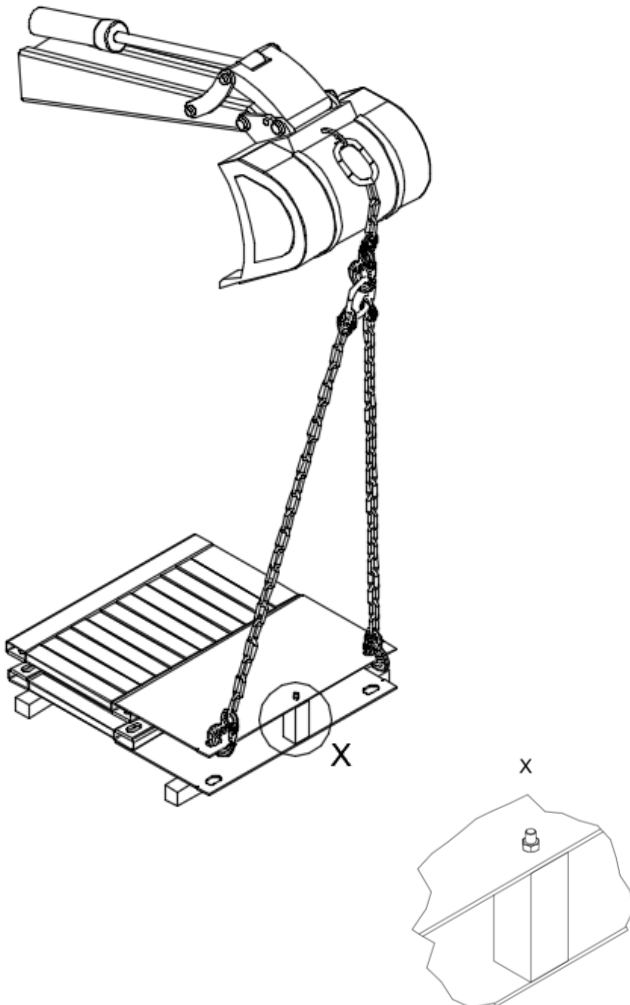


The KRINGS shoring corner is delivered in folded condition. Position the shoring corner on a sufficiently large, level and stable surface.

Use squared timber!

Before using it in the trench, remove the transport securing device first.

2. Removing the transport securing device

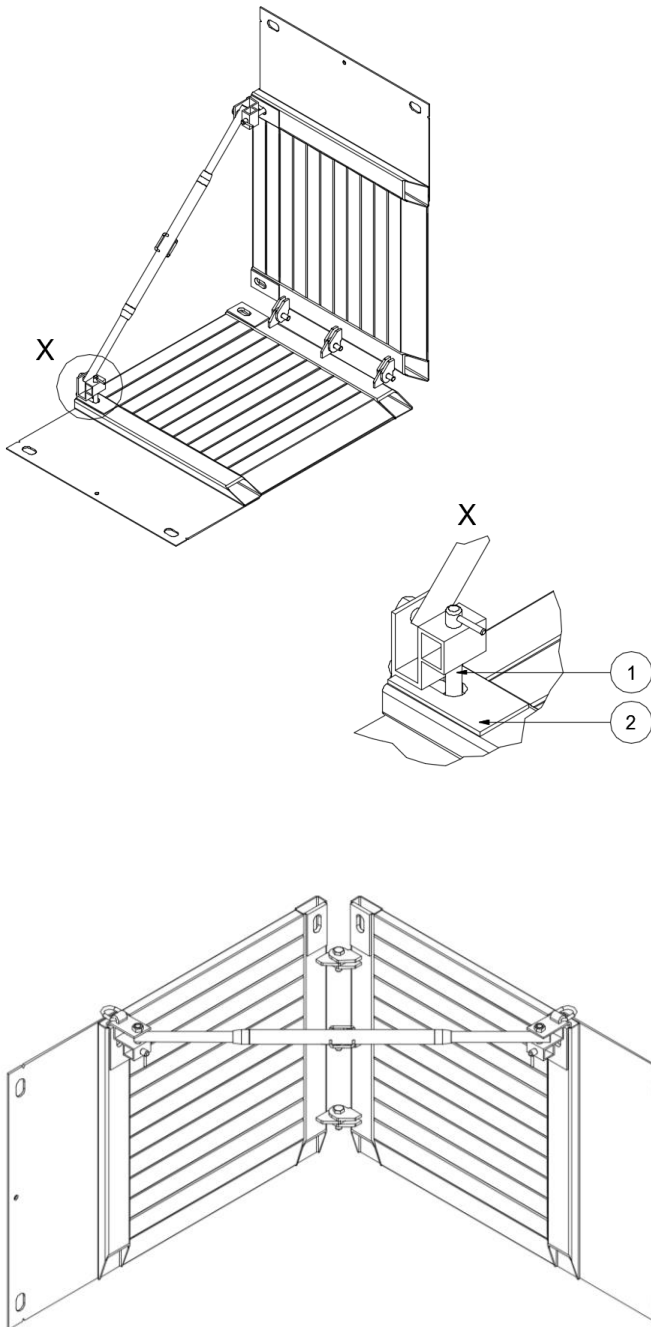


During transport, both panel parts are secured with squared timber and screws.

Before removing the transport securing device, secure the upper panel half with a lifting device in position.

The hexagon screw (M20) can then be loosened (30 mm width across flats).

3. Mounting the installation aid



After unfolding the shoring corner, mount the installation aid.

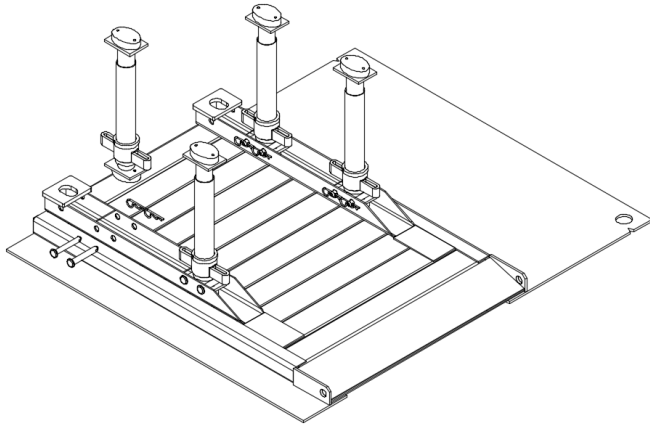
Make sure that the locking pin (1) arrests in the eye of the post pocket (2) and that the pin lever faces down.

After complete installation of the shoring, the installation aid must be removed.

3.2 Installation instructions KRINGS length compensation

Before starting the work, it is obligatory to observe all “Occupational health and safety and general remarks according to DIN EN 13331-1/-2” safety precautions (see Section 2 Occupational health and safety and general remarks according to DIN EN 13331-1/-2 on page 3).

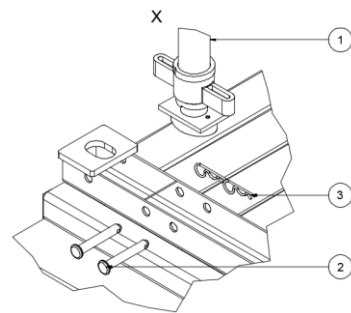
1. Delivery and preassembly of the first panel half



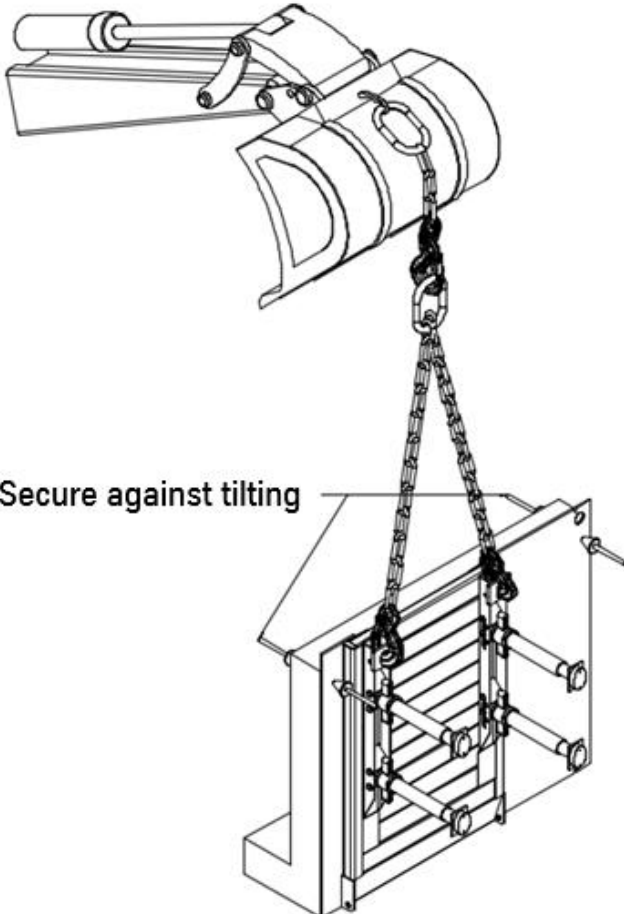
First, position the KRINGS length compensation – LAV on a sufficiently level and stable surface.

Then, insert the KVL spindles (1) from the top onto the traverses.

They are secured by a pin (2) and spring cotter (3).



2. Erecting the pre-assembled panel half

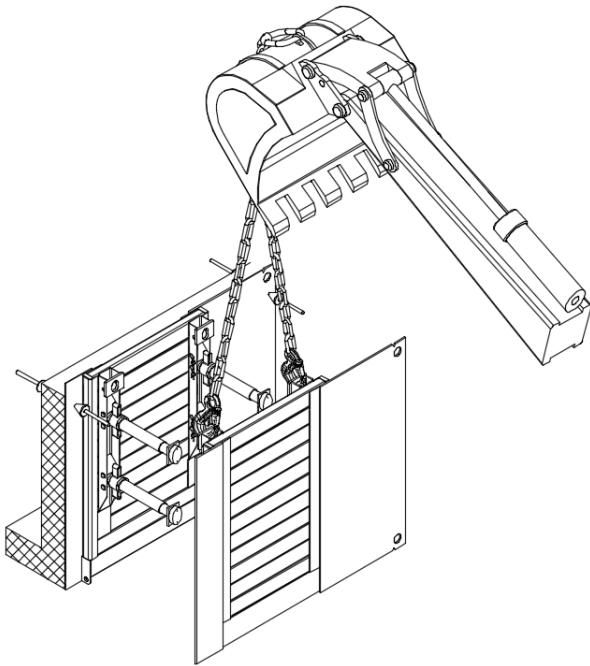


The shoring box must be assembled standing up.

For this purpose, erect the panel half with the struts and secure it from tipping over.

If required, a second excavator must secure the shoring box for the entire installation process.

3. Assembling the box



Bring the second panel half with lifting gear to the first panel half, secured in vertical position, and fasten it with pins as described above under item 1.

3.3 Installation instructions KRINGS piling frame shoring

Installation of the KRINGS piling frame shoring is identical to the installation of the KRINGS length compensation (see Section 3.2).

4 Assembly instructions for edge-supported shoring systems KRINGS

Note: According to DIN EN 13331, edge-supported shoring systems are abbreviated with the letters ES.

Shoring products based on the KVL system shall only be inserted with insertion process.

4.1 Insertion process

1. Preconditions

For all work, observe the applicable regulations from DIN, EN, *UVV* [German accident prevention regulations] and *BGBau* [German employers' liability insurance association for the construction industry].

In the insertion process, trench shoring units are inserted into a section of trench which has already been excavated to its final depth according to the provisions in DIN 4124.

The insertion process is only permissible if the following preconditions have been fulfilled:

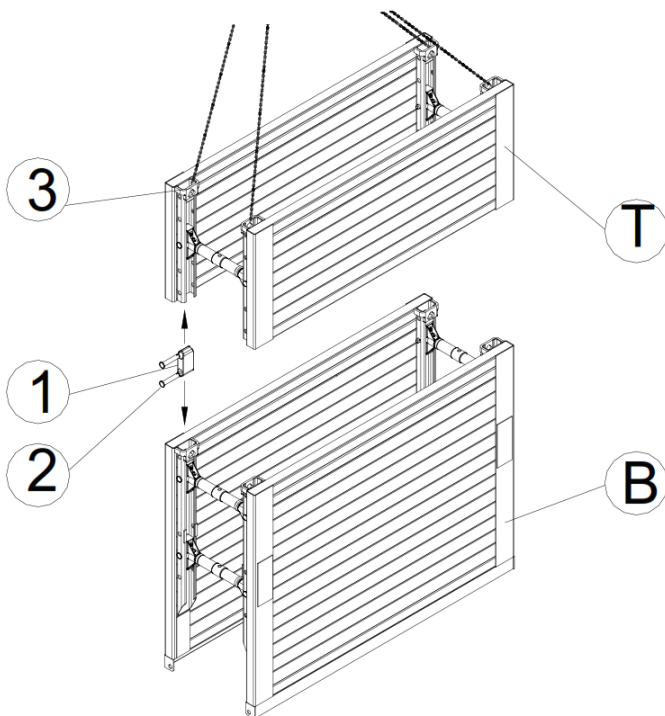
- Temporarily firm ground
- Vertical trench walls
- Same trench width for the entire length of the shoring unit
- Keep out of the trench until the shoring unit has been inserted into it.
- There must be no crossing pipes, buildings or other structures and / or traffic areas within the range of the trench.
- The degree of anticipated settlement, loosening and displacement of soil within the range of the trench is acceptable.

The ground is considered temporarily firm if no major crumbling is noted in the period from the start of excavation until the insertion of the shoring.

The permitted load values in accordance with the technical data of the shoring system employed must be observed at all times. For details concerning the trench width, refer to DIN 4124.

It is forbidden at all times to enter trenches with a trench depth ≥ 1.25 m without shoring or slope. It is also prohibited to stay or to work with heavy machinery in the area of risk e. g. the edge of the pit.

2. Use of top panels



During the insertion process, the assembly of the base (B) and top module (T) must be carried out outside the trench.

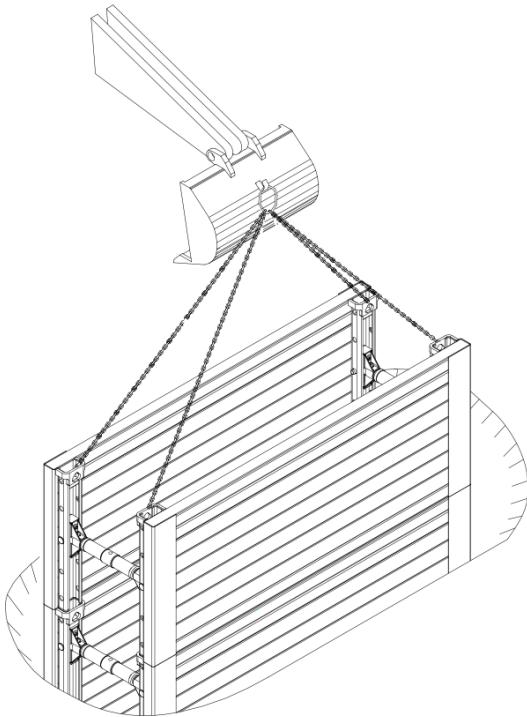
The system must be set as a whole in the trench if shoring boxes with top boxes are required to secure deeper trenches.

Base and top modules are connected by stanchions (1) and pins with spring cotters (2).

The system is assembled by using a lifting gear and suitable lifting slings (GS approval).

The lifting slings must be hooked exclusively and at least four points (ES) into the lifting eyes (3) provided for this purpose.

3. Assembly



The shoring system prepared outside the pit is inserted with lifting gear and suitable and lifting slings (GS approval) into the trench which has been excavated in the final depth for the length and width of a shoring box.

The length of the excavated and unsecured trench section must be limited to a length required for the insertion of one single trench shoring unit.

The gap between the trench wall and the inserted shoring unit must be backfilled right up to the top. In addition, the shoring unit should be pressed against the trench wall by spinning out the struts.

The permitted load values in accordance with the technical data of the shoring system employed must be observed at all times. For details concerning the trench width, refer to DIN 4124.

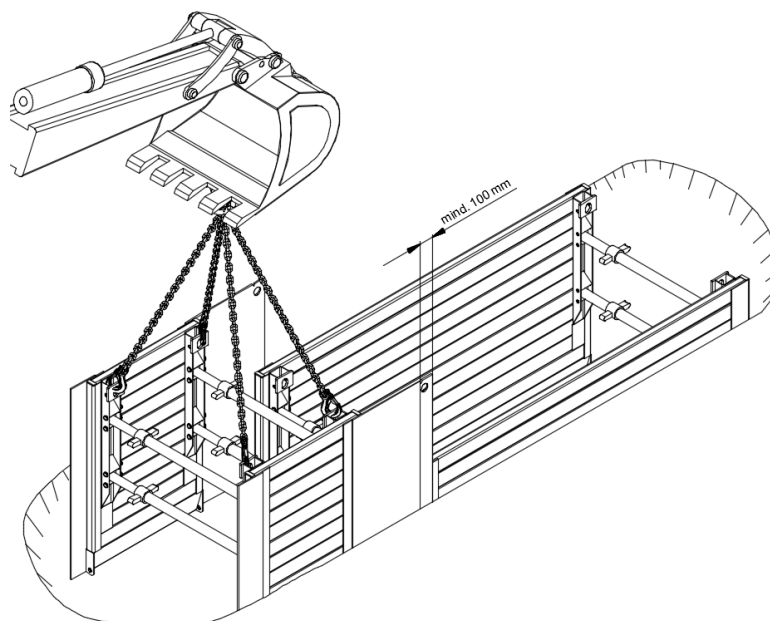
4.1.1 Insertion of the KRINGS length compensation

The LAV element set to the width of the trench is inserted with lifting gear and suitable and tested lifting slings into the excavated trench and aligned up to the transversal obstacle.

The length compensation area must fit closely to the previous shoring element. Make sure that the length compensation area protrudes up to the V mark over the contacting formwork (min. 10 cm overlap) for safety reasons.

If the LAV element is not used as length compensation, it must be positioned flush at the last inserted shoring element.

As soon as the LAV element is in the correct position, the element is pressed to the trench wall by turning the shoring spindles. The gap between the trench wall and the installed shoring element must be backfilled right up to the top.



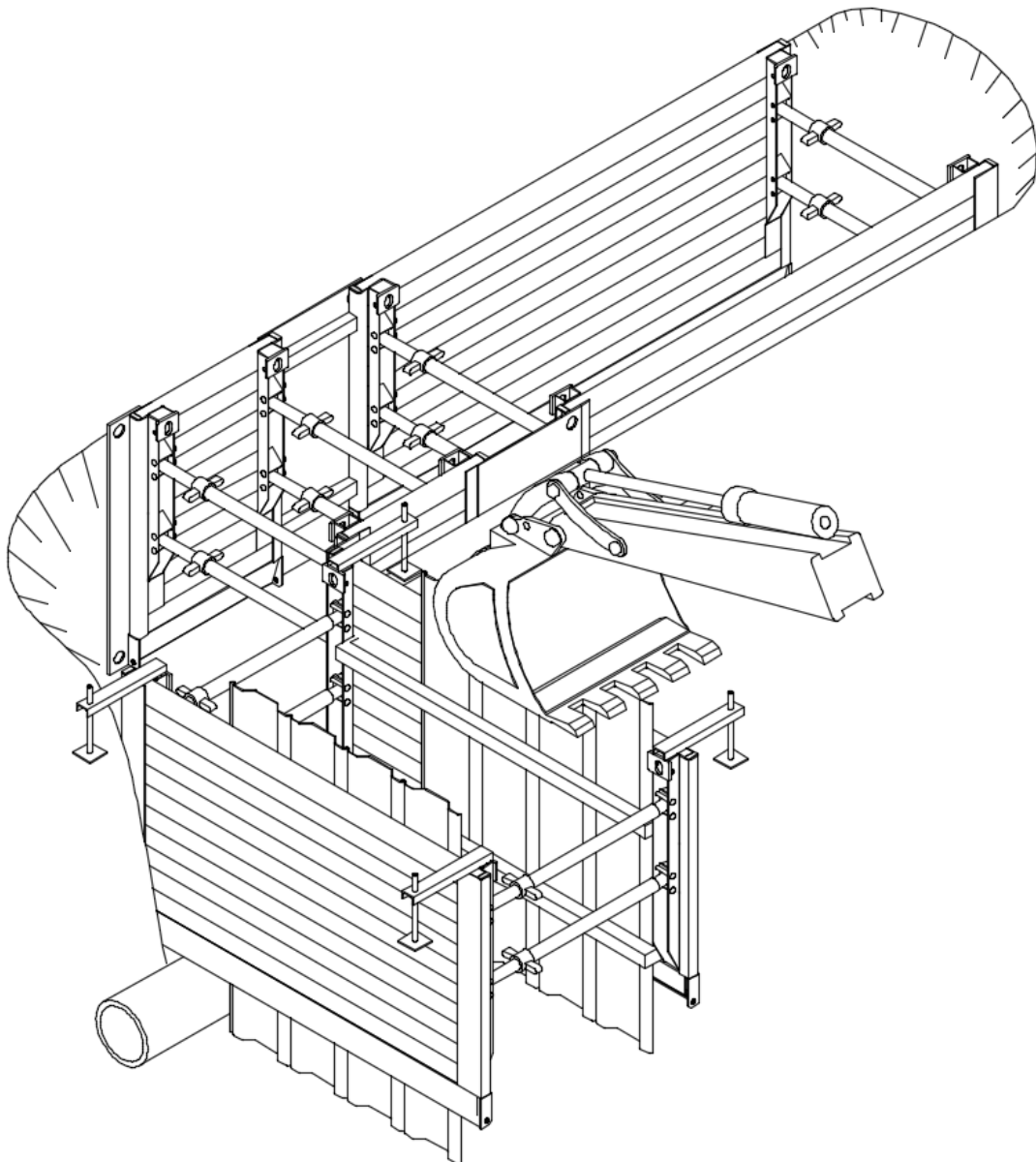
4.1.2 Insertion of the KRINGS piling frame shoring element

The frame shoring is inserted as described above up to the crossing pipe. The road support attached during installation prevents slipping of the element.

Both foldable frames of the box are used as a guide for the wooden planks or steel or aluminium sheet piles which will be inserted vertically into the soil. In a cut-and-lower process, the excavator bucket pushes the sheet piles into the ground with minimum vibration

It is absolutely necessary to observe the maximum permitted cantilever lengths of the sheet piles. If required, the permitted cantilever lengths must be determined statically.

The area below the crossing pipes must be shored conventionally.



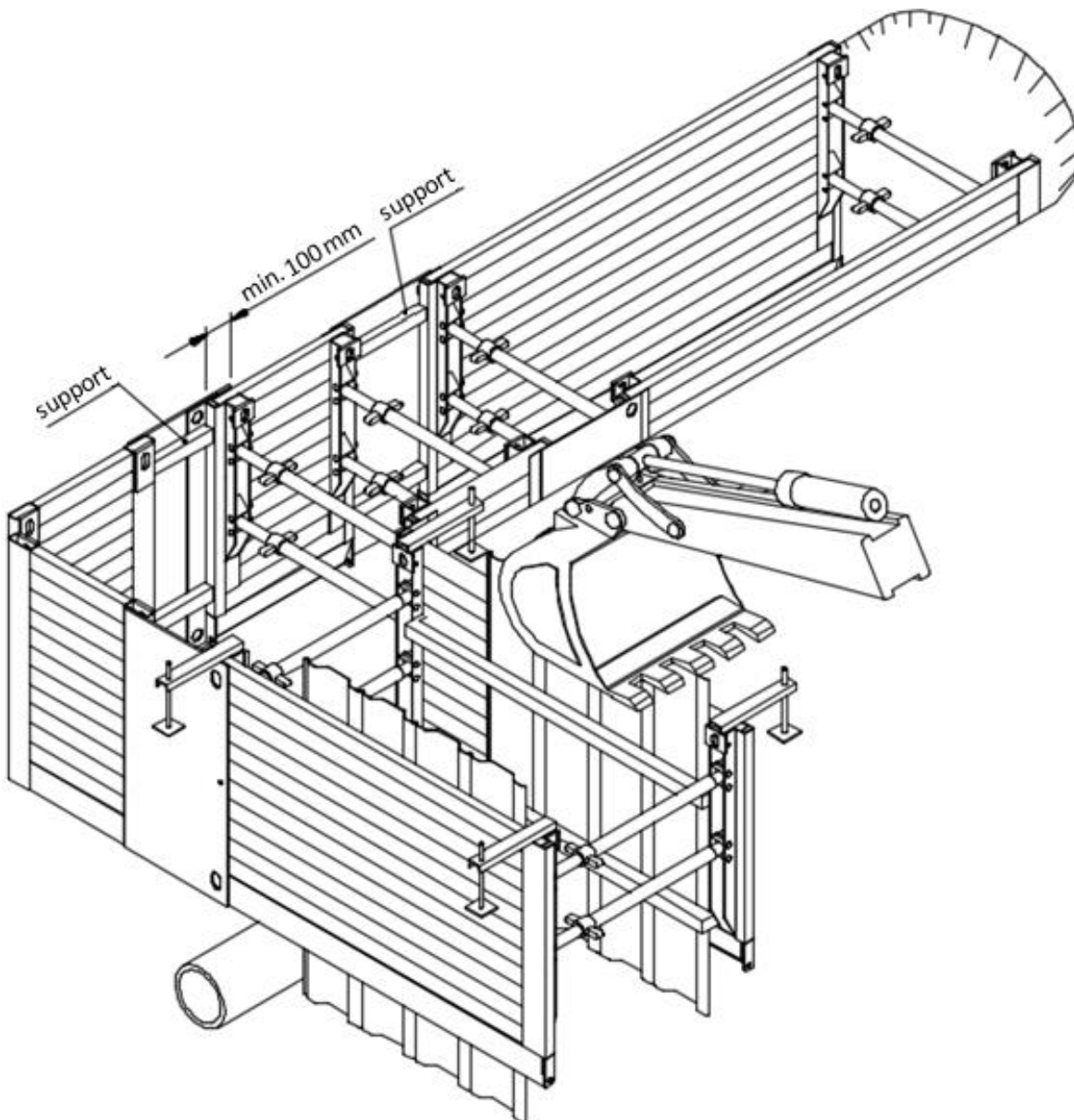
4.1.3 Insertion of the KRINGS shoring corner

The KRINGS shoring corner – UVP completes the shoring elements described above. The shoring corner is positioned with suitable and tested lifting slings close to the previously inserted shoring element and inserted into the trench.

Make sure that the length compensation area protrudes up to the V mark over the contacting formwork (min. 10 cm overlap) for safety reasons.

To avoid movement of the KRINGS shoring corner, spread a suitable support between the shoring corner and the next shoring element.

The gap between the trench wall and the inserted shoring corner must be backfilled up to the top.



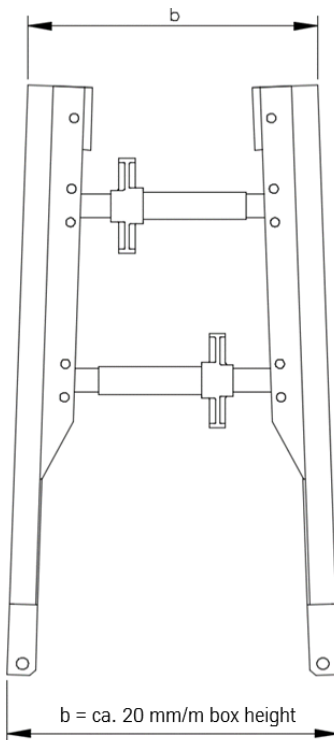
4.2 Lowering procedure

1. General

In the lowering procedure, trench shoring units or parts thereof are pressed vertically into the ground.

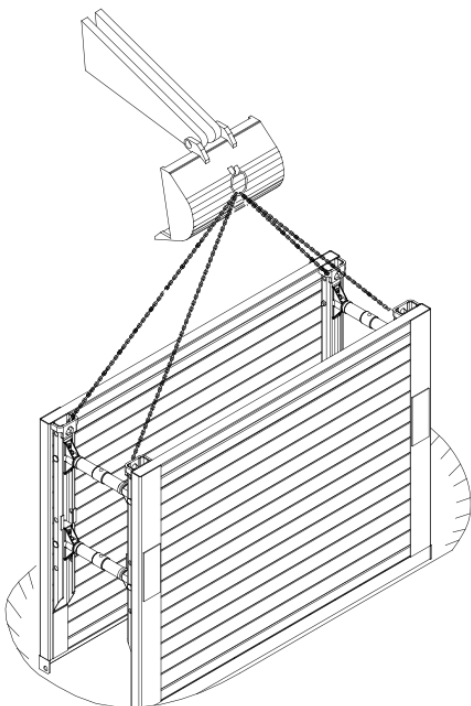
The lowering procedure is only permitted for edge-supported shoring systems. Centrally supported trench shoring systems must not be used in the lowering procedure.

2. Pre-adjustment of the shoring systems



Before inserting the applicable shoring system, its struts must be adjusted with the spindles until the distance between the shoring panels of one shoring unit is greater at the bottom than on top. This so-called A-form is achieved by extending the spindles in the bottom strut by approx. 20 mm / per meter of box height more than the spindles in the top strut.

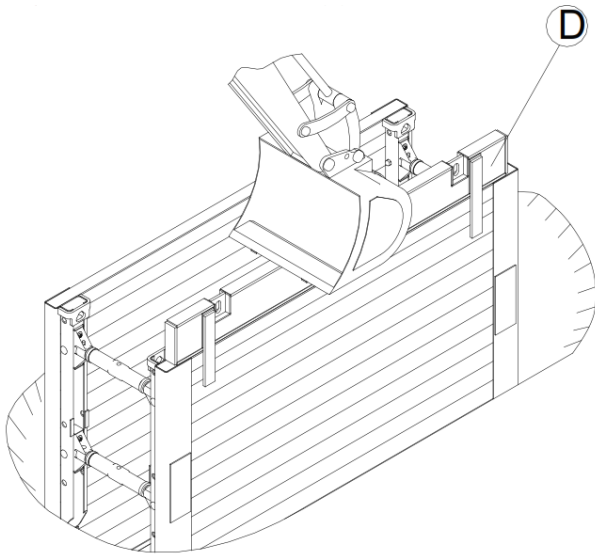
3. Advanced excavation, insertion and alignment of the shoring unit



After the trench alignment has been measured, advanced excavation for inserting the first shoring unit takes place. This is adjusted and aligned centrally and parallel to the trench axis by means of lifting gear and lifting slings (GS approval, lifting eyes).

After adjusting the shoring, all screw connections must be retightened.

4. Lowering the shoring system

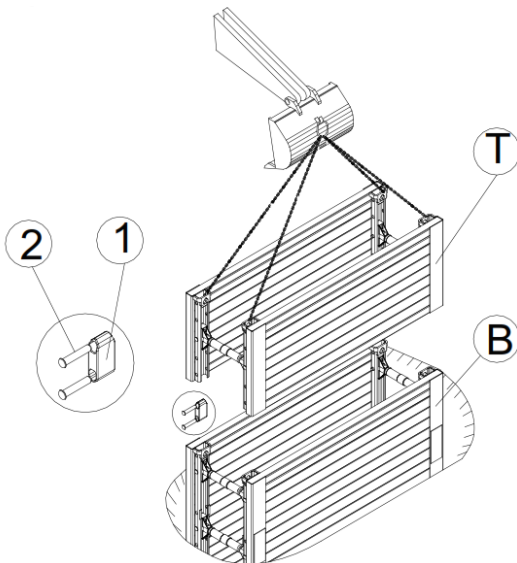


Lowering takes place alternately with the soil excavation

During the lowering process, the advance soil excavation underneath the panels must not exceed 0.50 m. During the alternate pushing of the shoring walls, care must be taken to ensure that the possible angle of rotation in a vertical plane between strut and shoring wall does not exceed $\delta = \pm 8^\circ$.

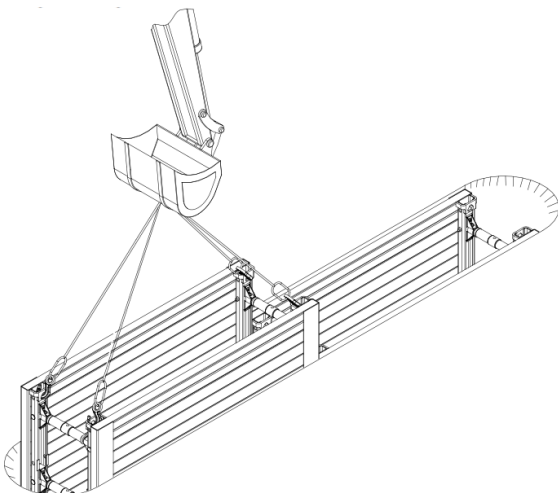
Pressure plates and / or pressure beams (D) must be used for the lowering process. Care must be taken to ensure that the shoring panels are not used as “chisel”.

5. Top panel



Depending on the required trench depth, top modules (T) are mounted on the base modules (B). Base and top modules are to be connected by stanchions (1) and pins (2). Here too, pressure plates and / or pressure beams must be used for the further lowering process.

6. Installation of the next shoring field

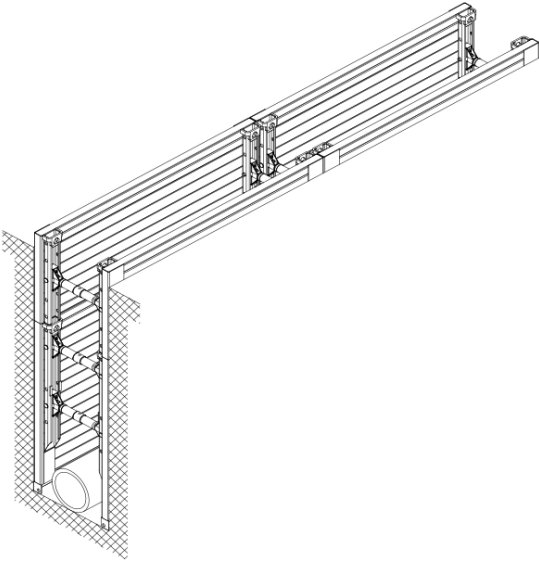


The next shoring unit is installed as soon as the previous system has been fully lowered to the bottom of the trench.

The installation is carried out according to the previously described points.

The shoring must be complete. Wall sections that cannot be secured with shoring units, e. g. pipes that cross each other under certain conditions, must be installed separately.

7. Pipe laying



Once the shoring has been lowered completely and without gaps to the bottom of the trench to the required length, pipe laying work can begin.

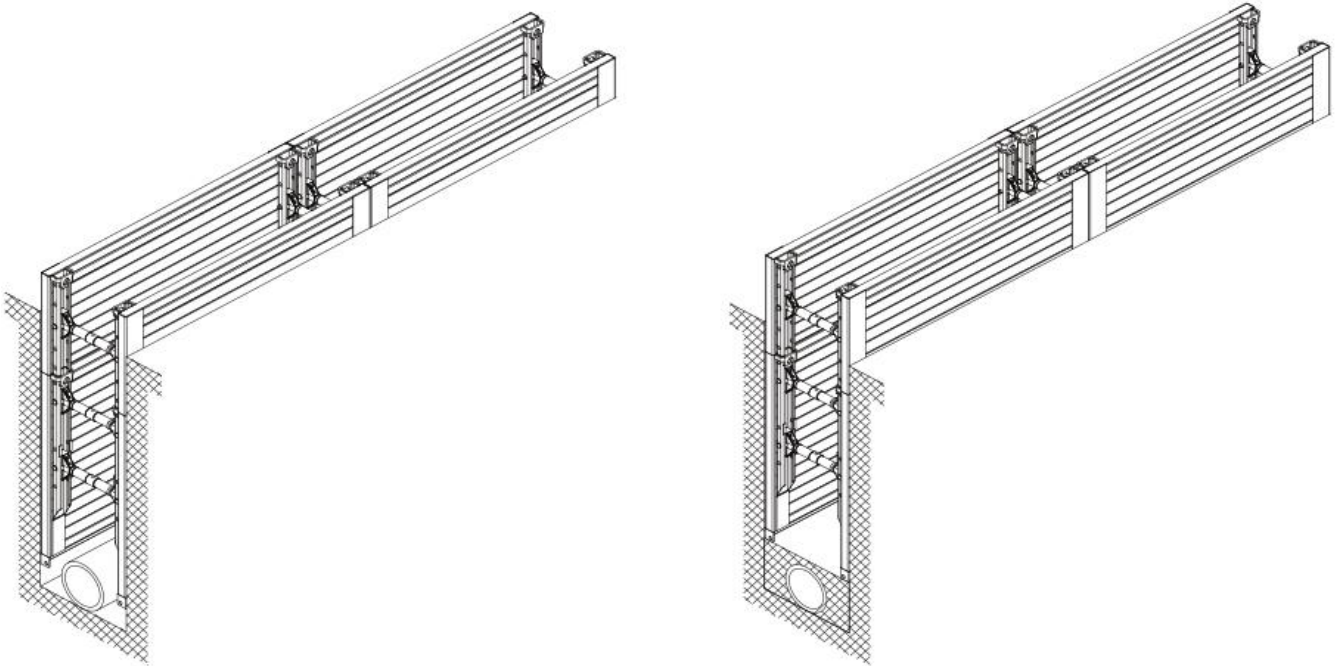
5 Instructions for removing for edge-supported shoring systems KRINGS

1. Removing, backfilling and compacting

After completing the pipe-laying work the shoring is removed with layer-by-layer backfilling and compacting. To this end, the shoring is extracted step-by-step in accordance with the instructions of the local site management and the expert's specifications and the backfilling material returned to the trench is compacted against the existing soil.

Lifting slings may only be attached to the provided attachment points.

Also during removal, the possible rotation angle in a vertical level between strut and shoring wall may not exceed $\delta = \pm 8^\circ$.



2. Service and maintenance

All shoring components must be checked for proper functioning before they are used in subsequent shoring fields.

Defective parts must be replaced and / or repaired.

Minor repairs can be carried out by the user after consultation with the manufacturer.

Only use original spare parts from the manufacturer!

No warranty for improperly performed repairs and use of non-original parts.

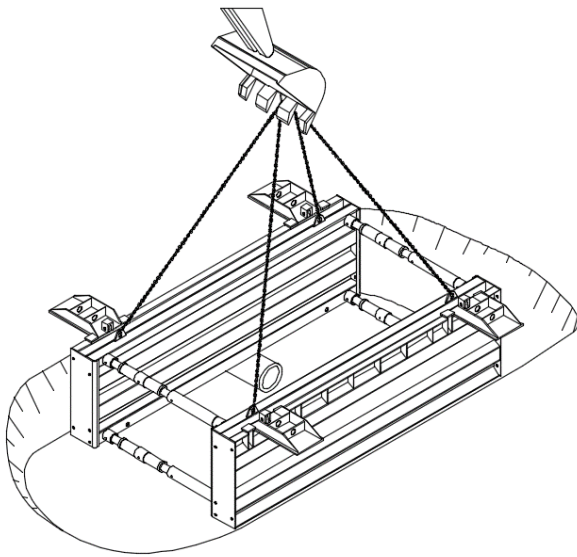
6 Assembly instructions piling frame shoring

1. General

The piling frame shoring is a universal and economical shoring method in inner-city areas, especially for crossing pipes. The two opposite piling frame elements, supported against each other with struts, serve as upper guides for trench sheets to be inserted vertically into the ground.

The trench sheets can be inserted by static pressing with an excavator bucket or by vibration method. Installation and presetting of the piling frame element are carried out in the same way as for edge-supported shoring systems.

2. Advance excavation, insertion and alignment of the shoring unit

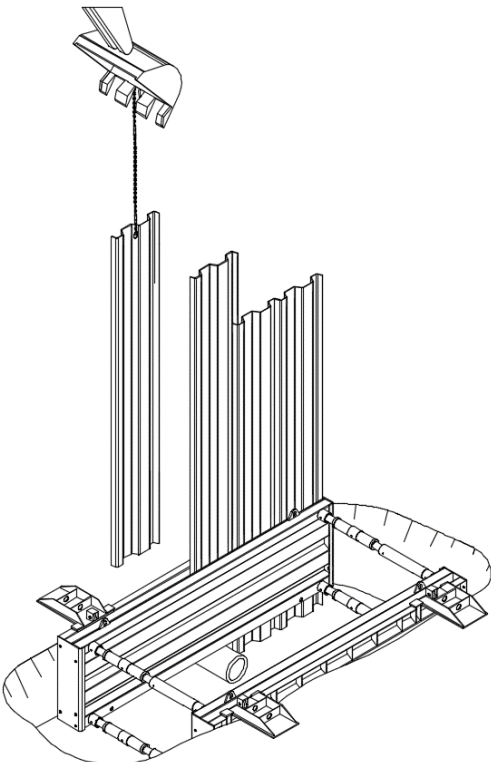


After the trench alignment has been measured, advance excavation for inserting the piling frame element is carried out.

As a rule, the piling frame element is installed with the upper edge flush with the working level, the advance excavation is then approx. 1 m.

The gap between trench wall and sheet piling frame element must be filled in over the entire height. In addition, the piling frame element must be pressed against the trench wall by spinning the struts.

3. Inserting the trench sheets



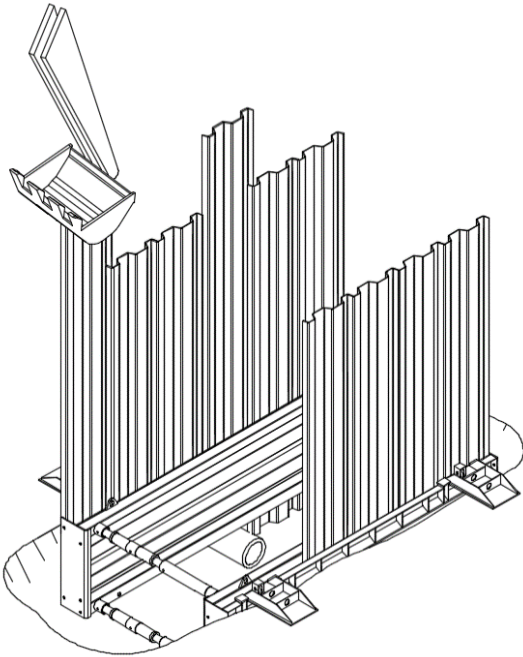
Now the trench sheets can be inserted into the slotted double panel walls of the piling frame elements and pressed into the ground with the excavator bucket.

To facilitate work, especially with trench sheets over 4 m in length, the use of trench sheet pliers is recommended.

The basic equipment of piling frame elements does not include a vertical guide for the trench sheets. This has the advantage that the piles can be inserted in any required position. It is also possible to overlap the piles. However, a frame for vertical guidance of the piles can be supplied on request.

Lightweight profiles KD VI/8 are used as trench sheets.

4. Lowering the shoring system



After adjusting the trench sheets, lowering is carried out alternately with the soil excavation.

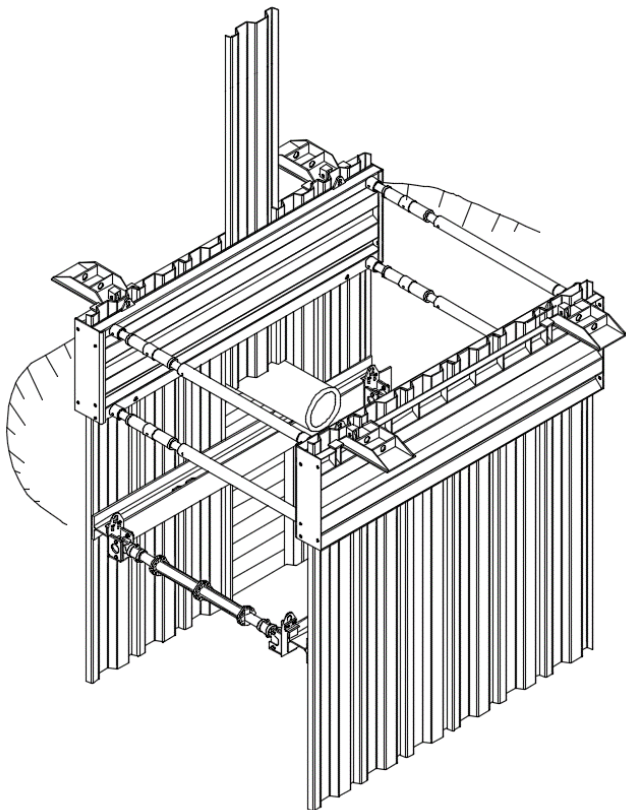
During the lowering process, the advanced soil excavation underneath the trench sheets must not exceed 0.50 m, depending on the soil conditions. Any pipes that may be crossing must be exposed beforehand and the trench sheet above it must be secured against further sinking. The use of shorter trench sheets is advantageous here.

The area below the crossing pipe must be conventionally secured with horizontal timber shoring. The adjacent trench sheets can be used as a support.

Care must be taken to ensure that the trench sheets are not used as “chisel”. Solid obstacles (e. g. unnatural fillings, rock) must be removed manually. To prevent subsidence, backfilling of the elements and trench sheets must be ensured with soil.

In the case of well drivable soils, the trench sheets can be inserted to their final depth. The soil is then subsequently excavated with a suitable excavator.

5. Additional walers



Depending on the required trench depth, measures to ensure the stability of the shoring system may be required for static reasons. As with all trench shoring systems, a site-related static proof is required in accordance with DIN 4124.

Longitudinal waler beams must be installed at a depth of approx. 2 m from the top edge of the terrain. These must be secured against sinking on the piling frame element with suspension chains and supported against each other with waler struts. These waler beams must be lowered simultaneously with the trench sheets to the statically required depth.

The next shoring unit is installed as soon as the previous system has been fully lowered to the bottom of the trench.

Depending on site conditions, this can be another piling frame element or another shoring system. After laying the pipes, the removal of the system takes place in reverse order.

7 Statics questionnaire

terra infrastructure GmbH can carry out a static calculation on the basis of multiple requirements.

Company: _____ Quote/order no: _____

Construction project: _____

Contact person: _____ Mobile: _____

Tel.: _____ Fax: _____

Email: _____ Shoring system: _____

Shoring material dimensions: _____

(e.g. panel or box length and height, module length, etc.)

1. Trench/excavation dimensions:

Trench depth T [m]

Trench width b [m]

Clear shoring width b_c [m]

Pipe culvert height h_c [m]

Pipe length l [m]

Pipe diameter DN [mm]

2. Building impact:

yes

no

Distance between building and trench edge [m]:

Number of floors:

Foundation depth (lower edge of foundation) [m]:

3. Traffic loads:

3.1 Site traffic

yes

no

3.2 Excavators

yes

no

Type/weight

Distance between vehicle and trench edge [m]

Vehicle position alongside trench

head ends of trench

3.3 Road traffic (load model 1) in accordance with DIN EN1991-2

Yes no Distance between vehicle and trench edge [m]

Vehicle position alongside trench

head ends of trench

3.4 Rail traffic in accordance with DIN EN 1991-2

yes no Type of rail traffic

Distance between axis and trench edge [m]

3.5 Crane

yes no Type/weight

Dimensions of support brackets [m]

Center distance of support brackets [m]

Max. support load per bracket [kN]

4. General information:

4.1 Can be sloped yes no Berm height h_1 [m]:

4.2 Head end shoring yes no with:

4.3 Lines crossing the trench yes no Pipe \varnothing , height of bottom of pipe

4.4 Concrete floor (building concrete) yes no

5. Soil-mechanical parameters

(please forward appropriate information from the geological survey, core samples or soil characteristics)

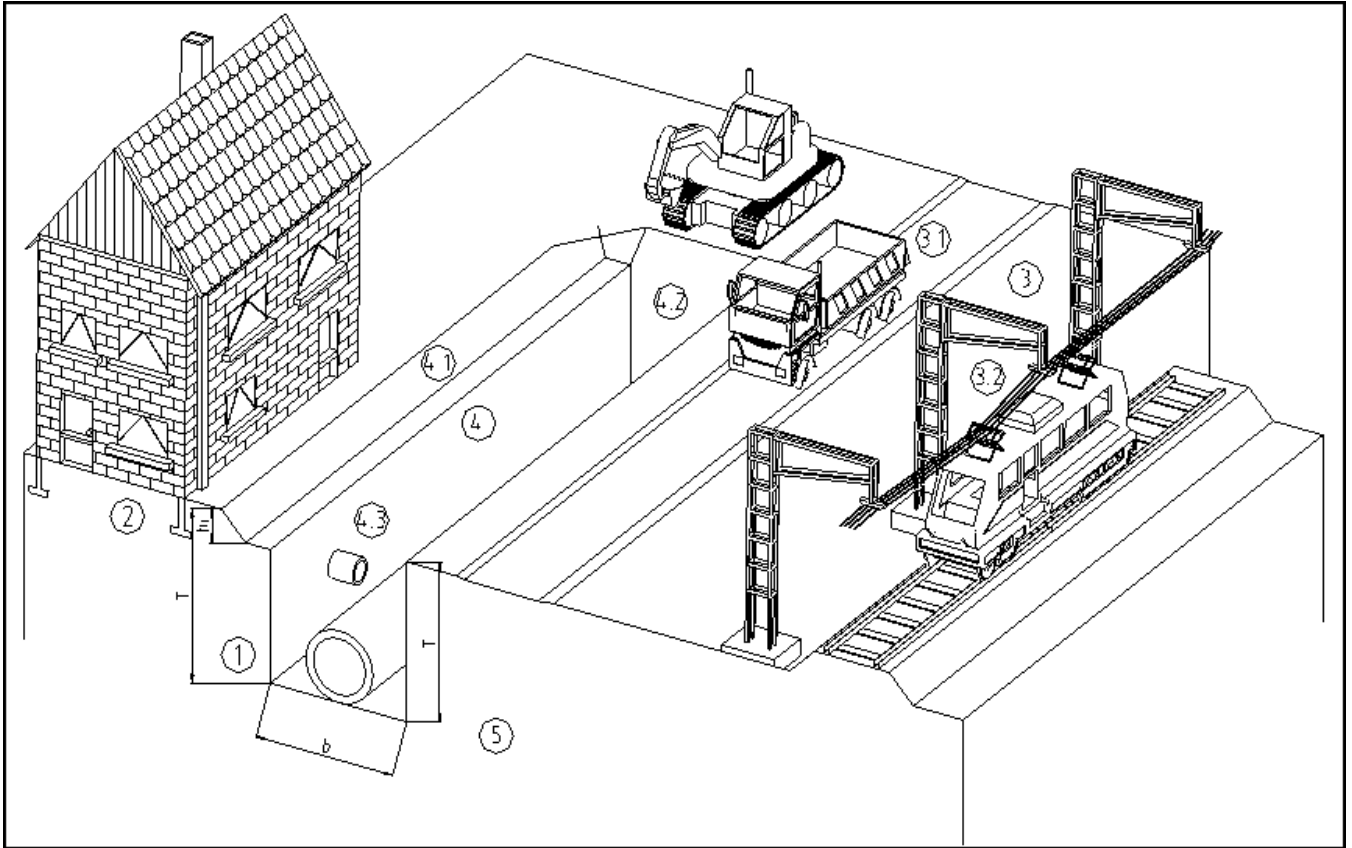
5.1 Site plan yes no

5.2 Geological survey yes no

5.3 Soil characteristics φ γ c

6. Other:

7. Drawing



Place, date

Signature

terra infrastructure

terra infrastructure GmbH
Hollestraße 7a
45127 Essen, Germany
T: +49 201 844-562313
F: +49 201 844-562333
info@terra-infrastructure.com
www.terra-infrastructure.com

Trench Shoring

terra infrastructure GmbH
Ottostr. 30
41836 Hückelhoven, Germany
P: +49 2433 453-0
F: +49 2433 453-100
trenchshoring@terra-infrastructure.com