

ASSEMBLY AND OPERATING MANUAL

LTW SLIDE RAIL SYSTEM - Type FP



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General Instructions

The **Standard** Slide Rail System is available as **EG-FP** (Single Slide Rail System) for a maximum trench depths of ~3,80m and **DG-FP** (Double Slide Rail System) for maximum excavation depths of ~5,50m. Slide Rail Systems are being installed using the lowering and cut method ("dig and push").

The following regulations and rules have to be followed in their valid version:

- Regulations of the BG-Fachausschuss Tiefbau (technical committee civil and underground engineering)
- DIN 4124 Baugruben und Gräben (excavation pits and trenches)
- DIN EN 13331 Teil 1 & 2 Grabenverbaugeräte (part 1 and 2 construction equipment)
- Regeln für Sicherheit und Gesundheit bei der Arbeit (rules for safety and health during work)
- Unfallverhütungsvorschriften / Arbeitsschutzvorschriften (regulations for the prevention of accidents and safety at work rules)

Our shoring components have the GS-Sign „Certified Safety“.

Please follow the instructions making use of our Slide rail systems.

Lifting & Transportation

The shoring may only be attached at the corresponding eyes and openings and/or lifting accessories.

Lifting chains must be chosen to suit the weight being handled.

To prevent the accidental detachment of the load use only load hooks with safety catches.

The allowed tensile forces have to be kept in any cases.

Transportation has to be carried out next to soil and unneeded oscillations have to be avoided.

It is prohibited to stand within the pivoting range of the excavator or crane and beneath suspended loads.

When handling and removing the shoring, watch out for overhead contact lines (power cables).

A load operator must stand to the front of the excavator and be in eye contact with the machine operator.

Measures to reduce hazards

The safety of persons on site must be enhanced with the aid of signs, cones, warning tapes and/or safety staff specially deployed on site for this purpose.

Neighbouring traffic flow has to be made possible by means of safety staff if needed.

Personnel must wear protective clothing (helmet/safety shoes/gloves).

The risk of instability as a consequence of wind loads when setting up or using the shoring must be considered.

The shoring must be lowered onto level and firm ground. Where the ground is sloping or uneven, the shoring should be set up, if possible, at right angles to the slope.

Maintenance & Repair

Before use, all shoring components must be checked for their correct function.

Faulty or deformed parts must be replaced in any case.

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

There is no warranty on incorrectly performed repairs and the use of non-original parts.

According to intenseness of use, the components should be painted with anticorrosion paint every two years.

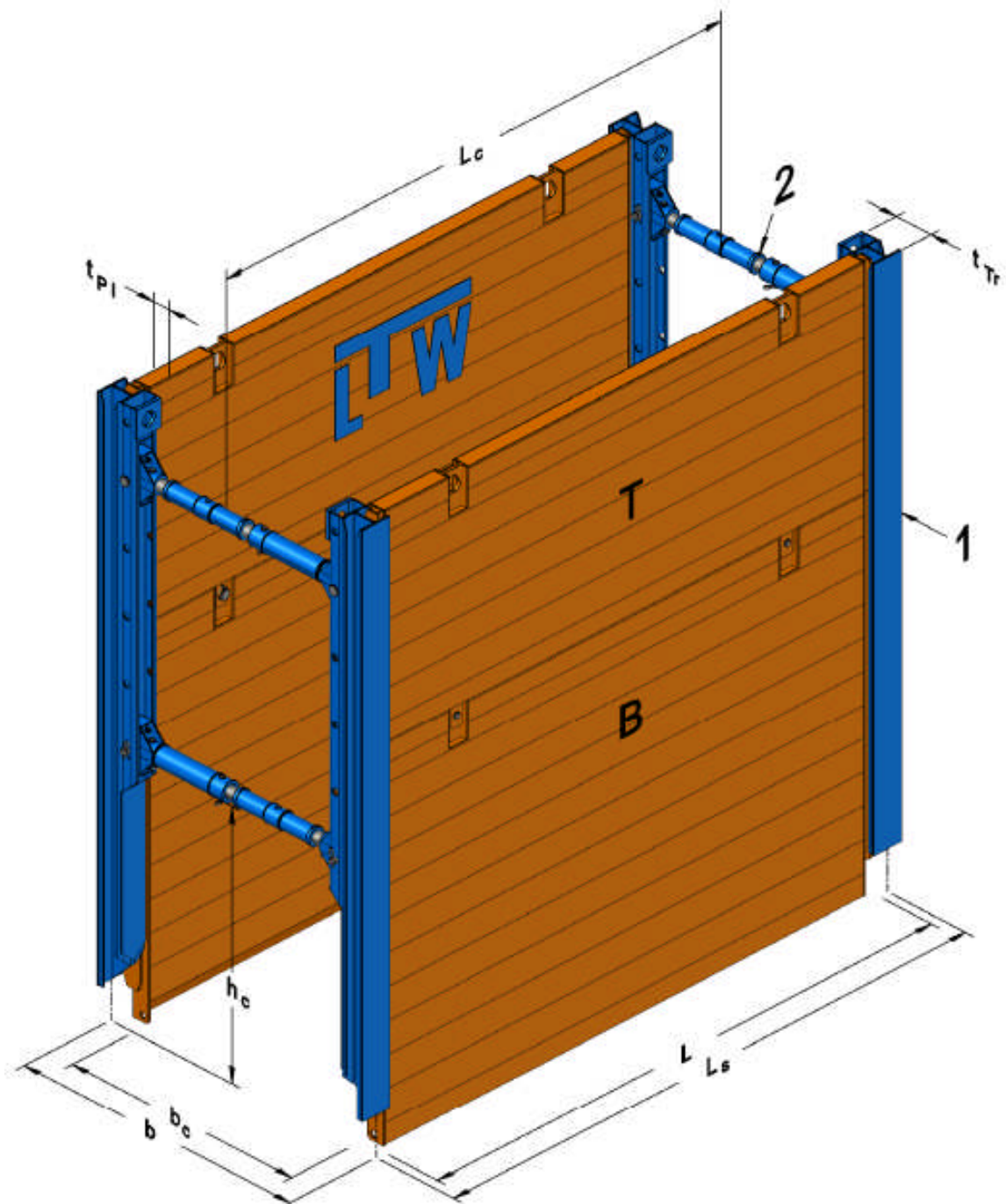
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System view

Single Slide Rail System - Type EG FP



- 1 Single Slide Rail
- 2 Standard Strut
- B Base Plate
- T Top Plate

- b Shoring Width
- b_c Inner Working Width
- t_{Pl} Plate Thickness
- t_{Tr} Rail Thickness

- h_c Pipe Culvert Height
- L Plate Length
- L_c Pipe Culvert Length
- L_s System Length

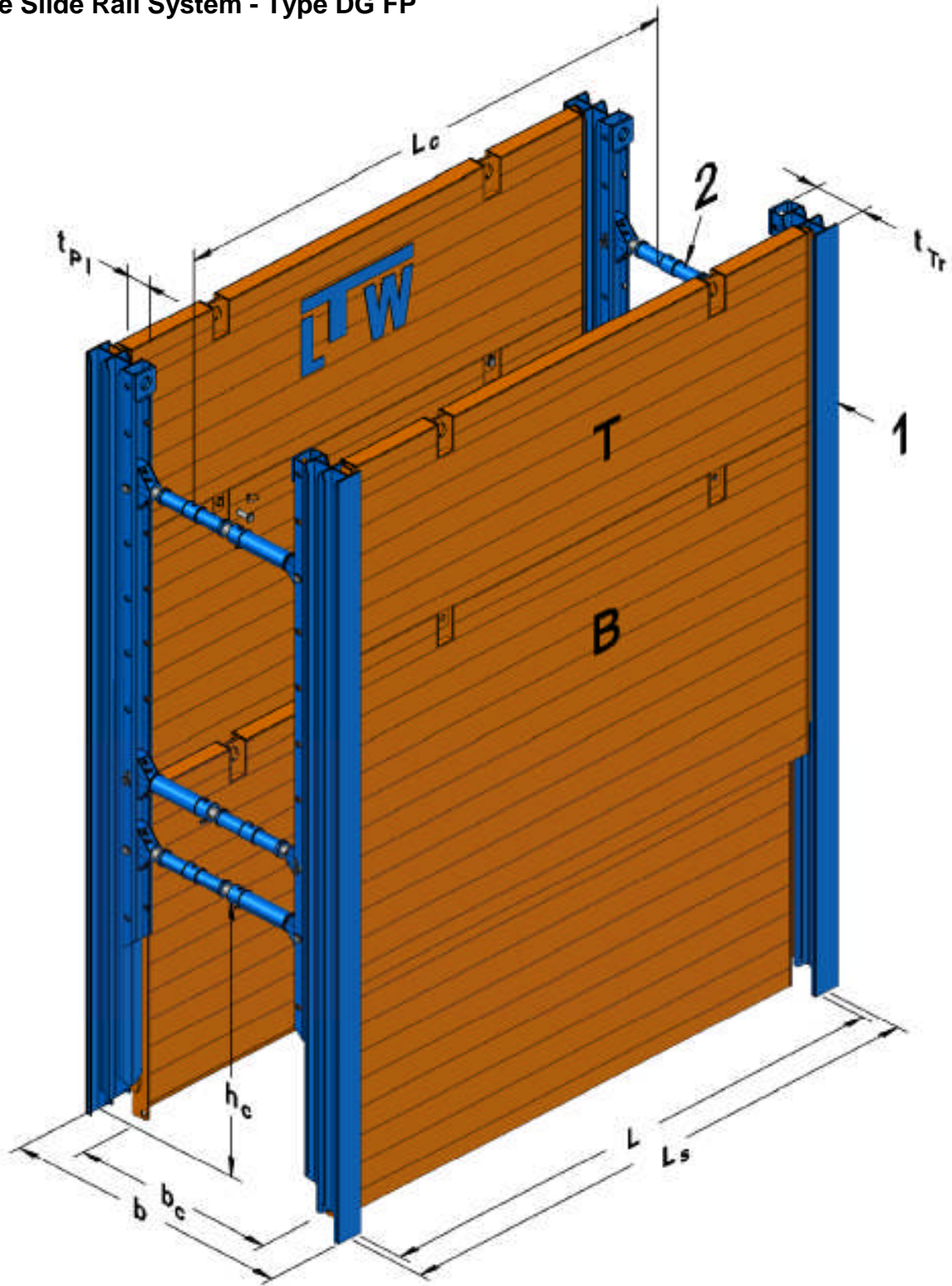
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LTW SLIDE RAIL SYSTEM - Type FP



System view

Double Slide Rail System - Type DG FP



- 1 Double Slide Rail
- 2 Standard Strut
- B Base Plate
- T Top Plate

- b Shoring Width
- b_c Inner Working Width
- t_{p1} Plate Thickness
- t_{tr} Rail Thickness

- h_c Pipe Culvert Height
- L Plate Length
- L_c Pipe Culvert Length
- L_s System Length



Technical Characteristics

SLIDE RAIL SHORING PLATES

Off-the-shelf, the Slide Rail Plates are designed - **VSI** -; e.g. Rails and Plates are **flush inside** (for use with in-situ ducts). On demand the plates can also be supplied - **VSA** -; e.g. Rails and plates are **flush outside** (for inner city shoring, allowing a straight blacktop cut.)

Plates VS 100

Plate length L [m]	Plate height H [m]	Plate thickness t_{PI} [mm]	Pipe culvert length L_c [m]	System length L_s [m]	Limit state design load e_d [kN / m ²]	Plate weight G_{PL} [kg]
2,00	2,40	100	2,03	2,15	171,6	510
	1,40					335
	1,60					370
2,50	2,40	100	2,53	2,65	110,4	605
	1,40					400
	1,60					440
3,00	2,40	100	2,95	3,07	81,1	690
	1,40					450
	1,60					500
3,50	2,40	100	3,53	3,65	56,6	805
	1,40					525
	1,60					580

Plates VS 120

Plate length L [m]	Plate height H [m]	Plate thickness t_{PI} [mm]	Pipe culvert length L_c [m]	System length L_s [m]	Limit state design load e_d [kN / m ²]	Plate weight G_{PL} [kg]
4,00	2,40	120	4,03	4,15	71,0	1170
	1,40					745
	1,60					835
4,50	2,40	120	4,53	4,65	56,2	1305
	1,40					830
	1,60					930
5,00	2,40	120	5,03	5,15	72,1	1635
	1,40					1020
	1,60					1150

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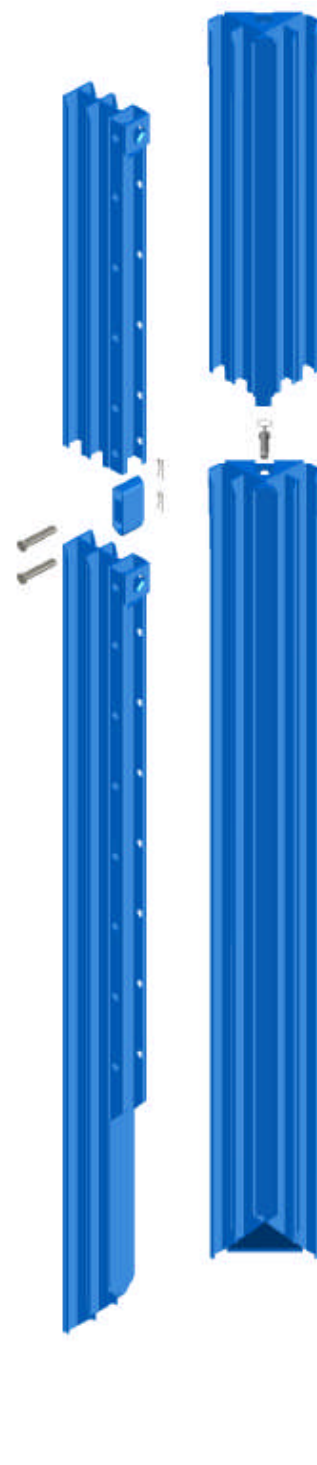


Single Slide Rail - Type EG FP

Description	Rail length [m]	Rail thickness t_{Tr} [mm]	Limit state design moment M_d [kNm]	Weight G_{Tr} [kg]
<i>EG FP</i>	3,00	252	156	180
<i>EG FP</i>	3,50			215
<i>EG FP</i>	4,00			245
<i>Corner - EG</i>	3,00	183	113	165
<i>Corner - EG</i>	3,50			195
<i>Corner - EG</i>	4,00			220

Double Slide Rail - Type DG FP

Description	Rail length [m]	Rail thickness t_{Tr} [mm]	Limit state design moment M_d [kNm]	Weight G_{Tr} [kg]
<i>DG FP</i>	4,50	402	328	415
<i>DG FP</i>	5,00			460
<i>DG FP</i>	5,50			510
<i>DG FP - A</i>	2,00			200
<i>Corner - DG</i>	4,50	273	324	475
<i>Corner - DG</i>	5,00			530
<i>Corner - DG</i>	5,50			580
<i>Corner Top DG</i>	2,00			235



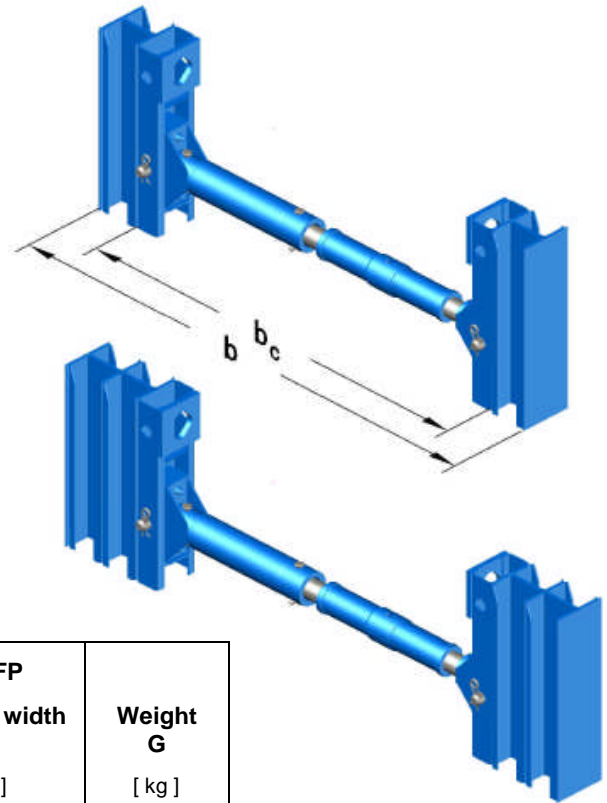
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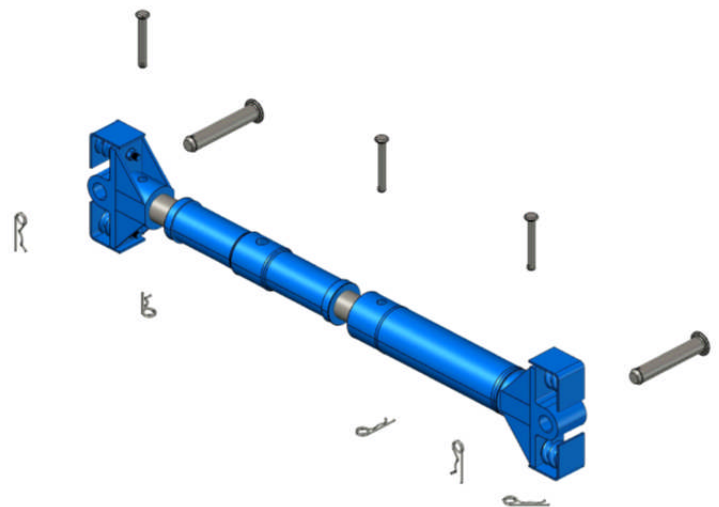
Standard Strut

A Strut unit consists of two spring mushrooms, the strut, and if required a brace extension.



Shoring Width

Brace Extension [m]	EG & DG FP Working width b_c [m]	EG FP Shoring width b [m]	DG FP Shoring width b [m]	Weight G [kg]
<i>without</i>	0,99 - 1,29	1,31 - 1,61	1,61 - 1,91	71,0
0,30	1,29 - 1,59	1,61 - 1,91	1,91 - 2,21	15,5
0,50	1,49 - 1,79	1,81 - 2,11	2,11 - 2,41	20,0
0,80	1,79 - 2,09	2,11 - 2,41	2,41 - 2,71	26,7
1,00	1,99 - 2,29	2,31 - 2,61	2,61 - 2,91	31,1
1,50	2,49 - 2,79	2,81 - 3,11	3,11 - 3,41	42,3
2,00	2,99 - 3,29	3,31 - 3,61	3,61 - 3,91	53,4
2,50	3,49 - 3,79	3,81 - 4,11	4,11 - 4,41	64,5



spring mushroom
standard Strut
brace extension

bolt $\varnothing 20 \times 148$ with locking clip
bolt $\varnothing 40 \times 226$ with locking clip

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Accessories

Description	Dimension	specified use for	Weight [kg]
bolt	Ø20 * 148	spindle and brace extension	0,4
bolt	Ø40 * 226	fixing the spring mushroom into C-Profile	2,3
locking clip	Ø5	to secure Bolts Ø20 *148 and Ø40 * 226	0,1
bolt	Ø40 * 128	connection Base and Extension Plates	1,4
bolt	Ø40 * 198	connection of Base and Ext. Corner Rails	2,2
locking clip [R]	Ø6	locking clip for connecting bolt Ø40 * 128 and Ø40 * 198	0,1
connector		connection between Base and Ext. DG-FP	6,8
Rail protector		protection of Rail-Top EG-FP	23
Rail Protector		protection of Rail-Top DG-FP	31
protection rail	L = 1800	for Plate length 2,00m	151
protection rail	L = 2300	for Plate length 2,50m	188
protection rail	L = 2500	for Plate length 3,00m	203
protection rail	L = 3300	for Plate length 3,50m	264
protection rail	L = 3800	for Plate length 4,00m	304
protection rail	L = 4300	for Plate length 4,50m	341
protection rail	L = 4800	for Plate length 5,00m	378

Tensile Forces

lifting eyes at the rail head

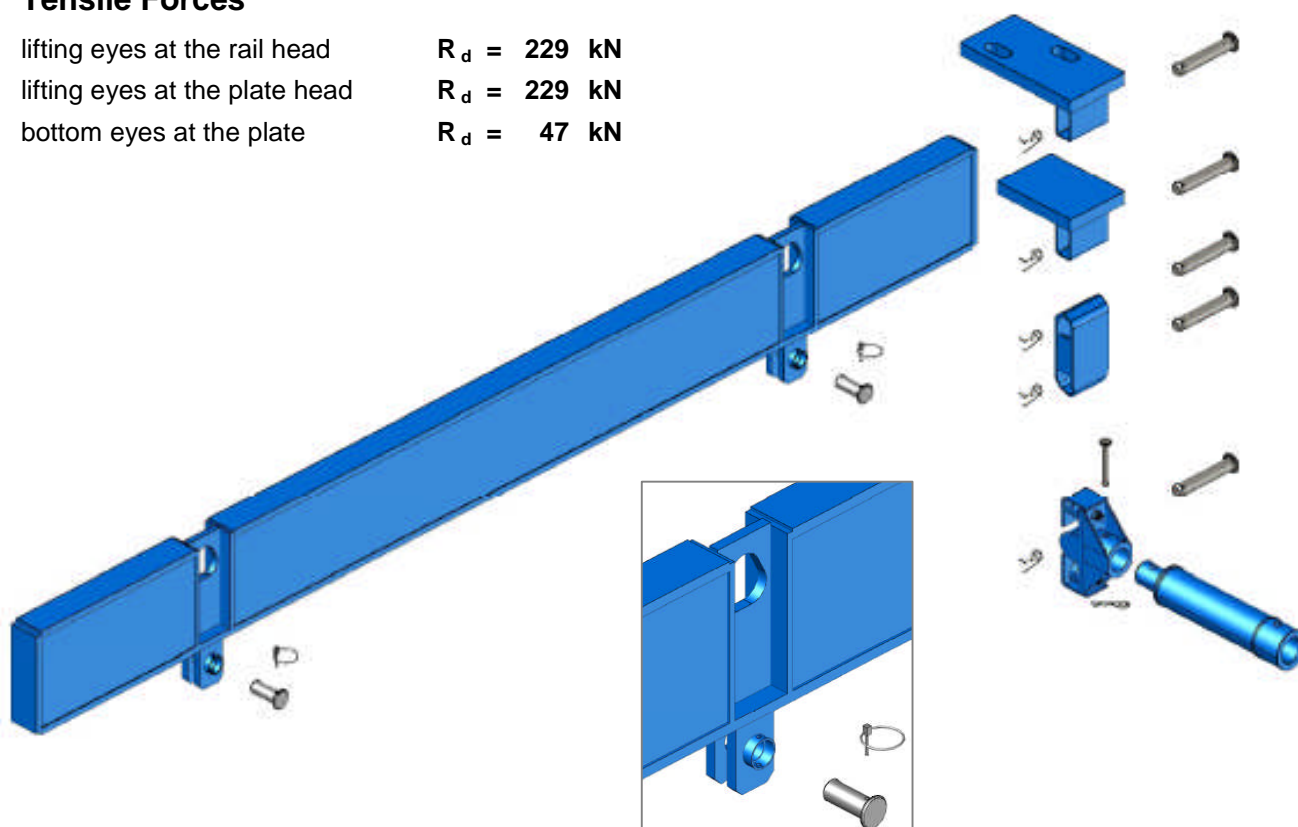
$$R_d = 229 \text{ kN}$$

lifting eyes at the plate head

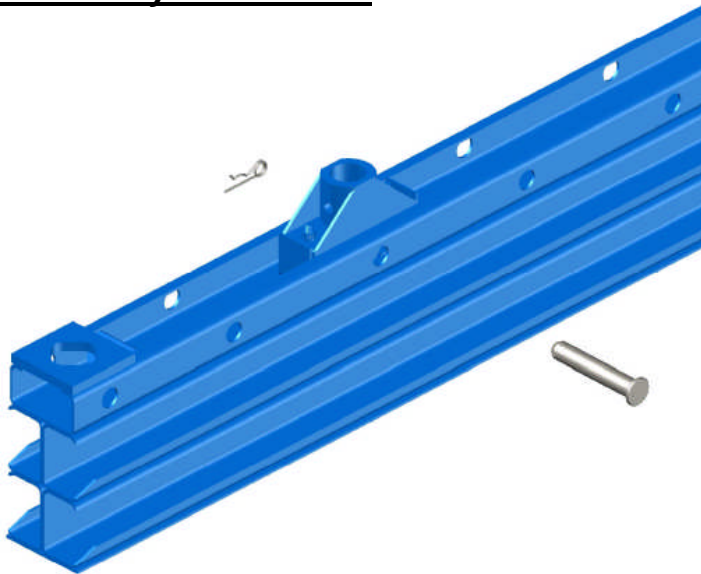
$$R_d = 229 \text{ kN}$$

bottom eyes at the plate

$$R_d = 47 \text{ kN}$$

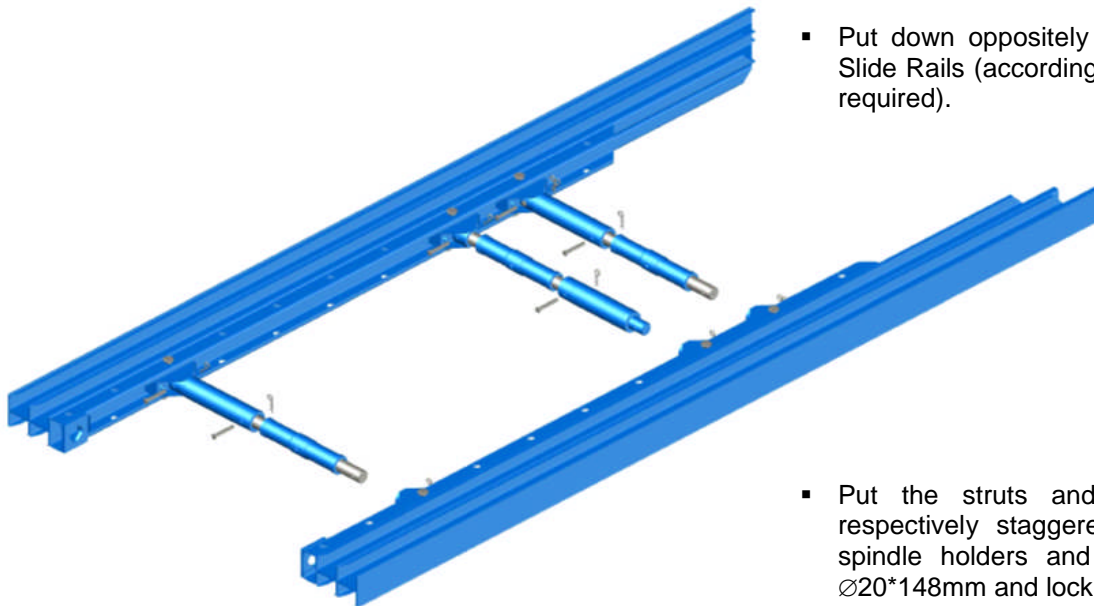


Assembly Instruction

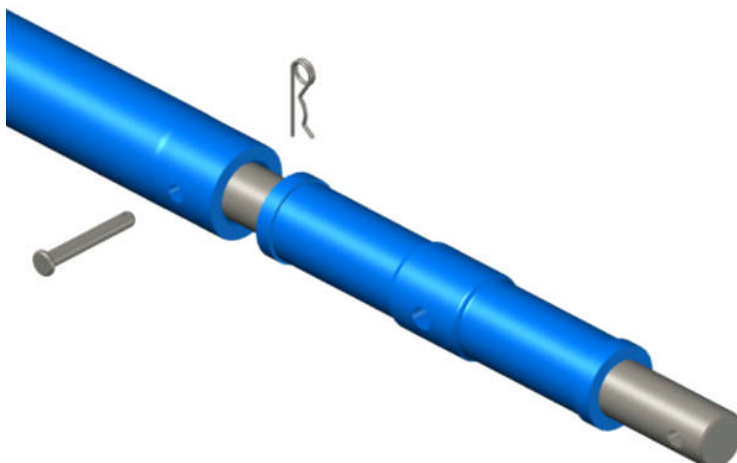


Slide Rail Frame

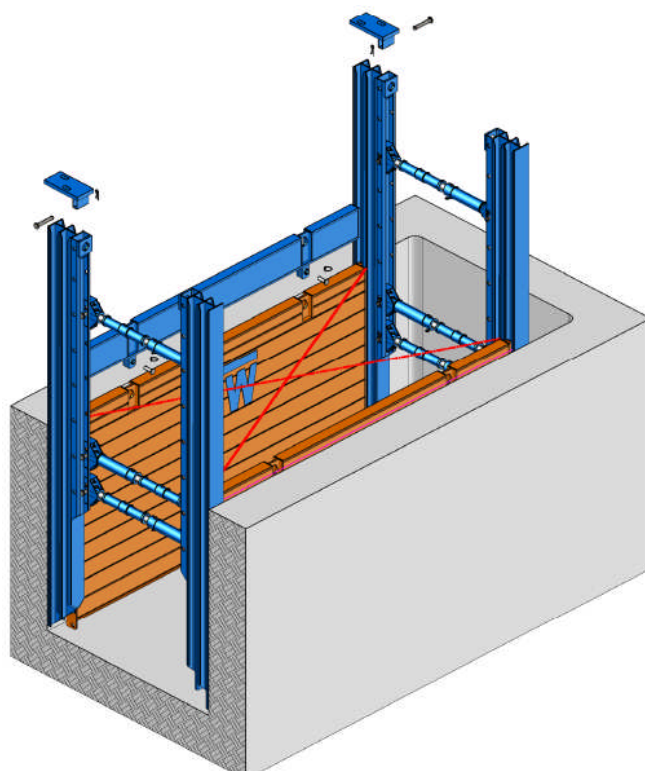
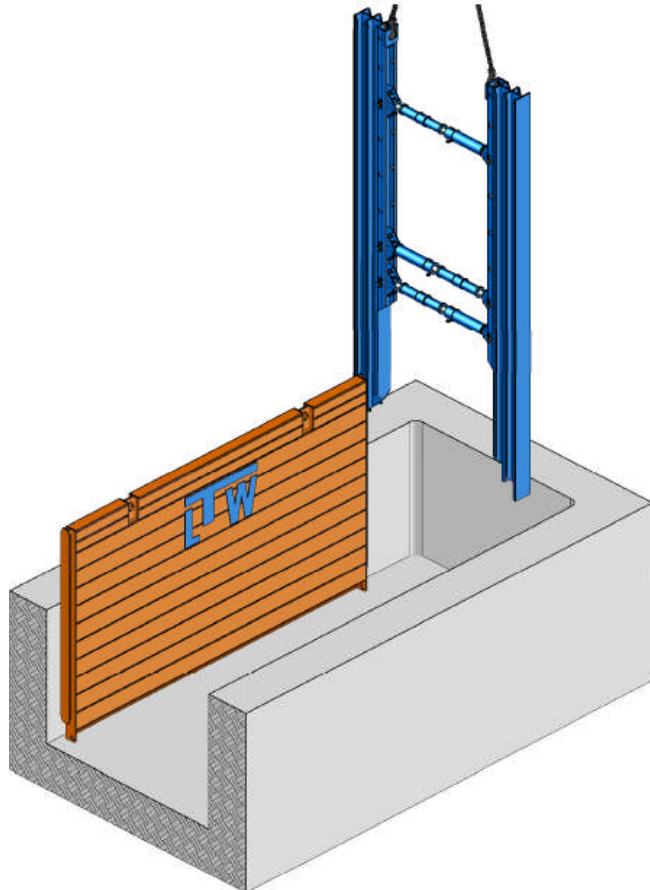
- place the Slide Rails with the guiding profile upwards onto a flat and firm ground
- depending on the required pipe culvert height, spring spindle holders (mushrooms) are placed into the guiding profile and secured with bolt $\varnothing 40 \times 226$ mm and locking clips.
- In accordance with the statical requirements the number of bottom spindles will be specified. From experience we know, that it is not necessary to assemble a second bottom spindle up to a Slide Rail Length of 4,50m.
- **Release the nuts to expand the spring holder!**
- Put down oppositely the pre-assembled Slide Rails (according to the trench width required).



- Put the struts and extension pipes, respectively staggered, into the spring spindle holders and secure with bolts $\varnothing 20 \times 148$ mm and locking clips.
- Per strut unit brace extensions up to a maximum lengths of 3,00m can be used.
- Lift the second pre-assembled Slide Rail carefully above the first one, so that the spring spindle holder align with the struts assemblies. Secure it with bolts and clips.
- Adjust the struts to the desired trench width (fine adjustment).
- **Take care to ensure that the lower struts are adjusted 4-5cm wider than the top one. You must achieve an "A" position.**

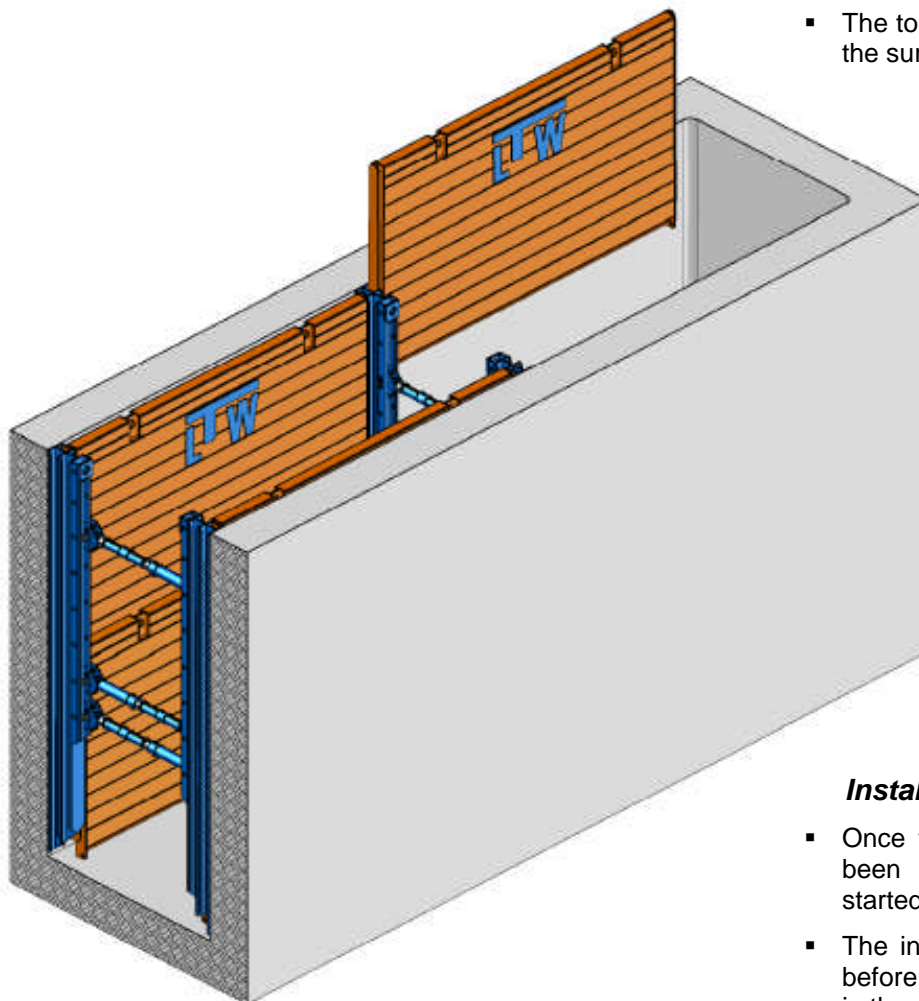


Installation Instruction



- To protect the shoring plates and ensure a long life cycle we recommend the use of protection rails.
- Pre-Excavation max. 1,25m and not more than one shoring length. In principle the pre-excavation complies with the type of soil and safety regulations.
- Connect the lifting hocks to the first Base Plate, place it into the pre-excavated trench, push in and secure it.
- Pick up the pre-assembled Slide Rail Frame with an appropriate lifting device, raise it over the Base panel and insert the **outer guidance** over the side part (T-Section) of the Panel. Press the Slide Rail Frame carefully into the ground.
- Insert the second shoring plate in the **outer guidance** of the other Slide Rail, align it diagonal and press it carefully in the ground.
- Ropes can be connected to the eyes at the cutting edge in order to provide better handling of the plates.
- Now the second pre-assembled Slide Rail Frame is guided over the **outer guidance** and pushed into the soil.
- Fill the gap between the trench walls and the inserted shoring unit !
- Excavate about further 0,50m in between the plates press in by turns the slide rails, the Shoring Frame and the Plates.
- **For security reasons it is not allowed to push on the Brace Extensions.**
- At this stage the trench must not be entered!
- As smaller the steps of excavation are carried out, as better for the shoring. Do not press more than 50cm on one side. The spindle assemblies have a maximum of $\pm 8^\circ$ vertical movement available.

- When the top of the externally guided plate has reached the top ground surface, the system will be extended by using a top plate (outer guidance) or by mounting another Base Plate in the **inner guidance**.
- Connect the Base and Top plates with the Connecting Bolts $\varnothing 40 \times 128\text{mm}$ and the [R] locking clips.
- Excavate about further 0,50m in between the plates press in by turns the slide rails, the Shoring Frame and the Plates.
- The step-by-step installation has to be continued, until the trench has reached the desired trench depth.
- If required, the Base Rail can be extended with a Top Rail. Connect the Top Rail with a rail connector and secure with Bolts $\varnothing 40 \times 226\text{mm}$ and locking clips.
- The top edge of the shoring must overtop the surrounding terrain by at least 5cm.



Installation of the next shoring unit

- Once the foregoing shoring section has been installed to full depth, it can be started with the next shoring unit.
- The installation is effected as described before - with the installation of the Plates in the **outer** guidance.
- The Plate distance has to be checked for every new shoring bay!



Re-Installation

After completion of the Pipe laying the re-installation of the shoring can be effected.

According to compacting possibilities bring in 0,50m filling material. Start lifting the inner plates by the filled height. Finally compact the backfill.

As smaller the lifting steps as better for the shoring! Do not lift more than 0,50m to one side and not exceed the $\pm 8^\circ$ limitation on horizontal movement of the spindle assemblies.

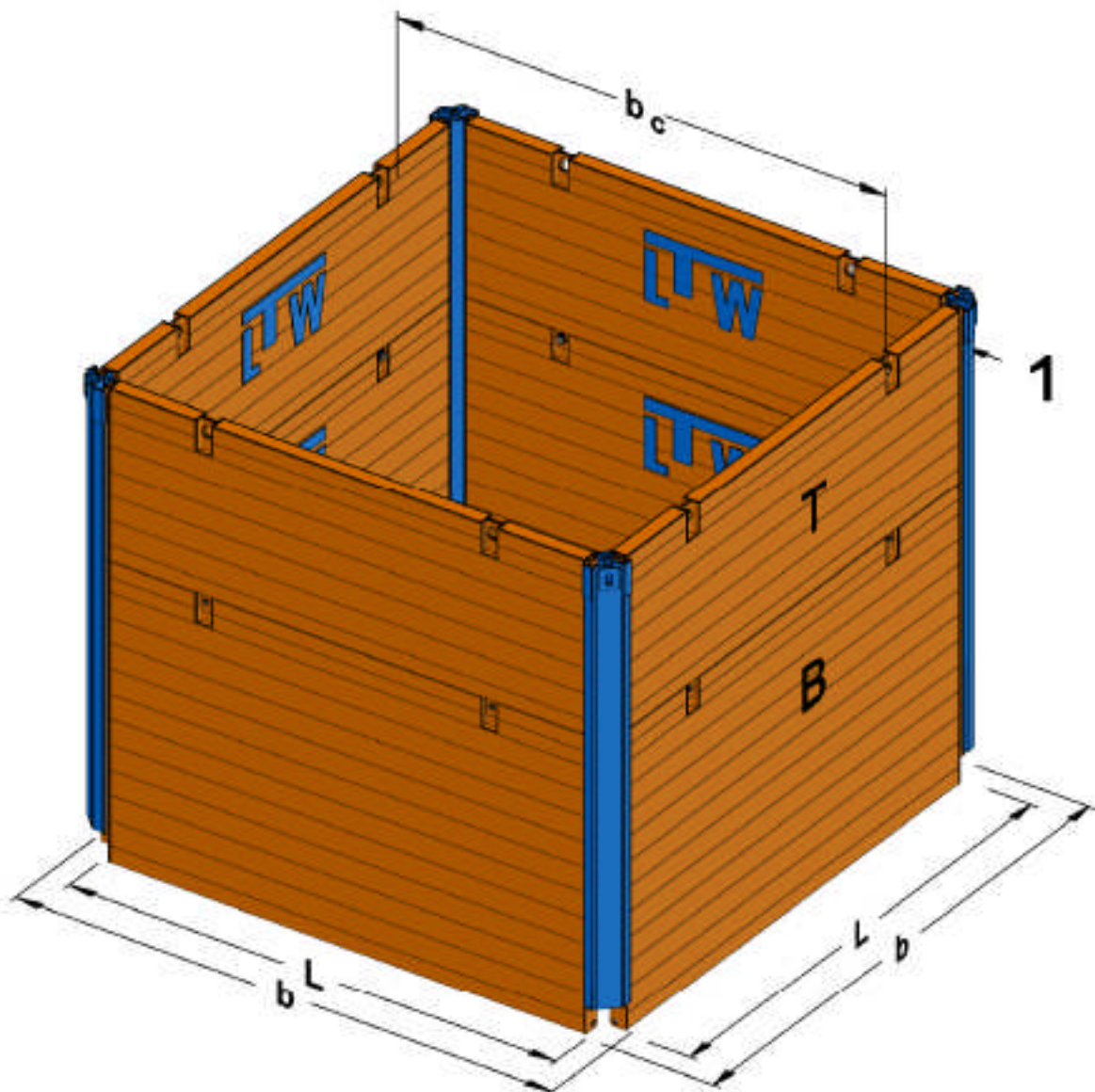
Repeat the procedure as described until the shoring can be lifted out of the trench according to the safety regulations.

Only use the corresponding lifting eyes for lifting! It is not allowed to lift at the struts or brace extensions!

It is prohibited to stand within the pivoting range of the excavator or crane and beneath suspended loads.

Pits

Corner Single Slide Rails



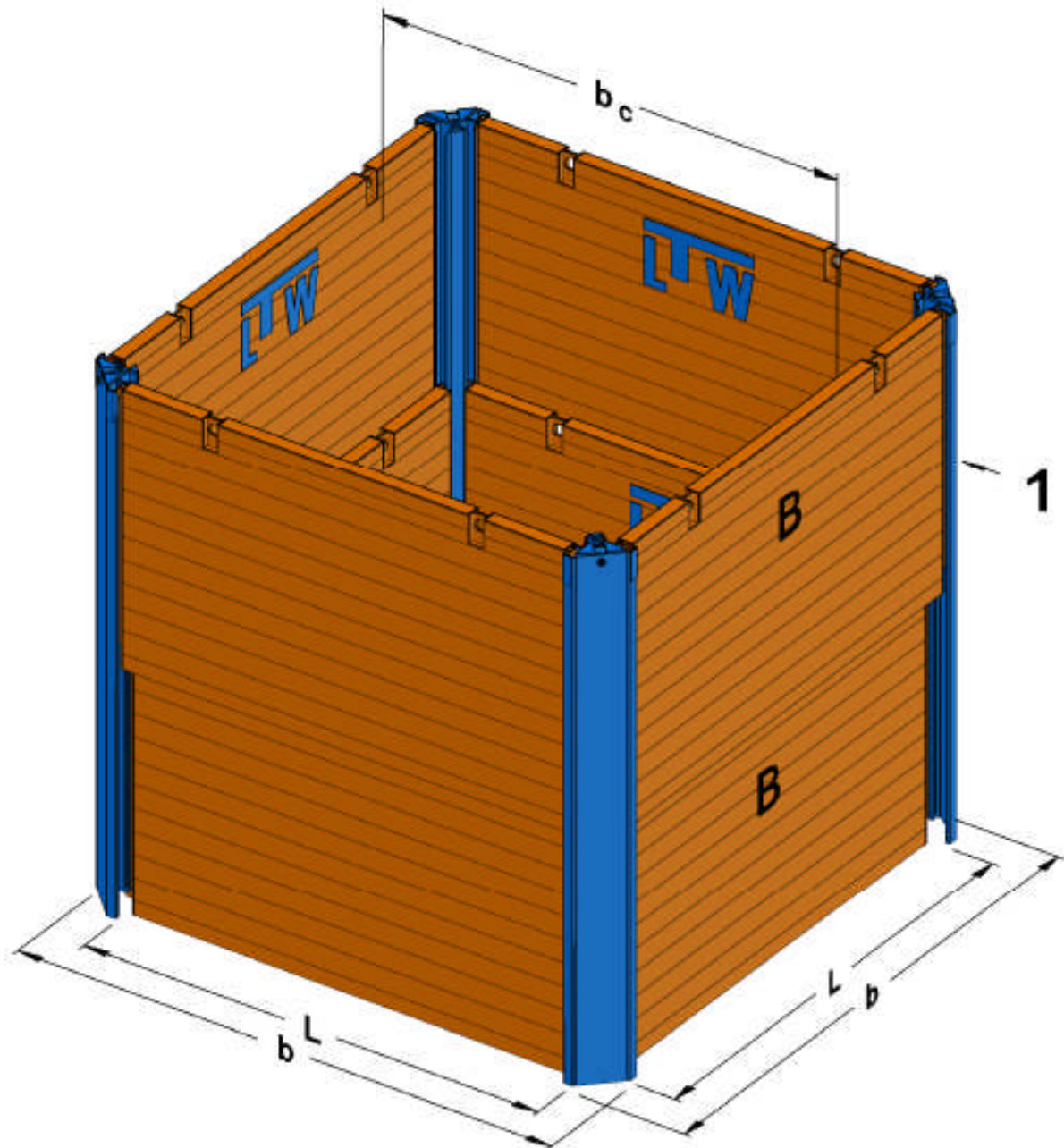
1 Corner slide rail EG
B Base Plate

T Top Plate
b Shoring Width

b_c Inner Working Width
L Plate Length

Pits

Corner Double Slide Rails

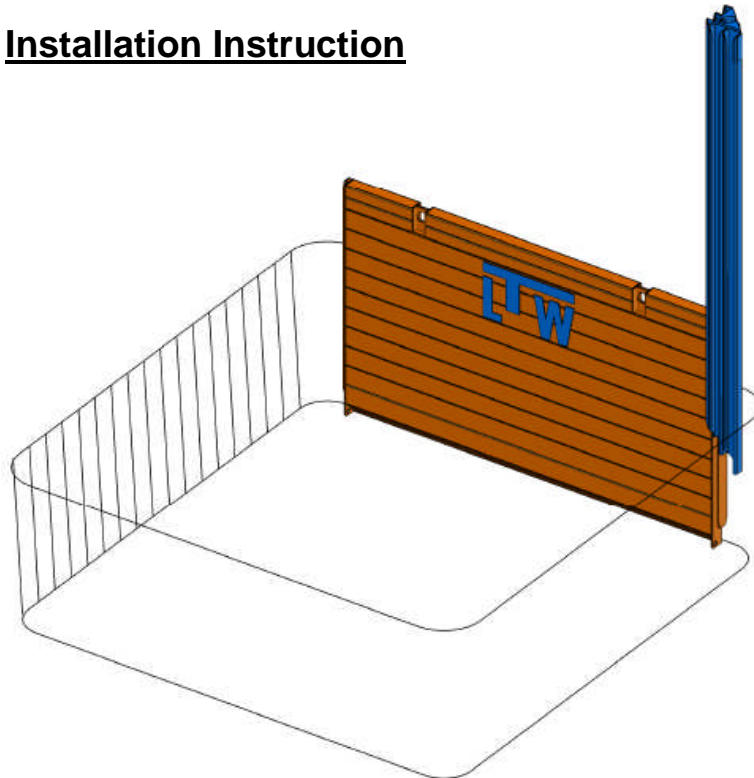


1 Corner slide rail DG
B Base Plate

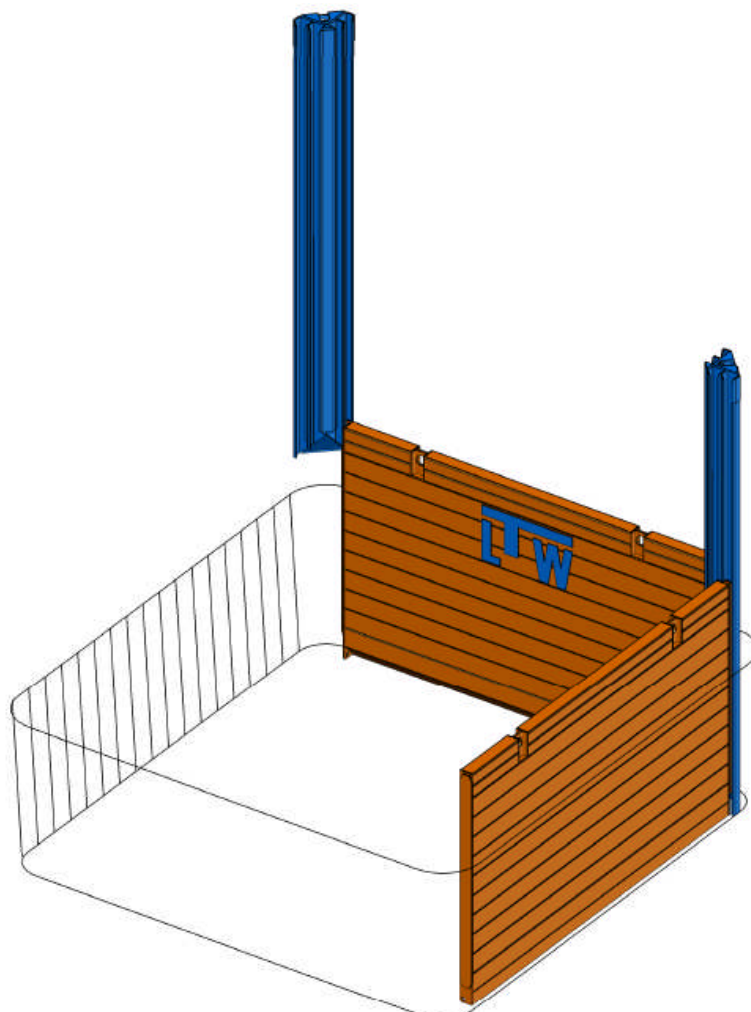
T Top Plate
b Shoring Width

b_c Inner Working Width
L Plate Length

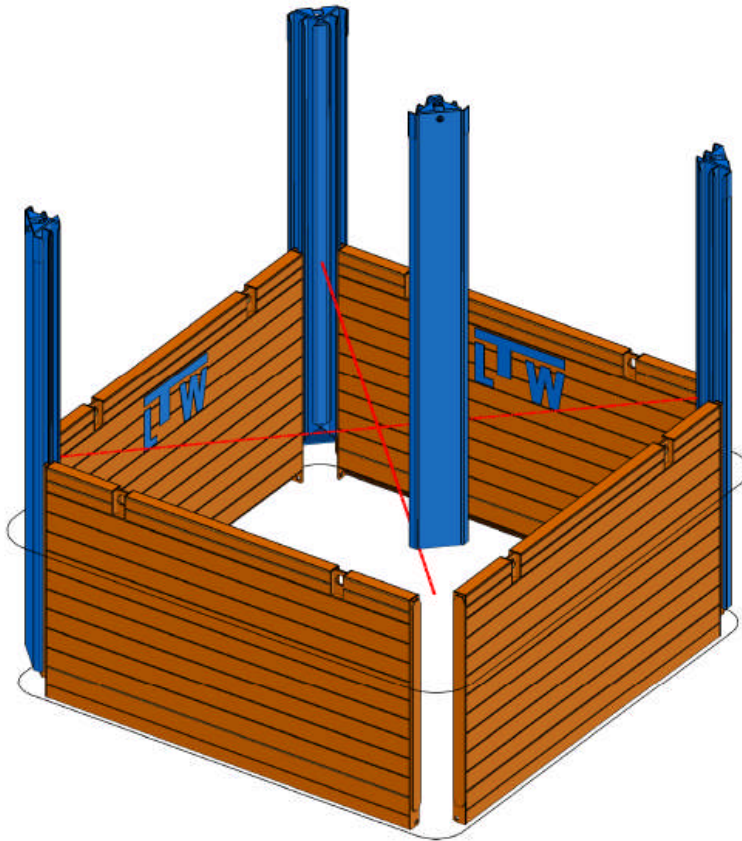
Installation Instruction



- Pre-Excavation of max. 1,25m and approx. 10cm wider than the pit will be. In principle the pre-excavation complies with the type of soil and safety regulations.
- Connect the lifting hocks to the first Base Panel, place it into the pre-excavated trench, push in and secure it.
- Pick up the 1. Corner Slide Rail with an appropriate lifting device, raise it over the Base panel and insert the **outer guidance** over the side part (T-Section) of the Panel. Press the Slide Rail Frame carefully into the ground.
- At this stage the trench must not be entered!



- Mount the second plate in the free **outer guidance** of the Corner Slide Rail and align rectangular.
- The 2. Corner Slide Rail is now guided with the **outer guidance** over the side part (T-Section) of the already installed Panel. The further installation is effected as described before, until all 4 Plates had been installed.



- The 4. Corner Slide Rail is now guided over the two free side parts (T-Sections) of the plates. The perfect distances between the two free side parts should be ~8cm using the Corner Single Slide Rail System and ~30cm using the Corner Double Slide Rail System.
- Pre-excavate about another 50cm and push in Rails and Plates by turn.
- Fill the gap between the trench walls and the inserted shoring!
- To protect the shoring plates and ensure a long life cycle we recommend the use of protection rails.
- When the top of the externally guided plate has reached the top ground surface, the system will be extended by using a top plate (outer guidance) or by mounting another Base Plate in the **inner guidance**.
- Connect the Base and Top Plates with the Connecting Bolts $\varnothing 40 \times 128\text{mm}$ and the [R] locking clips.
- The step-by-step installation has to be continued, until the trench has reached the desired trench depth.
- For trench depths greater than the length of the Base Rail, Top Rails have to be used. Base and Top Rails are connected with the Connection Bolt $\varnothing 40 \times 198\text{mm}$ and the [R] locking clip.
- The top edge of the shoring must overtop the surrounding terrain by at least 5cm.